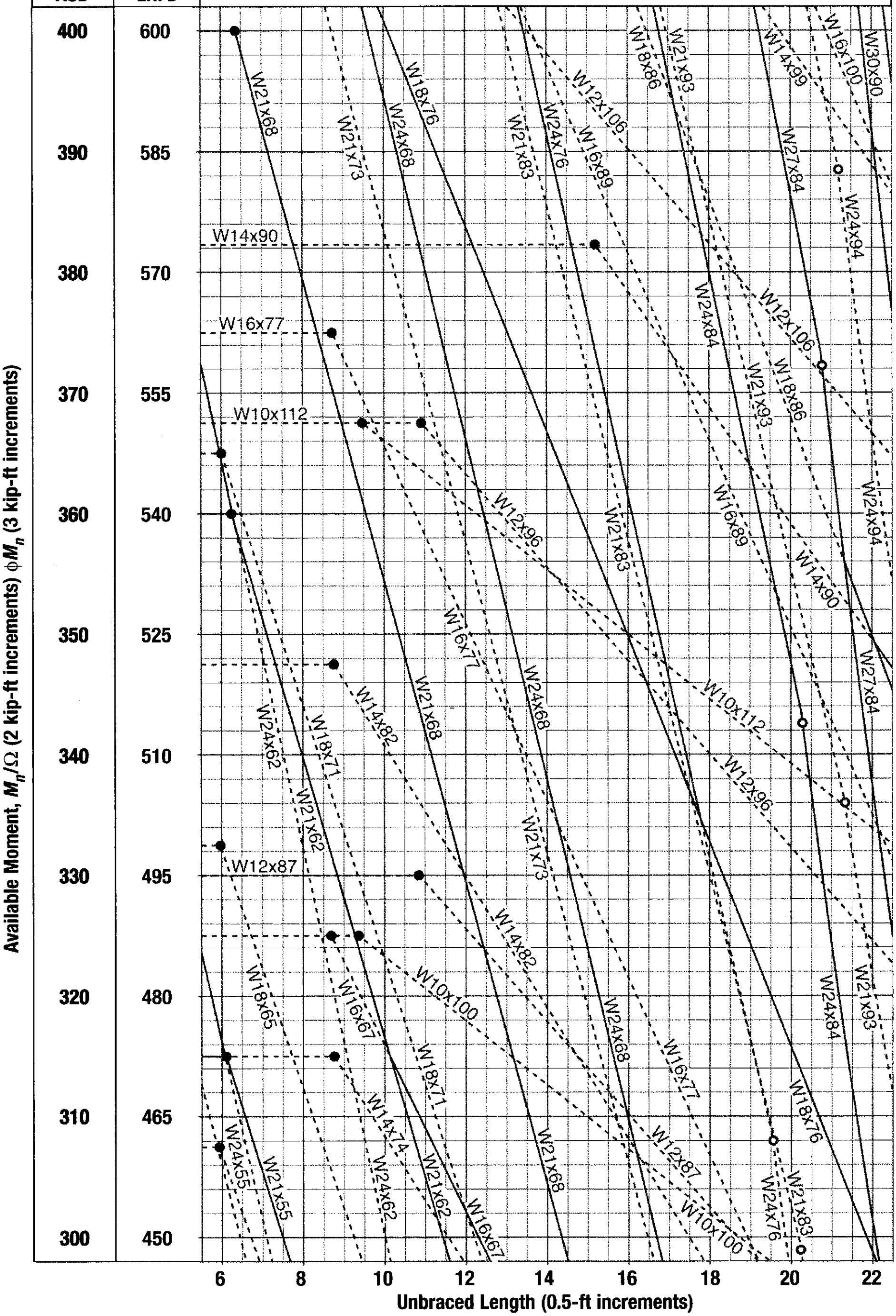
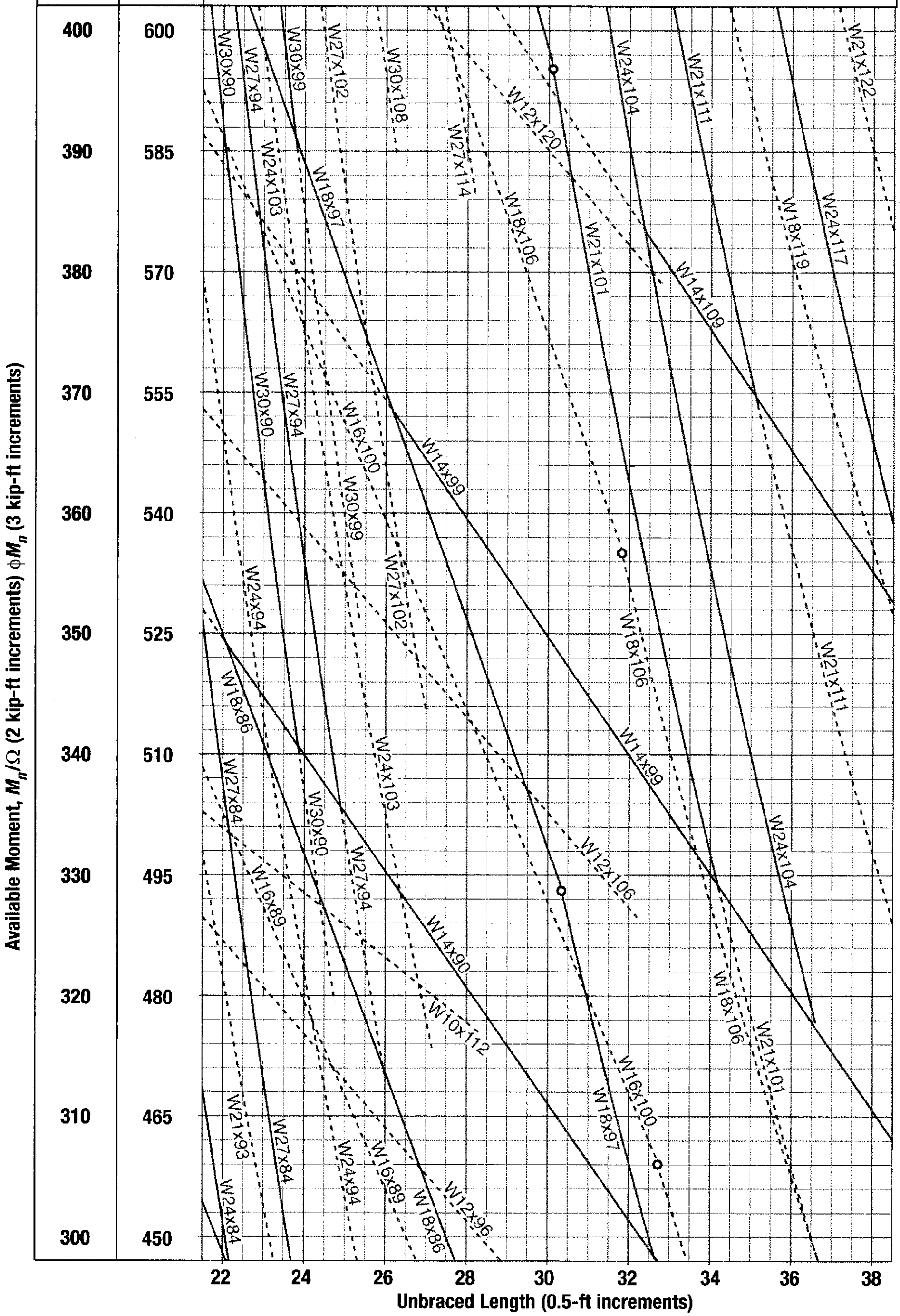
F_y = 50 ksi C_b = 1	
M_n/Ω	ϕM_n
kip-ft	kip-ft
ASD	LRFD

Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length

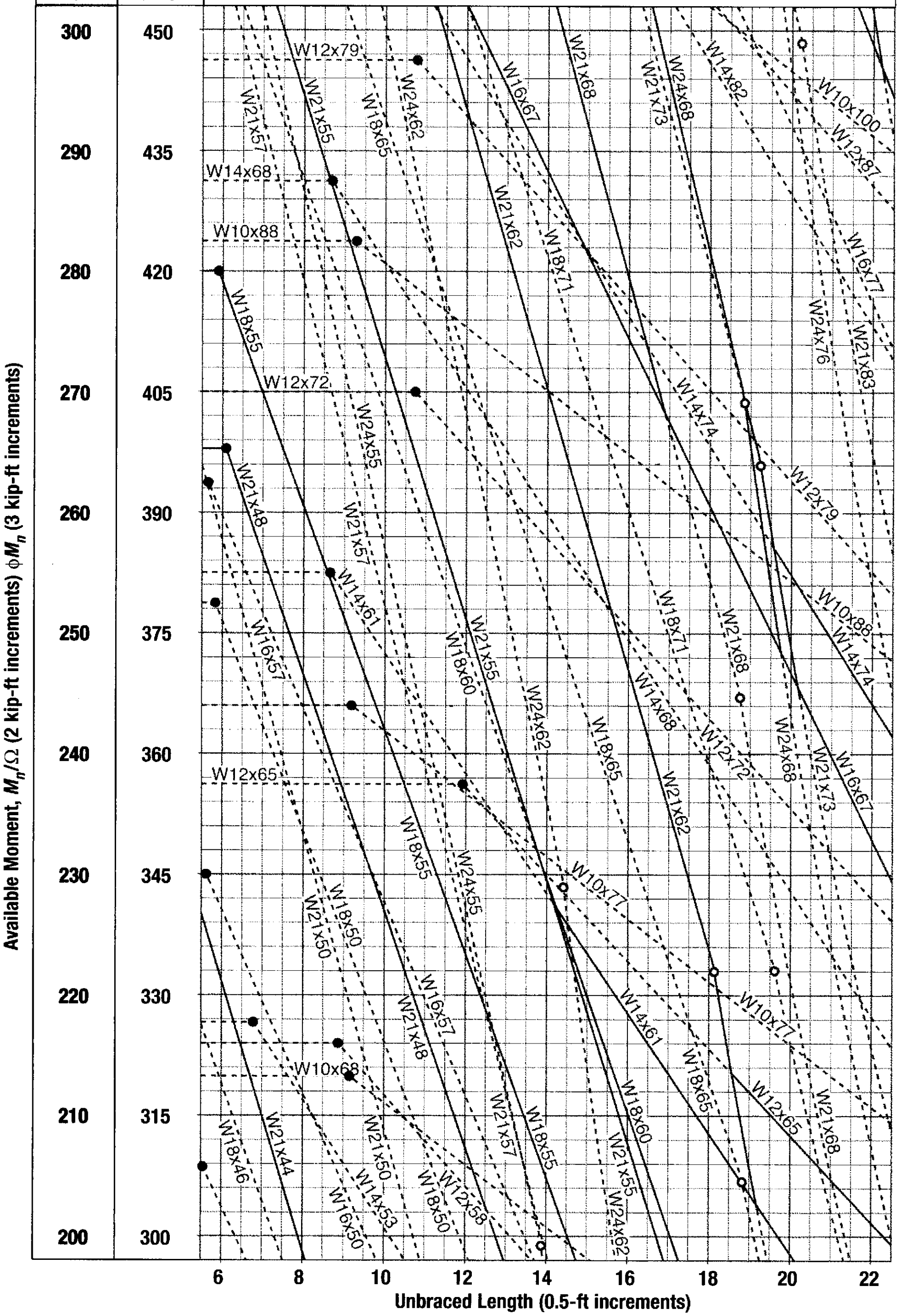


F_y = 50 ksi C_b = 1	
M_n/Ω	ϕM_n
kip-ft	kip-ft
ASD	LRFD

Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length



F_y = 50 ksi C_b = 1		**Table 3–10 (continued)** **W Shapes** **Available Moment vs. Unbraced Length**
M_n/Ω	ϕM_n	
kip-ft	kip-ft	
ASD	LRFD	



F_y = 50 ksi
C_b = 1

Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length

M_n/Ω	ϕM_n
kip-ft	kip-ft
ASD	LRFD

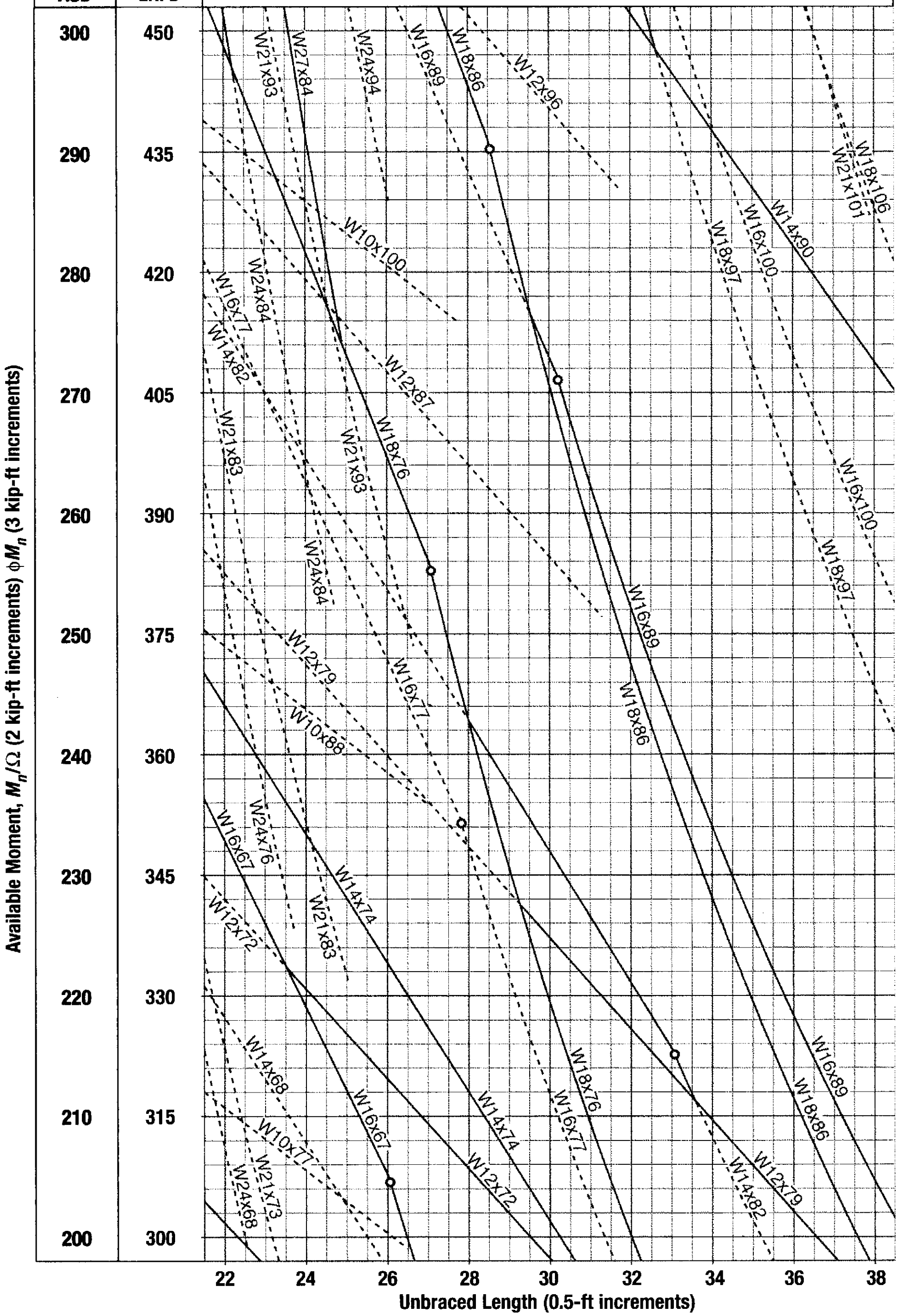
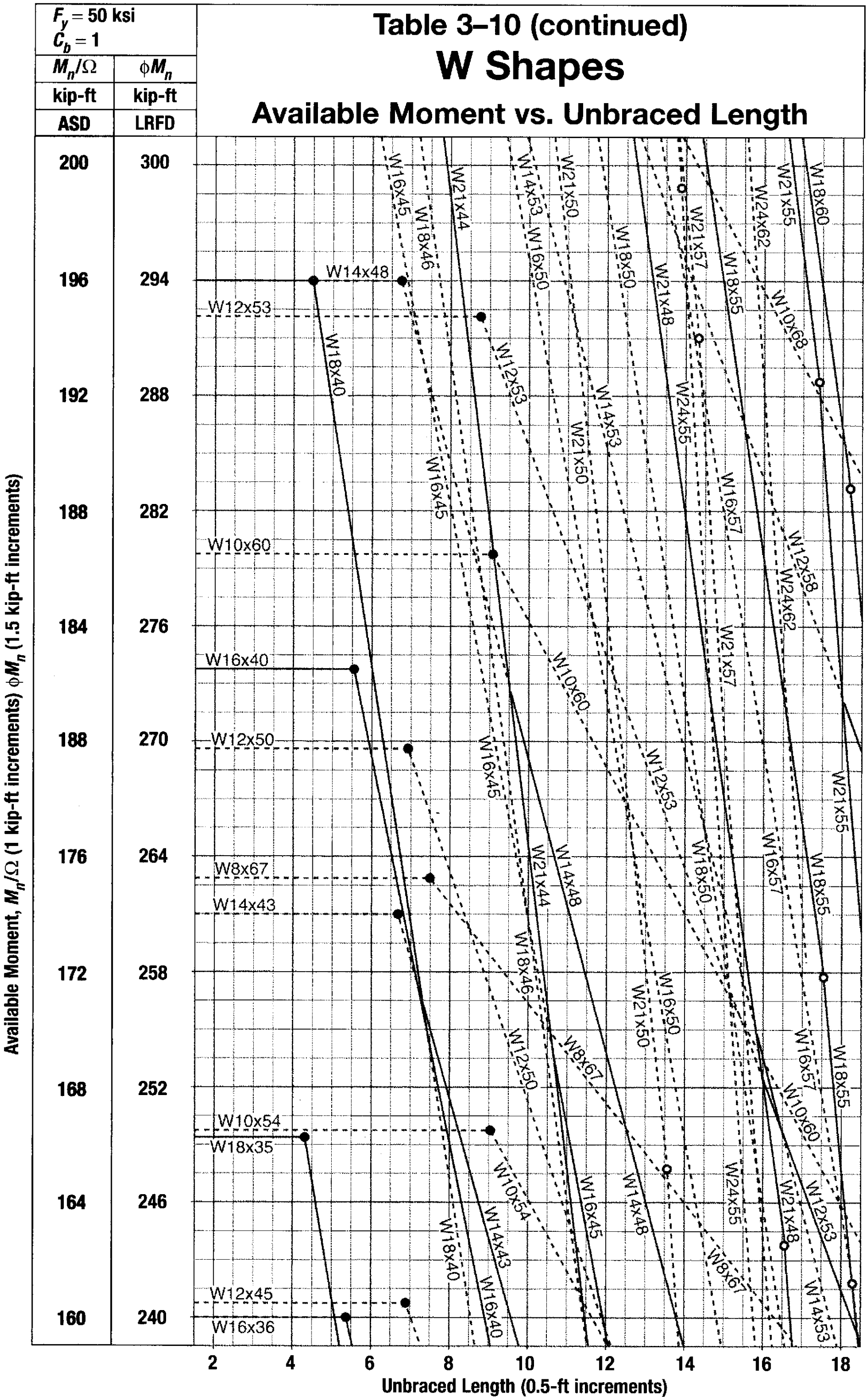
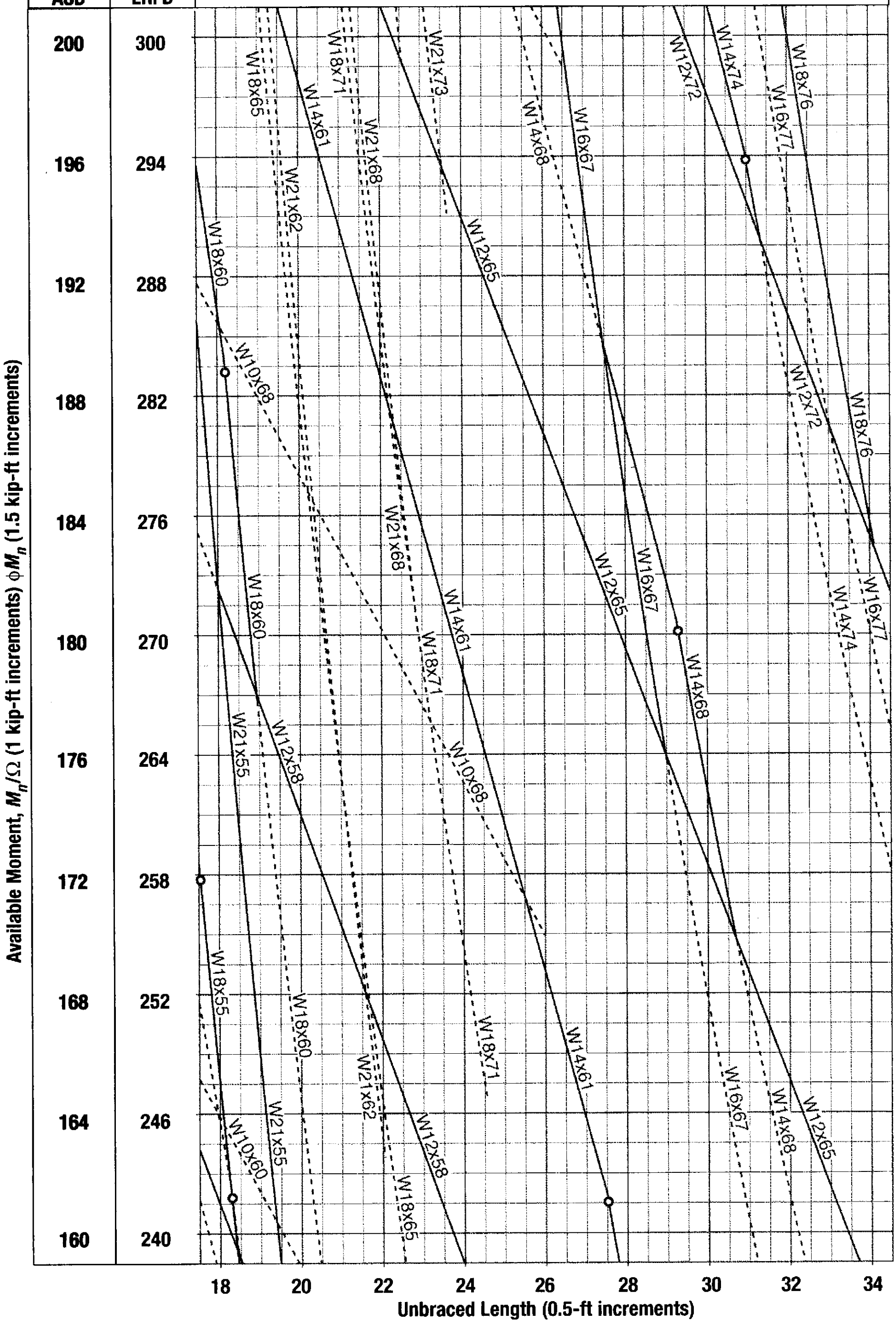


Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length



F_y = 50 ksi C_b = 1	
M_n/Ω	ϕM_n
kip-ft	kip-ft
ASD	LRFD

Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length



$F_y = 50$ ksi
$C_b = 1$

M_n/Ω	ϕM_n
kip-ft	kip-ft
ASD	LRFD

Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length

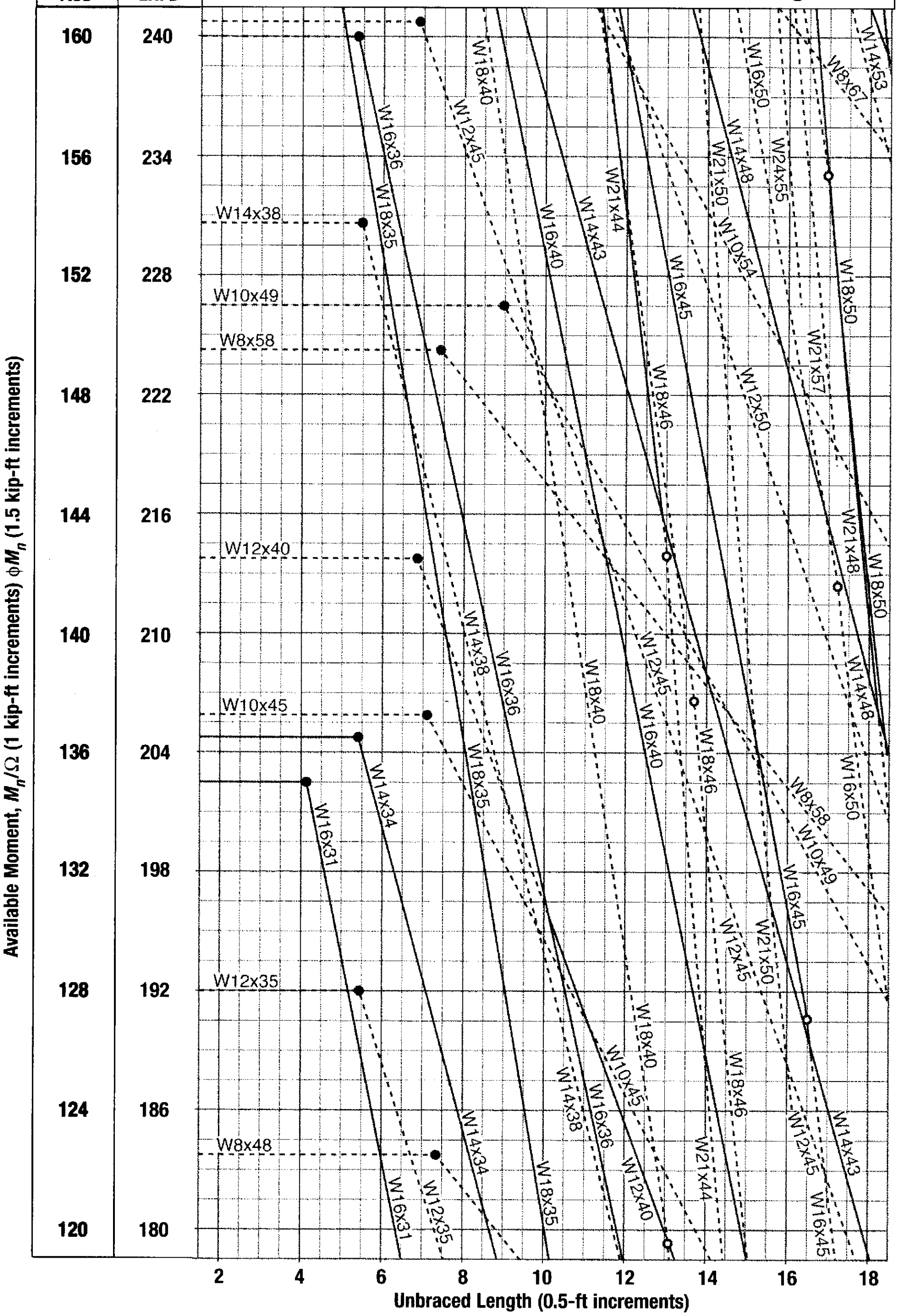


Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length

F_y = 50 ksi
C_b = 1

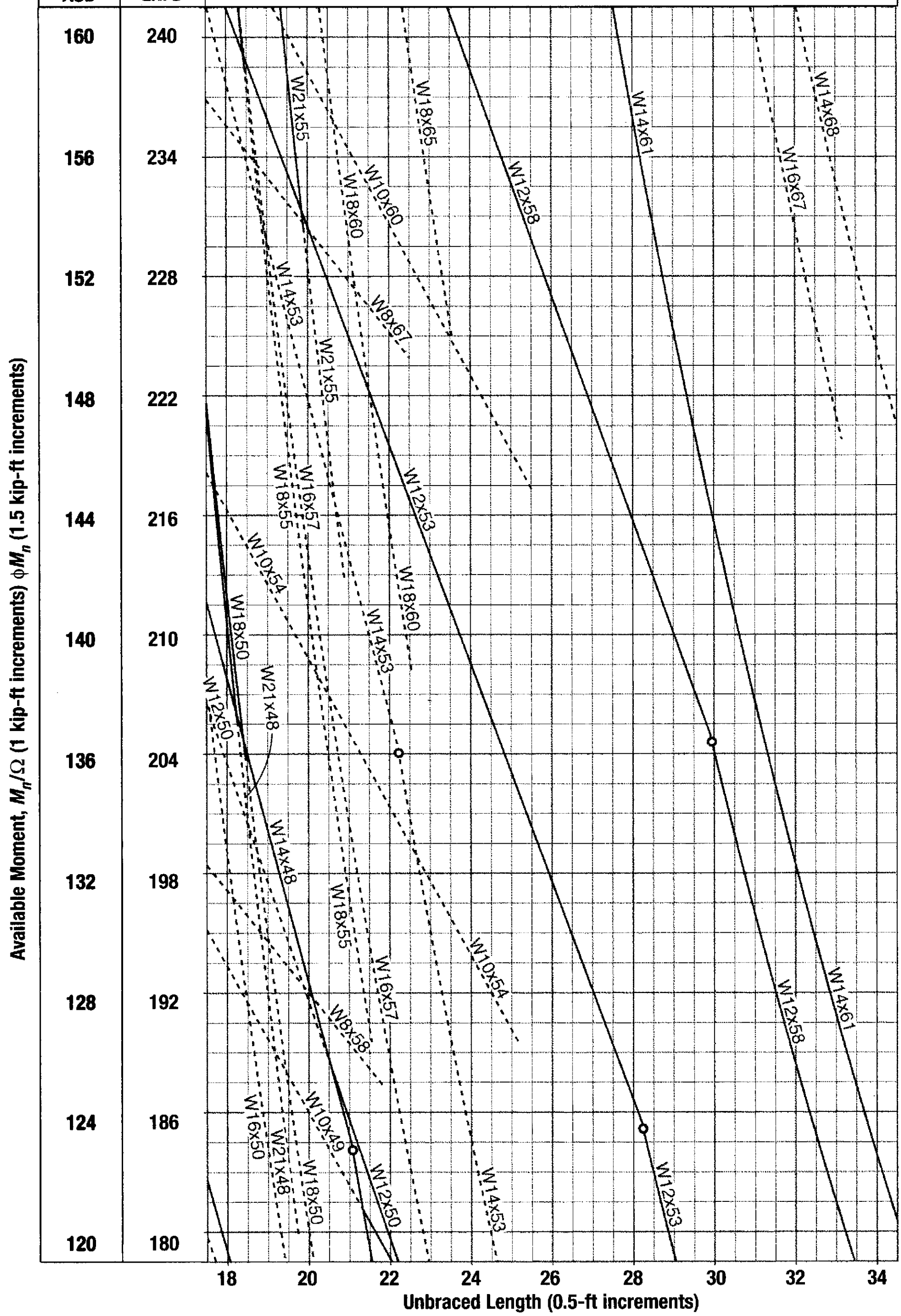
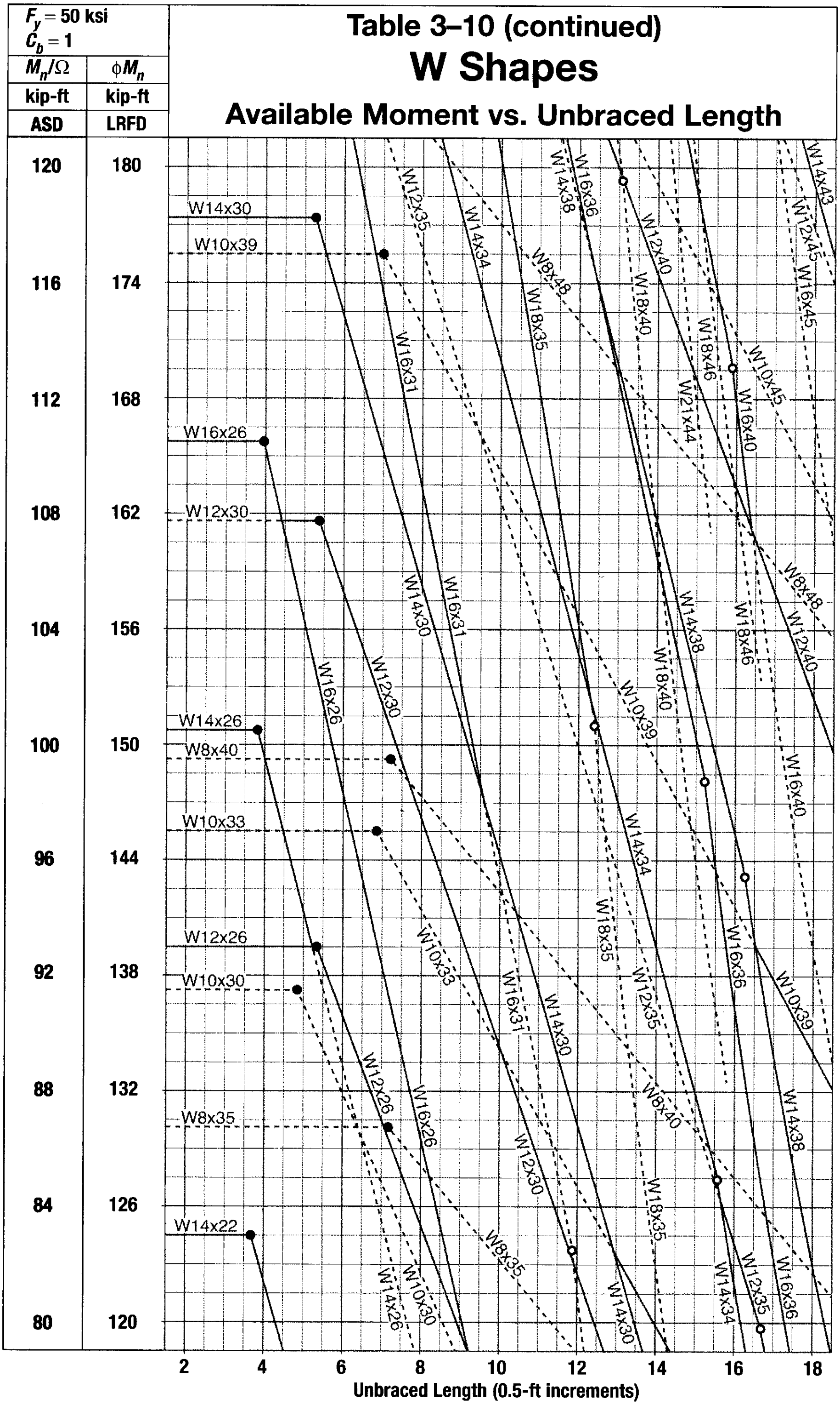
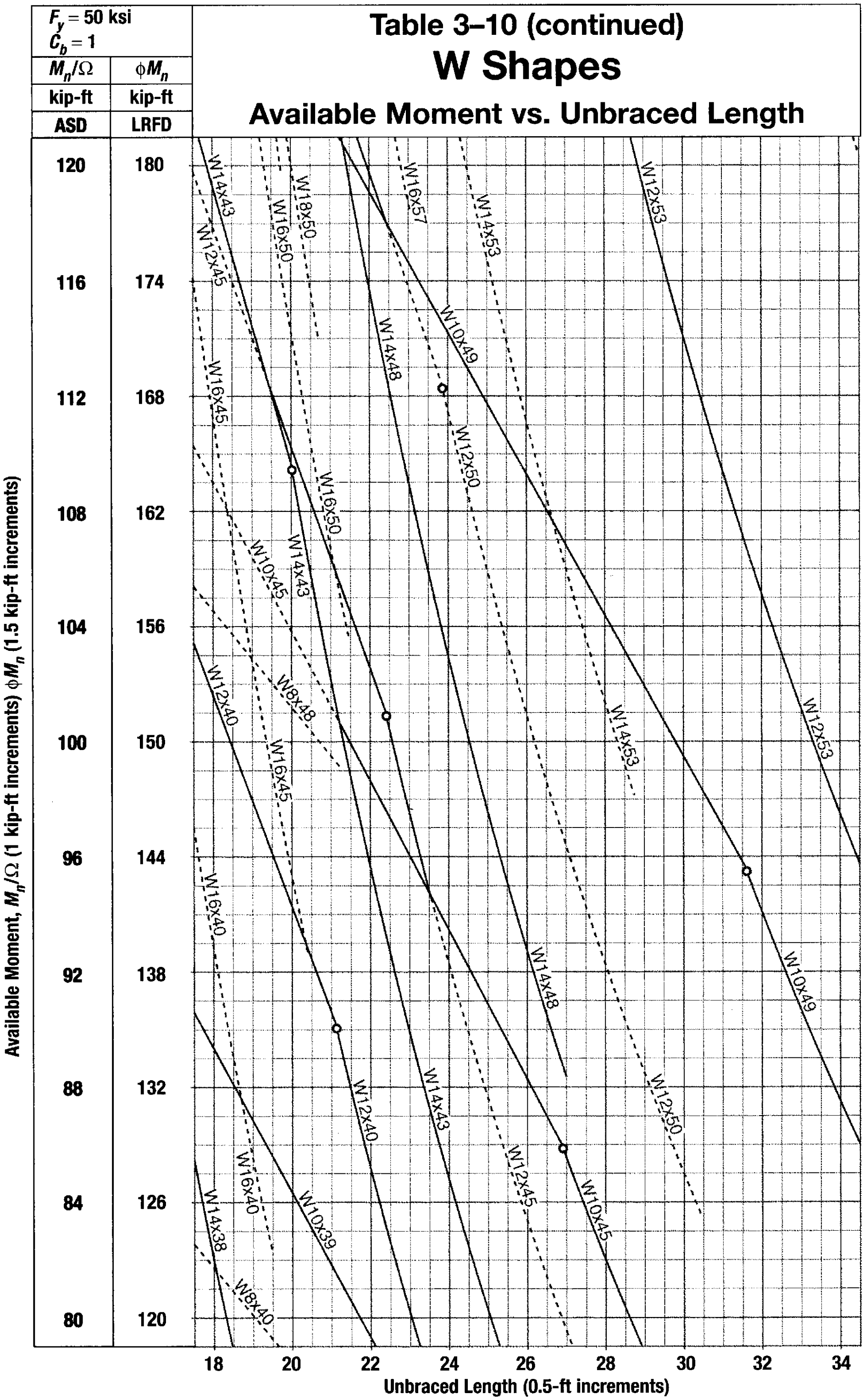


Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length



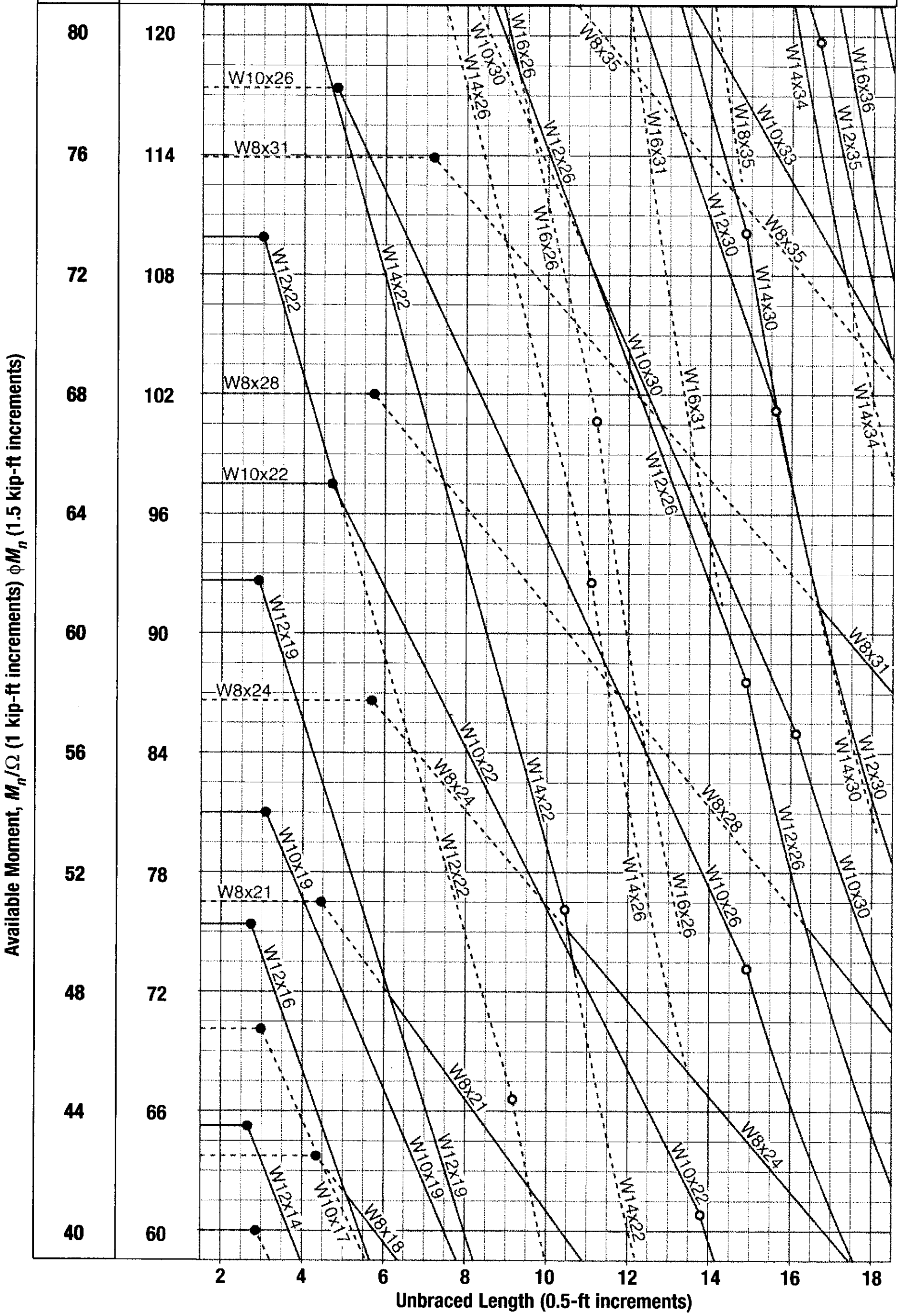
F_y = 50 ksi
C_b = 1

Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length



F_y = 50 ksi C_b = 1		
M_n/Ω	ϕM_n	
kip-ft	kip-ft	
ASD	LRFD	

Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length



F_y = 50 ksi C_b = 1		**Table 3–10 (continued)**
M_n/Ω	ϕM_n	**W Shapes**
kip-ft	kip-ft	
ASD	LRFD	**Available Moment vs. Unbraced Length**

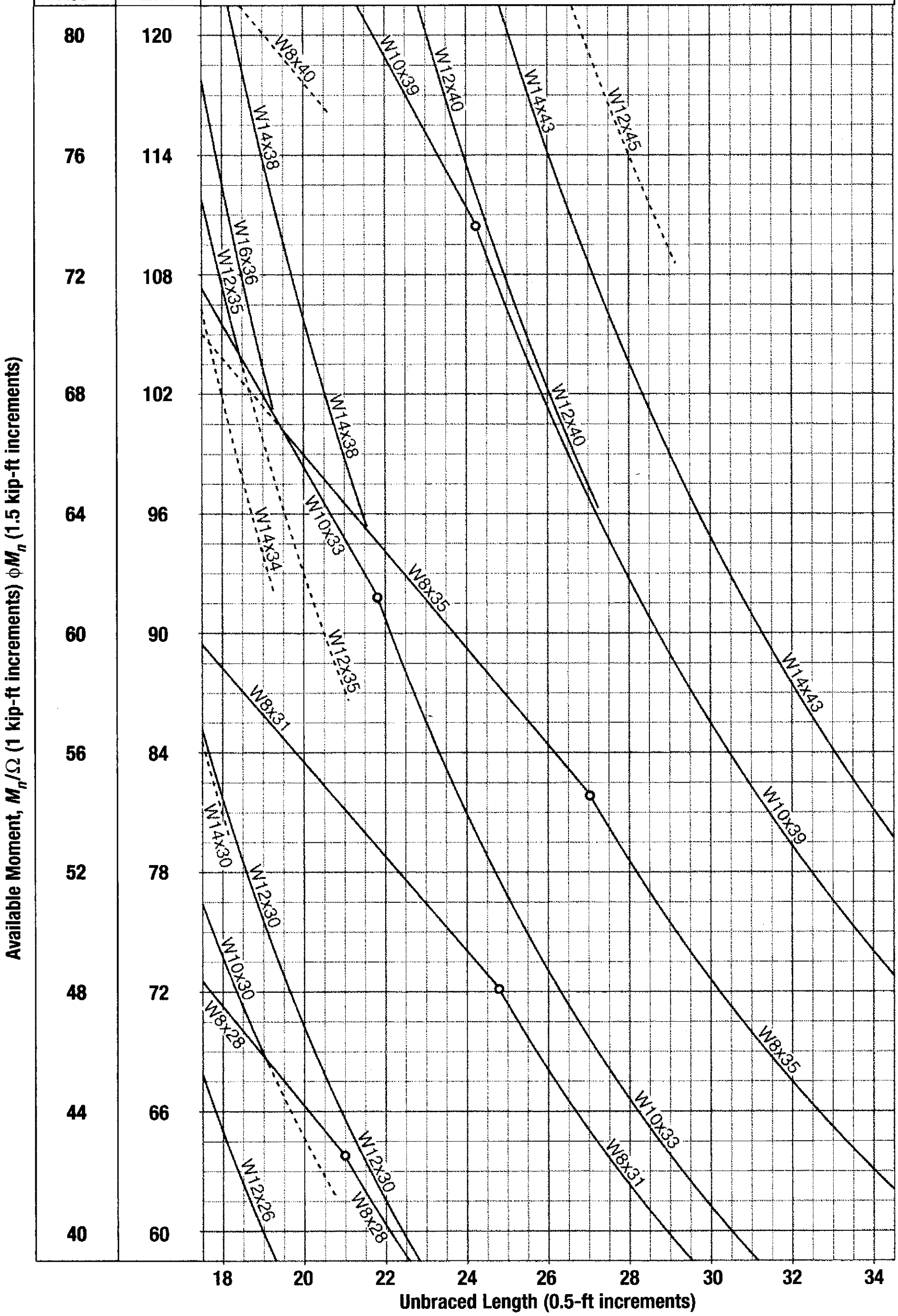


Table 3–10 (continued)
W Shapes
Available Moment vs. Unbraced Length

$F_y = 50$ ksi
$C_b = 1$

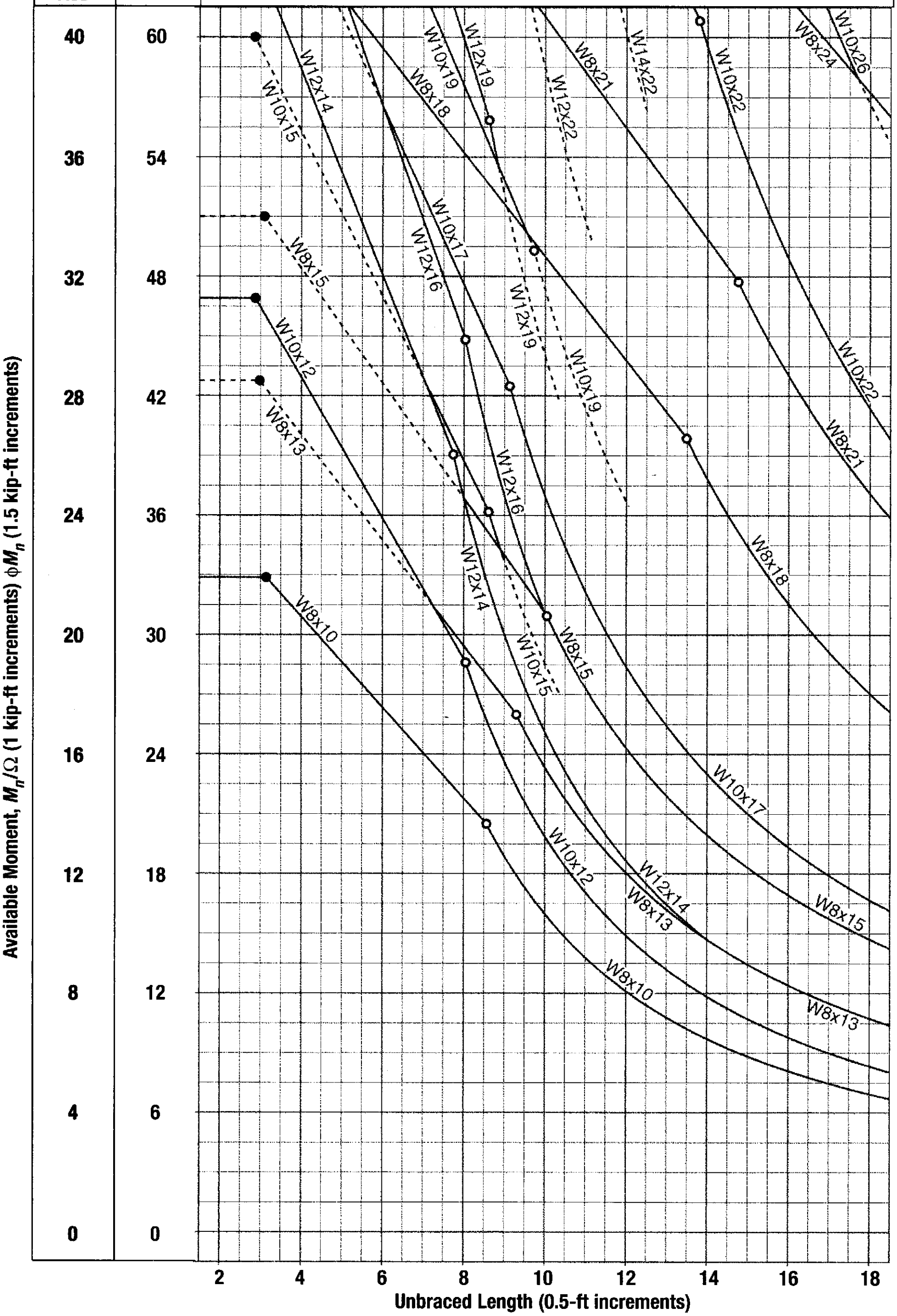


Table 3–11
Channels
Available Moment vs. Unbraced Length

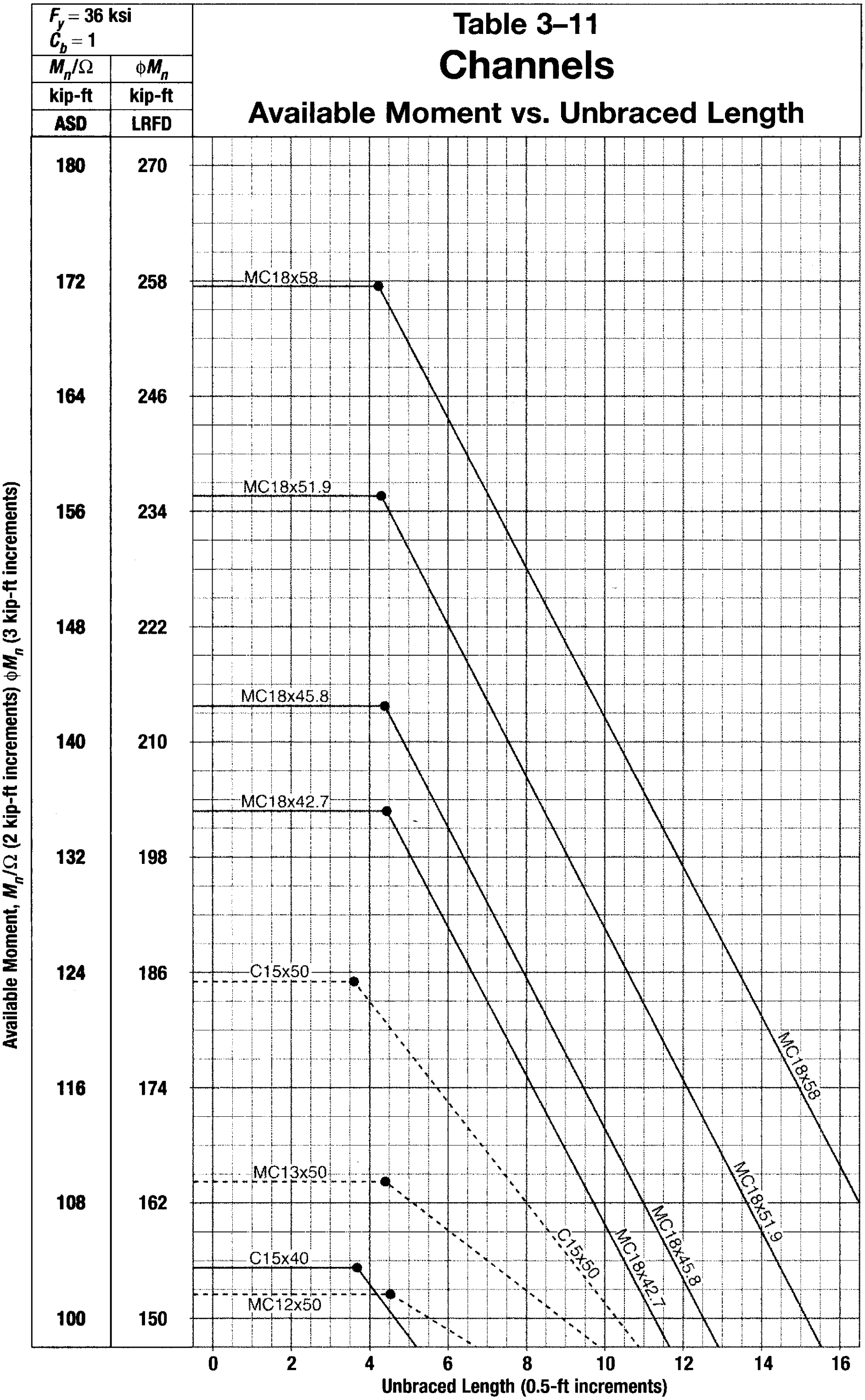


Table 3–11 (continued)
Channels
Available Moment vs. Unbraced Length

F_y = 36 ksi
C_b = 1

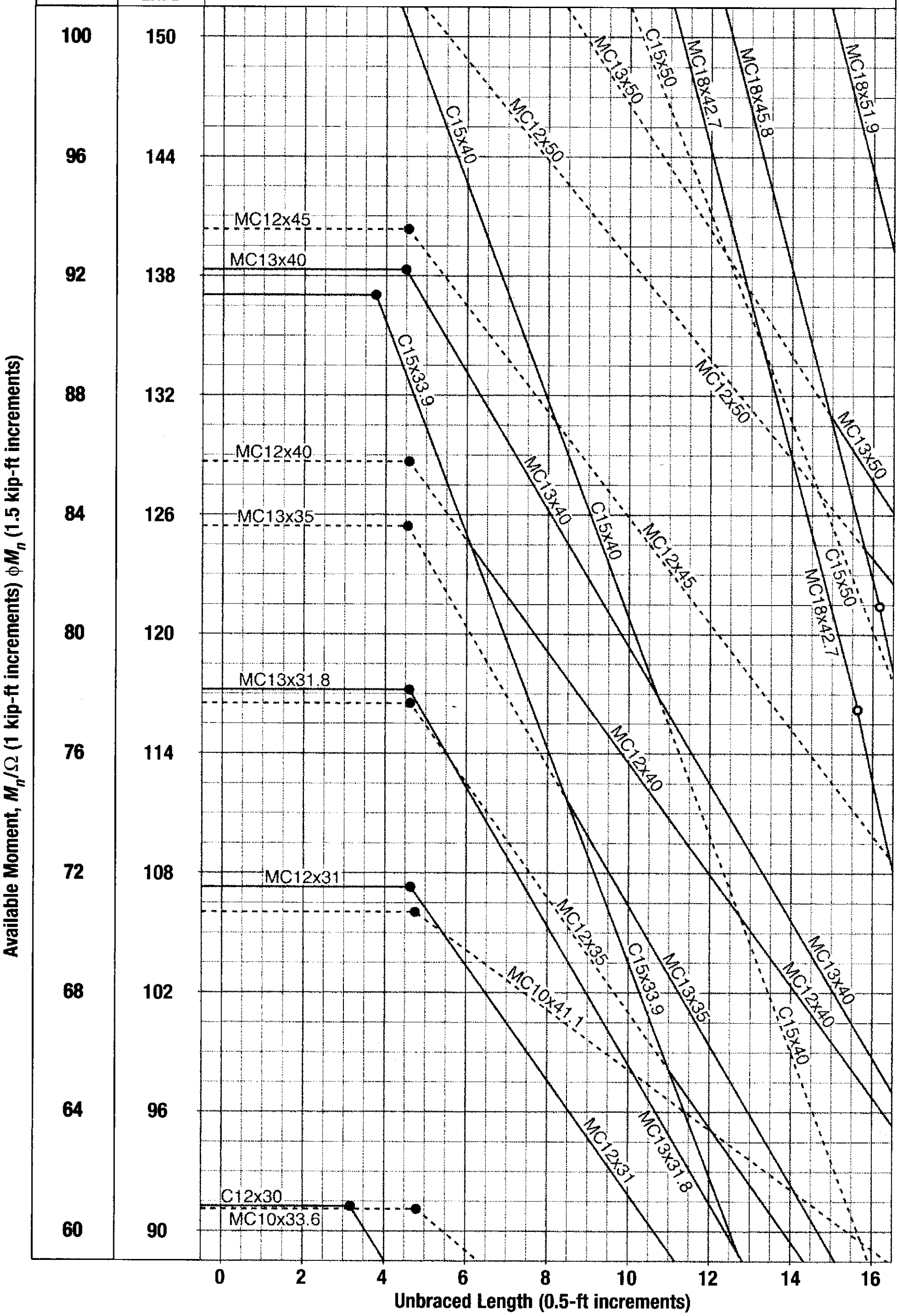
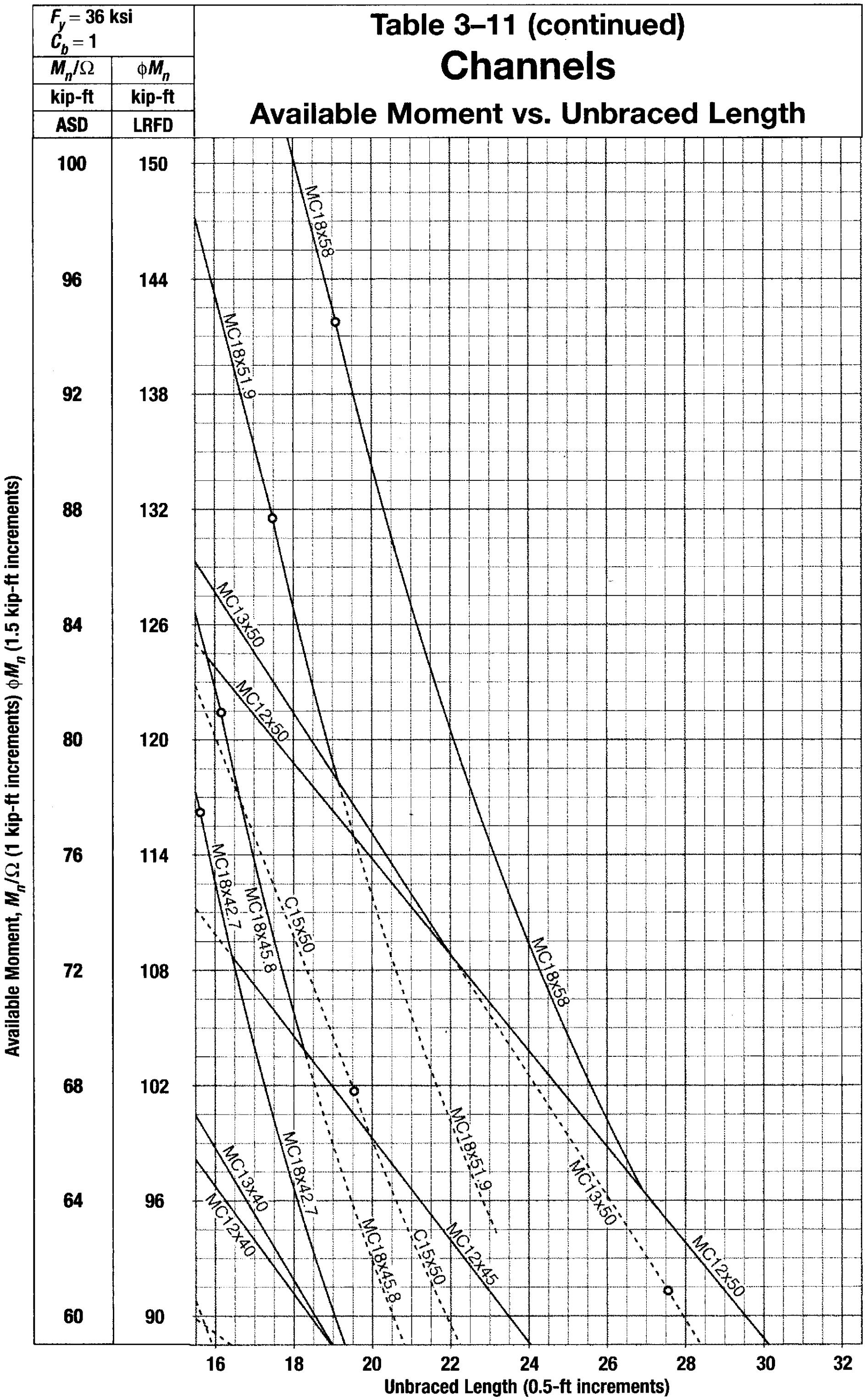
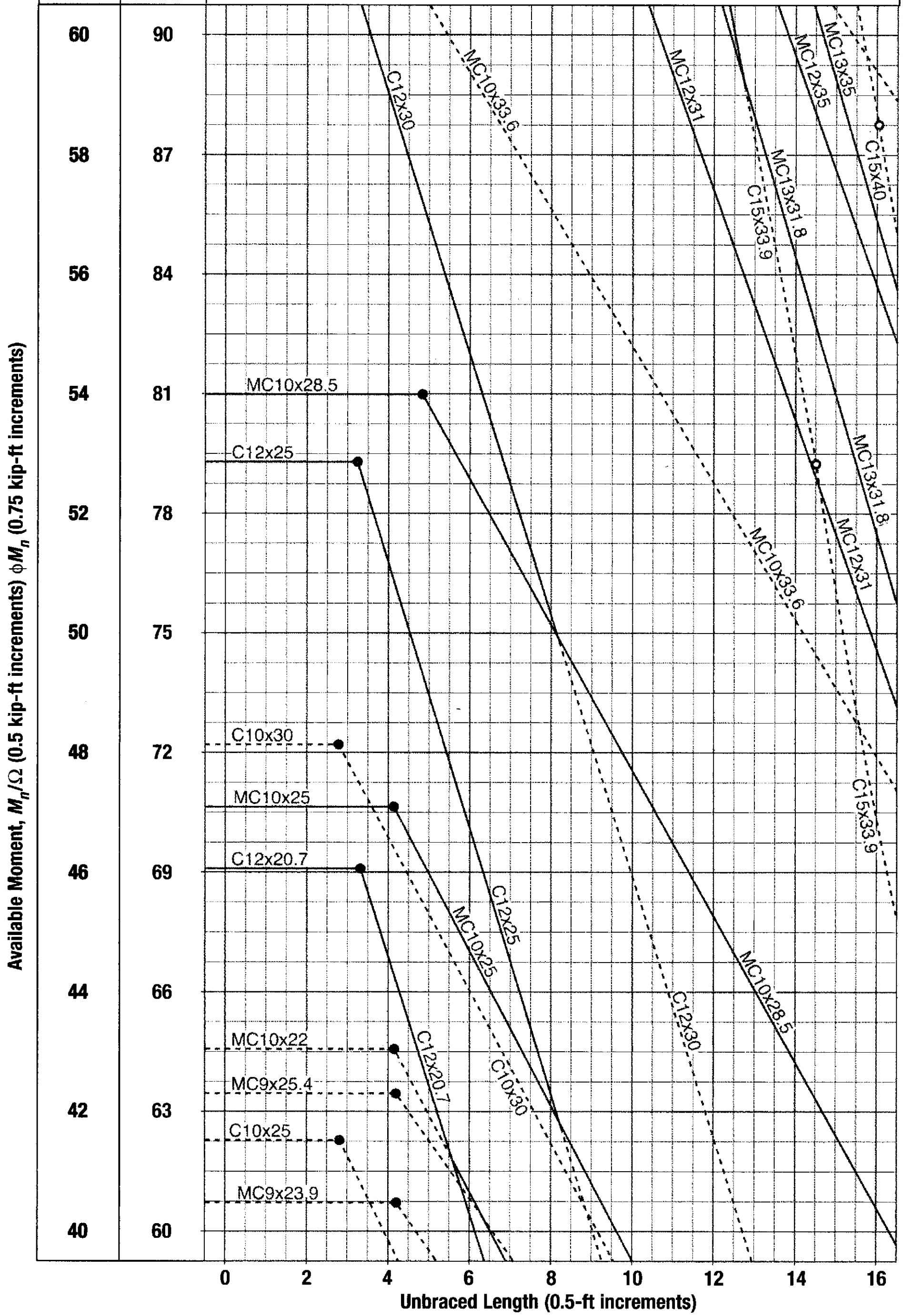


Table 3–11 (continued)
Channels
Available Moment vs. Unbraced Length



F_y = 36 ksi C_b = 1		**Table 3–11 (continued)**
M_n/Ω	ϕM_n	**Channels**
kip-ft	kip-ft	
ASD	LRFD	**Available Moment vs. Unbraced Length**



F_y = 36 ksi C_b = 1		Table 3–11 (continued)
M_n/Ω	ϕM_n	**Channels**
kip-ft	kip-ft	**Available Moment vs. Unbraced Length**
ASD	LRFD	

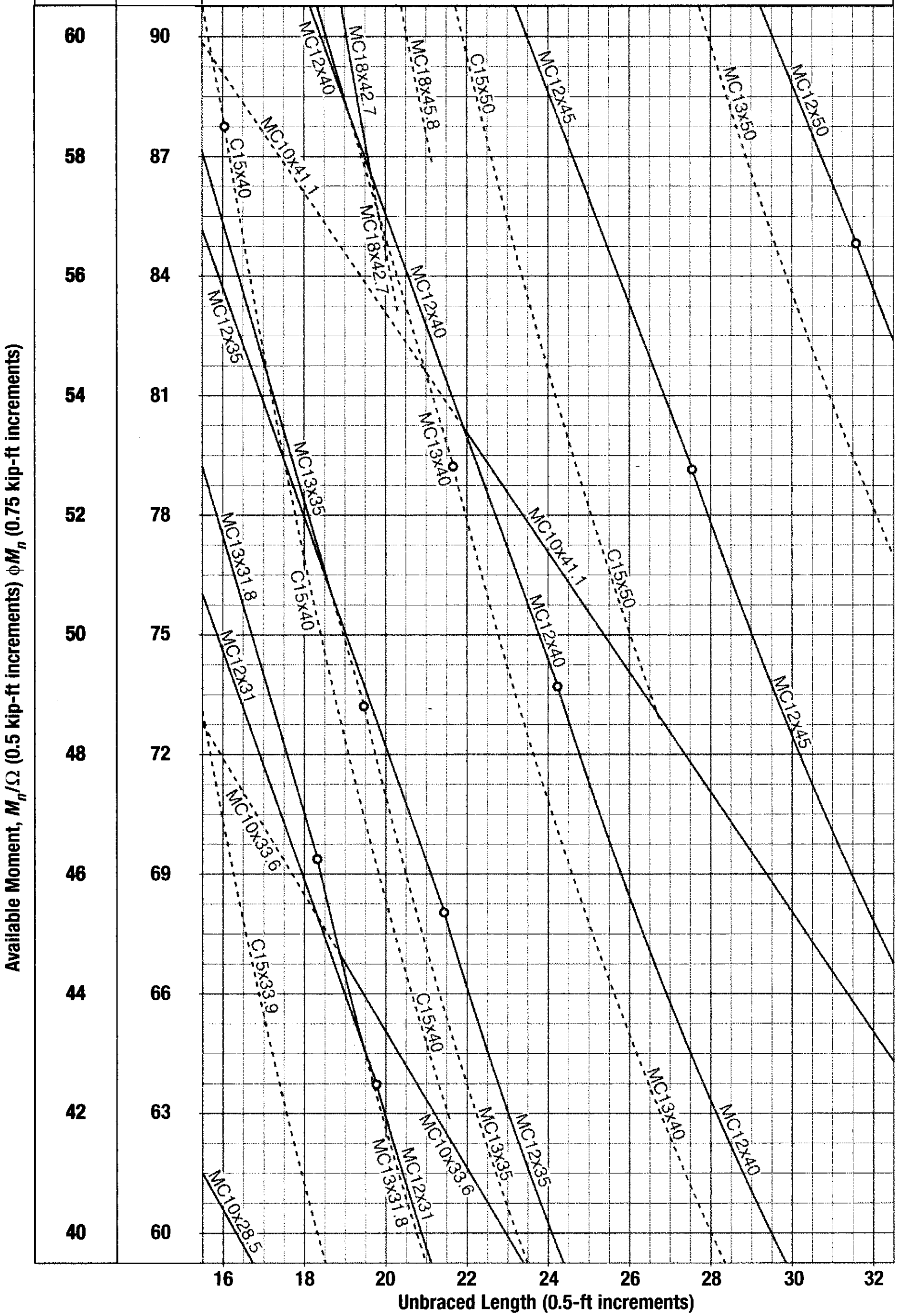


Table 3–11 (continued)
Channels
Available Moment vs. Unbraced Length

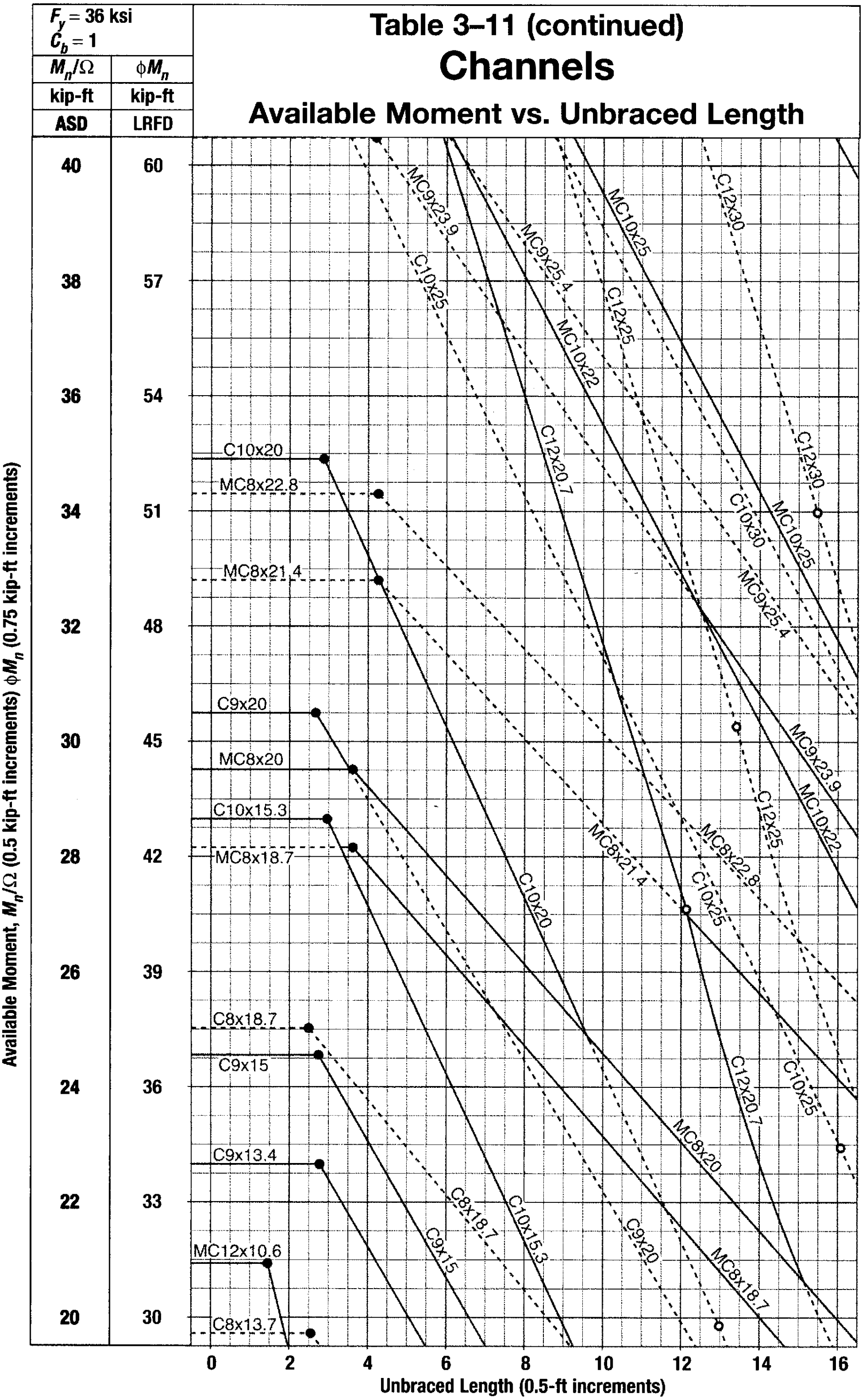
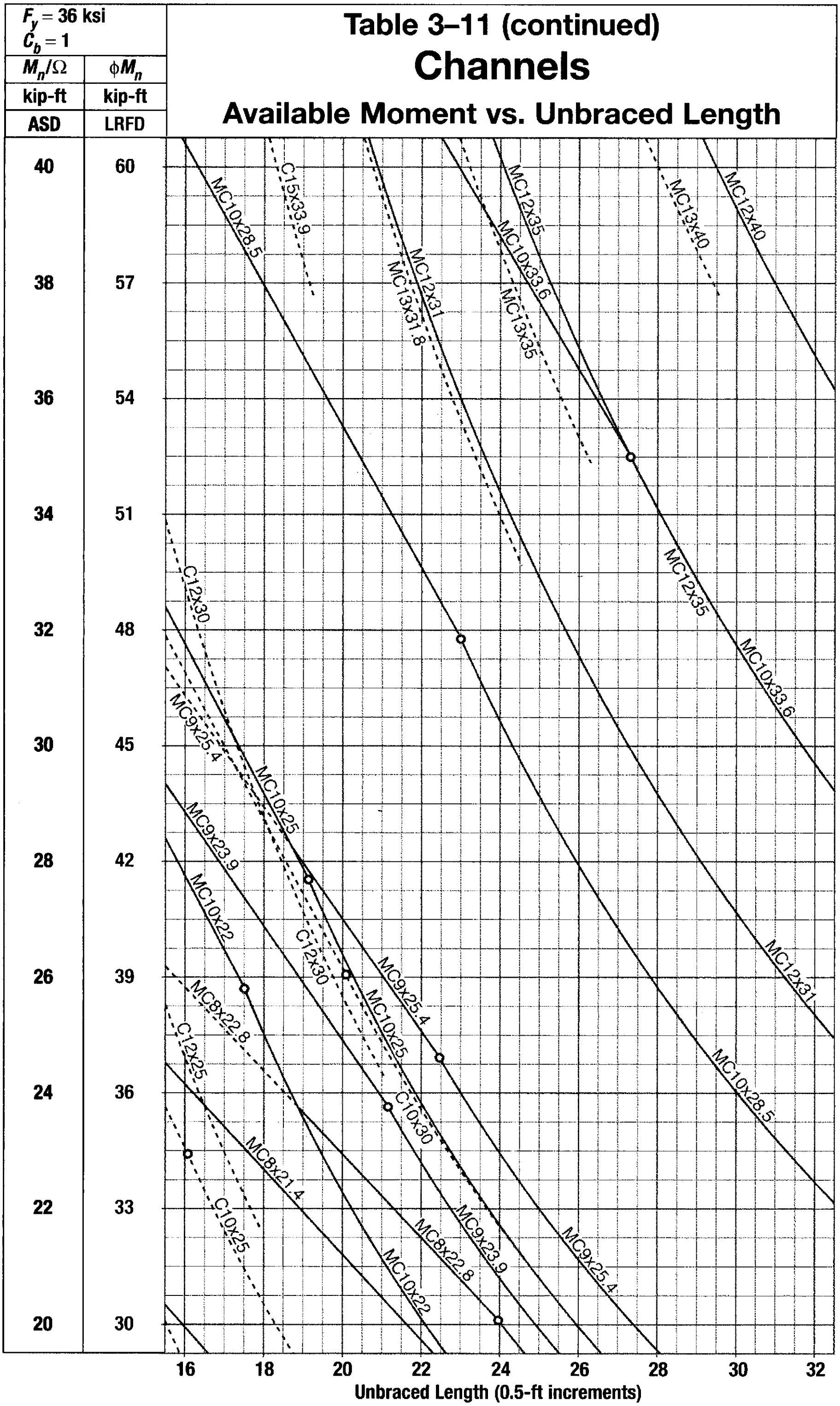
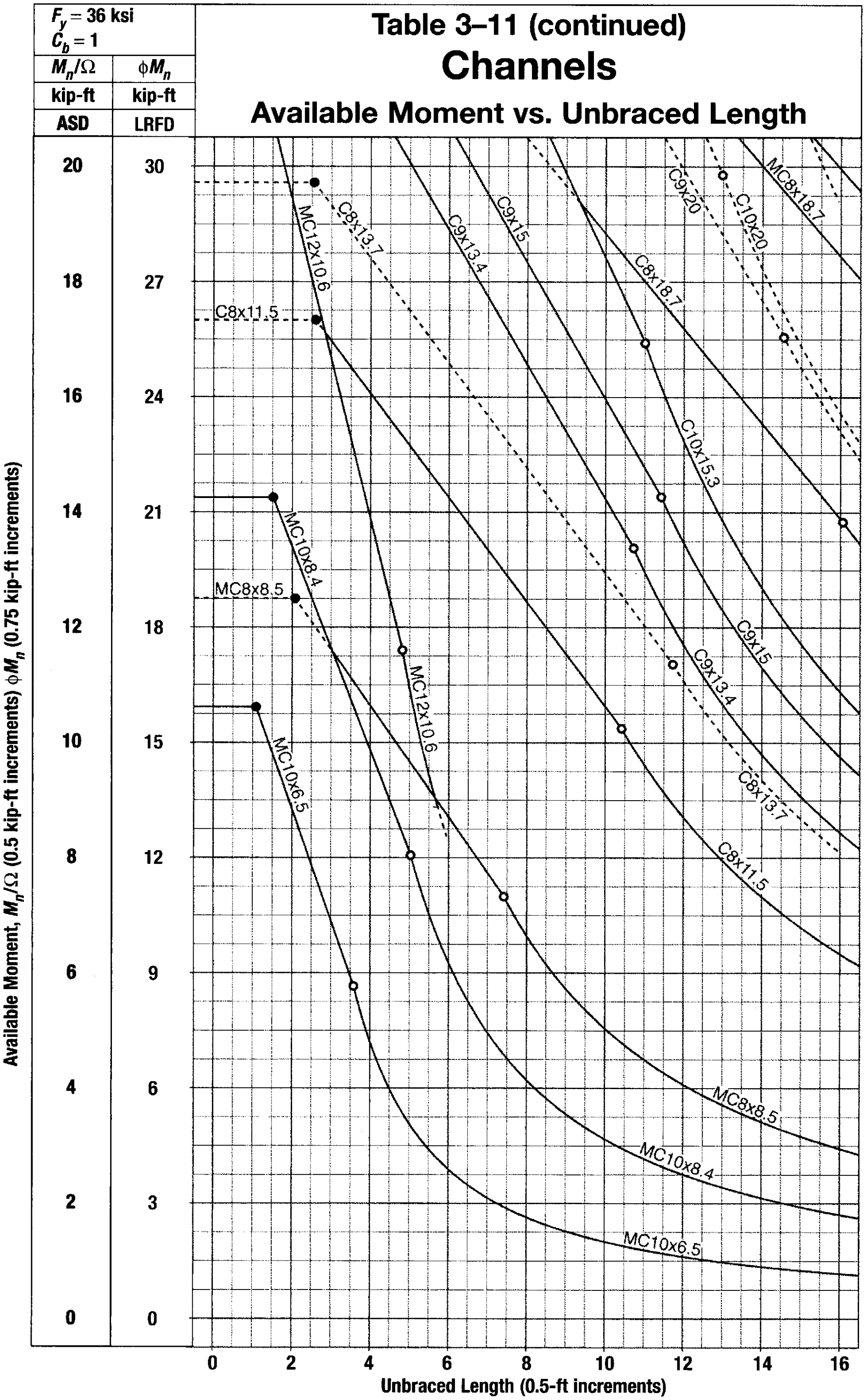
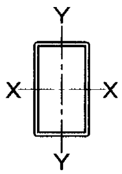


Table 3–11 (continued)
Channels
Available Moment vs. Unbraced Length

F_y = 36 ksi
C_b = 1




F_y = 36 ksi
C_b = 1
M_n/Ω
ϕM_n
kip-ft
kip-ft
ASD
LRFD
Table 3–11 (continued)
Channels
Available Moment vs. Unbraced Length
C8x13.7
MC12x10.6
C9x13.4
C9x15
C9x20
C10x20
MC8x18.7
C8x18.7
C8x11.5
C10x15.3
MC10x8.4
MC8x8.5
C9x15
C9x13.4
MC12x10.6
MC10x6.5
C8x13.7
C8x11.5
MC8x8.5
MC10x8.4
MC10x6.5
Available Moment, M_n/Ω (0.5 kip-ft increments) ϕM_n (0.75 kip-ft increments)
Unbraced Length (0.5-ft increments)



HSS20–HSS12

Table 3–12
Available Flexural Strength, kip-ft
Rectangular HSS

F_y = 46 ksi

Shape		X-Axis M_n/Ω ASD	X-Axis ϕM_n LRFD	Y-Axis M_n/Ω ASD	Y-Axis ϕM_n LRFD
HSS20×12×	5/8	**528**	794	**350**	527
	1/2	**432**	649	**254**	382
	3/8	**305**	459	**169**	255
	5/16	**226**	339	**130**	196
HSS20×8×	5/8	**425**	638	**209**	314
	1/2	**349**	524	**152**	229
	3/8	**269**	404	**101**	152
	5/16	**223**	336	**76.8**	115
HSS20×4×	1/2	**264**	397	**62.7**	94.3
	3/8	**205**	308	**42.2**	63.4
	5/16	**171**	257	**32.1**	48.3
	1/4	**131**	198	**22.8**	34.3
HSS18×6×	5/8	**310**	466	**140**	210
	1/2	**257**	386	**102**	153
	3/8	**198**	298	**68.0**	102
	5/16	**168**	252	**52.2**	78.5
	1/4	**132**	198	**37.3**	56.1
HSS16×12×	5/8	**379**	569	**310**	466
	1/2	**310**	466	**240**	360
	3/8	**221**	333	**159**	238
	5/16	**166**	249	**123**	185
HSS16×8×	5/8	**296**	445	**182**	273
	1/2	**243**	366	**142**	213
	3/8	**188**	283	**94.3**	142
	5/16	**159**	240	**73.0**	110
	1/4	**119**	178	**52.6**	79.1
HSS16×4×	5/8	**213**	321	**74.6**	112
	1/2	**177**	267	**58.8**	88.3
	3/8	**138**	208	**39.4**	59.2
	5/16	**117**	176	**30.4**	45.7
	1/4	**94.3**	142	**21.8**	32.8
	3/16	**66.9**	100	**13.9**	20.9
HSS14×10×	5/8	**275**	414	**218**	328
	1/2	**227**	341	**180**	271
	3/8	**175**	263	**120**	180
	5/16	**137**	207	**93.2**	140
	1/4	**97.3**	146	**68.2**	103

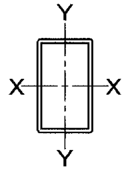
Shape		X-Axis M_n/Ω ASD	X-Axis ϕM_n LRFD	Y-Axis M_n/Ω ASD	Y-Axis ϕM_n LRFD
HSS14×6×	5/8	**204**	306	**111**	167
	1/2	**169**	254	**92.7**	139
	3/8	**131**	198	**62.6**	94.2
	5/16	**112**	168	**48.7**	73.2
	1/4	**90.9**	137	**35.2**	53.0
	3/16	**62.7**	94.3	**22.8**	34.2
HSS14×4×	5/8	**168**	252	**65.4**	98.3
	1/2	**140**	211	**55.4**	83.3
	3/8	**110**	165	**37.5**	56.3
	5/16	**93.3**	140	**29.2**	43.9
	1/4	**76.2**	115	**21.1**	31.8
	3/16	**55.4**	83.2	**13.6**	20.4
HSS12×10×	1/2	**181**	272	**160**	240
	3/8	**140**	211	**116**	175
	5/16	**111**	166	**88.7**	133
	1/4	**78.9**	119	**65.5**	98.5
HSS12×8×	5/8	**188**	283	**142**	214
	1/2	**156**	235	**118**	178
	3/8	**122**	183	**86.8**	130
	5/16	**103**	155	**66.3**	99.7
	1/4	**77.8**	117	**48.8**	73.4
	3/16	**50.0**	75.2	**32.1**	48.3
HSS12×6×	5/8	**158**	237	**96.6**	145
	1/2	**132**	198	**80.9**	122
	3/8	**103**	155	**59.9**	90.1
	5/16	**87.5**	132	**46.1**	69.4
	1/4	**71.4**	107	**33.8**	50.8
	3/16	**49.6**	74.6	**22.0**	33.1
HSS12×4×	5/8	**127**	192	**56.3**	84.6
	1/2	**107**	161	**47.9**	71.9
	3/8	**84.2**	127	**35.8**	53.8
	5/16	**71.9**	108	**27.7**	41.6
	1/4	**58.8**	88.4	**20.3**	30.5
	3/16	**44.3**	66.6	**13.1**	19.7
HSS12×3½×	3/8	**79.6**	120	**30.2**	45.4
	5/16	**67.9**	102	**23.4**	35.1

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

Note: Values above are reduced for compactness criteria, when appropriate. See Table 1–12 for limiting dimensions for compactness.

F_y = 46 ksi

Table 3–12 (continued)
Available Flexural Strength, kip-ft
Rectangular HSS



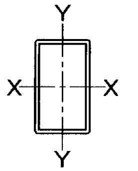
HSS12–HSS8

Shape		X-Axis M_n/Ω ASD	X-Axis ϕM_n LRFD	Y-Axis M_n/Ω ASD	Y-Axis ϕM_n LRFD
HSS12×3×	5/16	**64.0**	96.2	**19.2**	28.8
	1/4	**52.5**	79.0	**14.1**	21.2
	3/16	**39.6**	59.5	**9.15**	13.7
HSS12×2×	5/16	**56.2**	84.5	**11.2**	16.8
	1/4	**46.3**	69.5	**8.37**	12.6
	3/16	**34.9**	52.4	**5.48**	8.24
HSS10×8×	5/8	**143**	215	**122**	184
	1/2	**119**	179	**102**	153
	3/8	**93.0**	140	**79.8**	120
	5/16	**79.0**	119	**63.8**	95.9
	1/4	**60.0**	90.2	**46.1**	69.2
	3/16	**39.0**	58.6	**30.7**	46.2
HSS10×6×	5/8	**118**	177	**82.1**	123
	1/2	**98.7**	148	**69.1**	104
	3/8	**77.5**	116	**54.4**	81.8
	5/16	**66.1**	99.3	**43.9**	65.9
	1/4	**54.1**	81.3	**31.8**	47.9
	3/16	**37.9**	57.0	**21.1**	31.7
HSS10×5×	3/8	**69.8**	105	**42.9**	64.5
	5/16	**59.6**	89.5	**34.7**	52.2
	1/4	**48.8**	73.4	**25.3**	38.0
	3/16	**37.3**	56.1	**16.7**	25.1
HSS10×4×	5/8	**92.6**	139	**47.2**	70.9
	1/2	**78.3**	118	**40.3**	60.6
	3/8	**62.0**	93.2	**32.2**	48.4
	5/16	**53.1**	79.8	**26.1**	39.3
	1/4	**43.6**	65.5	**19.1**	28.7
	3/16	**33.4**	50.2	**12.6**	18.9
	1/8	**20.7**	31.1	**6.84**	10.3
HSS10×3 1/2×	1/2	**73.2**	110	**33.8**	50.8
	3/8	**58.2**	87.4	**27.2**	40.8
	5/16	**49.8**	74.9	**22.1**	33.2
	1/4	**41.0**	61.6	**16.1**	24.3
	3/16	**31.5**	47.3	**10.6**	16.0
	1/8	**20.3**	30.5	**5.75**	8.65

Shape		X-Axis M_n/Ω ASD	X-Axis ϕM_n LRFD	Y-Axis M_n/Ω ASD	Y-Axis ϕM_n LRFD
HSS10×3×	3/8	**54.3**	81.6	**22.3**	33.6
	5/16	**46.6**	70.0	**18.1**	27.3
	1/4	**38.4**	57.7	**13.3**	20.0
	3/16	**29.5**	44.3	**8.75**	13.2
	1/8	**19.0**	28.5	**4.72**	7.10
HSS10×2×	3/8	**46.6**	70.0	**13.2**	19.9
	5/16	**40.1**	60.3	**10.8**	16.2
	1/4	**33.2**	49.8	**7.86**	11.8
	3/16	**25.6**	38.4	**5.25**	7.89
	1/8	**16.3**	24.6	**2.83**	4.25
HSS9×7×	5/8	**111**	167	**93.0**	140
	1/2	**92.9**	140	**78.1**	117
	3/8	**72.9**	110	**61.4**	92.3
	5/16	**62.2**	93.4	**52.4**	78.7
	1/4	**50.9**	76.5	**37.3**	56.0
	3/16	**32.3**	48.6	**25.0**	37.6
HSS9×5×	5/8	**88.3**	133	**58.1**	87.3
	1/2	**74.7**	112	**49.3**	74.1
	3/8	**59.1**	88.8	**39.2**	58.9
	5/16	**50.5**	75.9	**33.6**	50.5
	1/4	**41.5**	62.4	**24.3**	36.5
	3/16	**31.8**	47.8	**16.2**	24.3
HSS9×3×	1/2	**56.4**	84.8	**24.8**	37.3
	3/8	**45.2**	67.9	**20.2**	30.4
	5/16	**38.9**	58.5	**17.5**	26.3
	1/4	**32.1**	48.3	**12.7**	19.1
	3/16	**24.7**	37.2	**8.50**	12.8
HSS8×6×	5/8	**82.8**	124	**67.7**	102
	1/2	**69.9**	105	**57.3**	86.1
	3/8	**55.3**	83.1	**45.4**	68.2
	5/16	**47.3**	71.1	**38.8**	58.4
	1/4	**38.8**	58.4	**30.1**	45.2
	3/16	**27.5**	41.4	**19.7**	29.7

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

Note: Values above are reduced for compactness criteria, when appropriate. See Table 1–12 for limiting dimensions for compactness.



HSS8–HSS5

Table 3–12 (continued)
Available Flexural Strength, kip-ft
Rectangular HSS

F_y = 46 ksi

Shape		X-Axis M_n/Ω ASD	X-Axis ϕM_n LRFD	Y-Axis M_n/Ω ASD	Y-Axis ϕM_n LRFD
HSS8×4×	5/8	**63.0**	94.7	**38.1**	57.2
	1/2	**53.8**	80.9	**32.8**	49.3
	3/8	**43.0**	64.7	**26.4**	39.6
	5/16	**37.0**	55.6	**22.7**	34.2
	1/4	**30.5**	45.9	**17.8**	26.7
	3/16	**23.5**	35.3	**11.8**	17.7
	1/8	**14.7**	22.1	**6.53**	9.82
HSS8×3×	1/2	**45.8**	68.8	**22.1**	33.3
	3/8	**36.9**	55.5	**18.1**	27.2
	5/16	**31.9**	47.9	**15.7**	23.6
	1/4	**26.4**	39.6	**12.3**	18.6
	3/16	**20.4**	30.6	**8.19**	12.3
	1/8	**13.8**	20.8	**4.52**	6.79
HSS8×2×	3/8	**30.8**	46.3	**10.6**	15.9
	5/16	**26.7**	40.1	**9.33**	14.0
	1/4	**22.2**	33.4	**7.37**	11.1
	3/16	**17.2**	25.9	**4.90**	7.37
	1/8	**11.7**	17.6	**2.71**	4.07
HSS7×5×	1/2	**50.2**	75.4	**39.6**	59.6
	3/8	**40.1**	60.2	**31.7**	47.7
	5/16	**34.4**	51.8	**27.3**	41.1
	1/4	**28.4**	42.7	**22.6**	33.9
	3/16	**21.8**	32.8	**14.9**	22.4
	1/8	**12.1**	18.2	**8.47**	12.7
HSS7×4×	1/2	**43.2**	64.9	**29.0**	43.6
	3/8	**34.7**	52.2	**23.4**	35.2
	5/16	**30.0**	45.0	**20.3**	30.5
	1/4	**24.8**	37.3	**16.8**	25.3
	3/16	**19.1**	28.7	**11.2**	16.8
	1/8	**12.1**	18.1	**6.33**	9.51
HSS7×3×	1/2	**36.2**	54.4	**19.4**	29.2
	3/8	**29.4**	44.2	**16.0**	24.0
	5/16	**25.5**	38.3	**13.9**	20.9
	1/4	**21.2**	31.8	**11.6**	17.4
	3/16	**16.4**	24.6	**7.80**	11.7
	1/8	**11.3**	17.0	**4.38**	6.58

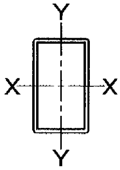
Shape		X-Axis M_n/Ω ASD	X-Axis ϕM_n LRFD	Y-Axis M_n/Ω ASD	Y-Axis ϕM_n LRFD
HSS7×2×	1/4	**17.5**	26.4	**6.94**	10.4
	3/16	**13.7**	20.5	**4.67**	7.01
	1/8	**9.49**	14.3	**2.63**	3.95
HSS6×5×	1/2	**39.5**	59.4	**34.8**	52.3
	3/8	**31.8**	47.8	**28.0**	42.1
	5/16	**27.4**	41.2	**24.2**	36.3
	1/4	**22.7**	34.1	**20.0**	30.1
	3/16	**17.5**	26.3	**14.5**	21.8
	1/8	**9.80**	14.7	**8.12**	12.2
HSS6×4×	1/2	**33.6**	50.5	**25.2**	37.9
	3/8	**27.3**	41.0	**20.5**	30.8
	5/16	**23.6**	35.4	**17.8**	26.7
	1/4	**19.6**	29.4	**14.8**	22.2
	3/16	**15.2**	22.8	**10.8**	16.2
	1/8	**9.65**	14.5	**6.07**	9.12
HSS6×3×	1/2	**27.7**	41.7	**16.7**	25.1
	3/8	**22.7**	34.2	**13.8**	20.8
	5/16	**19.8**	29.7	**12.1**	18.2
	1/4	**16.5**	24.8	**10.1**	15.2
	3/16	**12.8**	19.3	**7.46**	11.2
	1/8	**8.89**	13.4	**4.20**	6.31
HSS6×2×	3/8	**18.2**	27.4	**7.94**	11.9
	5/16	**16.0**	24.0	**7.05**	10.6
	1/4	**13.4**	20.2	**5.99**	9.01
	3/16	**10.5**	15.8	**4.46**	6.70
	1/8	**7.33**	11.0	**2.52**	3.79
HSS5×4×	1/2	**25.1**	37.8	**21.5**	32.2
	3/8	**20.6**	30.9	**17.6**	26.5
	5/16	**17.9**	26.9	**15.3**	23.0
	1/4	**14.9**	22.4	**12.8**	19.2
	3/16	**11.6**	17.4	**9.95**	15.0
	1/8	**7.45**	11.2	**5.72**	8.60

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

Note: Values above are reduced for compactness criteria, when appropriate. See Table 1–12 for limiting dimensions for compactness.

F_y = 46 ksi

Table 3–12 (continued)
Available Flexural Strength, kip-ft
Rectangular HSS



HSS5–HSS2

Shape		X-Axis M_n/Ω ASD	X-Axis ϕM_n LRFD	Y-Axis M_n/Ω ASD	Y-Axis ϕM_n LRFD
HSS5×3×	1/2	20.3	30.5	14.0	21.1
	3/8	16.8	25.3	11.7	17.6
	5/16	14.7	22.1	10.3	15.4
	1/4	12.4	18.6	8.65	13.0
	3/16	9.66	14.5	6.79	10.2
	1/8	6.73	10.1	3.96	5.95
HSS5×2 1/2×	1/4	11.1	16.7	6.78	10.2
	3/16	8.70	13.1	5.35	8.04
	1/8	6.08	9.14	3.14	4.72
HSS5×2×	3/8	13.1	19.7	6.62	9.95
	5/16	11.6	17.4	5.91	8.88
	1/4	9.81	14.7	5.05	7.59
	3/16	7.74	11.6	4.02	6.04
	1/8	5.43	8.16	2.37	3.57
HSS4×3×	3/8	11.7	17.7	9.58	14.4
	5/16	10.4	15.6	8.47	12.7
	1/4	8.76	13.2	7.17	10.8
	3/16	6.90	10.4	5.66	8.50
	1/8	4.84	7.27	3.73	5.61
HSS4×2 1/2×	3/8	10.3	15.5	7.34	11.0
	5/16	9.12	13.7	6.53	9.82
	1/4	7.75	11.6	5.57	8.37
	3/16	6.13	9.22	4.42	6.65
	1/8	4.32	6.49	2.94	4.42
HSS4×2×	3/8	8.82	13.3	5.30	7.96
	5/16	7.88	11.8	4.76	7.16
	1/4	6.74	10.1	4.10	6.17
	3/16	5.37	8.07	3.29	4.94
	1/8	3.80	5.71	2.21	3.32
HSS3 1/2×2 1/2×	3/8	8.24	12.4	6.48	9.74
	5/16	7.35	11.1	5.79	8.71
	1/4	6.28	9.44	4.96	7.46
	3/16	5.00	7.51	3.96	5.95
	1/8	3.54	5.32	2.81	4.22

Shape		X-Axis M_n/Ω ASD	X-Axis ϕM_n LRFD	Y-Axis M_n/Ω ASD	Y-Axis ϕM_n LRFD
HSS3 1/2×2×	1/4	5.41	8.13	3.63	5.46
	3/16	4.33	6.51	2.92	4.40
	1/8	3.09	4.64	2.09	3.15
HSS3 1/2×1 1/2×	1/4	4.53	6.82	2.43	3.65
	3/16	3.67	5.51	1.99	2.99
	1/8	2.64	3.96	1.45	2.17
HSS3×2 1/2×	5/16	5.75	8.65	5.06	7.60
	1/4	4.95	7.44	4.36	6.55
	3/16	3.96	5.96	3.49	5.25
	1/8	2.82	4.24	2.49	3.74
HSS3×2×	5/16	4.85	7.29	3.62	5.45
	1/4	4.21	6.33	3.16	4.75
	3/16	3.40	5.11	2.56	3.85
	1/8	2.44	3.66	1.84	2.77
HSS3×1 1/2×	1/4	3.47	5.21	2.09	3.14
	3/16	2.83	4.26	1.73	2.59
	1/8	2.05	3.09	1.26	1.90
HSS3×1×	3/16	2.27	3.41	0.991	1.49
	1/8	1.67	2.51	0.747	1.12
HSS2 1/2×2×	1/4	3.14	4.73	2.69	4.04
	3/16	2.56	3.86	2.20	3.30
	1/8	1.86	2.79	1.59	2.39
HSS2 1/2×1 1/2×	1/4	2.54	3.81	1.75	2.64
	3/16	2.10	3.16	1.46	2.20
	1/8	1.54	2.31	1.08	1.62
HSS2 1/2×1×	3/16	1.64	2.46	0.826	1.24
	1/8	1.22	1.84	0.629	0.945
HSS2 1/4×2×	3/16	2.19	3.28	2.01	3.03
	1/8	1.59	2.39	1.47	2.20
HSS2×1 1/2×	3/16	1.47	2.20	1.20	1.80
	1/8	1.09	1.64	0.893	1.34
HSS2×1×	3/16	1.10	1.66	0.661	0.994
	1/8	0.840	1.26	0.511	0.768

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

Note: Values above are reduced for compactness criteria, when appropriate. See Table 1-12 for limiting dimensions for compactness.

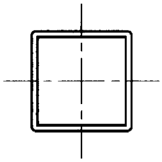


Table 3–13
Available Flexural Strength, kip-ft
Square HSS

F_y = 46 ksi

HSS16–HSS4½

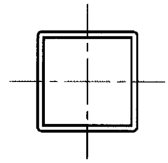
Shape		M_n/Ω	ϕM_n
		ASD	LRFD
HSS16×16×	5/8	459	690
	1/2[f]	352	529
	3/8[f]	242	363
	5/16[f]	187	281
HSS14×14×	5/8	347	521
	1/2	285	428
	3/8[f]	189	284
	5/16[f]	151	227
HSS12×12×	5/8	250	376
	1/2	206	309
	3/8[f]	149	223
	5/16[f]	116	175
	1/4[f]	86.3	130
	3/16[f]	56.9	85.6
HSS10×10×	5/8	168	252
	1/2	139	210
	3/8	108	163
	5/16[f]	86.1	129
	1/4[f]	64.4	96.8
	3/16[f]	42.8	64.3
HSS9×9×	5/8	133	200
	1/2	111	167
	3/8	86.8	130
	5/16	73.8	111
	1/4[f]	52.0	78.2
	3/16[f]	36.3	54.6
	1/8[f]	20.3	30.5
HSS8×8×	5/8	103	154
	1/2	86.0	129
	3/8	67.6	102
	5/16	57.6	86.6
	1/4[f]	44.1	66.3
	3/16[f]	30.1	45.3
	1/8[f]	16.9	25.4

Shape		M_n/Ω	ϕM_n
		ASD	LRFD
HSS7×7×	5/8	75.9	114
	1/2	64.1	96.4
	3/8	50.7	76.2
	5/16	43.4	65.2
	1/4	35.6	53.6
	3/16[f]	23.6	35.5
	1/8[f]	13.7	20.6
HSS6×6×	5/8	53.2	80.0
	1/2	45.4	68.3
	3/8	36.3	54.6
	5/16	31.2	46.9
	1/4	25.7	38.7
	3/16[f]	18.5	27.8
	1/8[f]	10.8	16.2
HSS5½×5½×	3/8	30.0	45.1
	5/16	25.9	38.9
	1/4	21.4	32.2
	3/16[f]	16.4	24.6
	1/8[f]	9.37	14.1
HSS5×5×	1/2	30.0	45.0
	3/8	24.3	36.5
	5/16	21.0	31.6
	1/4	17.5	26.2
	3/16	13.5	20.3
	1/8[f]	8.04	12.1
HSS4½×4½×	1/2	23.4	35.2
	3/8	19.2	28.8
	5/16	16.7	25.1
	1/4	13.9	20.9
	3/16	10.8	16.3
	1/8[f]	6.48	9.73

[f] Shape exceeds compact limit for flexure with F_y = 46 ksi.

F_y = 46 ksi

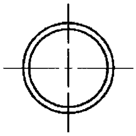
Table 3–13 (continued)
Available Flexural Strength, kip-ft
Square HSS



HSS4–HSS2

Shape		M_n/Ω	ϕM_n	Shape		M_n/Ω	ϕM_n
		ASD	LRFD			ASD	LRFD
HSS4×4×	1/2	17.7	26.6	HSS2 1/2×2 1/2×	5/16	4.32	6.49
	3/8	14.7	22.1		1/4	3.75	5.64
	5/16	12.8	19.3		3/16	3.03	4.55
	1/4	10.8	16.2		1/8	2.17	3.27
	3/16	8.42	12.7	HSS2 1/4×2 1/4×	1/4	2.93	4.41
	1/8[f]	5.48	8.23		3/16	2.39	3.60
HSS3 1/2×3 1/2×	3/8	10.8	16.2		1/8	1.73	2.60
	5/16	9.50	14.3	HSS2×2×	1/4	2.21	3.33
	1/4	8.03	12.1		3/16	1.83	2.75
	3/16	6.33	9.51		1/8	1.34	2.02
	1/8	4.44	6.67				
HSS3×3×	3/8	7.46	11.2				
	5/16	6.66	10.0				
	1/4	5.69	8.55				
	3/16	4.53	6.81				
	1/8	3.21	4.82				

[f] Shape exceeds compact limit for flexure with F_y = 46 ksi.



HSS20.000–HSS6.625

Table 3–14
Available Flexural Strength, kip-ft
Round HSS

F_y = 42 ksi

Shape		M_n/Ω ASD	ϕM_n LRFD
HSS20.000×	0.500	371	558
	0.375[f]	273	410
HSS18.000×	0.500	300	450
	0.375[f]	225	338
HSS16.000×	0.625	289	435
	0.500	235	353
	0.438	207	312
	0.375	179	269
	0.312[f]	147	221
	0.250[f]	114	171
HSS14.000×	0.625	220	331
	0.500	179	268
	0.375	136	205
	0.312	115	172
	0.250[f]	88.8	133
HSS12.750×	0.500	147	221
	0.375	113	169
	0.250[f]	74.6	112
HSS10.750×	0.500	103	155
	0.375	79.2	119
	0.250	54.0	81.2
HSS10.000×	0.625	108	163
	0.500	88.7	133
	0.375	68.2	102
	0.312	57.5	86.4
	0.250	46.6	70.0
	0.188[f]	34.0	51.2
HSS9.625×	0.500	81.8	123
	0.375	63.0	94.6
	0.312	53.2	79.9
	0.250	43.1	64.8
	0.188[f]	31.7	47.7
HSS8.625×	0.625	78.9	119
	0.500	65.0	97.6
	0.375	50.1	75.3
	0.322	43.6	65.5
	0.250	34.4	51.7
	0.188[f]	25.9	39.0
HSS7.625×	0.375	38.8	58.2
	0.328	34.3	51.5
HSS7.500×	0.500	48.3	72.6
	0.375	37.4	56.3
	0.312	31.7	47.7
	0.250	25.8	38.8
	0.188	19.6	29.4
HSS7.000×	0.500	41.7	62.7
	0.375	32.4	48.7
	0.312	27.5	41.3
	0.250	22.4	33.6
	0.188	17.0	25.5
	0.125[f]	11.0	16.6
HSS6.875×	0.500	40.1	60.3
	0.375	31.2	46.9
	0.312	26.5	39.8
	0.250	21.6	32.4
	0.188	16.4	24.6
HSS6.625×	0.500	37.1	55.7
	0.432	32.7	49.1
	0.375	28.8	43.3
	0.312	24.5	36.8
	0.280	22.1	33.2
	0.250	20.0	30.0
	0.188	15.2	22.8
	0.125[f]	9.97	15.0

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[f] Shape exceeds compact limit for flexure with F_y = 42 ksi.

F_y = 42 ksi

Table 3–14 (continued)
Available Flexural Strength, kip-ft
Round HSS

HSS6.000–HSS1.660

Shape		M_n/Ω	ϕM_n	Shape		M_n/Ω	ϕM_n
		ASD	**LRFD**			**ASD**	**LRFD**
HSS6.000×	0.500	**29.9**	45.0	HSS3.500×	0.313	**6.30**	9.47
	0.375	**23.4**	35.2		0.300	**6.08**	9.14
	0.312	**19.9**	29.9		0.250	**5.22**	7.85
	0.280	**18.0**	27.0		0.216	**4.59**	6.90
	0.250	**16.2**	24.4		0.203	**4.35**	6.53
	0.188	**12.4**	18.6		0.188	**4.04**	6.07
	0.125[f]	**8.30**	12.5		0.125	**2.79**	4.19
HSS5.563×	0.500	**25.4**	38.2	HSS3.000×	0.250	**3.75**	5.63
	0.375	**19.9**	29.9		0.216	**3.31**	4.97
	0.258	**14.3**	21.4		0.203	**3.13**	4.71
	0.188	**10.6**	15.9		0.188	**2.92**	4.38
	0.134	**7.69**	11.6		0.152	**2.42**	3.63
					0.134	**2.15**	3.23
HSS5.500×	0.500	**24.8**	37.2		0.125	**2.02**	3.04
	0.375	**19.4**	29.2				
	0.258	**13.9**	20.9	HSS2.875×	0.250	**3.42**	5.14
					0.203	**2.86**	4.30
HSS5.000×	0.500	**20.1**	30.2		0.188	**2.66**	4.00
	0.375	**15.9**	23.8		0.125	**1.85**	2.78
	0.312	**13.5**	20.4				
	0.258	**11.4**	17.1	HSS2.500×	0.250	**2.52**	3.79
	0.250	**11.1**	16.7		0.188	**1.98**	2.97
	0.188	**8.50**	12.8		0.125	**1.38**	2.08
	0.125	**5.80**	8.72				
				HSS2.375×	0.250	**2.25**	3.38
HSS4.500×	0.375	**12.6**	19.0		0.218	**2.01**	3.03
	0.337	**11.5**	17.3		0.188	**1.77**	2.66
	0.237	**8.45**	12.7		0.154	**1.50**	2.25
	0.188	**6.83**	10.3		0.125	**1.24**	1.87
	0.125	**4.67**	7.02				
				HSS1.900×	0.188	**1.09**	1.64
HSS4.000×	0.313	**8.41**	12.6		0.145	**0.883**	1.33
	0.250	**6.94**	10.4		0.120	**0.746**	1.12
	0.237	**6.60**	9.91				
	0.226	**6.33**	9.51	HSS1.660×	0.140	**0.639**	0.961
	0.220	**6.19**	9.31				
	0.188	**5.34**	8.03				
	0.125	**3.67**	5.51				

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[f] Shape exceeds compact limit for flexure with F_y = 42 ksi.

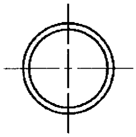


Table 3–15
Pipe
Available Flexural Strength, kip-ft

F_y = 35 ksi

Shape	ASD	LRFD
Pipe 12 X-Strong	123	184
Pipe 12 Std	93.8	141
Pipe 10 X-Strong	86.0	129
Pipe 10 Std	64.4	96.8
Pipe 8 XX-Strong	87.2	131
Pipe 8 X-Strong	54.1	81.4
Pipe 8 Std	36.3	54.6
Pipe 6 XX-Strong	47.9	72.0
Pipe 6 X-Strong	27.3	41.0
Pipe 6 Std	18.5	27.8
Pipe 5 XX-Strong	29.1	43.7
Pipe 5 X-Strong	16.6	24.9
Pipe 5 Std	11.9	17.9
Pipe 4 XX-Strong	16.6	24.9
Pipe 4 X-Strong	9.65	14.5
Pipe 4 Std	7.07	10.6
Pipe 3½ X-Strong	7.11	10.7
Pipe 3½ Std	5.30	7.96

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

F_y = 35 ksi

Table 3–15 (continued) Pipe

Available Flexural Strength, kip-ft

Shape	ASD	LRFD	Shape	ASD	LRFD
Pipe 3 XX-Strong	8.55	12.8	Pipe 1¼ X-Strong	0.686	1.03
Pipe 3 X-Strong	5.08	7.64	Pipe 1¼ Std	0.533	0.801
Pipe 3 Std	3.83	5.75	Pipe 1 X-Strong	0.385	0.579
Pipe 2½ XX-Strong	5.08	7.64	Pipe 1 Std	0.308	0.463
Pipe 2½ X-Strong	3.09	4.64	Pipe ¾ X-Strong	0.207	0.311
Pipe 2½ Std	2.39	3.59	Pipe ¾ Std	0.164	0.247
Pipe 2 XX-Strong	2.79	4.19	Pipe ½ X-Strong	0.120	0.180
Pipe 2 X-Strong	1.68	2.53	Pipe ½ Std	0.0969	0.146
Pipe 2 Std	1.25	1.87			
Pipe 1½ X-Strong	0.958	1.44			
Pipe 1½ Std	0.736	1.11			

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

Table 3–16a
Available Shear Stress, ksi
Tension Field Action NOT Included

F_y = 36 ksi

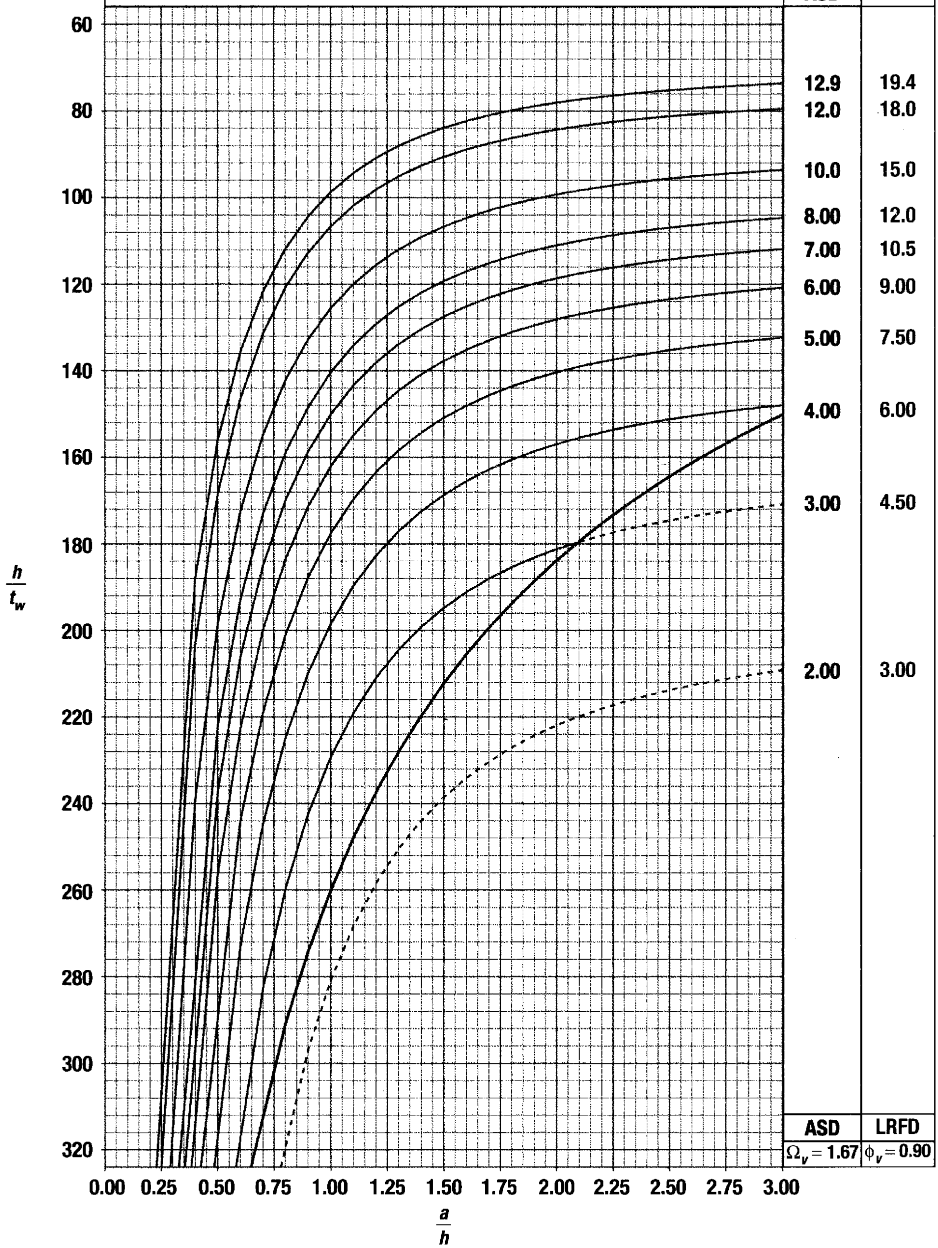
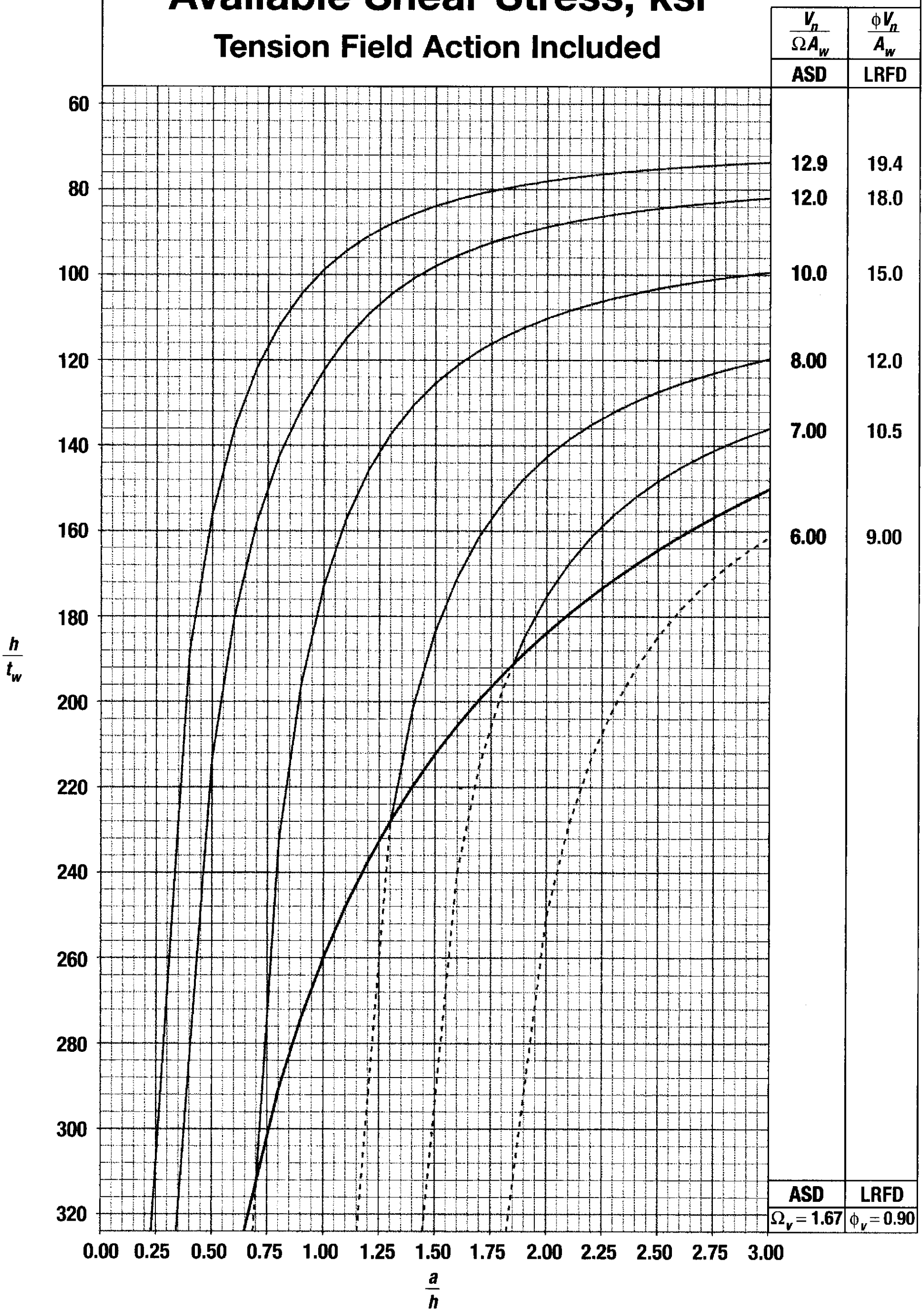


Table 3–16b
Available Shear Stress, ksi
Tension Field Action Included

F_y = 36 ksi



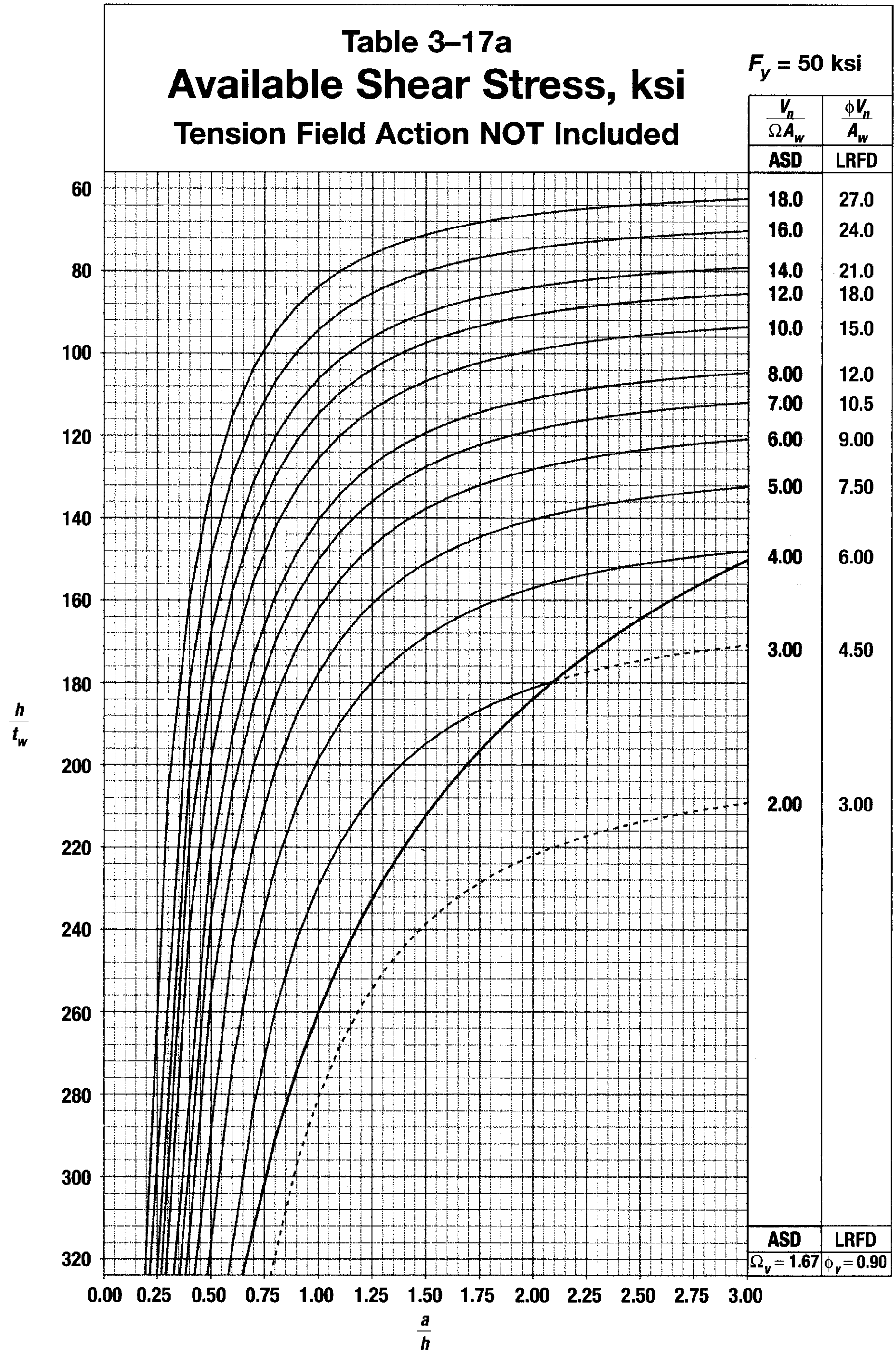


Table 3–17a
Available Shear Stress, ksi
Tension Field Action NOT Included
F_y = 50 ksi
$\frac{V_n}{\Omega A_w}$ ASD
$\frac{\phi V_n}{A_w}$ LRFD
18.0 27.0
16.0 24.0
14.0 21.0
12.0 18.0
10.0 15.0
8.00 12.0
7.00 10.5
6.00 9.00
5.00 7.50
4.00 6.00
3.00 4.50
2.00 3.00
ASD LRFD
$\Omega_v = 1.67$ $\phi_v = 0.90$
$\frac{h}{t_w}$
60 80 100 120 140 160 180 200 220 240 260 280 300 320
0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
$\frac{a}{h}$

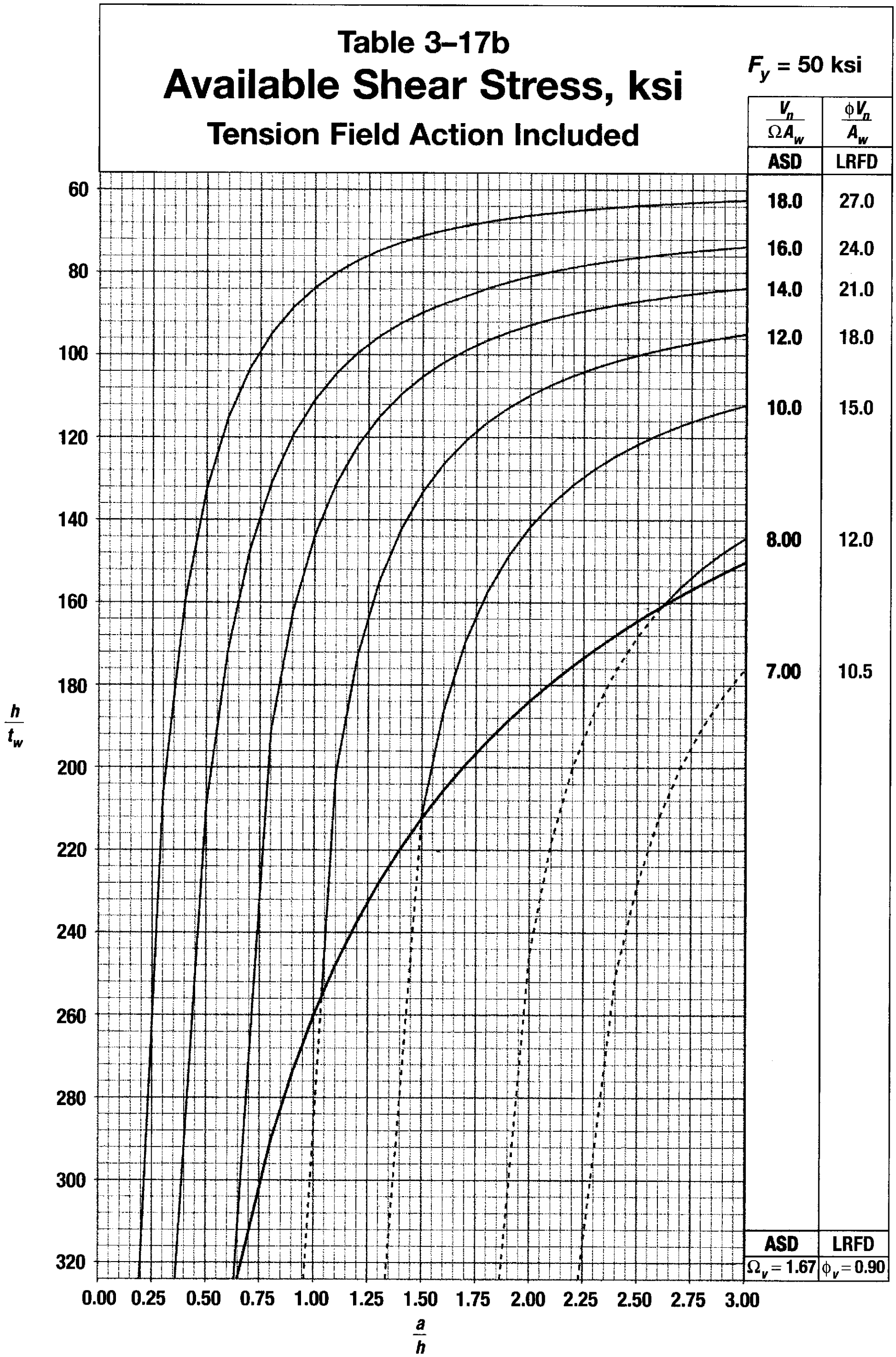


Table 3–17b
Available Shear Stress, ksi
Tension Field Action Included
F_y = 50 ksi
$\frac{V_n}{\Omega A_w}$ ASD
$\frac{\phi V_n}{A_w}$ LRFD
18.0 27.0
16.0 24.0
14.0 21.0
12.0 18.0
10.0 15.0
8.00 12.0
7.00 10.5
ASD Ω_v = 1.67
LRFD ϕ_v = 0.90
$\frac{h}{t_w}$
60 80 100 120 140 160 180 200 220 240 260 280 300 320
0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
$\frac{a}{h}$

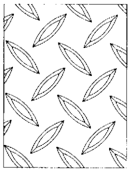


Table 3–18a
Raised Pattern Floor Plate Deflection-Controlled Applications
Recommended Maximum Uniformly Distributed Service Load, lb/ft^2

Plate thickness t, in.	Theoretical weight, lb/ft^2	Span, ft					Moment of inertia per ft of width, in.^{4}/ft
		1.5	2	2.5	3	3.5	
1/8	6.15	89.5	37.8	19.3	11.2	7.05	0.00195
3/16	8.70	302	127	65.3	37.8	23.8	0.00659
1/4	11.3	716	302	155	89.5	56.4	0.0156
5/16	13.8	1400	590	302	175	110	0.0305
3/8	16.4	2420	1020	522	302	190	0.0527
1/2	21.5	5730	2420	1240	716	451	0.125
5/8	26.6	11200	4720	2420	1400	881	0.244
3/4	31.7	19300	8160	4180	2420	1520	0.422
7/8	36.8	30700	13000	6630	3840	2420	0.670
1	41.9	45800	19300	9900	5730	3610	1.00
1 1/4	52.1	89500	37800	19300	11200	7050	1.95
1 1/2	62.3	155000	65300	33400	19300	12200	3.38
1 3/4	72.5	246000	104000	53100	30700	19300	5.36
2	82.7	367000	155000	79200	45800	28900	8.00
Plate thickness t, in.	**Theoretical weight, lb/ft^2**	**Span, ft**					**Moment of inertia per ft of width, in.^{4}/ft**
		4	**4.5**	**5**	**6**	**7**	
3/16	8.70	15.9	11.2	8.16	4.72	2.97	0.00659
1/4	11.3	37.8	26.5	19.3	11.2	7.05	0.0156
5/16	13.8	73.8	51.8	37.8	21.9	13.8	0.0305
3/8	16.4	127	89.5	65.3	37.8	23.8	0.0527
1/2	21.5	302	212	155	89.5	56.4	0.125
5/8	26.6	590	414	302	175	110	0.244
3/4	31.7	1020	716	522	302	190	0.422
7/8	36.8	1620	1140	829	480	302	0.670
1	41.9	2420	1700	1240	716	451	1.00
1 1/4	52.1	4720	3320	2420	1400	881	1.95
1 1/2	62.3	8160	5730	4180	2420	1520	3.38
1 3/4	72.5	13000	9100	6630	3840	2420	5.36
2	82.7	19300	13600	9900	5730	3610	8.00

Note: Material conforms to ASTM A786.

Table 3–18b
Raised Pattern Floor Plate Flexural-Strength-Controlled Applications
Recommended Maximum Uniformly Distributed Load, lb/ft²

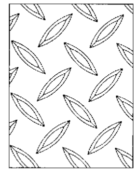


Plate thickness *t*, in.	Theoretical weight, lb/ft²	Span, ft 1.5		2		2.5		3		3.5		Plastic section modulus per ft of width, in.³/ft
Design		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
1/8	6.15	222	333	125	188	79.8	120	55.4	83.3	40.7	61.2	0.0469
3/16	8.70	499	750	281	422	180	270	125	188	91.7	138	0.105
1/4	11.3	887	1330	499	750	319	480	222	333	163	245	0.188
5/16	13.8	1390	2080	780	1170	499	750	347	521	255	383	0.293
3/8	16.4	2000	3000	1120	1690	719	1080	499	750	367	551	0.422
1/2	21.5	3550	5330	2000	3000	1280	1920	887	1330	652	980	0.750
5/8	26.6	5540	8330	3120	4690	2000	3000	1390	2080	1020	1530	1.17
3/4	31.7	7980	12000	4490	6750	2870	4320	2000	3000	1470	2200	1.69
7/8	36.8	10900	16300	6110	9190	3910	5880	2720	4080	2000	3000	2.30
1	41.9	14200	21300	7980	12000	5110	7680	3550	5330	2610	3920	3.00
1 1/4	52.1	22200	33300	12500	18800	7980	12000	5540	8330	4070	6120	4.69
1 1/2	62.3	31900	48000	18000	27000	11500	17300	7980	12000	5870	8820	6.75
1 3/4	72.5	43500	65300	24500	36800	15600	23500	10900	16300	7980	12000	9.19
2	82.7	56800	85300	31900	48000	20400	30700	14200	21300	10400	15700	12.0

Plate thickness *t*, in.	Theoretical weight, lb/ft²	Span, ft 4		4.5		5		6		7		Plastic section modulus per ft of width, in.³/ft
Design		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
3/16	8.70	70.2	105	55.4	83.3	44.9	67.5	31.2	46.9	22.9	34.4	0.105
1/4	11.3	125	188	98.6	148	79.8	120	55.4	83.3	40.7	61.2	0.188
5/16	13.8	195	293	154	231	125	188	86.6	130	63.6	95.7	0.293
3/8	16.4	281	422	222	333	180	270	125	188	91.7	138	0.422
1/2	21.5	499	750	394	593	319	480	222	333	163	245	0.750
5/8	26.6	780	1170	616	926	499	750	347	521	255	383	1.17
3/4	31.7	1120	1690	887	1330	719	1080	499	750	367	551	1.69
7/8	36.8	1530	2300	1210	1810	978	1470	679	1020	499	750	2.30
1	41.9	2000	3000	1580	2370	1280	1920	887	1330	652	980	3.00
1 1/4	52.1	3120	4690	2460	3700	2000	3000	1390	2080	1020	1530	4.69
1 1/2	62.3	4490	6750	3550	5330	2870	4320	2000	3000	1470	2200	6.75
1 3/4	72.5	6110	9190	4830	7260	3910	5880	2720	4080	2000	3000	9.19
2	82.7	7980	12000	6310	9480	5110	7680	3550	5330	2610	3920	12.0

Note: Material conforms to ASTM A786.

W40

Table 3–19
Composite W Shapes
Available Strength in Flexure, kip-ft

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W40×297	3320	4990	TFL	0	4370	4780	7180	4890	7350	5000	7510	5110	7680
			2	0.413	3720	4710	7080	4800	7220	4890	7360	4990	7490
			3	0.825	3060	4620	6950	4700	7060	4780	7180	4850	7290
			4	1.24	2410	4520	6800	4580	6890	4640	6980	4700	7070
			BFL	1.65	1760	4410	6630	4460	6700	4500	6760	4540	6830
			6	4.59	1430	4330	6510	4370	6570	4400	6620	4440	6670
			7	8.17	1090	4190	6300	4220	6340	4250	6380	4270	6420
W40×294	3170	4760	TFL	0	4310	4780	7180	4890	7340	4990	7500	5100	7670
			2	0.483	3730	4710	7080	4810	7220	4900	7360	4990	7500
			3	0.965	3150	4630	6970	4710	7080	4790	7200	4870	7320
			4	1.45	2580	4540	6830	4610	6920	4670	7020	4730	7120
			BFL	1.93	2000	4440	6670	4480	6740	4530	6820	4580	6890
			6	5.69	1540	4310	6480	4350	6530	4390	6590	4420	6650
			7	10.00	1080	4080	6140	4110	6180	4140	6220	4170	6260
W40×278	2970	4460	TFL	0	4100	4520	6790	4620	6940	4720	7100	4820	7250
			2	0.453	3560	4460	6700	4540	6830	4630	6960	4720	7100
			3	0.905	3020	4380	6590	4460	6700	4530	6820	4610	6930
			4	1.36	2470	4300	6460	4360	6550	4420	6650	4480	6740
			BFL	1.81	1930	4200	6320	4250	6390	4300	6460	4350	6530
			6	5.65	1480	4080	6130	4120	6190	4150	6240	4190	6300
			7	10.1	1020	3850	5790	3880	5830	3910	5870	3930	5910
W40×277	3120	4690	TFL	0	4070	4440	6670	4540	6820	4640	6970	4740	7130
			2	0.394	3450	4370	6560	4450	6690	4540	6820	4630	6950
			3	0.788	2820	4290	6440	4360	6550	4430	6660	4500	6760
			4	1.18	2200	4190	6300	4250	6390	4300	6470	4360	6550
			BFL	1.58	1580	4090	6150	4130	6210	4170	6260	4210	6320
			6	4.22	1300	4030	6050	4060	6100	4090	6150	4120	6200
			7	7.59	1020	3920	5890	3940	5920	3970	5960	3990	6000
W40×264	2820	4240	TFL	0	3880	4260	6400	4350	6540	4450	6690	4550	6830
			2	0.433	3360	4200	6310	4280	6440	4370	6560	4450	6690
			3	0.865	2850	4130	6210	4200	6320	4270	6420	4340	6530
			4	1.30	2330	4050	6090	4110	6180	4170	6270	4230	6350
			BFL	1.73	1810	3960	5950	4010	6020	4050	6090	4100	6160
			6	5.50	1390	3850	5790	3880	5840	3920	5890	3950	5940
			7	9.90	969	3650	5480	3670	5520	3690	5550	3720	5590

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W40

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W40×297	**5220**	7840	**5330**	8000	**5430**	8170	**5540**	8330	**5650**	8500	**5760**	8660	**5870**	8820
	5080	7630	**5170**	7770	**5260**	7910	**5360**	8050	**5450**	8190	**5540**	8330	**5640**	8470
	4930	7410	**5010**	7520	**5080**	7640	**5160**	7750	**5230**	7870	**5310**	7980	**5390**	8100
	4760	7160	**4820**	7250	**4890**	7340	**4950**	7430	**5010**	7520	**5070**	7610	**5130**	7700
	4590	6900	**4630**	6960	**4680**	7030	**4720**	7090	**4760**	7160	**4810**	7230	**4850**	7290
	4480	6730	**4510**	6780	**4550**	6830	**4580**	6890	**4620**	6940	**4650**	6990	**4690**	7050
	4300	6470	**4330**	6510	**4360**	6550	**4380**	6590	**4410**	6630	**4440**	6670	**4460**	6710
W40×294	**5210**	7830	**5320**	7990	**5420**	8150	**5530**	8310	**5640**	8480	**5750**	8640	**5850**	8800
	5090	7640	**5180**	7780	**5270**	7920	**5370**	8060	**5460**	8200	**5550**	8340	**5640**	8480
	4950	7440	**5030**	7560	**5110**	7670	**5180**	7790	**5260**	7910	**5340**	8030	**5420**	8150
	4800	7210	**4860**	7310	**4930**	7410	**4990**	7500	**5060**	7600	**5120**	7700	**5180**	7790
	4630	6970	**4680**	7040	**4730**	7120	**4780**	7190	**4830**	7270	**4880**	7340	**4930**	7410
	4460	6710	**4500**	6760	**4540**	6820	**4580**	6880	**4620**	6940	**4650**	7000	**4690**	7050
	4190	6300	**4220**	6340	**4250**	6380	**4270**	6420	**4300**	6460	**4330**	6500	**4350**	6540
W40×278	**4930**	7400	**5030**	7560	**5130**	7710	**5230**	7860	**5330**	8020	**5440**	8170	**5540**	8330
	4810	7230	**4900**	7360	**4990**	7500	**5080**	7630	**5170**	7770	**5260**	7900	**5340**	8030
	4680	7040	**4760**	7150	**4840**	7270	**4910**	7380	**4990**	7490	**5060**	7610	**5140**	7720
	4550	6830	**4610**	6930	**4670**	7020	**4730**	7110	**4790**	7200	**4850**	7300	**4920**	7390
	4390	6610	**4440**	6680	**4490**	6750	**4540**	6820	**4590**	6900	**4640**	6970	**4680**	7040
	4230	6350	**4260**	6410	**4300**	6460	**4340**	6520	**4370**	6580	**4410**	6630	**4450**	6690
	3960	5950	**3980**	5980	**4010**	6020	**4030**	6060	**4060**	6100	**4080**	6140	**4110**	6180
W40×277	**4840**	7280	**4940**	7430	**5050**	7580	**5150**	7740	**5250**	7890	**5350**	8040	**5450**	8190
	4710	7080	**4800**	7210	**4880**	7340	**4970**	7470	**5060**	7600	**5140**	7730	**5230**	7860
	4570	6870	**4640**	6970	**4710**	7080	**4780**	7180	**4850**	7290	**4920**	7400	**4990**	7500
	4410	6630	**4470**	6720	**4520**	6800	**4580**	6880	**4630**	6960	**4690**	7050	**4740**	7130
	4250	6380	**4290**	6440	**4330**	6500	**4370**	6560	**4400**	6620	**4440**	6680	**4480**	6740
	4160	6250	**4190**	6290	**4220**	6340	**4250**	6390	**4290**	6440	**4320**	6490	**4350**	6540
	4020	6040	**4040**	6080	**4070**	6110	**4090**	6150	**4120**	6190	**4140**	6230	**4170**	6270
W40×264	**4640**	6980	**4740**	7130	**4840**	7270	**4930**	7420	**5030**	7560	**5130**	7710	**5220**	7850
	4540	6820	**4620**	6940	**4700**	7070	**4790**	7190	**4870**	7320	**4950**	7450	**5040**	7570
	4420	6640	**4490**	6740	**4560**	6850	**4630**	6960	**4700**	7060	**4770**	7170	**4840**	7280
	4280	6440	**4340**	6530	**4400**	6610	**4460**	6700	**4520**	6790	**4580**	6880	**4630**	6960
	4140	6230	**4190**	6290	**4230**	6360	**4280**	6430	**4320**	6500	**4370**	6570	**4410**	6630
	3990	6000	**4020**	6050	**4060**	6100	**4090**	6150	**4130**	6200	**4160**	6260	**4200**	6310
	3740	5630	**3770**	5660	**3790**	5700	**3820**	5730	**3840**	5770	**3860**	5810	**3890**	5840

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

W40

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W40×249	2790	4200	TFL	0	3670	3970	5960	4060	6100	4150	6240	4240	6380
			2	0.355	3110	3910	5870	3990	5990	4060	6110	4140	6220
			3	0.710	2550	3840	5770	3900	5860	3960	5960	4030	6050
			4	1.07	1990	3760	5650	3810	5720	3860	5800	3910	5870
			BFL	1.42	1430	3670	5510	3700	5560	3740	5620	3770	5670
			6	4.04	1170	3610	5430	3640	5470	3670	5510	3700	5560
			7	7.47	917	3510	5280	3530	5310	3560	5350	3580	5380
W40×235	2520	3790	TFL	0	3450	3760	5650	3850	5780	3930	5910	4020	6040
			2	0.394	2980	3710	5570	3780	5690	3860	5800	3930	5910
			3	0.788	2510	3650	5480	3710	5580	3770	5670	3840	5770
			4	1.18	2040	3580	5380	3630	5450	3680	5530	3730	5610
			BFL	1.58	1580	3500	5260	3540	5320	3580	5380	3620	5440
			6	5.16	1220	3410	5120	3440	5170	3470	5220	3500	5260
			7	9.46	862	3240	4880	3270	4910	3290	4940	3310	4970
W40×215	2410	3620	TFL	0	3170	3400	5110	3480	5230	3560	5350	3640	5460
			2	0.305	2690	3350	5030	3410	5130	3480	5230	3550	5330
			3	0.610	2210	3290	4940	3340	5020	3400	5110	3450	5190
			4	0.915	1730	3220	4840	3260	4910	3310	4970	3350	5040
			BFL	1.22	1250	3150	4730	3180	4780	3210	4830	3240	4870
			6	3.80	1020	3100	4660	3130	4700	3150	4740	3180	4780
			7	7.30	792	3020	4530	3040	4560	3050	4590	3070	4620
W40×211	2260	3400	TFL	0	3100	3360	5040	3430	5160	3510	5280	3590	5390
			2	0.354	2680	3310	4980	3380	5080	3440	5180	3510	5280
			3	0.708	2270	3260	4900	3310	4980	3370	5070	3430	5150
			4	1.06	1850	3200	4810	3240	4880	3290	4940	3340	5010
			BFL	1.42	1430	3130	4700	3170	4760	3200	4810	3240	4870
			6	4.98	1100	3050	4590	3080	4630	3110	4670	3130	4710
			7	9.35	775	2900	4360	2920	4390	2940	4420	2960	4450
W40×199	2170	3260	TFL	0	2920	3110	4680	3190	4790	3260	4900	3330	5010
			2	0.266	2510	3070	4610	3130	4710	3190	4800	3260	4890
			3	0.533	2090	3020	4540	3070	4620	3120	4690	3180	4770
			4	0.799	1670	2960	4450	3000	4520	3050	4580	3090	4640
			BFL	1.07	1250	2900	4360	2930	4410	2960	4460	3000	4500
			6	4.11	989	2850	4280	2870	4320	2900	4350	2920	4390
			7	8.09	731	2740	4120	2760	4150	2780	4180	2800	4210

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W40

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W40×249	4330	6510	4430	6650	4520	6790	4610	6930	4700	7060	4790	7200	4880	7340
	4220	6340	4300	6460	4370	6570	4450	6690	4530	6810	4610	6920	4680	7040
	4090	6150	4160	6250	4220	6340	4280	6440	4350	6530	4410	6630	4470	6720
	3960	5940	4000	6020	4050	6090	4100	6170	4150	6240	4200	6320	4250	6390
	3810	5720	3840	5780	3880	5830	3920	5890	3950	5940	3990	5990	4020	6050
	3730	5600	3760	5650	3790	5690	3810	5730	3840	5780	3870	5820	3900	5870
	3600	5410	3620	5450	3650	5480	3670	5520	3690	5550	3720	5590	3740	5620
W40×235	4100	6170	4190	6300	4280	6430	4360	6560	4450	6690	4530	6810	4620	6940
	4010	6020	4080	6130	4150	6240	4230	6360	4300	6470	4380	6580	4450	6690
	3900	5860	3960	5950	4020	6050	4090	6140	4150	6240	4210	6330	4270	6420
	3780	5680	3830	5760	3880	5840	3930	5910	3990	5990	4040	6070	4090	6140
	3660	5500	3700	5560	3740	5610	3770	5670	3810	5730	3850	5790	3890	5850
	3530	5310	3560	5350	3590	5400	3620	5440	3650	5490	3680	5540	3710	5580
	3330	5000	3350	5040	3370	5070	3390	5100	3420	5130	3440	5170	3460	5200
W40×215	3710	5580	3790	5700	3870	5820	3950	5940	4030	6060	4110	6180	4190	6300
	3610	5430	3680	5530	3750	5630	3820	5740	3880	5840	3950	5940	4020	6040
	3510	5270	3560	5360	3620	5440	3670	5520	3730	5600	3780	5690	3840	5770
	3390	5100	3440	5170	3480	5230	3520	5300	3570	5360	3610	5430	3650	5490
	3270	4920	3300	4970	3330	5010	3370	5060	3400	5110	3430	5150	3460	5200
	3200	4810	3230	4850	3250	4890	3280	4930	3300	4970	3330	5010	3360	5040
	3090	4650	3110	4680	3130	4710	3150	4740	3170	4770	3190	4800	3210	4830
W40×211	3670	5510	3740	5630	3820	5740	3900	5860	3970	5970	4050	6090	4130	6210
	3580	5380	3650	5480	3710	5580	3780	5680	3850	5780	3910	5880	3980	5980
	3480	5240	3540	5320	3600	5410	3650	5490	3710	5580	3770	5660	3820	5750
	3380	5080	3430	5150	3470	5220	3520	5290	3570	5360	3610	5430	3660	5500
	3270	4920	3310	4970	3340	5030	3380	5080	3420	5130	3450	5190	3490	5240
	3160	4750	3190	4790	3220	4830	3240	4870	3270	4920	3300	4960	3330	5000
	2980	4480	3000	4510	3020	4530	3040	4560	3060	4590	3080	4620	3090	4650
W40×199	3410	5120	3480	5230	3550	5340	3620	5450	3700	5560	3770	5670	3840	5780
	3320	4990	3380	5080	3440	5180	3510	5270	3570	5360	3630	5460	3690	5550
	3230	4850	3280	4930	3330	5010	3380	5090	3440	5160	3490	5240	3540	5320
	3130	4700	3170	4770	3210	4830	3250	4890	3300	4950	3340	5020	3380	5080
	3030	4550	3060	4600	3090	4640	3120	4690	3150	4740	3180	4780	3210	4830
	2950	4430	2970	4470	3000	4500	3020	4540	3050	4580	3070	4610	3090	4650
	2820	4230	2830	4260	2850	4290	2870	4310	2890	4340	2910	4370	2930	4400

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W40–W36

F_y = 50 ksi

Shape	M_p/Ω_b kip-ft	$\phi_b M_p$ kip-ft	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in. 2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W40×183	**1930**	2900	TFL	0	2670	**2860**	4300	**2930**	4400	**2990**	4500	**3060**	4600
			2	0.300	2310	**2820**	4240	**2880**	4330	**2940**	4410	**2990**	4500
			3	0.600	1960	**2780**	4170	**2830**	4250	**2880**	4320	**2920**	4390
			4	0.900	1600	**2730**	4100	**2770**	4160	**2810**	4220	**2850**	4280
			BFL	1.20	1250	**2670**	4020	**2710**	4070	**2740**	4110	**2770**	4160
			6	4.76	958	**2610**	3920	**2630**	3960	**2660**	3990	**2680**	4030
			7	9.24	666	**2480**	3720	**2490**	3750	**2510**	3770	**2530**	3800
W40×167	**1730**	2600	TFL	0	2460	**2610**	3930	**2670**	4020	**2730**	4110	**2800**	4200
			2	0.256	2160	**2580**	3880	**2630**	3960	**2690**	4040	**2740**	4120
			3	0.513	1850	**2540**	3820	**2590**	3890	**2640**	3960	**2680**	4030
			4	0.769	1550	**2500**	3760	**2540**	3820	**2580**	3880	**2620**	3940
			BFL	1.03	1250	**2460**	3700	**2490**	3740	**2520**	3790	**2550**	3840
			6	4.97	931	**2390**	3590	**2410**	3620	**2430**	3660	**2460**	3690
			7	9.84	614	**2240**	3370	**2250**	3390	**2270**	3410	**2280**	3430
W40×149	**1490**	2240	TFL	0	2190	**2310**	3470	**2360**	3550	**2420**	3630	**2470**	3710
			2	0.208	1950	**2280**	3430	**2330**	3500	**2380**	3570	**2430**	3650
			3	0.415	1700	**2250**	3390	**2300**	3450	**2340**	3510	**2380**	3580
			4	0.623	1460	**2220**	3340	**2260**	3390	**2290**	3450	**2330**	3500
			BFL	0.830	1210	**2190**	3290	**2220**	3340	**2250**	3380	**2280**	3430
			6	5.14	879	**2110**	3180	**2140**	3210	**2160**	3240	**2180**	3280
			7	10.4	548	**1950**	2930	**1970**	2950	**1980**	2970	**1990**	3000
W36×302	**3190**	4800	TFL	0	4440	**4580**	6880	**4690**	7050	**4800**	7220	**4910**	7380
			2	0.420	3740	**4500**	6770	**4600**	6910	**4690**	7050	**4780**	7190
			3	0.840	3040	**4410**	6630	**4490**	6740	**4560**	6860	**4640**	6970
			4	1.26	2340	**4300**	6470	**4360**	6560	**4420**	6650	**4480**	6730
			BFL	1.68	1640	**4180**	6290	**4220**	6350	**4270**	6410	**4310**	6470
			6	4.09	1380	**4120**	6200	**4160**	6250	**4190**	6300	**4230**	6350
			7	6.91	1110	**4020**	6050	**4050**	6090	**4080**	6130	**4110**	6170
W36×282	**2970**	4460	TFL	0	4150	**4250**	6390	**4360**	6550	**4460**	6700	**4560**	6860
			2	0.393	3500	**4180**	6290	**4270**	6420	**4360**	6550	**4440**	6680
			3	0.785	2840	**4100**	6160	**4170**	6270	**4240**	6370	**4310**	6480
			4	1.18	2190	**4000**	6010	**4060**	6100	**4110**	6180	**4170**	6260
			BFL	1.57	1540	**3890**	5850	**3930**	5910	**3970**	5960	**4010**	6020
			6	3.99	1290	**3830**	5760	**3870**	5810	**3900**	5860	**3930**	5910
			7	6.84	1040	**3740**	5620	**3770**	5660	**3790**	5700	**3820**	5740

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite WShapes
Available Strength in Flexure, kip-ft

W40–W36

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W40×183	**3120**	4700	**3190**	4800	**3260**	4900	**3320**	5000	**3390**	5100	**3460**	5200	**3520**	5300
	3050	4590	**3110**	4670	**3170**	4760	**3220**	4850	**3280**	4930	**3340**	5020	**3400**	5110
	2970	4470	**3020**	4540	**3070**	4620	**3120**	4690	**3170**	4760	**3220**	4840	**3270**	4910
	2890	4340	**2930**	4400	**2970**	4460	**3010**	4520	**3050**	4580	**3090**	4640	**3130**	4700
	2800	4210	**2830**	4250	**2860**	4300	**2890**	4350	**2920**	4400	**2960**	4440	**2990**	4490
	2700	4060	**2730**	4100	**2750**	4140	**2780**	4170	**2800**	4210	**2820**	4240	**2850**	4280
	2540	3820	**2560**	3850	**2580**	3870	**2590**	3900	**2610**	3920	**2630**	3950	**2640**	3970
W40×167	**2860**	4290	**2920**	4390	**2980**	4480	**3040**	4570	**3100**	4660	**3160**	4760	**3230**	4850
	2790	4200	**2850**	4280	**2900**	4360	**2960**	4440	**3010**	4520	**3060**	4600	**3120**	4690
	2730	4100	**2770**	4170	**2820**	4240	**2870**	4310	**2910**	4380	**2960**	4450	**3010**	4520
	2660	4000	**2700**	4050	**2740**	4110	**2770**	4170	**2810**	4230	**2850**	4290	**2890**	4340
	2580	3880	**2620**	3930	**2650**	3980	**2680**	4030	**2710**	4070	**2740**	4120	**2770**	4170
	2480	3730	**2500**	3760	**2530**	3800	**2550**	3830	**2570**	3870	**2600**	3900	**2620**	3940
	2300	3460	**2320**	3480	**2330**	3500	**2350**	3530	**2360**	3550	**2380**	3570	**2390**	3600
W40×149	**2530**	3800	**2580**	3880	**2640**	3960	**2690**	4040	**2740**	4120	**2800**	4210	**2850**	4290
	2480	3720	**2520**	3790	**2570**	3870	**2620**	3940	**2670**	4010	**2720**	4090	**2770**	4160
	2420	3640	**2470**	3710	**2510**	3770	**2550**	3830	**2590**	3900	**2630**	3960	**2680**	4020
	2370	3560	**2400**	3610	**2440**	3670	**2480**	3720	**2510**	3780	**2550**	3830	**2590**	3890
	2310	3470	**2340**	3520	**2370**	3560	**2400**	3610	**2430**	3650	**2460**	3700	**2490**	3740
	2200	3310	**2220**	3340	**2240**	3370	**2270**	3410	**2290**	3440	**2310**	3470	**2330**	3510
	2010	3020	**2020**	3040	**2030**	3060	**2050**	3080	**2060**	3100	**2070**	3120	**2090**	3140
W36×302	**5020**	7550	**5130**	7720	**5250**	7880	**5360**	8050	**5470**	8220	**5580**	8380	**5690**	8550
	4880	7330	**4970**	7470	**5060**	7610	**5160**	7750	**5250**	7890	**5340**	8030	**5440**	8170
	4710	7090	**4790**	7200	**4870**	7310	**4940**	7430	**5020**	7540	**5090**	7660	**5170**	7770
	4540	6820	**4600**	6910	**4660**	7000	**4710**	7080	**4770**	7170	**4830**	7260	**4890**	7350
	4350	6530	**4390**	6600	**4430**	6660	**4470**	6720	**4510**	6780	**4550**	6840	**4590**	6900
	4260	6400	**4290**	6450	**4330**	6510	**4360**	6560	**4400**	6610	**4430**	6660	**4470**	6710
	4130	6210	**4160**	6250	**4190**	6300	**4220**	6340	**4240**	6380	**4270**	6420	**4300**	6460
W36×282	**4670**	7020	**4770**	7170	**4870**	7330	**4980**	7480	**5080**	7640	**5190**	7790	**5290**	7950
	4530	6810	**4620**	6940	**4710**	7070	**4790**	7200	**4880**	7340	**4970**	7470	**5050**	7600
	4380	6590	**4450**	6690	**4520**	6800	**4590**	6910	**4670**	7010	**4740**	7120	**4810**	7230
	4220	6340	**4270**	6420	**4330**	6510	**4380**	6590	**4440**	6670	**4490**	6750	**4550**	6840
	4050	6080	**4080**	6140	**4120**	6200	**4160**	6250	**4200**	6310	**4240**	6370	**4280**	6430
	3960	5960	**4000**	6010	**4030**	6050	**4060**	6100	**4090**	6150	**4120**	6200	**4160**	6250
	3850	5780	**3870**	5820	**3900**	5860	**3920**	5900	**3950**	5940	**3970**	5970	**4000**	6010

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W36

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	Y1[a]	ΣQ_n	Y2[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W36×262	2740	4130	TFL	0	3850	**3920**	5900	**4020**	6040	**4110**	6180	**4210**	6330
			2	0.360	3250	**3860**	5800	**3940**	5920	**4020**	6040	**4100**	6160
			3	0.720	2660	**3780**	5680	**3850**	5780	**3910**	5880	**3980**	5980
			4	1.08	2060	**3700**	5550	**3750**	5630	**3800**	5710	**3850**	5790
			BFL	1.44	1470	**3600**	5410	**3640**	5460	**3670**	5520	**3710**	5570
			6	3.98	1210	**3540**	5320	**3570**	5370	**3600**	5420	**3630**	5460
			7	6.97	962	**3450**	5180	**3470**	5220	**3500**	5260	**3520**	5290
W36×256	2590	3900	TFL	0	3770	**3890**	5850	**3990**	6000	**4080**	6140	**4180**	6280
			2	0.433	3240	**3840**	5770	**3920**	5890	**4000**	6010	**4080**	6130
			3	0.865	2710	**3770**	5660	**3830**	5760	**3900**	5860	**3970**	5970
			4	1.30	2180	**3690**	5540	**3740**	5620	**3790**	5700	**3850**	5780
			BFL	1.73	1650	**3590**	5400	**3630**	5460	**3680**	5520	**3720**	5590
			6	5.19	1300	**3500**	5260	**3530**	5310	**3560**	5360	**3600**	5400
			7	8.90	942	**3340**	5020	**3360**	5050	**3380**	5090	**3410**	5120
W36×247	2570	3860	TFL	0	3630	**3680**	5530	**3770**	5670	**3860**	5800	**3950**	5940
			2	0.338	3070	**3620**	5440	**3700**	5560	**3770**	5670	**3850**	5790
			3	0.675	2510	**3550**	5340	**3610**	5430	**3670**	5520	**3740**	5620
			4	1.01	1950	**3470**	5220	**3520**	5290	**3570**	5360	**3620**	5440
			BFL	1.35	1400	**3380**	5080	**3420**	5140	**3450**	5190	**3490**	5240
			6	3.93	1150	**3330**	5000	**3360**	5050	**3390**	5090	**3410**	5130
			7	7.00	907	**3240**	4870	**3260**	4900	**3280**	4930	**3300**	4970
W36×232	2340	3510	TFL	0	3410	**3490**	5250	**3580**	5380	**3660**	5510	**3750**	5630
			2	0.393	2930	**3440**	5170	**3510**	5280	**3590**	5390	**3660**	5500
			3	0.785	2450	**3380**	5080	**3440**	5170	**3500**	5260	**3560**	5360
			4	1.18	1980	**3310**	4970	**3360**	5050	**3410**	5120	**3460**	5200
			BFL	1.57	1500	**3230**	4850	**3270**	4910	**3300**	4970	**3340**	5020
			6	5.03	1180	**3150**	4730	**3180**	4770	**3200**	4820	**3230**	4860
			7	8.77	851	**3000**	4510	**3020**	4540	**3040**	4570	**3060**	4610
W36×231	2400	3610	TFL	0	3400	**3440**	5170	**3520**	5300	**3610**	5430	**3690**	5550
			2	0.315	2890	**3380**	5090	**3460**	5190	**3530**	5300	**3600**	5410
			3	0.630	2370	**3320**	4990	**3380**	5080	**3440**	5170	**3500**	5260
			4	0.945	1850	**3250**	4880	**3290**	4950	**3340**	5020	**3390**	5090
			BFL	1.26	1330	**3170**	4760	**3200**	4810	**3230**	4860	**3270**	4910
			6	3.90	1090	**3120**	4680	**3140**	4720	**3170**	4760	**3200**	4810
			7	7.05	851	**3030**	4550	**3050**	4580	**3070**	4610	**3090**	4640

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W36

Shape	Y2[b], in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W36×262	4310	6470	4400	6620	4500	6760	4590	6910	4690	7050	4790	7190	4880	7340
	4180	6290	4260	6410	4340	6530	4430	6650	4510	6770	4590	6900	4670	7020
	4050	6080	4110	6180	4180	6280	4250	6380	4310	6480	4380	6580	4450	6680
	3900	5860	3950	5940	4000	6020	4060	6100	4110	6170	4160	6250	4210	6330
	3750	5630	3780	5680	3820	5740	3860	5800	3890	5850	3930	5910	3970	5960
	3660	5510	3690	5550	3720	5600	3750	5640	3780	5690	3810	5730	3840	5780
	3550	5330	3570	5360	3590	5400	3620	5440	3640	5470	3670	5510	3690	5540
W36×256	4270	6420	4370	6560	4460	6700	4550	6840	4650	6980	4740	7130	4840	7270
	4160	6250	4240	6370	4320	6500	4400	6620	4480	6740	4560	6860	4640	6980
	4040	6070	4100	6170	4170	6270	4240	6370	4310	6470	4380	6580	4440	6680
	3900	5870	3960	5950	4010	6030	4070	6110	4120	6190	4180	6280	4230	6360
	3760	5650	3800	5710	3840	5770	3880	5830	3920	5900	3960	5960	4000	6020
	3630	5450	3660	5500	3690	5550	3730	5600	3760	5650	3790	5700	3820	5750
	3430	5160	3460	5190	3480	5230	3500	5260	3530	5300	3550	5330	3570	5370
W36×247	4040	6070	4130	6210	4220	6350	4310	6480	4400	6620	4490	6750	4580	6890
	3930	5900	4000	6020	4080	6130	4160	6250	4230	6360	4310	6480	4390	6590
	3800	5710	3860	5810	3930	5900	3990	5990	4050	6090	4110	6180	4180	6280
	3670	5510	3710	5580	3760	5660	3810	5730	3860	5800	3910	5880	3960	5950
	3520	5290	3560	5350	3590	5400	3630	5450	3660	5500	3700	5560	3730	5610
	3440	5180	3470	5220	3500	5260	3530	5300	3560	5350	3590	5390	3620	5430
	3330	5000	3350	5040	3370	5070	3400	5100	3420	5140	3440	5170	3460	5210
W36×232	3830	5760	3920	5890	4000	6020	4090	6140	4170	6270	4260	6400	4340	6530
	3730	5610	3810	5720	3880	5830	3950	5940	4030	6050	4100	6160	4170	6270
	3620	5450	3690	5540	3750	5630	3810	5720	3870	5820	3930	5910	3990	6000
	3510	5270	3560	5340	3610	5420	3650	5490	3700	5570	3750	5640	3800	5720
	3380	5080	3420	5130	3450	5190	3490	5250	3530	5300	3570	5360	3600	5420
	3260	4910	3290	4950	3320	4990	3350	5040	3380	5080	3410	5130	3440	5170
	3090	4640	3110	4670	3130	4700	3150	4730	3170	4770	3190	4800	3210	4830
W36×231	3780	5680	3860	5810	3950	5940	4030	6060	4120	6190	4200	6320	4290	6450
	3670	5520	3740	5630	3820	5740	3890	5840	3960	5950	4030	6060	4100	6170
	3560	5340	3620	5430	3670	5520	3730	5610	3790	5700	3850	5790	3910	5880
	3430	5160	3480	5230	3520	5300	3570	5370	3620	5440	3660	5510	3710	5570
	3300	4960	3330	5010	3370	5060	3400	5110	3430	5160	3470	5210	3500	5260
	3220	4850	3250	4890	3280	4930	3310	4970	3330	5010	3360	5050	3390	5090
	3110	4680	3130	4710	3150	4740	3170	4770	3200	4800	3220	4840	3240	4870

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W36

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W36×210	2080	3120	TFL	0	3090	3140	4720	3210	4830	3290	4950	3370	5060
			2	0.340	2680	3090	4650	3160	4750	3230	4850	3290	4950
			3	0.680	2260	3040	4570	3100	4660	3150	4740	3210	4820
			4	1.02	1850	2980	4480	3030	4550	3070	4620	3120	4690
			BFL	1.36	1430	2920	4380	2950	4440	2990	4490	3020	4540
			6	5.05	1100	2830	4260	2860	4300	2890	4340	2920	4380
			7	9.04	773	2680	4030	2700	4060	2720	4090	2740	4120
W36×194	1910	2880	TFL	0	2850	2880	4330	2950	4430	3020	4540	3090	4650
			2	0.315	2470	2840	4270	2900	4360	2960	4450	3020	4540
			3	0.630	2090	2790	4200	2840	4270	2900	4350	2950	4430
			4	0.945	1710	2740	4120	2780	4180	2820	4240	2870	4310
			BFL	1.26	1320	2680	4030	2710	4080	2740	4130	2780	4170
			6	4.94	1020	2600	3910	2630	3950	2650	3990	2680	4030
			7	8.93	713	2470	3710	2490	3740	2500	3760	2520	3790
W36×182	1790	2690	TFL	0	2680	2700	4050	2760	4150	2830	4260	2900	4360
			2	0.295	2320	2660	4000	2720	4080	2780	4170	2830	4260
			3	0.590	1970	2620	3930	2660	4010	2710	4080	2760	4150
			4	0.885	1610	2570	3860	2610	3920	2650	3980	2690	4040
			BFL	1.18	1260	2510	3780	2540	3820	2580	3870	2610	3920
			6	4.88	963	2440	3670	2470	3710	2490	3740	2510	3780
			7	8.92	670	2310	3480	2330	3500	2350	3530	2360	3550
W36×170	1670	2510	TFL	0	2500	2510	3770	2570	3860	2630	3960	2700	4050
			2	0.275	2170	2470	3720	2530	3800	2580	3880	2640	3960
			3	0.550	1840	2430	3660	2480	3730	2520	3790	2570	3860
			4	0.825	1510	2390	3590	2430	3650	2460	3700	2500	3760
			BFL	1.10	1180	2340	3520	2370	3560	2400	3610	2430	3650
			6	4.81	902	2270	3420	2300	3450	2320	3490	2340	3520
			7	8.88	626	2150	3230	2170	3260	2180	3280	2200	3300
W36×160	1560	2340	TFL	0	2350	2350	3530	2410	3620	2470	3710	2520	3790
			2	0.255	2050	2320	3480	2370	3560	2420	3630	2470	3710
			3	0.510	1740	2280	3430	2320	3490	2370	3560	2410	3620
			4	0.765	1430	2240	3370	2270	3420	2310	3470	2350	3530
			BFL	1.02	1130	2190	3300	2220	3340	2250	3380	2280	3430
			6	4.80	858	2130	3200	2150	3240	2170	3270	2200	3300
			7	8.96	588	2010	3020	2030	3050	2040	3070	2060	3090

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W36

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W36×210	**3450**	5180	**3520**	5300	**3600**	5410	**3680**	5530	**3750**	5640	**3830**	5760	**3910**	5870
	3360	5050	**3430**	5150	**3490**	5250	**3560**	5350	**3630**	5450	**3690**	5550	**3760**	5650
	3270	4910	**3320**	4990	**3380**	5080	**3440**	5160	**3490**	5250	**3550**	5330	**3610**	5420
	3170	4760	**3210**	4830	**3260**	4900	**3300**	4970	**3350**	5040	**3400**	5110	**3440**	5180
	3060	4600	**3090**	4650	**3130**	4700	**3170**	4760	**3200**	4810	**3240**	4870	**3270**	4920
	2940	4420	**2970**	4460	**3000**	4510	**3030**	4550	**3050**	4590	**3080**	4630	**3110**	4670
	2760	4150	**2780**	4180	**2800**	4210	**2820**	4240	**2840**	4270	**2860**	4290	**2880**	4320
W36×194	**3160**	4760	**3230**	4860	**3310**	4970	**3380**	5080	**3450**	5180	**3520**	5290	**3590**	5400
	3080	4640	**3150**	4730	**3210**	4820	**3270**	4910	**3330**	5010	**3390**	5100	**3450**	5190
	3000	4510	**3050**	4590	**3100**	4660	**3160**	4740	**3210**	4820	**3260**	4900	**3310**	4980
	2910	4370	**2950**	4440	**2990**	4500	**3040**	4560	**3080**	4630	**3120**	4690	**3160**	4760
	2810	4220	**2840**	4270	**2880**	4320	**2910**	4370	**2940**	4420	**2980**	4470	**3010**	4520
	2710	4070	**2730**	4100	**2760**	4140	**2780**	4180	**2810**	4220	**2830**	4260	**2860**	4300
	2540	3820	**2560**	3840	**2570**	3870	**2590**	3900	**2610**	3920	**2630**	3950	**2650**	3980
W36×182	**2960**	4460	**3030**	4560	**3100**	4660	**3170**	4760	**3230**	4860	**3300**	4960	**3370**	5060
	2890	4350	**2950**	4430	**3010**	4520	**3060**	4610	**3120**	4690	**3180**	4780	**3240**	4870
	2810	4230	**2860**	4300	**2910**	4370	**2960**	4450	**3010**	4520	**3060**	4600	**3110**	4670
	2730	4100	**2770**	4160	**2810**	4220	**2850**	4280	**2890**	4340	**2930**	4400	**2970**	4460
	2640	3970	**2670**	4010	**2700**	4060	**2730**	4110	**2760**	4150	**2800**	4200	**2830**	4250
	2540	3820	**2560**	3850	**2590**	3890	**2610**	3920	**2630**	3960	**2660**	4000	**2680**	4030
	2380	3580	**2400**	3600	**2410**	3630	**2430**	3650	**2450**	3680	**2460**	3700	**2480**	3730
W36×170	**2760**	4150	**2820**	4240	**2880**	4330	**2950**	4430	**3010**	4520	**3070**	4610	**3130**	4710
	2690	4040	**2740**	4120	**2800**	4210	**2850**	4290	**2910**	4370	**2960**	4450	**3010**	4530
	2620	3930	**2660**	4000	**2710**	4070	**2750**	4140	**2800**	4210	**2850**	4280	**2890**	4350
	2540	3820	**2580**	3870	**2610**	3930	**2650**	3990	**2690**	4040	**2730**	4100	**2770**	4160
	2460	3690	**2490**	3740	**2520**	3780	**2550**	3830	**2580**	3870	**2600**	3910	**2630**	3960
	360	3550	**2390**	3590	**2410**	3620	**2430**	3650	**2450**	3690	**2480**	3720	**2500**	3760
	2210	3330	**2230**	3350	**2250**	3380	**2260**	3400	**2280**	3420	**2290**	3450	**2310**	3470
W36×160	**2580**	3880	**2640**	3970	**2700**	4060	**2760**	4150	**2820**	4240	**2880**	4320	**2940**	4410
	2520	3790	**2570**	3860	**2620**	3940	**2670**	4020	**2720**	4090	**2780**	4170	**2830**	4250
	2450	3690	**2500**	3750	**2540**	3820	**2580**	3880	**2630**	3950	**2670**	4010	**2710**	4080
	2380	3580	**2420**	3630	**2450**	3690	**2490**	3740	**2530**	3800	**2560**	3850	**2600**	3900
	2310	3470	**2340**	3510	**2360**	3550	**2390**	3600	**2420**	3640	**2450**	3680	**2480**	3720
	2220	3330	**2240**	3360	**2260**	3400	**2280**	3430	**2300**	3460	**2320**	3490	**2350**	3530
	2070	3110	**2080**	3130	**2100**	3160	**2110**	3180	**2130**	3200	**2140**	3220	**2160**	3240

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W36–W33

F_y = 50 ksi

Shape	M_p/Ω_b kip-ft ASD	$\phi_b M_p$ kip-ft LRFD	PNA[c]	Y1[a] in.	ΣQ_n kip	Y2[b] = 2 in. ASD	Y2 = 2 in. LRFD	Y2 = 2.5 in. ASD	Y2 = 2.5 in. LRFD	Y2 = 3 in. ASD	Y2 = 3 in. LRFD	Y2 = 3.5 in. ASD	Y2 = 3.5 in. LRFD
W36×150	1450	2180	TFL	0	2210	2200	3300	2250	3390	2310	3470	2360	3550
			2	0.235	1930	2170	3260	2220	3330	2270	3400	2310	3480
			3	0.470	1650	2140	3210	2180	3270	2220	3330	2260	3400
			4	0.705	1370	2100	3160	2130	3210	2170	3260	2200	3310
			BFL	0.940	1090	2060	3100	2090	3140	2110	3180	2140	3220
			6	4.82	819	2000	3000	2020	3030	2040	3060	2060	3090
			7	9.08	553	1880	2820	1890	2840	1910	2870	1920	2890
W36×135	1270	1910	TFL	0	1990	1960	2950	2010	3020	2060	3100	2110	3170
			2	0.198	1750	1940	2910	1980	2980	2020	3040	2070	3110
			3	0.395	1520	1910	2870	1950	2930	1990	2980	2020	3040
			4	0.593	1280	1880	2830	1910	2870	1940	2920	1980	2970
			BFL	0.790	1040	1850	2780	1870	2820	1900	2860	1930	2900
			6	4.94	770	1780	2680	1800	2710	1820	2740	1840	2770
			7	9.49	497	1660	2490	1670	2510	1680	2530	1700	2550
W33×221	2140	3210	TFL	0	3260	3080	4630	3160	4760	3250	4880	3330	5000
			2	0.319	2750	3030	4550	3100	4660	3170	4760	3230	4860
			3	0.638	2250	2970	4460	3020	4540	3080	4630	3130	4710
			4	0.956	1750	2900	4350	2940	4420	2980	4480	3030	4550
			BFL	1.28	1240	2820	4230	2850	4280	2880	4330	2910	4370
			6	3.69	1030	2770	4170	2800	4200	2820	4240	2850	4280
			7	6.46	814	2700	4050	2720	4080	2740	4110	2760	4140
W33×201	1930	2900	TFL	0	2960	2780	4180	2860	4290	2930	4400	3000	4510
			2	0.288	2510	2730	4110	2800	4200	2860	4300	2920	4390
			3	0.575	2050	2680	4030	2730	4100	2780	4180	2830	4260
			4	0.863	1600	2620	3930	2660	3990	2700	4050	2740	4110
			BFL	1.15	1150	2550	3830	2580	3870	2610	3920	2640	3960
			6	3.64	944	2510	3770	2530	3800	2550	3840	2580	3870
			7	6.49	740	2430	3660	2450	3690	2470	3710	2490	3740
W33×169	1570	2360	TFL	0	2480	2340	3510	2400	3600	2460	3700	2520	3790
			2	0.305	2120	2300	3450	2350	3530	2400	3610	2460	3690
			3	0.610	1770	2250	3390	2300	3460	2340	3520	2390	3590
			4	0.915	1420	2210	3320	2240	3370	2280	3420	2310	3480
			BFL	1.22	1070	2150	3240	2180	3280	2210	3320	2230	3360
			6	4.29	846	2100	3160	2120	3190	2140	3220	2160	3250
			7	7.67	619	2010	3020	2030	3050	2040	3070	2060	3090

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W36–W33

Shape	$Y2^b$, in. 4 ASD	4 LRFD	4.5 ASD	4.5 LRFD	5 ASD	5 LRFD	5.5 ASD	5.5 LRFD	6 ASD	6 LRFD	6.5 ASD	6.5 LRFD	7 ASD	7 LRFD
W36×150	2420	3640	2470	3720	2530	3800	2590	3890	2640	3970	2700	4050	2750	4130
	2360	3550	2410	3620	2460	3690	2510	3770	2550	3840	2600	3910	2650	3980
	2300	3460	2340	3520	2380	3580	2420	3640	2470	3710	2510	3770	2550	3830
	2240	3360	2270	3410	2300	3460	2340	3520	2370	3570	2410	3620	2440	3670
	2170	3260	2200	3300	2220	3340	2250	3380	2280	3420	2300	3460	2330	3500
	2080	3130	2100	3160	2120	3190	2140	3220	2160	3250	2180	3280	2200	3310
	1930	2910	1950	2930	1960	2950	1980	2970	1990	2990	2000	3010	2020	3030
W36×135	2160	3250	2210	3320	2260	3390	2310	3470	2360	3540	2410	3620	2460	3690
	2110	3170	2150	3240	2200	3300	2240	3370	2290	3440	2330	3500	2370	3570
	2060	3100	2100	3150	2140	3210	2170	3270	2210	3320	2250	3380	2290	3440
	2010	3020	2040	3070	2070	3110	2100	3160	2140	3210	2170	3260	2200	3310
	1950	2930	1980	2970	2000	3010	2030	3050	2060	3090	2080	3130	2110	3170
	1860	2800	1880	2830	1900	2860	1920	2880	1940	2910	1960	2940	1980	2970
	1710	2570	1720	2590	1730	2610	1750	2620	1760	2640	1770	2660	1780	2680
W33×221	3410	5120	3490	5240	3570	5370	3650	5490	3730	5610	3810	5730	3900	5860
	3300	4970	3370	5070	3440	5170	3510	5270	3580	5380	3650	5480	3720	5580
	3190	4800	3250	4880	3300	4960	3360	5050	3420	5130	3470	5220	3530	5300
	3070	4620	3110	4680	3160	4750	3200	4810	3240	4880	3290	4940	3330	5010
	2940	4420	2970	4470	3000	4510	3030	4560	3070	4610	3100	4650	3130	4700
	2870	4320	2900	4360	2930	4400	2950	4440	2980	4480	3000	4510	3030	4550
	2780	4170	2800	4200	2820	4240	2840	4270	2860	4300	2880	4330	2900	4360
W33×201	3080	4630	3150	4740	3220	4850	3300	4960	3370	5070	3450	5180	3520	5290
	2980	4480	3050	4580	3110	4670	3170	4770	3230	4860	3300	4950	3360	5050
	2880	4330	2930	4410	2990	4490	3040	4560	3090	4640	3140	4720	3190	4800
	2780	4170	2820	4230	2860	4290	2900	4350	2940	4410	2980	4470	3020	4530
	2660	4000	2690	4050	2720	4090	2750	4130	2780	4180	2810	4220	2840	4260
	2600	3910	2620	3940	2650	3980	2670	4010	2690	4050	2720	4090	2740	4120
	2510	3770	2530	3800	2550	3830	2560	3850	2580	3880	2600	3910	2620	3940
W33×169	2580	3880	2640	3970	2710	4070	2770	4160	2830	4250	2890	4350	2950	4440
	2510	3770	2560	3850	2620	3930	2670	4010	2720	4090	2780	4170	2830	4250
	2430	3660	2480	3720	2520	3790	2560	3850	2610	3920	2650	3990	2700	4050
	2350	3530	2380	3580	2420	3640	2460	3690	2490	3740	2530	3800	2560	3850
	2260	3400	2290	3440	2310	3480	2340	3520	2370	3560	2390	3600	2420	3640
	2190	3280	2210	3320	2230	3350	2250	3380	2270	3410	2290	3440	2310	3480
	2070	3120	2090	3140	2100	3160	2120	3180	2130	3210	2150	3230	2170	3250

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

W33–W30

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W33×152	**1390**	2100	TFL	0	2240	**2090**	3150	**2150**	3230	**2200**	3310	**2260**	3400
			2	0.264	1930	**2060**	3100	**2110**	3170	**2160**	3240	**2210**	3310
			3	0.528	1630	**2020**	3040	**2060**	3100	**2110**	3160	**2150**	3230
			4	0.791	1320	**1980**	2980	**2020**	3030	**2050**	3080	**2080**	3130
			BFL	1.06	1020	**1940**	2910	**1960**	2950	**1990**	2990	**2020**	3030
			6	4.33	788	**1890**	2840	**1910**	2870	**1930**	2900	**1950**	2930
			7	7.94	559	**1790**	2700	**1810**	2720	**1820**	2740	**1840**	2760
W33×141	**1280**	1930	TFL	0	2080	**1930**	2910	**1990**	2980	**2040**	3060	**2090**	3140
			2	0.240	1800	**1900**	2860	**1950**	2930	**1990**	3000	**2040**	3060
			3	0.480	1520	**1870**	2810	**1910**	2870	**1950**	2930	**1990**	2980
			4	0.720	1250	**1840**	2760	**1870**	2810	**1900**	2850	**1930**	2900
			BFL	0.960	970	**1800**	2700	**1820**	2740	**1840**	2770	**1870**	2810
			6	4.34	745	**1750**	2620	**1760**	2650	**1780**	2680	**1800**	2710
			7	8.06	519	**1650**	2490	**1670**	2510	**1680**	2530	**1690**	2540
W33×130	**1170**	1750	TFL	0	1920	**1770**	2660	**1820**	2740	**1870**	2810	**1920**	2880
			2	0.214	1670	**1750**	2620	**1790**	2690	**1830**	2750	**1870**	2810
			3	0.428	1420	**1720**	2580	**1750**	2640	**1790**	2690	**1820**	2740
			4	0.641	1180	**1690**	2540	**1720**	2580	**1750**	2620	**1780**	2670
			BFL	0.855	931	**1650**	2480	**1680**	2520	**1700**	2550	**1720**	2590
			6	4.39	705	**1600**	2410	**1620**	2440	**1640**	2460	**1660**	2490
			7	8.29	479	**1510**	2270	**1520**	2290	**1530**	2300	**1540**	2320
W33×118	**1040**	1560	TFL	0	1730	**1590**	2400	**1640**	2460	**1680**	2530	**1720**	2590
			2	0.185	1520	**1570**	2360	**1610**	2420	**1650**	2480	**1690**	2530
			3	0.370	1310	**1550**	2330	**1580**	2380	**1610**	2420	**1650**	2470
			4	0.555	1100	**1520**	2290	**1550**	2330	**1580**	2370	**1600**	2410
			BFL	0.740	884	**1490**	2250	**1520**	2280	**1540**	2310	**1560**	2340
			6	4.45	659	**1440**	2170	**1460**	2200	**1480**	2220	**1490**	2250
			7	8.55	433	**1350**	2030	**1360**	2040	**1370**	2060	**1380**	2080
W30×116	**943**	1420	TFL	0	1710	**1450**	2180	**1490**	2240	**1540**	2310	**1580**	2370
			2	0.213	1490	**1430**	2150	**1460**	2200	**1500**	2260	**1540**	2310
			3	0.425	1260	**1400**	2110	**1430**	2150	**1460**	2200	**1500**	2250
			4	0.638	1040	**1370**	2060	**1400**	2100	**1430**	2140	**1450**	2180
			BFL	0.850	818	**1340**	2020	**1360**	2050	**1380**	2080	**1400**	2110
			6	3.98	623	**1300**	1960	**1320**	1980	**1330**	2000	**1350**	2030
			7	7.44	427	**1230**	1840	**1240**	1860	**1250**	1880	**1260**	1890

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W33–W30

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W33×152	2320	3480	2370	3570	2430	3650	2480	3730	2540	3820	2600	3900	2650	3980
	2250	3390	2300	3460	2350	3530	2400	3600	2450	3680	2490	3750	2540	3820
	2190	3290	2230	3350	2270	3410	2310	3470	2350	3530	2390	3590	2430	3650
	2120	3180	2150	3230	2180	3280	2210	3330	2250	3380	2280	3430	2310	3480
	2040	3070	2070	3110	2090	3140	2120	3180	2140	3220	2170	3260	2190	3300
	1970	2950	1990	2980	2010	3010	2030	3040	2040	3070	2060	3100	2080	3130
	1850	2780	1860	2800	1880	2820	1890	2840	1910	2860	1920	2890	1930	2910
W33×141	2140	3220	2190	3300	2240	3370	2300	3450	2350	3530	2400	3610	2450	3690
	2080	3130	2130	3200	2170	3270	2220	3330	2260	3400	2310	3470	2350	3540
	2020	3040	2060	3100	2100	3160	2140	3210	2180	3270	2210	3330	2250	3380
	1960	2950	1990	2990	2020	3040	2050	3090	2080	3130	2120	3180	2150	3230
	1890	2850	1920	2880	1940	2920	1970	2950	1990	2990	2010	3030	2040	3060
	1820	2740	1840	2760	1860	2790	1880	2820	1890	2850	1910	2880	1930	2900
	1710	2560	1720	2580	1730	2600	1740	2620	1760	2640	1770	2660	1780	2680
W33×130	1960	2950	2010	3020	2060	3090	2110	3170	2150	3240	2200	3310	2250	3380
	1910	2880	1950	2940	2000	3000	2040	3060	2080	3130	2120	3190	2160	3250
	1860	2800	1900	2850	1930	2900	1970	2960	2000	3010	2040	3060	2070	3120
	1800	2710	1830	2760	1860	2800	1890	2840	1920	2890	1950	2930	1980	2980
	1750	2620	1770	2660	1790	2690	1820	2730	1840	2760	1860	2800	1890	2830
	1670	2520	1690	2540	1710	2570	1730	2590	1740	2620	1760	2650	1780	2670
	1560	2340	1570	2360	1580	2380	1590	2390	1600	2410	1620	2430	1630	2450
W33×118	1770	2660	1810	2720	1850	2790	1900	2850	1940	2920	1980	2980	2030	3050
	1720	2590	1760	2650	1800	2710	1840	2760	1880	2820	1910	2880	1950	2930
	1680	2520	1710	2570	1740	2620	1780	2670	1810	2720	1840	2770	1870	2820
	1630	2450	1660	2490	1690	2530	1710	2580	1740	2620	1770	2660	1800	2700
	1580	2380	1600	2410	1630	2440	1650	2480	1670	2510	1690	2540	1710	2580
	1510	2270	1530	2290	1540	2320	1560	2340	1580	2370	1590	2390	1610	2420
	1390	2090	1400	2110	1410	2120	1420	2140	1440	2160	1450	2170	1460	2190
W30×116	1620	2440	1660	2500	1710	2570	1750	2630	1790	2690	1830	2760	1880	2820
	1580	2370	1610	2420	1650	2480	1690	2540	1720	2590	1760	2650	1800	2700
	1530	2300	1560	2340	1590	2390	1620	2440	1650	2490	1690	2530	1720	2580
	1480	2220	1500	2260	1530	2300	1560	2340	1580	2380	1610	2420	1630	2450
	1420	2140	1450	2170	1470	2200	1490	2230	1510	2260	1530	2290	1550	2330
	1360	2050	1380	2070	1390	2100	1410	2120	1430	2140	1440	2170	1460	2190
	1270	1910	1280	1920	1290	1940	1300	1960	1310	1970	1320	1990	1330	2000

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W30–W27

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W30×108	863	1300	TFL	0	1590	1340	2010	1380	2070	1420	2130	1460	2190
			2	0.190	1390	1320	1980	1350	2030	1390	2080	1420	2140
			3	0.380	1190	1290	1950	1320	1990	1350	2040	1380	2080
			4	0.570	989	1270	1910	1300	1950	1320	1980	1340	2020
			BFL	0.760	790	1240	1870	1260	1900	1280	1930	1300	1960
			6	4.03	593	1200	1810	1220	1830	1230	1850	1250	1870
			7	7.64	396	1130	1690	1140	1710	1150	1720	1160	1740
W30×99	778	1170	TFL	0	1450	1220	1840	1260	1890	1290	1940	1330	2000
			2	0.168	1280	1200	1810	1230	1860	1270	1900	1300	1950
			3	0.335	1100	1180	1780	1210	1820	1240	1860	1270	1900
			4	0.503	929	1160	1750	1190	1780	1210	1820	1230	1850
			BFL	0.670	754	1140	1710	1160	1740	1180	1770	1200	1800
			6	4.08	559	1100	1650	1110	1670	1130	1690	1140	1710
			7	7.83	364	1020	1530	1030	1550	1040	1560	1050	1580
W30×90	706	1060	TFL	0	1320	1100	1660	1140	1710	1170	1760	1200	1810
			2	0.153	1160	1090	1630	1110	1680	1140	1720	1170	1760
			3	0.305	1000	1070	1610	1090	1640	1120	1680	1140	1720
			4	0.458	842	1050	1580	1070	1610	1090	1640	1110	1670
			BFL	0.610	683	1030	1550	1050	1570	1060	1600	1080	1620
			6	3.99	506	993	1490	1010	1510	1020	1530	1030	1550
			7	7.76	329	924	1390	932	1400	940	1410	948	1430
W27×102	761	1140	TFL	0	1500	1160	1750	1200	1810	1240	1860	1280	1920
			2	0.208	1290	1140	1720	1180	1770	1210	1810	1240	1860
			3	0.415	1090	1120	1680	1150	1720	1170	1760	1200	1800
			4	0.623	879	1090	1640	1110	1680	1140	1710	1160	1740
			BFL	0.830	671	1060	1600	1080	1630	1100	1650	1110	1680
			6	3.38	523	1040	1560	1050	1580	1060	1600	1070	1620
			7	6.26	375	985	1480	994	1490	1000	1510	1010	1520
W27×94	694	1040	TFL	0	1380	1070	1600	1100	1660	1140	1710	1170	1760
			2	0.186	1200	1050	1570	1080	1620	1110	1660	1140	1710
			3	0.373	1010	1030	1540	1050	1580	1080	1620	1100	1660
			4	0.559	824	1000	1510	1020	1540	1040	1570	1060	1600
			BFL	0.745	638	978	1470	994	1490	1010	1520	1030	1540
			6	3.43	492	950	1430	962	1450	974	1460	987	1480
			7	6.41	346	899	1350	908	1360	917	1380	925	1390

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W30–W27

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W30×108	**1500**	2250	**1540**	2310	**1580**	2370	**1620**	2430	**1650**	2490	**1690**	2550	**1730**	2610
	1460	2190	**1490**	2240	**1530**	2290	**1560**	2340	**1590**	2400	**1630**	2450	**1660**	2500
	1410	2120	**1440**	2170	**1470**	2210	**1500**	2260	**1530**	2300	**1560**	2350	**1590**	2390
	1370	2060	**1390**	2090	**1420**	2130	**1440**	2170	**1470**	2210	**1490**	2240	**1520**	2280
	1320	1990	**1340**	2020	**1360**	2050	**1380**	2080	**1400**	2110	**1420**	2140	**1440**	2170
	1260	1900	**1280**	1920	**1290**	1940	**1310**	1960	**1320**	1990	**1340**	2010	**1350**	2030
	1170	1750	**1170**	1770	**1180**	1780	**1190**	1800	**1200**	1810	**1210**	1830	**1220**	1840
W30×99	**1370**	2050	**1400**	2110	**1440**	2160	**1480**	2220	**1510**	2270	**1550**	2330	**1580**	2380
	1330	2000	**1360**	2050	**1390**	2100	**1430**	2140	**1460**	2190	**1490**	2240	**1520**	2290
	1290	1940	**1320**	1990	**1350**	2030	**1380**	2070	**1400**	2110	**1430**	2150	**1460**	2190
	1250	1890	**1280**	1920	**1300**	1960	**1320**	1990	**1350**	2030	**1370**	2060	**1390**	2090
	1210	1830	**1230**	1850	**1250**	1880	**1270**	1910	**1290**	1940	**1310**	1970	**1330**	2000
	1150	1730	**1170**	1760	**1180**	1780	**1200**	1800	**1210**	1820	**1220**	1840	**1240**	1860
	1060	1590	**1070**	1600	**1080**	1620	**1080**	1630	**1090**	1640	**1100**	1660	**1110**	1670
W30×90	**1230**	1850	**1270**	1900	**1300**	1950	**1330**	2000	**1370**	2050	**1400**	2100	**1430**	2150
	1200	1810	**1230**	1850	**1260**	1890	**1290**	1940	**1320**	1980	**1350**	2020	**1380**	2070
	1170	1760	**1190**	1790	**1220**	1830	**1240**	1870	**1270**	1910	**1290**	1940	**1320**	1980
	1130	1700	**1150**	1740	**1180**	1770	**1200**	1800	**1220**	1830	**1240**	1860	**1260**	1890
	1100	1650	**1110**	1680	**1130**	1700	**1150**	1730	**1170**	1750	**1180**	1780	**1200**	1800
	1040	1570	**1060**	1590	**1070**	1610	**1080**	1630	**1090**	1640	**1110**	1660	**1120**	1680
	956	1440	**965**	1450	**973**	1460	**981**	1470	**989**	1490	**997**	1500	**1010**	1510
W27×102	**1310**	1980	**1350**	2030	**1390**	2090	**1430**	2140	**1460**	2200	**1500**	2260	**1540**	2310
	1270	1910	**1300**	1960	**1340**	2010	**1370**	2060	**1400**	2110	**1430**	2150	**1470**	2200
	1230	1840	**1250**	1890	**1280**	1930	**1310**	1970	**1340**	2010	**1360**	2050	**1390**	2090
	1180	1770	**1200**	1810	**1220**	1840	**1250**	1870	**1270**	1910	**1290**	1940	**1310**	1970
	1130	1700	**1150**	1730	**1170**	1750	**1180**	1780	**1200**	1800	**1220**	1830	**1230**	1850
	1090	1630	**1100**	1650	**1110**	1670	**1130**	1690	**1140**	1710	**1150**	1730	**1170**	1750
	1020	1540	**1030**	1550	**1040**	1560	**1050**	1580	**1060**	1590	**1070**	1610	**1080**	1620
W27×94	**1200**	1810	**1240**	1860	**1270**	1910	**1310**	1970	**1340**	2020	**1380**	2070	**1410**	2120
	1170	1750	**1200**	1800	**1230**	1840	**1260**	1890	**1290**	1930	**1320**	1980	**1350**	2020
	1130	1690	**1150**	1730	**1180**	1770	**1200**	1810	**1230**	1850	**1250**	1880	**1280**	1920
	1090	1630	**1110**	1660	**1130**	1690	**1150**	1720	**1170**	1750	**1190**	1790	**1210**	1820
	1040	1570	**1060**	1590	**1070**	1610	**1090**	1640	**1110**	1660	**1120**	1690	**1140**	1710
	999	1500	**1010**	1520	**1020**	1540	**1040**	1560	**1050**	1580	**1060**	1590	**1070**	1610
	934	1400	**943**	1420	**951**	1430	**960**	1440	**968**	1460	**977**	1470	**986**	1480

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W27–W24

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W27×84	**609**	915	TFL	0	1240	**948**	1430	**979**	1470	**1010**	1520	**1040**	1560
			2	0.160	1080	**932**	1400	**959**	1440	**986**	1480	**1010**	1520
			3	0.320	918	**914**	1370	**937**	1410	**960**	1440	**983**	1480
			4	0.480	758	**895**	1340	**914**	1370	**932**	1400	**951**	1430
			BFL	0.640	598	**874**	1310	**889**	1340	**904**	1360	**919**	1380
			6	3.50	454	**846**	1270	**857**	1290	**869**	1310	**880**	1320
			7	6.63	309	**795**	1200	**803**	1210	**811**	1220	**818**	1230
W24×94	**634**	953	TFL	0	1380	**978**	1470	**1010**	1520	**1050**	1570	**1080**	1630
			2	0.219	1190	**957**	1440	**987**	1480	**1020**	1530	**1050**	1570
			3	0.438	988	**934**	1400	**959**	1440	**984**	1480	**1010**	1520
			4	0.656	790	**909**	1370	**929**	1400	**948**	1430	**968**	1460
			BFL	0.875	592	**882**	1330	**896**	1350	**911**	1370	**926**	1390
			6	3.05	469	**858**	1290	**870**	1310	**882**	1320	**893**	1340
			7	5.43	346	**820**	1230	**829**	1250	**837**	1260	**846**	1270
W24×84	**559**	840	TFL	0	1240	**866**	1300	**897**	1350	**928**	1390	**959**	1440
			2	0.193	1060	**848**	1270	**874**	1310	**901**	1350	**927**	1390
			3	0.385	888	**828**	1240	**850**	1280	**872**	1310	**895**	1340
			4	0.578	715	**807**	1210	**825**	1240	**842**	1270	**860**	1290
			BFL	0.770	541	**784**	1180	**797**	1200	**810**	1220	**824**	1240
			6	3.01	425	**762**	1140	**772**	1160	**783**	1180	**793**	1190
			7	5.48	309	**726**	1090	**733**	1100	**741**	1110	**749**	1130
W24×76	**499**	750	TFL	0	1120	**779**	1170	**807**	1210	**835**	1250	**863**	1300
			2	0.170	966	**763**	1150	**787**	1180	**811**	1220	**835**	1260
			3	0.340	813	**746**	1120	**766**	1150	**787**	1180	**807**	1210
			4	0.510	660	**727**	1090	**744**	1120	**760**	1140	**777**	1170
			BFL	0.680	507	**708**	1060	**720**	1080	**733**	1100	**746**	1120
			6	3.02	393	**687**	1030	**696**	1050	**706**	1060	**716**	1080
			7	5.61	280	**651**	978	**658**	988	**665**	999	**672**	1010
W24×68	**442**	664	TFL	0	1000	**694**	1040	**719**	1080	**744**	1120	**769**	1160
			2	0.146	872	**681**	1020	**702**	1060	**724**	1090	**746**	1120
			3	0.293	741	**666**	1000	**685**	1030	**703**	1060	**722**	1080
			4	0.439	610	**651**	978	**666**	1000	**681**	1020	**696**	1050
			BFL	0.585	479	**634**	953	**646**	971	**658**	989	**670**	1010
			6	3.07	365	**613**	922	**622**	935	**631**	949	**640**	963
			7	5.82	251	**576**	866	**583**	876	**589**	885	**595**	895

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W27–W24

Shape	$Y2$[b], in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W27×84	1070	1610	1100	1660	1130	1700	1160	1750	1200	1800	1230	1840	1260	1890
	1040	1560	1070	1600	1090	1640	1120	1680	1150	1720	1170	1760	1200	1800
	1010	1510	1030	1550	1050	1580	1070	1610	1100	1650	1120	1680	1140	1720
	970	1460	989	1490	1010	1520	1030	1540	1050	1570	1060	1600	1080	1630
	934	1400	949	1430	964	1450	979	1470	994	1490	1010	1520	1020	1540
	891	1340	903	1360	914	1370	925	1390	937	1410	948	1420	959	1440
	826	1240	834	1250	841	1260	849	1280	857	1290	865	1300	872	1310
W24×94	1120	1680	1150	1730	1190	1780	1220	1830	1250	1890	1290	1940	1320	1990
	1080	1620	1110	1660	1130	1710	1160	1750	1190	1790	1220	1840	1250	1880
	1030	1550	1060	1590	1080	1630	1110	1660	1130	1700	1160	1740	1180	1770
	988	1480	1010	1510	1030	1540	1050	1570	1070	1600	1090	1630	1110	1660
	941	1410	956	1440	970	1460	985	1480	1000	1500	1010	1520	1030	1550
	905	1360	917	1380	928	1400	940	1410	952	1430	963	1450	975	1470
	854	1280	863	1300	872	1310	880	1320	889	1340	898	1350	906	1360
W24×84	989	1490	1020	1530	1050	1580	1080	1630	1110	1670	1140	1720	1170	1770
	954	1430	980	1470	1010	1510	1030	1550	1060	1590	1090	1630	1110	1670
	917	1380	939	1410	961	1440	983	1480	1010	1510	1030	1540	1050	1580
	878	1320	896	1350	914	1370	931	1400	949	1430	967	1450	985	1480
	837	1260	851	1280	864	1300	878	1320	891	1340	905	1360	918	1380
	804	1210	815	1220	825	1240	836	1260	847	1270	857	1290	868	1300
	756	1140	764	1150	772	1160	779	1170	787	1180	795	1190	803	1210
W24×76	891	1340	919	1380	946	1420	974	1460	1000	1510	1030	1550	1060	1590
	860	1290	884	1330	908	1360	932	1400	956	1440	980	1470	1000	1510
	827	1240	847	1270	868	1300	888	1330	908	1370	928	1400	949	1430
	793	1190	810	1220	826	1240	843	1270	859	1290	876	1320	892	1340
	758	1140	771	1160	784	1180	796	1200	809	1220	822	1230	834	1250
	726	1090	736	1110	745	1120	755	1140	765	1150	775	1160	785	1180
	679	1020	686	1030	693	1040	700	1050	707	1060	714	1070	721	1080
W24×68	794	1190	819	1230	844	1270	869	1310	894	1340	919	1380	944	1420
	768	1150	789	1190	811	1220	833	1250	855	1280	876	1320	898	1350
	740	1110	759	1140	777	1170	795	1200	814	1220	832	1250	851	1280
	711	1070	727	1090	742	1120	757	1140	772	1160	788	1180	803	1210
	682	1020	694	1040	706	1060	718	1080	730	1100	742	1110	754	1130
	650	976	659	990	668	1000	677	1020	686	1030	695	1040	704	1060
	602	904	608	913	614	923	620	932	627	942	633	951	639	961

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W24–W21

F_y = 50 ksi

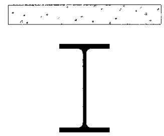
Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W24×62	382	574	TFL	0	911	631	948	653	982	676	1020	699	1050
			2	0.148	807	620	932	640	962	660	992	680	1020
			3	0.295	703	608	914	626	941	643	967	661	993
			4	0.443	600	596	896	611	918	626	941	641	963
			BFL	0.590	496	583	876	595	895	608	914	620	932
			6	3.46	362	557	837	566	851	575	864	584	878
			7	6.57	228	510	767	516	775	522	784	527	792
W24×55	334	503	TFL	0	810	557	837	577	868	598	898	618	929
			2	0.126	722	548	824	566	851	584	878	602	905
			3	0.253	633	538	809	554	833	570	857	586	881
			4	0.379	545	528	794	542	814	555	835	569	855
			BFL	0.505	456	517	778	529	795	540	812	552	829
			6	3.45	329	493	741	501	753	510	766	518	778
			7	6.66	203	449	674	454	682	459	689	464	697
W21×73	429	645	TFL	0	1070	676	1020	703	1060	730	1100	757	1140
			2	0.185	921	660	993	683	1030	706	1060	729	1100
			3	0.370	767	643	966	662	995	681	1020	700	1050
			4	0.555	614	624	938	639	961	655	984	670	1010
			BFL	0.740	460	604	908	615	925	627	942	638	959
			6	2.61	364	587	882	596	896	605	909	614	923
			7	4.72	269	560	841	566	851	573	861	580	872
W21×68	399	600	TFL	0	1000	628	944	653	982	678	1020	703	1060
			2	0.171	860	614	922	635	954	656	987	678	1020
			3	0.343	719	598	898	616	925	633	952	651	979
			4	0.514	577	580	872	595	894	609	916	624	937
			BFL	0.685	436	562	845	573	861	584	878	595	894
			6	2.59	343	546	820	554	833	563	846	572	859
			7	4.74	251	520	781	526	791	532	800	539	809
W21×62	359	540	TFL	0	913	569	855	592	890	615	924	637	958
			2	0.154	786	556	836	576	865	595	895	615	924
			3	0.308	659	542	814	558	839	575	864	591	889
			4	0.461	533	527	792	540	812	553	832	567	852
			BFL	0.615	406	511	768	521	783	531	798	541	813
			6	2.57	317	495	745	503	756	511	768	519	780
			7	4.79	228	470	707	476	715	482	724	487	732

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft



W24–W21

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W24×62	722	1080	744	1120	767	1150	790	1190	812	1220	835	1260	858	1290
	700	1050	721	1080	741	1110	761	1140	781	1170	801	1200	821	1230
	679	1020	696	1050	714	1070	731	1100	749	1130	766	1150	784	1180
	656	986	671	1010	686	1030	701	1050	716	1080	731	1100	746	1120
	633	951	645	969	657	988	670	1010	682	1030	694	1040	707	1060
	593	891	602	905	611	919	620	932	629	946	638	959	647	973
	533	801	539	810	544	818	550	827	556	835	561	844	567	852
W24×55	638	959	658	989	678	1020	699	1050	719	1080	739	1110	759	1140
	620	932	638	959	656	986	674	1010	692	1040	710	1070	728	1090
	602	904	617	928	633	952	649	975	665	999	681	1020	696	1050
	583	876	596	896	610	917	623	937	637	957	651	978	664	998
	563	846	574	863	586	880	597	897	608	915	620	932	631	949
	526	790	534	803	542	815	551	827	559	840	567	852	575	865
	469	705	474	712	479	720	484	727	489	735	494	743	499	750
W21×73	784	1180	810	1220	837	1260	864	1300	891	1340	918	1380	944	1420
	752	1130	775	1170	798	1200	821	1230	844	1270	867	1300	890	1340
	719	1080	739	1110	758	1140	777	1170	796	1200	815	1230	834	1250
	685	1030	701	1050	716	1080	731	1100	747	1120	762	1150	777	1170
	650	977	661	994	673	1010	684	1030	696	1050	707	1060	719	1080
	623	937	632	950	641	964	650	978	660	991	669	1000	678	1020
	587	882	593	892	600	902	607	912	613	922	620	932	627	942
W21×68	728	1090	753	1130	778	1170	803	1210	828	1240	853	1280	878	1320
	699	1050	721	1080	742	1120	764	1150	785	1180	807	1210	828	1240
	669	1010	687	1030	705	1060	723	1090	741	1110	759	1140	777	1170
	638	959	652	981	667	1000	681	1020	696	1050	710	1070	724	1090
	606	910	616	927	627	943	638	959	649	976	660	992	671	1010
	580	872	589	885	597	898	606	910	614	923	623	936	631	949
	545	819	551	828	557	838	564	847	570	856	576	866	582	875
W21×62	660	992	683	1030	706	1060	728	1090	751	1130	774	1160	797	1200
	634	953	654	983	674	1010	693	1040	713	1070	732	1100	752	1130
	608	913	624	938	641	963	657	987	673	1010	690	1040	706	1060
	580	872	593	892	607	912	620	932	633	952	646	972	660	992
	551	829	561	844	571	859	582	874	592	889	602	905	612	920
	527	792	535	804	543	816	551	828	559	840	567	852	574	863
	493	741	499	749	504	758	510	767	516	775	521	784	527	792

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W21

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	Y1[a]	ΣQ_n	Y2[b], in. 2		2.5		3		3.5	
	kip-ft			in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
	ASD	LRFD											
W21×57	322	484	TFL	0	837	523	787	544	818	565	849	586	881
			2	0.163	730	512	770	530	797	549	825	567	852
			3	0.325	624	500	752	516	775	531	799	547	822
			4	0.488	517	488	733	500	752	513	772	526	791
			BFL	0.650	411	474	712	484	728	494	743	505	758
			6	2.87	310	456	685	463	696	471	708	479	720
			7	5.36	209	425	639	430	646	435	654	441	662
W21×55	314	473	TFL	0	810	501	754	522	784	542	814	562	845
			2	0.131	703	490	737	508	763	525	790	543	816
			3	0.261	596	479	719	493	742	508	764	523	786
			4	0.392	488	466	701	478	719	490	737	503	755
			BFL	0.522	381	453	681	462	695	472	709	481	724
			6	2.62	292	438	658	445	669	452	680	459	691
			7	5.00	203	412	619	417	627	422	634	427	642
W21×50	274	413	TFL	0	736	456	685	474	712	492	740	511	768
			2	0.134	648	447	671	463	696	479	720	495	744
			3	0.268	561	437	657	451	678	465	699	479	720
			4	0.401	474	427	642	439	659	451	677	462	695
			BFL	0.535	386	416	625	426	640	435	654	445	669
			6	2.91	285	398	598	405	609	412	620	419	630
			7	5.58	184	366	551	371	558	376	565	380	572
W21×48	267	401	TFL	0	707	434	652	452	679	469	705	487	732
			2	0.108	619	425	639	440	662	456	685	471	708
			3	0.215	532	416	625	429	645	442	665	455	684
			4	0.323	444	406	610	417	626	428	643	439	660
			BFL	0.430	357	395	594	404	608	413	621	422	634
			6	2.69	267	380	571	387	581	393	591	400	601
			7	5.26	177	353	531	358	538	362	544	366	551
W21×44	238	358	TFL	0	649	399	600	416	625	432	649	448	673
			2	0.113	576	392	589	406	611	421	632	435	654
			3	0.225	503	384	577	396	596	409	615	422	634
			4	0.338	430	376	565	386	581	397	597	408	613
			BFL	0.450	357	367	551	376	565	385	578	394	592
			6	2.92	259	350	526	356	535	363	545	369	555
			7	5.69	162	319	480	323	486	327	492	331	498

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] Y1 = distance from top of the steel beam to plastic neutral axis.
[b] Y2 = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

F_y = 50 ksi

W21

Shape	Y2[b], in. 4 ASD	4 LRFD	4.5 ASD	4.5 LRFD	5 ASD	5 LRFD	5.5 ASD	5.5 LRFD	6 ASD	6 LRFD	6.5 ASD	6.5 LRFD	7 ASD	7 LRFD
W21×57	607	912	628	943	649	975	669	1010	690	1040	711	1070	732	1100
	585	879	603	907	622	934	640	962	658	989	676	1020	694	1040
	563	846	578	869	594	892	609	916	625	939	640	963	656	986
	539	810	552	830	565	849	578	869	591	888	604	907	617	927
	515	774	525	789	535	805	546	820	556	836	566	851	576	866
	487	731	494	743	502	755	510	766	518	778	525	790	533	801
	446	670	451	678	456	686	461	693	467	701	472	709	477	717
W21×55	582	875	602	905	623	936	643	966	663	997	683	1030	704	1060
	560	842	578	869	596	895	613	921	631	948	648	974	666	1000
	538	809	553	831	568	853	583	876	597	898	612	920	627	943
	515	774	527	792	539	810	551	829	564	847	576	865	588	884
	491	738	500	752	510	766	519	781	529	795	539	809	548	824
	467	702	474	713	481	723	489	734	496	745	503	756	510	767
	432	649	437	657	442	665	447	672	452	680	457	687	462	695
W21×50	529	795	547	823	566	850	584	878	602	906	621	933	639	961
	511	769	528	793	544	817	560	841	576	866	592	890	608	914
	493	741	507	762	521	783	535	804	549	825	563	846	577	867
	474	713	486	730	498	748	510	766	521	784	533	801	545	819
	455	683	464	698	474	712	484	727	493	741	503	756	512	770
	427	641	434	652	441	662	448	673	455	684	462	695	469	705
	385	578	389	585	394	592	399	599	403	606	408	613	412	620
W21×48	505	758	522	785	540	811	557	838	575	864	593	891	610	917
	487	732	502	755	518	778	533	801	549	825	564	848	579	871
	469	704	482	724	495	744	508	764	522	784	535	804	548	824
	450	676	461	693	472	710	483	726	494	743	505	760	516	776
	431	648	440	661	449	674	458	688	467	701	475	715	484	728
	407	611	413	621	420	631	427	641	433	651	440	661	447	671
	371	557	375	564	380	571	384	577	389	584	393	591	397	597
W21×44	464	698	480	722	496	746	513	771	529	795	545	819	561	844
	449	675	464	697	478	718	492	740	507	762	521	783	536	805
	434	652	447	671	459	690	472	709	484	728	497	747	509	766
	418	629	429	645	440	661	451	677	461	693	472	710	483	726
	402	605	411	618	420	632	429	645	438	658	447	672	456	685
	376	564	382	574	388	584	395	594	401	603	408	613	414	623
	335	504	339	510	343	516	347	522	352	528	356	534	360	541

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3-19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W18

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W18×60	**307**	461	TFL	0	882	**489**	735	**511**	768	**533**	801	**555**	834
			2	0.174	750	**476**	715	**494**	743	**513**	771	**532**	799
			3	0.348	619	**461**	692	**476**	716	**492**	739	**507**	762
			4	0.521	488	**445**	669	**457**	687	**469**	705	**481**	723
			BFL	0.695	357	**428**	643	**437**	656	**446**	670	**454**	683
			6	2.17	288	**416**	626	**424**	637	**431**	647	**438**	658
			7	3.81	220	**399**	600	**405**	609	**410**	617	**416**	625
W18×55	**279**	420	TFL	0	810	**447**	672	**467**	702	**487**	732	**507**	763
			2	0.158	691	**434**	653	**452**	679	**469**	705	**486**	731
			3	0.315	573	**421**	633	**436**	655	**450**	676	**464**	698
			4	0.473	454	**407**	612	**418**	629	**430**	646	**441**	663
			BFL	0.630	336	**392**	589	**400**	602	**409**	614	**417**	627
			6	2.16	269	**381**	573	**388**	583	**394**	593	**401**	603
			7	3.86	202	**364**	548	**369**	555	**374**	563	**380**	570
W18×50	**252**	379	TFL	0	733	**402**	605	**421**	632	**439**	660	**457**	687
			2	0.143	626	**391**	588	**407**	612	**423**	635	**438**	659
			3	0.285	520	**379**	570	**392**	590	**405**	609	**418**	629
			4	0.428	413	**367**	551	**377**	567	**388**	582	**398**	598
			BFL	0.570	306	**354**	531	**361**	543	**369**	554	**376**	566
			6	2.10	245	**344**	517	**350**	526	**356**	535	**362**	544
			7	3.83	183	**328**	494	**333**	501	**338**	507	**342**	514
W18×46	**226**	340	TFL	0	677	**373**	560	**389**	585	**406**	611	**423**	636
			2	0.151	585	**363**	546	**378**	568	**392**	590	**407**	612
			3	0.303	494	**353**	530	**365**	549	**378**	567	**390**	586
			4	0.454	402	**342**	514	**352**	529	**362**	544	**372**	559
			BFL	0.605	310	**330**	497	**338**	508	**346**	520	**354**	532
			6	2.37	240	**319**	479	**325**	488	**330**	497	**336**	506
			7	4.33	169	**300**	450	**304**	457	**308**	463	**312**	469
W18×40	**196**	294	TFL	0	588	**321**	483	**336**	505	**351**	527	**365**	549
			2	0.131	509	**313**	471	**326**	490	**339**	509	**351**	528
			3	0.263	430	**305**	458	**315**	474	**326**	490	**337**	506
			4	0.394	351	**295**	444	**304**	457	**313**	470	**322**	483
			BFL	0.525	272	**286**	429	**292**	440	**299**	450	**306**	460
			6	2.29	210	**275**	414	**281**	422	**286**	430	**291**	438
			7	4.28	147	**259**	389	**263**	395	**266**	400	**270**	406

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W18

Shape	Y2[b], in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W18×60	**577**	868	**599**	901	**621**	934	**643**	967	**665**	1000	**687**	1030	**709**	1070
	550	827	**569**	855	**588**	884	**607**	912	**625**	940	**644**	968	**663**	996
	523	785	**538**	809	**553**	832	**569**	855	**584**	878	**600**	901	**615**	925
	493	742	**506**	760	**518**	778	**530**	797	**542**	815	**554**	833	**567**	851
	463	696	**472**	710	**481**	723	**490**	737	**499**	750	**508**	763	**517**	777
	445	669	**452**	680	**459**	691	**467**	701	**474**	712	**481**	723	**488**	734
	421	633	**427**	642	**432**	650	**438**	658	**443**	666	**449**	675	**454**	683
W18×55	**528**	793	**548**	823	**568**	854	**588**	884	**608**	914	**629**	945	**649**	975
	503	757	**521**	783	**538**	809	**555**	834	**572**	860	**590**	886	**607**	912
	478	719	**493**	741	**507**	762	**521**	783	**536**	805	**550**	826	**564**	848
	452	680	**464**	697	**475**	714	**486**	731	**498**	748	**509**	765	**520**	782
	426	640	**434**	652	**442**	665	**451**	677	**459**	690	**467**	702	**476**	715
	408	613	**415**	623	**421**	633	**428**	643	**435**	653	**441**	663	**448**	674
	385	578	**390**	586	**395**	593	**400**	601	**405**	608	**410**	616	**415**	624
W18×50	**475**	715	**494**	742	**512**	770	**530**	797	**549**	825	**567**	852	**585**	880
	454	682	**469**	706	**485**	729	**501**	752	**516**	776	**532**	799	**548**	823
	431	648	**444**	668	**457**	687	**470**	707	**483**	726	**496**	746	**509**	765
	408	613	**418**	629	**429**	644	**439**	660	**449**	675	**460**	691	**470**	706
	384	577	**392**	589	**399**	600	**407**	612	**415**	623	**422**	635	**430**	646
	368	553	**374**	563	**380**	572	**386**	581	**393**	590	**399**	599	**405**	608
	347	521	**351**	528	**356**	535	**360**	542	**365**	549	**370**	555	**374**	562
W18×46	**440**	661	**457**	687	**474**	712	**491**	738	**508**	763	**525**	788	**541**	814
	421	633	**436**	655	**451**	677	**465**	699	**480**	721	**494**	743	**509**	765
	402	604	**414**	623	**427**	641	**439**	660	**451**	678	**464**	697	**476**	715
	382	574	**392**	589	**402**	604	**412**	620	**422**	635	**432**	650	**442**	665
	361	543	**369**	555	**377**	566	**385**	578	**392**	590	**400**	601	**408**	613
	342	515	**348**	524	**354**	533	**360**	542	**366**	551	**372**	560	**378**	569
	317	476	**321**	482	**325**	488	**329**	495	**333**	501	**338**	507	**342**	514
W18×40	**380**	571	**395**	593	**409**	615	**424**	637	**439**	659	**453**	681	**468**	704
	364	547	**377**	566	**389**	585	**402**	604	**415**	623	**428**	643	**440**	662
	347	522	**358**	538	**369**	555	**380**	571	**390**	587	**401**	603	**412**	619
	330	497	**339**	510	**348**	523	**357**	536	**365**	549	**374**	562	**383**	576
	313	470	**320**	480	**326**	491	**333**	501	**340**	511	**347**	521	**354**	531
	296	445	**302**	453	**307**	461	**312**	469	**317**	477	**323**	485	**328**	493
	274	411	**277**	417	**281**	422	**285**	428	**288**	433	**292**	439	**296**	444

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W18–W16

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	Y1[a]	ΣQ_n	Y2[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W18×35	166	249	TFL	0	515	279	419	292	438	304	457	317	477
			2	0.106	451	272	409	283	426	295	443	306	460
			3	0.213	387	265	399	275	413	285	428	294	442
			4	0.319	323	258	388	266	400	274	412	282	424
			BFL	0.425	260	251	377	257	386	263	396	270	406
			6	2.38	194	240	360	245	368	249	375	254	382
			7	4.56	129	222	334	225	338	228	343	232	348
W16×45	205	309	TFL	0	663	333	501	350	525	366	550	383	575
			2	0.141	564	323	485	337	506	351	527	365	549
			3	0.283	464	312	469	323	486	335	504	347	521
			4	0.424	365	300	451	309	465	318	479	327	492
			BFL	0.565	266	288	433	294	443	301	453	308	462
			6	1.81	216	280	421	286	429	291	437	296	445
			7	3.26	166	269	404	273	410	277	416	281	423
W16×40	182	274	TFL	0	589	294	442	309	464	323	486	338	508
			2	0.126	501	285	428	297	447	310	466	322	485
			3	0.253	412	275	414	286	429	296	445	306	460
			4	0.379	324	265	398	273	411	281	423	289	435
			BFL	0.505	236	254	382	260	391	266	400	272	409
			6	1.73	191	248	372	252	379	257	387	262	394
			7	3.18	147	238	357	242	363	245	368	249	374
W16×36	160	240	TFL	0	529	262	394	275	413	288	433	301	453
			2	0.108	453	254	382	266	399	277	416	288	433
			3	0.215	378	246	370	256	384	265	398	274	412
			4	0.323	303	238	357	245	368	253	380	260	391
			BFL	0.430	228	229	344	234	352	240	361	246	369
			6	1.82	180	221	333	226	340	230	346	235	353
			7	3.45	132	210	316	214	321	217	326	220	331
W16×31	135	203	TFL	0	456	226	340	238	357	249	374	260	391
			2	0.110	396	220	331	230	346	240	360	250	375
			3	0.220	335	214	321	222	333	230	346	239	359
			4	0.330	274	207	311	213	321	220	331	227	341
			BFL	0.440	213	199	300	205	308	210	316	215	324
			6	1.99	164	192	288	196	294	200	300	204	307
			7	3.79	114	180	270	182	274	185	279	188	283

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W18–W16

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W18×35	330	496	343	515	356	535	369	554	381	573	394	593	407	612
	317	477	328	494	340	510	351	527	362	544	373	561	385	578
	304	457	314	471	323	486	333	500	343	515	352	529	362	544
	290	436	298	448	306	461	315	473	323	485	331	497	339	509
	276	415	283	425	289	435	296	445	302	454	309	464	315	474
	259	389	264	397	269	404	274	411	278	419	283	426	288	433
	235	353	238	358	241	363	244	367	248	372	251	377	254	382
W16×45	399	600	416	625	432	650	449	675	465	700	482	724	499	749
	379	570	393	591	407	612	421	633	435	654	449	675	463	697
	358	538	370	556	381	573	393	591	405	608	416	625	428	643
	337	506	346	520	355	533	364	547	373	561	382	574	391	588
	314	472	321	482	328	492	334	502	341	512	348	522	354	532
	302	453	307	462	312	470	318	478	323	486	329	494	334	502
	285	429	290	435	294	441	298	448	302	454	306	460	310	466
W16×40	353	530	367	552	382	574	397	597	412	619	426	641	441	663
	335	503	347	522	360	541	372	560	385	578	397	597	410	616
	316	476	327	491	337	507	347	522	358	537	368	553	378	568
	297	447	306	459	314	471	322	483	330	496	338	508	346	520
	278	418	284	426	290	435	296	444	301	453	307	462	313	471
	267	401	272	408	276	415	281	422	286	430	291	437	295	444
	253	380	256	385	260	391	264	396	267	402	271	407	275	413
W16×36	315	473	328	493	341	513	354	532	367	552	381	572	394	592
	299	450	311	467	322	484	333	501	345	518	356	535	367	552
	284	427	293	441	303	455	312	469	322	483	331	498	340	512
	268	403	275	414	283	425	291	437	298	448	306	459	313	471
	251	378	257	386	263	395	269	404	274	412	280	421	286	429
	239	360	244	367	248	373	253	380	257	387	262	394	266	400
	224	336	227	341	230	346	233	351	237	356	240	361	243	366
W16×31	272	409	283	426	295	443	306	460	317	477	329	494	340	511
	260	390	269	405	279	420	289	435	299	449	309	464	319	479
	247	371	255	384	264	396	272	409	280	421	289	434	297	446
	234	352	241	362	248	372	254	382	261	393	268	403	275	413
	221	332	226	340	231	348	237	356	242	364	247	372	253	380
	208	313	212	319	216	325	220	331	224	337	229	343	233	350
	191	287	194	291	197	296	200	300	202	304	205	309	208	313

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

W16–W14

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W16×26	110	166	TFL	0	384	189	284	198	298	208	312	217	327
			2	0.0863	337	184	276	192	289	201	302	209	314
			3	0.173	289	179	269	186	280	193	291	201	301
			4	0.259	242	174	261	180	270	186	279	192	288
			BFL	0.345	194	168	253	173	260	178	267	183	275
			6	2.04	145	161	241	164	247	168	252	171	258
			7	4.00	96.0	148	223	151	227	153	230	156	234
W14×38	153	231	TFL	0	558	252	379	266	400	280	421	294	442
			2	0.129	471	243	365	255	383	267	401	278	418
			3	0.258	384	234	351	243	365	253	380	262	394
			4	0.386	297	223	336	231	347	238	358	246	369
			BFL	0.515	209	213	320	218	328	223	335	228	343
			6	1.42	174	208	312	212	319	216	325	221	332
			7	2.55	140	201	302	204	307	208	312	211	318
W14×34	136	205	TFL	0	500	224	337	237	356	249	375	262	393
			2	0.114	423	216	325	227	341	238	357	248	373
			3	0.228	347	208	313	217	326	225	339	234	352
			4	0.341	270	199	300	206	310	213	320	220	330
			BFL	0.455	193	190	286	195	293	200	300	205	308
			6	1.41	159	185	279	189	285	193	291	197	297
			7	2.60	125	179	268	182	273	185	278	188	283
W14×30	118	177	TFL	0	442	197	296	208	313	219	329	230	346
			2	0.0963	378	190	286	200	300	209	314	219	329
			3	0.193	313	183	276	191	287	199	299	207	311
			4	0.289	248	176	265	182	274	189	283	195	293
			BFL	0.385	183	169	253	173	260	178	267	182	274
			6	1.48	147	163	246	167	251	171	257	174	262
			7	2.82	111	156	234	159	239	162	243	164	247
W14×26	100	151	TFL	0	385	172	258	181	273	191	287	201	302
			2	0.105	332	166	250	175	263	183	275	191	287
			3	0.210	279	161	242	168	252	175	263	182	273
			4	0.315	226	155	233	160	241	166	250	172	258
			BFL	0.420	174	149	223	153	230	157	236	162	243
			6	1.67	135	143	215	146	220	150	225	153	230
			7	3.18	96.1	134	202	137	206	139	209	142	213

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W16–W14

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W16×26	**227**	341	**237**	356	**246**	370	**256**	385	**265**	399	**275**	413	**285**	428
	218	327	**226**	340	**234**	352	**243**	365	**251**	377	**260**	390	**268**	403
	208	312	**215**	323	**222**	334	**229**	345	**237**	356	**244**	366	**251**	377
	198	297	**204**	306	**210**	315	**216**	324	**222**	334	**228**	343	**234**	352
	188	282	**192**	289	**197**	296	**202**	304	**207**	311	**212**	318	**217**	326
	175	263	**179**	269	**182**	274	**186**	279	**190**	285	**193**	290	**197**	296
	158	237	**160**	241	**163**	245	**165**	248	**168**	252	**170**	255	**172**	259
W14×38	**308**	463	**322**	483	**336**	504	**350**	525	**363**	546	**377**	567	**391**	588
	290	436	**302**	454	**314**	471	**325**	489	**337**	507	**349**	524	**361**	542
	272	409	**281**	423	**291**	437	**301**	452	**310**	466	**320**	481	**329**	495
	253	380	**260**	391	**268**	403	**275**	414	**283**	425	**290**	436	**297**	447
	234	351	**239**	359	**244**	367	**249**	375	**255**	383	**260**	390	**265**	398
	225	338	**229**	345	**234**	351	**238**	358	**243**	365	**247**	371	**251**	378
	215	323	**218**	328	**222**	333	**225**	339	**229**	344	**232**	349	**236**	354
W14×34	**274**	412	**287**	431	**299**	450	**312**	468	**324**	487	**337**	506	**349**	525
	259	389	**269**	405	**280**	421	**290**	436	**301**	452	**311**	468	**322**	484
	243	365	**251**	378	**260**	391	**269**	404	**277**	417	**286**	430	**295**	443
	226	340	**233**	350	**240**	360	**247**	371	**253**	381	**260**	391	**267**	401
	209	315	**214**	322	**219**	329	**224**	337	**229**	344	**234**	351	**238**	358
	201	303	**205**	308	**209**	314	**213**	320	**217**	326	**221**	332	**225**	338
	191	287	**194**	292	**197**	297	**200**	301	**204**	306	**207**	311	**210**	315
W14×30	**241**	362	**252**	379	**263**	396	**274**	412	**285**	429	**296**	445	**307**	462
	228	343	**237**	357	**247**	371	**256**	385	**266**	399	**275**	413	**285**	428
	215	323	**222**	334	**230**	346	**238**	358	**246**	369	**254**	381	**261**	393
	201	302	**207**	311	**213**	321	**219**	330	**226**	339	**232**	348	**238**	358
	187	281	**191**	288	**196**	295	**201**	301	**205**	308	**210**	315	**214**	322
	178	268	**182**	273	**185**	279	**189**	284	**193**	290	**196**	295	**200**	301
	167	251	**170**	255	**173**	259	**175**	264	**178**	268	**181**	272	**184**	276
W14×26	**210**	316	**220**	330	**229**	345	**239**	359	**249**	374	**258**	388	**268**	402
	200	300	**208**	312	**216**	325	**224**	337	**233**	350	**241**	362	**249**	375
	189	283	**196**	294	**203**	304	**209**	315	**216**	325	**223**	336	**230**	346
	177	267	**183**	275	**189**	284	**194**	292	**200**	301	**206**	309	**211**	317
	166	249	**170**	256	**175**	262	**179**	269	**183**	275	**188**	282	**192**	288
	156	235	**160**	240	**163**	245	**166**	250	**170**	255	**173**	260	**177**	265
	144	216	**146**	220	**149**	224	**151**	227	**154**	231	**156**	234	**158**	238

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W14–W12 F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W14×22	82.8	125	TFL	0	325	144	216	152	228	160	240	168	253
			2	0.0838	283	139	210	146	220	154	231	161	241
			3	0.168	241	135	203	141	212	147	221	153	230
			4	0.251	199	130	196	135	203	140	211	145	218
			BFL	0.335	157	126	189	130	195	133	201	137	206
			6	1.69	119	120	181	123	185	126	189	129	194
			7	3.34	81.2	112	168	114	171	116	174	118	177
W12×30	108	162	TFL	0	440	179	269	190	286	201	302	212	319
			2	0.110	368	172	258	181	272	190	286	199	300
			3	0.220	296	164	247	172	258	179	269	186	280
			4	0.330	225	156	235	162	243	167	251	173	260
			BFL	0.440	153	147	222	151	227	155	233	159	239
			6	1.12	131	145	217	148	222	151	227	154	232
			7	1.94	110	141	212	144	216	146	220	149	224
W12×26	92.8	140	TFL	0	382	155	233	164	247	174	261	183	276
			2	0.0950	321	148	223	156	235	164	247	172	259
			3	0.190	259	142	213	148	223	155	233	161	242
			4	0.285	197	135	203	140	210	145	218	150	225
			BFL	0.380	136	128	192	131	197	135	202	138	207
			6	1.08	116	125	188	128	192	131	197	134	201
			7	1.95	95.6	122	183	124	186	126	190	129	194
W12×22	73.1	110	TFL	0	324	132	198	140	210	148	223	156	235
			2	0.106	281	128	192	135	202	142	213	149	223
			3	0.213	238	123	185	129	194	135	203	141	212
			4	0.319	196	118	177	123	185	128	192	133	199
			BFL	0.425	153	113	170	117	176	121	181	124	187
			6	1.66	117	108	162	111	166	114	171	116	175
			7	3.04	81.0	99.9	150	102	153	104	156	106	159
W12×19	61.6	92.6	TFL	0	279	112	169	119	179	126	190	133	200
			2	0.0875	244	109	164	115	173	121	182	127	191
			3	0.175	209	105	158	110	166	115	174	121	181
			4	0.263	174	101	152	106	159	110	165	114	172
			BFL	0.350	139	97.2	146	101	151	104	156	108	162
			6	1.65	104	92.1	138	94.7	142	97.3	146	99.9	150
			7	3.12	69.7	84.6	127	86.3	130	88.1	132	89.8	135

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W14–W12

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W14×22	176	265	184	277	192	289	200	301	209	313	217	326	225	338
	168	252	175	263	182	273	189	284	196	294	203	305	210	316
	159	239	165	248	171	257	177	266	183	275	189	284	195	293
	150	226	155	233	160	241	165	248	170	256	175	263	180	271
	141	212	145	218	149	224	153	230	157	236	161	242	165	248
	132	198	135	203	138	207	141	212	144	216	147	221	150	225
	120	180	122	183	124	186	126	189	128	192	130	195	132	198
W12×30	223	335	234	352	245	368	256	385	267	401	278	418	289	434
	209	314	218	327	227	341	236	355	245	369	255	383	264	396
	194	291	201	302	209	313	216	324	223	336	231	347	238	358
	178	268	184	277	190	285	195	294	201	302	206	310	212	319
	163	245	167	250	170	256	174	262	178	268	182	273	186	279
	158	237	161	242	164	247	167	252	171	257	174	262	177	266
	152	228	155	232	157	236	160	241	163	245	166	249	168	253
W12×26	193	290	202	304	212	319	221	333	231	347	241	362	250	376
	180	271	188	283	196	295	204	307	212	319	220	331	228	343
	168	252	174	262	181	271	187	281	194	291	200	301	206	310
	155	232	160	240	164	247	169	255	174	262	179	269	184	277
	141	212	145	218	148	223	151	228	155	233	158	238	162	243
	137	205	140	210	142	214	145	218	148	223	151	227	154	232
	131	197	134	201	136	204	138	208	141	211	143	215	145	219
W12×22	164	247	172	259	180	271	189	283	197	295	205	308	213	320
	156	234	163	244	170	255	177	265	184	276	191	287	198	297
	147	220	153	229	159	238	165	247	170	256	176	265	182	274
	138	207	142	214	147	221	152	229	157	236	162	244	167	251
	128	193	132	198	136	204	140	210	144	216	147	221	151	227
	119	179	122	184	125	188	128	193	131	197	134	201	137	206
	108	162	110	165	112	168	114	171	116	174	118	177	120	180
W12×19	140	211	147	221	154	232	161	242	168	252	175	263	182	273
	133	200	139	209	145	218	151	227	157	237	164	246	170	255
	126	189	131	197	136	205	142	213	147	221	152	228	157	236
	119	178	123	185	127	191	132	198	136	204	140	211	145	217
	111	167	114	172	118	177	121	182	125	188	128	193	132	198
	103	154	105	158	108	162	110	166	113	170	116	174	118	178
	91.5	138	93.3	140	95.0	143	96.8	145	98.5	148	100	151	102	153

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

W12–W10

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	Y1[a]	ΣQ_n	Y2[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W12×16	50.1	75.4	TFL	0	236	94.0	141	99.9	150	106	159	112	168
			2	0.0663	209	91.3	137	96.6	145	102	153	107	161
			3	0.133	183	88.6	133	93.1	140	97.7	147	102	154
			4	0.199	156	85.7	129	89.6	135	93.5	141	97.4	146
			BFL	0.265	130	82.8	124	86.0	129	89.3	134	92.5	139
			6	1.70	94.4	77.6	117	80.0	120	82.4	124	84.7	127
			7	3.32	58.9	69.6	105	71.1	107	72.6	109	74.0	111
W12×14	43.4	65.3	TFL	0	208	82.5	124	87.7	132	92.9	140	98.0	147
			2	0.0563	185	80.2	121	84.8	128	89.5	134	94.1	141
			3	0.113	163	77.9	117	82.0	123	86.0	129	90.1	135
			4	0.169	141	75.5	114	79.0	119	82.5	124	86.1	129
			BFL	0.225	118	73.1	110	76.0	114	79.0	119	81.9	123
			6	1.69	85.2	68.3	103	70.4	106	72.6	109	74.7	112
			7	3.36	51.9	60.8	91.4	62.1	93.3	63.4	95.3	64.7	97.2
W10×26	78.1	117	TFL	0	381	136	205	146	219	155	233	165	247
			2	0.110	317	130	195	137	207	145	219	153	230
			3	0.220	254	123	184	129	194	135	203	142	213
			4	0.330	190	115	174	120	181	125	188	130	195
			BFL	0.440	127	108	162	111	167	114	172	117	177
			6	0.898	111	106	159	109	163	111	168	114	172
			7	1.51	95.1	103	155	106	159	108	163	110	166
W10×22	64.9	97.5	TFL	0	324	115	172	123	184	131	197	139	209
			2	0.0900	273	109	164	116	175	123	185	130	195
			3	0.180	221	104	156	109	164	115	173	120	181
			4	0.270	169	98.1	147	102	154	107	160	111	166
			BFL	0.360	117	92.1	138	95.0	143	98.0	147	101	152
			6	0.953	99.2	89.8	135	92.3	139	94.7	142	97.2	146
			7	1.71	81.1	86.8	130	88.8	133	90.8	137	92.9	140
W10×19	53.9	81.0	TFL	0	281	99.8	150	107	160	114	171	121	182
			2	0.0988	241	95.7	144	102	153	108	162	114	171
			3	0.198	201	91.4	137	96.5	145	101	153	107	160
			4	0.296	162	87.0	131	91.0	137	95.1	143	99.1	149
			BFL	0.395	122	82.3	124	85.4	128	88.4	133	91.5	137
			6	1.28	96.1	78.8	118	81.2	122	83.6	126	86.0	129
			7	2.31	70.2	73.9	111	75.6	114	77.4	116	79.1	119

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W12–W10

Shape	$Y2$[b], in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W12×16	118	177	123	185	129	194	135	203	141	212	147	221	153	230
	112	169	117	177	123	184	128	192	133	200	138	208	144	216
	107	161	111	167	116	174	120	181	125	188	130	195	134	202
	101	152	105	158	109	164	113	170	117	176	121	182	125	187
	95.7	144	99.0	149	102	154	105	159	109	163	112	168	115	173
	87.1	131	89.4	134	91.8	138	94.1	141	96.5	145	98.8	149	101	152
	75.5	113	77.0	116	78.4	118	79.9	120	81.4	122	82.8	125	84.3	127
W12×14	103	155	108	163	114	171	119	179	124	186	129	194	134	202
	98.7	148	103	155	108	162	113	169	117	176	122	183	126	190
	94.2	142	98.2	148	102	154	106	160	110	166	115	172	119	178
	89.6	135	93.1	140	96.6	145	100	150	104	156	107	161	111	166
	84.9	128	87.8	132	90.8	136	93.7	141	96.7	145	99.6	150	103	154
	76.8	115	79.0	119	81.1	122	83.2	125	85.3	128	87.5	131	89.6	135
	66.0	99.1	67.3	101	68.6	103	69.8	105	71.1	107	72.4	109	73.7	111
W10×26	174	262	184	276	193	290	203	304	212	319	222	333	231	347
	161	242	169	254	177	266	185	278	193	290	201	302	209	314
	148	223	154	232	161	242	167	251	173	261	180	270	186	280
	134	202	139	209	144	216	149	224	153	231	158	238	163	245
	121	181	124	186	127	191	130	196	133	200	136	205	140	210
	117	176	120	180	123	184	125	188	128	192	131	197	134	201
	113	170	115	173	118	177	120	180	122	184	125	187	127	191
W10×22	147	221	155	233	163	245	171	257	179	270	187	282	196	294
	137	205	143	215	150	226	157	236	164	246	171	256	177	267
	126	189	131	197	137	206	142	214	148	222	153	231	159	239
	115	173	119	179	123	185	128	192	132	198	136	204	140	211
	104	156	107	160	110	165	113	169	115	174	118	178	121	182
	99.7	150	102	154	105	157	107	161	110	165	112	168	115	172
	94.9	143	96.9	146	98.9	149	101	152	103	155	105	158	107	161
W10×19	128	192	135	203	142	213	149	224	156	234	163	245	170	255
	120	180	126	189	132	198	138	207	144	216	150	225	156	234
	112	168	117	175	122	183	127	190	132	198	137	205	142	213
	103	155	107	161	111	167	115	173	119	179	123	185	127	191
	94.5	142	97.6	147	101	151	104	156	107	160	110	165	113	170
	88.4	133	90.8	136	93.2	140	95.5	144	97.9	147	100	151	103	154
	80.9	122	82.6	124	84.4	127	86.2	129	87.9	132	89.7	135	91.4	137

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W10

F_y = 50 ksi

Shape	M_p/Ω_b	$\phi_b M_p$	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.							
	kip-ft					2		2.5		3		3.5	
	ASD	LRFD		in.	kip	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W10×17	**46.7**	70.1	TFL	0	250	**87.9**	132	**94.1**	141	**100**	151	**107**	160
			2	0.0825	217	**84.5**	127	**89.9**	135	**95.3**	143	**101**	151
			3	0.165	183	**81.0**	122	**85.6**	129	**90.1**	135	**94.7**	142
			4	0.248	150	**77.3**	116	**81.1**	122	**84.8**	128	**88.6**	133
			BFL	0.330	117	**73.6**	111	**76.5**	115	**79.4**	119	**82.3**	124
			6	1.31	89.8	**69.8**	105	**72.1**	108	**74.3**	112	**76.6**	115
			7	2.46	62.4	**64.5**	96.9	**66.0**	99.3	**67.6**	102	**69.2**	104
W10×15	**39.9**	60.0	TFL	0	221	**77.0**	116	**82.5**	124	**88.0**	132	**93.5**	141
			2	0.0675	194	**74.3**	112	**79.1**	119	**84.0**	126	**88.8**	133
			3	0.135	167	**71.5**	107	**75.6**	114	**79.8**	120	**83.9**	126
			4	0.203	140	**68.6**	103	**72.0**	108	**75.5**	114	**79.0**	119
			BFL	0.270	113	**65.5**	98.5	**68.4**	103	**71.2**	107	**74.0**	111
			6	1.35	83.8	**61.6**	92.6	**63.7**	95.8	**65.8**	98.9	**67.9**	102
			7	2.60	55.1	**55.9**	84.1	**57.3**	86.1	**58.7**	88.2	**60.1**	90.3
W10×12	**31.4**	47.3	TFL	0	177	**61.2**	92.0	**65.6**	98.6	**70.0**	105	**74.4**	112
			2	0.0525	156	**59.1**	88.8	**63.0**	94.6	**66.9**	100	**70.8**	106
			3	0.105	135	**56.9**	85.6	**60.3**	90.6	**63.7**	95.7	**67.0**	101
			4	0.158	114	**54.7**	82.2	**57.6**	86.5	**60.4**	90.8	**63.3**	95.1
			BFL	0.210	93.6	**52.4**	78.8	**54.8**	82.3	**57.1**	85.8	**59.5**	89.4
			6	1.31	68.9	**49.2**	73.9	**50.9**	76.5	**52.6**	79.0	**54.3**	81.6
			7	2.61	44.2	**44.3**	66.5	**45.4**	68.2	**46.5**	69.9	**47.6**	71.5

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

F_y = 50 ksi

Table 3–19 (continued)
Composite W Shapes
Available Strength in Flexure, kip-ft

W10

Shape	$Y2^b$, in.													
	4		4.5		5		5.5		6		6.5		7	
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
W10×17	113	170	119	179	125	188	131	198	138	207	144	216	150	226
	106	159	112	168	117	176	122	184	128	192	133	200	139	208
	99.3	149	104	156	108	163	113	170	118	177	122	184	127	190
	92.3	139	96.1	144	99.8	150	104	156	107	161	111	167	115	173
	85.3	128	88.2	133	91.1	137	94.0	141	96.9	146	99.9	150	103	155
	78.8	118	81.0	122	83.3	125	85.5	129	87.8	132	90.0	135	92.2	139
	70.7	106	72.3	109	73.8	111	75.4	113	76.9	116	78.5	118	80.0	120
W10×15	99.0	149	105	157	110	165	116	174	121	182	127	190	132	198
	93.6	141	98.4	148	103	155	108	162	113	170	118	177	123	184
	88.1	132	92.3	139	96.4	145	101	151	105	157	109	164	113	170
	82.5	124	86.0	129	89.5	134	92.9	140	96.4	145	99.9	150	103	155
	76.8	115	79.6	120	82.4	124	85.2	128	88.0	132	90.8	137	93.7	141
	70.0	105	72.1	108	74.2	112	76.3	115	78.4	118	80.5	121	82.6	124
	61.4	92.3	62.8	94.4	64.2	96.5	65.6	98.5	66.9	101	68.3	103	69.7	105
W10×12	78.8	118	83.2	125	87.6	132	92.1	138	96.5	145	101	152	105	158
	74.6	112	78.5	118	82.4	124	86.3	130	90.2	136	94.1	141	98.0	147
	70.4	106	73.8	111	77.2	116	80.5	121	83.9	126	87.3	131	90.7	136
	66.1	99.4	69.0	104	71.8	108	74.7	112	77.5	117	80.4	121	83.2	125
	61.8	92.9	64.1	96.4	66.5	99.9	68.8	103	71.1	107	73.5	110	75.8	114
	56.0	84.2	57.7	86.8	59.5	89.4	61.2	92.0	62.9	94.5	64.6	97.1	66.3	99.7
	48.7	73.2	49.8	74.8	50.9	76.5	52.0	78.1	53.1	79.8	54.2	81.5	55.3	83.1

ASD	LRFD
$\Omega_b = 1.67$	$\phi_b = 0.90$

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.

Table 3–20 Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

I_{LB}

W40

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W40×297	TFL	0	4370	44200	45200	46200	47200	48200	49300	50300	51400	52600	53700	54900
(23200)	2	0.413	3720	42500	43400	44300	45200	46200	47200	48200	49200	50200	51300	52300
	3	0.825	3060	40500	41300	42100	42900	43800	44700	45600	46500	47400	48300	49300
	4	1.24	2410	38100	38800	39500	40200	41000	41700	42500	43300	44100	44900	45700
	BFL	1.65	1760	35300	35800	36400	37000	37600	38200	38800	39400	40100	40700	41400
	6	4.59	1430	33600	34000	34500	35000	35500	36100	36600	37100	37700	38200	38800
	7	8.17	1090	31600	32000	32400	32800	33200	33600	34000	34500	34900	35400	35800
W40×294	TFL	0	4310	43100	44100	45100	46100	47100	48200	49300	50400	51500	52600	53800
(21900)	2	0.483	3730	41600	42500	43400	44400	45300	46300	47300	48300	49400	50400	51500
	3	0.965	3150	39800	40700	41500	42300	43200	44100	45000	45900	46900	47800	48800
	4	1.45	2580	37800	38500	39300	40000	40800	41600	42400	43200	44100	44900	45800
	BFL	1.93	2000	35400	36000	36600	37200	37900	38600	39200	39900	40700	41400	42100
	6	5.69	1540	33100	33600	34100	34600	35200	35700	36300	36900	37500	38100	38700
	7	10.00	1080	30400	30800	31200	31600	32000	32400	32900	33300	33800	34200	34700
W40×278	TFL	0	4100	40500	41400	42300	43300	44300	45300	46300	47300	48400	49500	50600
(20500)	2	0.453	3560	39100	39900	40800	41700	42600	43500	44500	45400	46400	47400	48400
	3	0.905	3020	37500	38200	39000	39800	40700	41500	42400	43300	44200	45100	46000
	4	1.36	2470	35500	36200	36900	37600	38400	39100	39900	40700	41500	42300	43100
	BFL	1.81	1930	33300	33900	34500	35100	35700	36400	37000	37700	38400	39000	39700
	6	5.65	1480	31100	31600	32100	32600	33100	33600	34200	34700	35300	35900	36400
	7	10.1	1020	28500	28800	29200	29600	30000	30400	30800	31200	31600	32000	32500
W40×277	TFL	0	4070	41300	42200	43100	44100	45000	46000	47000	48000	49100	50100	51200
(21900)	2	0.394	3450	39700	40500	41400	42300	43100	44000	45000	45900	46800	47800	48800
	3	0.788	2820	37800	38500	39300	40100	40800	41600	42500	43300	44200	45000	45900
	4	1.18	2200	35500	36200	36800	37500	38100	38800	39500	40200	41000	41700	42500
	BFL	1.58	1580	32800	33300	33800	34300	34800	35400	36000	36500	37100	37700	38300
	6	4.22	1300	31300	31700	32200	32600	33100	33600	34100	34600	35100	35600	36100
	7	7.59	1020	29700	30000	30400	30800	31200	31600	32000	32400	32800	33200	33700
W40×264	TFL	0	3880	38200	39000	39900	40800	41700	42700	43600	44600	45600	46600	47700
(19400)	2	0.433	3360	36800	37600	38400	39300	40100	41000	41900	42800	43700	44700	45600
	3	0.865	2850	35300	36000	36800	37500	38300	39100	39900	40800	41600	42500	43400
	4	1.30	2330	33500	34100	34800	35500	36200	36900	37600	38300	39100	39800	40600
	BFL	1.73	1810	31300	31900	32500	33000	33600	34200	34800	35400	36100	36700	37400
	6	5.50	1390	29300	29800	30200	30700	31200	31700	32200	32700	33200	33800	34300
	7	9.90	969	26900	27200	27600	28000	28300	28700	29100	29500	29900	30300	30700

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

I_{LB}

W40

Shape[d]	PNA[c]	Y1[a]	ΣQ_n	Y2[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W40×249	TFL	0	3670	36900	37700	38500	39300	40200	41100	42000	42900	43800	44800	45700
(19600)	2	0.355	3110	35400	36200	36900	37700	38500	39300	40100	41000	41800	42700	43600
	3	0.710	2550	33800	34400	35100	35800	36500	37200	37900	38700	39500	40200	41000
	4	1.07	1990	31700	32300	32900	33500	34100	34700	35300	36000	36600	37300	38000
	BFL	1.42	1430	29300	29700	30200	30700	31100	31600	32100	32700	33200	33700	34300
	6	4.04	1170	27900	28300	28700	29100	29600	30000	30400	30900	31300	31800	32200
	7	7.47	917	26500	26800	27200	27500	27800	28200	28500	28900	29300	29700	30100
W40×235	TFL	0	3450	33900	34600	35400	36200	37000	37800	38700	39600	40400	41300	42300
(17400)	2	0.394	2980	32700	33400	34100	34800	35600	36400	37100	37900	38800	39600	40400
	3	0.788	2510	31300	31900	32600	33200	33900	34600	35300	36100	36800	37600	38300
	4	1.18	2040	29600	30200	30800	31400	32000	32600	33200	33900	34500	35200	35900
	BFL	1.58	1580	27700	28200	28700	29200	29700	30200	30800	31300	31900	32400	33000
	6	5.16	1220	26000	26400	26800	27200	27600	28100	28500	29000	29400	29900	30400
	7	9.46	862	24000	24300	24600	24900	25200	25600	25900	26300	26600	27000	27300
W40×215	TFL	0	3170	31300	32000	32700	33500	34200	34900	35700	36500	37300	38100	38900
(16700)	2	0.305	2690	30100	30800	31400	32100	32800	33400	34200	34900	35600	36400	37100
	3	0.610	2210	28700	29300	29900	30500	31100	31700	32300	33000	33600	34300	35000
	4	0.915	1730	27000	27500	28000	28500	29000	29600	30100	30700	31200	31800	32400
	BFL	1.22	1250	25000	25400	25800	26200	26600	27000	27500	27900	28300	28800	29300
	6	3.80	1020	23800	24200	24500	24900	25200	25600	26000	26300	26700	27100	27500
	7	7.30	792	22600	22800	23100	23400	23700	24000	24300	24600	24900	25300	25600
W40×211	TFL	0	3100	30100	30800	31500	32200	32900	33600	34400	35200	36000	36800	37600
(15500)	2	0.354	2680	29000	29700	30300	31000	31600	32300	33000	33700	34500	35200	36000
	3	0.708	2270	27800	28400	29000	29600	30200	30800	31500	32100	32800	33500	34200
	4	1.06	1850	26400	26900	27400	28000	28500	29100	29600	30200	30800	31400	32000
	BFL	1.42	1430	24700	25100	25600	26000	26500	26900	27400	27900	28400	28900	29400
	6	4.98	1100	23100	23500	23900	24200	24600	25000	25400	25800	26200	26600	27100
	7	9.35	775	21300	21600	21900	22200	22500	22800	23100	23400	23700	24000	24300
W40×199	TFL	0	2920	28200	28800	29500	30100	30800	31500	32200	32900	33700	34400	35200
(14900)	2	0.266	2510	27200	27800	28400	29000	29600	30200	30900	31600	32200	32900	33600
	3	0.533	2090	26000	26500	27100	27600	28200	28700	29300	29900	30500	31200	31800
	4	0.799	1670	24600	25000	25500	26000	26500	27000	27500	28000	28500	29100	29600
	BFL	1.07	1250	22900	23300	23600	24000	24400	24900	25300	25700	26100	26600	27000
	6	4.11	989	21600	21900	22300	22600	22900	23300	23700	24000	24400	24800	25200
	7	8.09	731	20200	20500	20700	21000	21300	21500	21800	22100	22400	22700	23000

[a] Y1 = distance from top of the steel beam to plastic neutral axis.
[b] Y2 = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

I_{LB}

W40–W36

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W40×183	TFL	0	2670	25500	26100	26700	27300	27900	28600	29200	29900	30500	31200	31900
(13200)	2	0.300	2310	24600	25200	25700	26300	26900	27400	28000	28700	29300	29900	30600
	3	0.600	1960	23600	24100	24600	25100	25700	26200	26700	27300	27900	28500	29100
	4	0.900	1600	22400	22900	23300	23800	24200	24700	25200	25700	26200	26700	27200
	BFL	1.20	1250	21100	21400	21800	22200	22600	23000	23400	23800	24300	24700	25100
	6	4.76	958	19700	20000	20300	20600	21000	21300	21700	22000	22400	22700	23100
	7	9.24	666	18100	18400	18600	18800	19100	19300	19600	19900	20100	20400	20700
W40×167	TFL	0	2460	22800	23300	23800	24400	24900	25500	26100	26700	27300	28000	28600
(11600)	2	0.256	2160	22000	22500	23000	23500	24100	24600	25200	25700	26300	26900	27500
	3	0.513	1850	21200	21600	22100	22600	23100	23600	24100	24600	25100	25600	26200
	4	0.769	1550	20200	20600	21000	21500	21900	22400	22800	23300	23800	24200	24700
	BFL	1.03	1250	19100	19500	19800	20200	20600	21000	21400	21800	22200	22600	23100
	6	4.97	931	17700	18000	18300	18600	18900	19200	19600	19900	20200	20600	20900
	7	9.84	614	16100	16300	16500	16700	16900	17200	17400	17600	17900	18100	18400
W40×149	TFL	0	2190	19600	20000	20500	21000	21500	22000	22500	23100	23600	24200	24700
(9800)	2	0.208	1950	19000	19400	19900	20300	20800	21300	21800	22300	22800	23300	23900
	3	0.415	1700	18300	18700	19200	19600	20000	20500	20900	21400	21900	22300	22800
	4	0.623	1460	17600	18000	18400	18800	19200	19600	20000	20400	20800	21300	21700
	BFL	0.830	1210	16700	17100	17400	17800	18100	18500	18900	19200	19600	20000	20400
	6	5.14	879	15400	15700	15900	16200	16500	16800	17100	17400	17700	18000	18300
	7	10.4	548	13700	13900	14100	14300	14500	14700	14900	15100	15300	15500	15800
W36×302	TFL	0	4440	40100	41000	41900	42900	43900	44900	46000	47000	48100	49200	50400
(21100)	2	0.420	3740	38400	39300	40200	41100	42000	42900	43800	44800	45800	46800	47800
	3	0.840	3040	36500	37300	38000	38800	39600	40500	41300	42200	43100	44000	44900
	4	1.26	2340	34200	34800	35500	36200	36800	37500	38300	39000	39700	40500	41300
	BFL	1.68	1640	31300	31800	32300	32900	33400	34000	34500	35100	35700	36300	36900
	6	4.09	1380	30100	30500	31000	31400	31900	32400	32900	33400	33900	34400	35000
	7	6.91	1110	28700	29100	29400	29800	30200	30600	31000	31500	31900	32300	32800
W36×282	TFL	0	4150	37100	38000	38900	39800	40700	41700	42600	43600	44600	45600	46700
(19600)	2	0.393	3500	35600	36400	37200	38100	38900	39800	40700	41600	42500	43400	44400
	3	0.785	2840	33800	34500	35300	36000	36800	37500	38300	39100	39900	40800	41600
	4	1.18	2190	31700	32300	32900	33500	34200	34800	35500	36200	36900	37600	38300
	BFL	1.57	1540	29100	29600	30000	30500	31000	31500	32100	32600	33100	33700	34300
	6	3.99	1290	27900	28300	28700	29200	29600	30100	30500	31000	31500	32000	32500
	7	6.84	1040	26600	27000	27300	27700	28100	28400	28800	29200	29600	30000	30500

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

I_{LB}

W36

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W36×262	TFL	0	3850	34000	34800	35600	36400	37300	38100	39000	39900	40900	41800	42800
(17900)	2	0.360	3250	32600	33300	34100	34800	35600	36400	37200	38100	38900	39800	40700
	3	0.720	2660	31000	31700	32300	33000	33700	34400	35200	35900	36700	37400	38200
	4	1.08	2060	29100	29700	30200	30800	31400	32000	32600	33300	33900	34600	35200
	BFL	1.44	1470	26800	27200	27700	28100	28600	29100	29600	30100	30600	31100	31700
	6	3.98	1210	25600	26000	26400	26800	27200	27600	28000	28400	28900	29300	29800
	7	6.97	962	24300	24600	25000	25300	25600	26000	26300	26700	27100	27500	27900
W36×256	TFL	0	3770	33000	33800	34600	35400	36200	37100	38000	38900	39800	40800	41700
(16800)	2	0.433	3240	31800	32500	33200	34000	34800	35600	36400	37200	38100	39000	39800
	3	0.865	2710	30300	31000	31700	32400	33100	33800	34500	35300	36100	36800	37600
	4	1.30	2180	28700	29200	29800	30400	31100	31700	32300	33000	33700	34400	35100
	BFL	1.73	1650	26600	27100	27600	28100	28600	29200	29700	30300	30800	31400	32000
	6	5.19	1300	25100	25500	25900	26300	26800	27200	27700	28100	28600	29100	29600
	7	8.90	942	23300	23600	23900	24200	24600	24900	25300	25600	26000	26400	26800
W36×247	TFL	0	3630	31700	32400	33200	34000	34800	35600	36500	37300	38200	39100	40000
(16700)	2	0.338	3070	30400	31100	31800	32600	33300	34000	34800	35600	36400	37200	38000
	3	0.675	2510	29000	29600	30200	30800	31500	32200	32900	33600	34300	35000	35700
	4	1.01	1950	27200	27700	28200	28800	29400	29900	30500	31100	31700	32300	33000
	BFL	1.35	1400	25100	25500	25900	26300	26800	27200	27700	28200	28700	29200	29700
	6	3.93	1150	23900	24300	24600	25000	25400	25800	26200	26600	27000	27500	27900
	7	7.00	907	22700	23000	23300	23600	23900	24300	24600	24900	25300	25600	26000
W36×232	TFL	0	3410	29400	30100	30800	31600	32300	33100	33900	34700	35600	36400	37300
(15000)	2	0.393	2930	28300	29000	29600	30300	31000	31700	32500	33200	34000	34800	35600
	3	0.785	2450	27000	27600	28200	28900	29500	30200	30800	31500	32200	32900	33600
	4	1.18	1980	25600	26100	26600	27200	27700	28300	28900	29500	30100	30700	31400
	BFL	1.57	1500	23800	24200	24700	25100	25600	26100	26600	27100	27600	28100	28600
	6	5.03	1180	22400	22800	23100	23500	23900	24300	24700	25100	25600	26000	26500
	7	8.77	851	20800	21000	21300	21600	21900	22200	22600	22900	23200	23600	23900
W36×231	TFL	0	3400	29500	30200	31000	31700	32400	33200	34000	34800	35600	36400	37300
(15600)	2	0.315	2890	28400	29100	29700	30400	31100	31800	32500	33200	34000	34700	35500
	3	0.630	2370	27100	27600	28200	28800	29400	30100	30700	31400	32000	32700	33400
	4	0.95	1850	25400	25900	26400	26900	27500	28000	28600	29100	29700	30300	30900
	BFL	1.26	1330	23400	23800	24200	24600	25100	25500	25900	26400	26800	27300	27800
	6	3.90	1090	22400	22700	23100	23400	23800	24100	24500	24900	25300	25700	26100
	7	7.05	851	21200	21500	21700	22000	22300	22600	23000	23300	23600	23900	24300

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

I_{LB}

W36

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W36×210	TFL	0	3090	26000	26600	27300	27900	28600	29300	30000	30800	31500	32300	33100
(13200)	2	0.340	2680	25100	25700	26300	26900	27500	28200	28800	29500	30200	30900	31600
	3	0.680	2260	24000	24500	25100	25700	26200	26800	27400	28000	28700	29300	30000
	4	1.02	1850	22800	23300	23700	24200	24800	25300	25800	26400	26900	27500	28100
	BFL	1.36	1430	21300	21700	22100	22500	23000	23400	23900	24300	24800	25300	25800
	6	5.05	1100	19900	20300	20600	20900	21300	21700	22000	22400	22800	23200	23600
	7	9.04	773	18300	18600	18800	19100	19400	19700	19900	20200	20500	20800	21100
W36×194	TFL	0	2850	23800	24400	25000	25600	26200	26800	27500	28200	28900	29600	30300
(12100)	2	0.315	2470	22900	23500	24000	24600	25200	25800	26400	27000	27700	28300	29000
	3	0.630	2090	22000	22500	23000	23500	24000	24600	25100	25700	26300	26900	27500
	4	0.945	1710	20900	21300	21700	22200	22700	23200	23600	24200	24700	25200	25700
	BFL	1.26	1320	19500	19900	20200	20600	21000	21400	21800	22300	22700	23100	23600
	6	4.94	1020	18300	18600	18900	19200	19500	19900	20200	20600	20900	21300	21700
	7	8.93	713	16800	17000	17200	17500	17700	18000	18300	18500	18800	19100	19400
W36×182	TFL	0	2680	22200	22700	23300	23900	24500	25100	25700	26300	27000	27600	28300
(11300)	2	0.295	2320	21400	21900	22400	23000	23500	24100	24600	25200	25800	26400	27100
	3	0.590	1970	20500	21000	21500	22000	22500	23000	23500	24000	24600	25100	25700
	4	0.885	1610	19500	19900	20300	20700	21200	21600	22100	22600	23000	23500	24000
	BFL	1.18	1260	18300	18600	19000	19300	19700	20100	20500	20900	21300	21700	22200
	6	4.88	963	17100	17400	17600	18000	18300	18600	18900	19200	19600	19900	20300
	7	8.92	670	15700	15900	16100	16300	16600	16800	17100	17300	17600	17800	18100
W36×170	TFL	0	2500	20600	21100	21600	22200	22700	23300	23800	24400	25000	25600	26200
(10500)	2	0.275	2170	19900	20300	20800	21300	21800	22400	22900	23400	24000	24500	25100
	3	0.550	1840	19100	19500	19900	20400	20800	21300	21800	22300	22800	23300	23800
	4	0.825	1510	18100	18500	18900	19300	19700	20100	20500	21000	21400	21900	22400
	BFL	1.10	1180	17000	17300	17600	18000	18300	18700	19000	19400	19800	20200	20600
	6	4.81	902	15800	16100	16400	16700	17000	17300	17600	17900	18200	18500	18800
	7	8.88	626	14500	14700	15000	15200	15400	15600	15800	16100	16300	16600	16800
W36×160	TFL	0	2350	19200	19600	20100	20600	21100	21700	22200	22700	23300	23900	24500
(9760)	2	0.255	2050	18500	19000	19400	19900	20400	20900	21400	21900	22400	22900	23500
	3	0.510	1740	17800	18200	18600	19000	19400	19900	20300	20800	21300	21800	22300
	4	0.765	1430	16900	17200	17600	18000	18400	18800	19200	19600	20000	20400	20900
	BFL	1.02	1130	15900	16200	16500	16800	17200	17500	17800	18200	18600	18900	19300
	6	4.80	858	14800	15000	15300	15600	15800	16100	16400	16700	17000	17300	17600
	7	8.96	588	13500	13700	13900	14100	14300	14500	14700	15000	15200	15400	15600

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

I_{LB}

W36–W33

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W36×150	TFL	0	2210	17800	18300	18700	19200	19700	20200	20700	21200	21700	22200	22800
(9040)	2	0.235	1930	17200	17600	18100	18500	18900	19400	19900	20400	20800	21300	21800
	3	0.470	1650	16500	16900	17300	17700	18100	18500	19000	19400	19900	20300	20800
	4	0.705	1370	15800	16100	16400	16800	17200	17500	17900	18300	18700	19100	19600
	BFL	0.940	1090	14800	15100	15400	15700	16100	16400	16700	17100	17400	17800	18100
	6	4.82	819	13800	14000	14300	14500	14800	15100	15300	15600	15900	16200	16500
	7	9.08	553	12600	12700	12900	13100	13300	13500	13700	13900	14100	14300	14500
W36×135	TFL	0	1990	15600	16000	16400	16800	17200	17700	18100	18600	19000	19500	20000
(7800)	2	0.198	1750	15100	15500	15800	16200	16600	17000	17500	17900	18300	18800	19200
	3	0.395	1520	14500	14900	15200	15600	16000	16300	16700	17100	17500	18000	18400
	4	0.593	1280	13900	14200	14500	14800	15200	15500	15900	16200	16600	17000	17400
	BFL	0.790	1040	13100	13400	13700	14000	14300	14600	14900	15200	15500	15800	16200
	6	4.94	770	12100	12400	12600	12800	13100	13300	13600	13800	14100	14300	14600
	7	9.49	497	10900	11100	11200	11400	11600	11700	11900	12100	12300	12500	12700
W33×221	TFL	0	3260	24600	25200	25900	26500	27200	27900	28600	29300	30100	30800	31600
(12900)	2	0.319	2750	23600	24200	24800	25400	26000	26600	27300	28000	28600	29300	30000
	3	0.638	2250	22500	23000	23500	24000	24600	25200	25700	26300	26900	27600	28200
	4	0.956	1750	21100	21500	22000	22400	22900	23400	23900	24400	24900	25400	26000
	BFL	1.28	1240	19400	19700	20100	20400	20800	21200	21600	22000	22400	22800	23200
	6	3.69	1030	18500	18800	19100	19500	19800	20100	20500	20800	21200	21500	21900
	7	6.46	814	17600	17800	18100	18400	18600	18900	19200	19500	19800	20100	20400
W33×201	TFL	0	2960	22100	22700	23200	23800	24500	25100	25700	26400	27000	27700	28400
(11600)	2	0.288	2510	21200	21800	22300	22800	23400	24000	24600	25200	25800	26400	27000
	3	0.575	2050	20200	20700	21100	21600	22100	22600	23200	23700	24200	24800	25400
	4	0.863	1600	19000	19400	19800	20200	20600	21100	21500	22000	22400	22900	23400
	BFL	1.15	1150	17500	17800	18100	18500	18800	19100	19500	19900	20200	20600	21000
	6	3.64	944	16700	17000	17200	17500	17800	18100	18400	18700	19100	19400	19700
	7	6.49	740	15800	16000	16300	16500	16700	17000	17200	17500	17800	18000	18300
W33×169	TFL	0	2480	18100	18600	19100	19600	20100	20600	21200	21700	22300	22900	23500
(9290)	2	0.305	2120	17500	17900	18300	18800	19300	19800	20300	20800	21300	21800	22300
	3	0.610	1770	16700	17100	17500	17900	18300	18800	19200	19700	20100	20600	21100
	4	0.915	1420	15700	16100	16400	16800	17200	17600	18000	18400	18800	19200	19600
	BFL	1.22	1070	14600	14900	15200	15500	15800	16100	16500	16800	17100	17500	17800
	6	4.29	846	13800	14000	14300	14500	14800	15100	15300	15600	15900	16200	16500
	7	7.67	619	12800	13000	13200	13400	13600	13800	14000	14300	14500	14700	15000

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3-20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

I_{LB}

W33–W30

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W33×152 (8160)	TFL	0	2240	16000	16500	16900	17300	17800	18300	18700	19200	19700	20300	20800
	2	0.264	1930	15400	15800	16200	16700	17100	17500	18000	18400	18900	19400	19800
	3	0.528	1630	14800	15100	15500	15900	16300	16700	17100	17500	17900	18400	18800
	4	0.791	1320	14000	14300	14600	15000	15300	15700	16000	16400	16800	17100	17500
	BFL	1.06	1020	13100	13300	13600	13900	14200	14500	14800	15100	15400	15700	16100
	6	4.33	788	12300	12500	12700	12900	13200	13400	13700	13900	14200	14500	14700
	7	7.94	559	11300	11500	11600	11800	12000	12200	12400	12600	12800	13000	13200
W33×141 (7450)	TFL	0	2080	14700	15100	15500	15900	16300	16700	17200	17600	18100	18600	19100
	2	0.240	1800	14200	14500	14900	15300	15700	16100	16500	16900	17300	17800	18200
	3	0.480	1520	13600	13900	14200	14600	14900	15300	15700	16100	16500	16900	17300
	4	0.720	1250	12900	13200	13500	13800	14100	14400	14800	15100	15500	15800	16200
	BFL	0.960	970	12100	12300	12600	12800	13100	13400	13600	13900	14200	14500	14800
	6	4.34	745	11300	11500	11700	11900	12100	12400	12600	12800	13100	13300	13600
	7	8.06	519	10300	10500	10700	10800	11000	11200	11300	11500	11700	11900	12100
W33×130 (6710)	TFL	0	1920	13300	13700	14000	14400	14800	15200	15600	16000	16500	16900	17300
	2	0.214	1670	12800	13200	13500	13900	14200	14600	15000	15400	15800	16200	16600
	3	0.428	1420	12300	12600	12900	13300	13600	13900	14300	14600	15000	15400	15800
	4	0.641	1180	11700	12000	12300	12600	12900	13200	13500	13800	14100	14500	14800
	BFL	0.855	931	11000	11300	11500	11700	12000	12300	12500	12800	13100	13400	13700
	6	4.39	705	10300	10400	10600	10900	11100	11300	11500	11700	11900	12200	12400
	7	8.29	479	9350	9490	9640	9790	9940	10100	10300	10400	10600	10800	11000
W33×118 (5900)	TFL	0	1730	11800	12100	12400	12800	13100	13500	13900	14200	14600	15000	15400
	2	0.185	1520	11400	11700	12000	12300	12700	13000	13300	13700	14000	14400	14800
	3	0.370	1310	11000	11200	11500	11800	12100	12400	12800	13100	13400	13700	14100
	4	0.555	1100	10500	10700	11000	11200	11500	11800	12100	12400	12700	13000	13300
	BFL	0.740	884	9880	10100	10300	10600	10800	11000	11300	11500	11800	12100	12300
	6	4.45	659	9140	9320	9510	9690	9890	10100	10300	10500	10700	10900	11100
	7	8.55	433	8250	8380	8520	8650	8790	8940	9080	9230	9390	9540	9700
W30×116 (4930)	TFL	0	1710	9870	10200	10500	10800	11100	11400	11800	12100	12500	12800	13200
	2	0.213	1490	9530	9810	10100	10400	10700	11000	11300	11600	12000	12300	12600
	3	0.425	1260	9130	9380	9630	9900	10200	10400	10700	11000	11300	11600	12000
	4	0.638	1040	8670	8890	9120	9360	9600	9850	10100	10400	10600	10900	11200
	BFL	0.850	818	8130	8320	8520	8720	8930	9140	9360	9580	9810	10000	10300
	6	3.98	623	7570	7730	7890	8060	8230	8400	8580	8770	8960	9150	9350
	7	7.44	427	6910	7020	7150	7270	7400	7530	7660	7800	7950	8090	8240

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3-3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

I_{LB}

W30–W27

Shape[d]	PNA[c]	Y1[a]	ΣQ_n	Y2[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W30×108 (4470)	TFL	0	1590	9010	9290	9570	9850	10200	10500	10800	11100	11400	11800	12100
	2	0.190	1390	8710	8960	9220	9490	9770	10100	10300	10600	11000	11300	11600
	3	0.380	1190	8360	8590	8830	9080	9330	9600	9860	10100	10400	10700	11000
	4	0.570	989	7960	8160	8380	8600	8830	9060	9300	9550	9800	10100	10300
	BFL	0.760	790	7490	7670	7850	8050	8240	8450	8650	8870	9080	9310	9530
	6	4.03	593	6940	7090	7240	7400	7560	7720	7890	8070	8250	8430	8620
	7	7.64	396	6280	6390	6500	6620	6740	6860	6980	7110	7240	7380	7510
W30×99 (3990)	TFL	0	1450	8100	8350	8600	8870	9140	9410	9700	9990	10300	10600	10900
	2	0.168	1280	7840	8080	8320	8560	8820	9080	9340	9610	9900	10200	10500
	3	0.335	1100	7540	7750	7970	8200	8430	8670	8910	9160	9420	9690	9960
	4	0.503	929	7200	7390	7590	7800	8010	8220	8450	8670	8910	9150	9390
	BFL	0.670	754	6800	6970	7150	7320	7510	7700	7890	8090	8300	8510	8720
	6	4.08	559	6280	6410	6560	6700	6850	7010	7160	7330	7490	7660	7840
	7	7.83	364	5640	5740	5840	5950	6050	6160	6280	6400	6520	6640	6760
W30×90 (3610)	TFL	0	1320	7320	7540	7770	8010	8250	8510	8760	9030	9300	9570	9860
	2	0.153	1160	7080	7290	7500	7730	7950	8190	8430	8680	8930	9190	9460
	3	0.305	1000	6810	7000	7200	7400	7610	7830	8050	8280	8510	8750	9000
	4	0.458	842	6500	6670	6850	7040	7230	7420	7620	7830	8040	8260	8480
	BFL	0.610	683	6140	6290	6450	6610	6780	6950	7120	7300	7490	7680	7870
	6	3.99	506	5670	5790	5920	6050	6180	6320	6470	6610	6760	6920	7070
	7	7.76	329	5090	5180	5270	5370	5460	5560	5670	5770	5880	5990	6100
W27×102 (3620)	TFL	0	1500	7250	7480	7730	7980	8240	8510	8780	9060	9350	9650	9950
	2	0.208	1290	6970	7190	7420	7650	7890	8140	8390	8650	8920	9200	9480
	3	0.415	1090	6670	6870	7080	7290	7510	7730	7960	8200	8440	8690	8950
	4	0.623	879	6300	6470	6660	6840	7030	7230	7430	7640	7860	8080	8300
	BFL	0.830	671	5860	6010	6160	6310	6480	6640	6810	6980	7160	7350	7530
	6	3.38	523	5490	5620	5740	5870	6010	6150	6290	6430	6580	6740	6890
	7	6.26	375	5070	5160	5260	5360	5470	5570	5680	5800	5910	6030	6150
W27×94 (3270)	TFL	0	1380	6570	6790	7010	7240	7480	7730	7980	8240	8500	8770	9050
	2	0.186	1200	6340	6540	6750	6970	7190	7410	7650	7890	8140	8390	8650
	3	0.373	1010	6060	6240	6430	6630	6830	7040	7250	7470	7690	7920	8160
	4	0.559	824	5740	5900	6070	6240	6420	6600	6790	6980	7180	7380	7590
	BFL	0.745	638	5360	5490	5640	5780	5930	6090	6250	6410	6580	6750	6920
	6	3.43	492	5000	5120	5240	5360	5480	5610	5740	5880	6020	6160	6310
	7	6.41	346	4590	4680	4770	4860	4960	5060	5160	5260	5370	5480	5590

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

I_{LB}

W27–W24

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W27×84 (2850)	TFL	0	1240	5770	5960	6160	6370	6580	6800	7020	7250	7490	7730	7980
	2	0.160	1080	5570	5750	5940	6130	6320	6530	6740	6950	7170	7400	7630
	3	0.320	918	5340	5500	5670	5840	6030	6210	6400	6600	6800	7010	7220
	4	0.480	758	5070	5210	5360	5520	5680	5850	6020	6190	6370	6560	6750
	BFL	0.640	598	4750	4880	5010	5140	5280	5420	5570	5720	5870	6030	6190
	6	3.50	454	4420	4520	4630	4740	4850	4970	5090	5210	5340	5470	5600
	7	6.63	309	4020	4090	4170	4250	4340	4430	4520	4610	4700	4800	4900
W24×94 (2700)	TFL	0	1380	5470	5670	5880	6090	6310	6530	6770	7010	7260	7510	7770
	2	0.219	1190	5260	5450	5640	5840	6040	6250	6470	6690	6920	7150	7400
	3	0.438	988	5010	5180	5350	5530	5710	5900	6090	6290	6500	6710	6930
	4	0.656	790	4720	4860	5010	5170	5330	5490	5660	5840	6020	6200	6390
	BFL	0.875	592	4360	4480	4600	4730	4860	5000	5140	5290	5430	5590	5740
	6	3.05	469	4100	4200	4310	4420	4530	4640	4760	4880	5010	5140	5270
	7	5.43	346	3810	3890	3970	4060	4140	4240	4330	4430	4520	4630	4730
W24×84 (2370)	TFL	0	1240	4810	4990	5170	5360	5560	5760	5970	6180	6400	6630	6860
	2	0.193	1060	4620	4790	4950	5130	5310	5500	5690	5880	6090	6300	6510
	3	0.385	888	4410	4560	4710	4870	5030	5200	5370	5550	5740	5930	6120
	4	0.578	715	4160	4290	4420	4560	4700	4850	5000	5160	5320	5490	5660
	BFL	0.770	541	3860	3960	4070	4190	4310	4430	4560	4690	4820	4960	5100
	6	3.01	425	3620	3710	3800	3900	4000	4100	4210	4320	4430	4550	4670
	7	5.48	309	3350	3420	3490	3570	3640	3720	3810	3890	3980	4070	4160
W24×76 (2100)	TFL	0	1120	4280	4440	4600	4770	4950	5130	5320	5510	5710	5910	6120
	2	0.170	966	4120	4270	4420	4580	4740	4910	5080	5260	5440	5630	5830
	3	0.340	813	3930	4070	4210	4350	4500	4650	4810	4970	5140	5310	5480
	4	0.510	660	3720	3840	3960	4080	4210	4350	4490	4630	4780	4930	5080
	BFL	0.680	507	3460	3560	3660	3770	3880	3990	4110	4230	4350	4480	4610
	6	3.02	393	3230	3320	3400	3490	3580	3680	3770	3870	3980	4080	4190
	7	5.61	280	2970	3040	3100	3170	3240	3310	3390	3470	3540	3630	3710
W24×68 (1830)	TFL	0	1000	3760	3900	4040	4190	4350	4510	4680	4850	5030	5210	5390
	2	0.146	872	3620	3760	3890	4030	4180	4330	4480	4640	4810	4980	5150
	3	0.293	741	3470	3590	3710	3840	3980	4110	4250	4400	4550	4710	4860
	4	0.439	610	3290	3400	3510	3620	3740	3860	3990	4120	4250	4390	4530
	BFL	0.585	479	3080	3170	3260	3360	3460	3570	3670	3790	3900	4020	4140
	6	3.07	365	2860	2930	3010	3090	3180	3260	3350	3440	3540	3640	3730
	7	5.82	251	2600	2660	2720	2780	2840	2910	2970	3040	3110	3180	3260

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

I_{LB}

W24–W21

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W24×62	TFL	0	911	3300	3430	3560	3700	3840	3990	4140	4300	4460	4620	4790
(1550)	2	0.148	807	3200	3320	3440	3570	3710	3840	3990	4130	4280	4440	4600
	3	0.295	703	3080	3190	3300	3420	3550	3680	3810	3940	4080	4230	4380
	4	0.443	600	2940	3040	3150	3260	3370	3490	3610	3730	3860	3990	4130
	BFL	0.590	496	2790	2880	2970	3070	3170	3270	3380	3490	3600	3720	3840
	6	3.46	362	2550	2620	2700	2770	2850	2940	3020	3110	3200	3300	3390
	7	6.57	228	2250	2300	2360	2410	2470	2530	2590	2650	2710	2780	2850
W24×55	TFL	0	810	2890	3000	3120	3240	3370	3500	3630	3770	3910	4060	4210
(1350)	2	0.126	722	2800	2910	3020	3130	3250	3370	3500	3630	3760	3900	4040
	3	0.253	633	2700	2800	2900	3010	3120	3230	3350	3470	3600	3730	3860
	4	0.379	545	2590	2680	2770	2870	2970	3080	3190	3300	3410	3530	3650
	BFL	0.505	456	2460	2540	2630	2710	2800	2900	2990	3090	3200	3300	3410
	6	3.45	329	2240	2300	2370	2440	2520	2590	2670	2750	2830	2910	3000
	7	6.66	203	1970	2010	2060	2110	2160	2210	2260	2320	2380	2440	2500
W21×73	TFL	0	1070	3310	3450	3590	3740	3890	4050	4220	4390	4560	4740	4930
(1600)	2	0.185	921	3180	3310	3440	3580	3720	3870	4020	4180	4340	4510	4680
	3	0.370	767	3030	3140	3260	3380	3510	3650	3780	3930	4070	4220	4380
	4	0.555	614	2840	2940	3050	3160	3270	3390	3510	3630	3760	3890	4030
	BFL	0.740	460	2630	2710	2790	2880	2980	3070	3170	3270	3380	3490	3600
	6	2.61	364	2470	2540	2610	2680	2760	2840	2930	3010	3100	3190	3290
	7	4.72	269	2290	2340	2400	2460	2520	2580	2650	2720	2790	2860	2940
W21×68	TFL	0	1000	3060	3190	3320	3460	3600	3750	3910	4060	4230	4400	4570
(1480)	2	0.171	860	2940	3060	3180	3310	3440	3580	3720	3870	4020	4180	4340
	3	0.343	719	2800	2910	3020	3140	3260	3380	3510	3640	3780	3920	4060
	4	0.514	577	2640	2730	2830	2930	3030	3140	3250	3370	3490	3610	3740
	BFL	0.685	436	2440	2520	2600	2680	2770	2860	2950	3050	3150	3250	3350
	6	2.59	343	2290	2350	2420	2490	2560	2640	2720	2800	2880	2970	3060
	7	4.74	251	2110	2170	2220	2270	2330	2390	2450	2520	2580	2650	2720
W21×62	TFL	0	913	2760	2870	2990	3120	3250	3380	3520	3670	3810	3970	4120
(1330)	2	0.154	786	2650	2760	2870	2980	3100	3230	3360	3490	3630	3770	3920
	3	0.308	659	2520	2620	2720	2830	2940	3050	3170	3290	3410	3540	3670
	4	0.461	533	2380	2470	2560	2650	2740	2840	2950	3050	3160	3270	3390
	BFL	0.615	406	2210	2280	2350	2430	2510	2590	2680	2770	2860	2950	3050
	6	2.57	317	2060	2120	2190	2250	2320	2390	2460	2530	2610	2690	2770
	7	4.79	228	1900	1950	1990	2040	2100	2150	2210	2260	2320	2380	2450

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

W21

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W21×57 (1170)	TFL	0	837	2480	2590	2700	2820	2940	3060	3190	3320	3460	3600	3740
	2	0.163	730	2390	2490	2600	2710	2820	2930	3050	3170	3300	3430	3570
	3	0.325	624	2290	2380	2480	2580	2680	2790	2890	3010	3120	3240	3370
	4	0.488	517	2170	2260	2340	2430	2520	2610	2710	2810	2920	3020	3130
	BFL	0.650	411	2040	2110	2180	2260	2330	2420	2500	2590	2680	2770	2860
	6	2.87	310	1880	1940	2000	2060	2130	2190	2260	2330	2410	2480	2560
	7	5.36	209	1700	1740	1780	1830	1880	1930	1980	2030	2080	2140	2200
W21×55 (1140)	TFL	0	810	2390	2490	2590	2710	2820	2940	3060	3190	3320	3450	3590
	2	0.131	703	2300	2390	2490	2590	2700	2810	2930	3040	3160	3290	3420
	3	0.261	596	2200	2280	2370	2470	2560	2660	2770	2880	2990	3100	3220
	4	0.392	488	2080	2150	2230	2320	2400	2490	2580	2680	2780	2880	2980
	BFL	0.522	381	1940	2000	2070	2140	2210	2290	2370	2450	2530	2620	2710
	6	2.62	292	1800	1850	1910	1970	2030	2090	2160	2230	2290	2370	2440
	7	5.00	203	1640	1680	1720	1770	1810	1860	1910	1960	2010	2070	2120
W21×50 (984)	TFL	0	736	2120	2210	2310	2410	2510	2620	2730	2850	2970	3090	3220
	2	0.134	648	2050	2130	2220	2320	2420	2520	2620	2730	2840	2960	3070
	3	0.268	561	1970	2050	2130	2220	2310	2400	2500	2600	2700	2810	2910
	4	0.401	474	1870	1950	2020	2100	2180	2270	2350	2440	2540	2630	2730
	BFL	0.535	386	1760	1830	1900	1960	2040	2110	2190	2270	2350	2430	2520
	6	2.91	285	1620	1670	1720	1780	1840	1900	1960	2020	2090	2160	2230
	7	5.58	184	1440	1470	1510	1550	1600	1640	1680	1730	1780	1830	1880
W21×48 (959)	TFL	0	707	2030	2120	2210	2310	2410	2510	2620	2730	2840	2960	3080
	2	0.108	619	1960	2040	2130	2220	2310	2410	2510	2610	2710	2820	2940
	3	0.215	532	1880	1960	2030	2120	2200	2290	2380	2480	2570	2670	2780
	4	0.323	444	1790	1850	1930	2000	2080	2160	2240	2320	2410	2500	2590
	BFL	0.430	357	1680	1740	1800	1860	1930	2000	2070	2140	2220	2300	2380
	6	2.69	267	1550	1590	1650	1700	1750	1810	1870	1930	1990	2050	2120
	7	5.26	177	1390	1420	1460	1500	1540	1580	1620	1670	1710	1760	1810
W21×44 (843)	TFL	0	649	1830	1910	2000	2080	2180	2270	2370	2470	2570	2680	2790
	2	0.113	576	1770	1850	1930	2010	2100	2190	2280	2370	2470	2570	2680
	3	0.225	503	1700	1780	1850	1930	2010	2090	2170	2260	2350	2450	2550
	4	0.338	430	1630	1690	1760	1830	1910	1980	2060	2140	2220	2310	2400
	BFL	0.450	357	1540	1600	1660	1720	1790	1860	1930	2000	2070	2150	2230
	6	2.92	259	1410	1450	1500	1550	1600	1660	1710	1770	1830	1890	1950
	7	5.69	162	1240	1270	1300	1340	1380	1410	1450	1490	1530	1580	1620

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

I_{LB}
W18

Shape[d]	PNA[c]	Y1[a]	ΣQ$_n$	Y2[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W18×60	TFL	0	882	2070	2170	2280	2390	2500	2620	2740	2870	3000	3140	3280
(984)	2	0.174	750	1990	2080	2170	2270	2380	2490	2600	2720	2840	2960	3090
	3	0.348	619	1880	1970	2050	2140	2240	2330	2430	2540	2650	2760	2870
	4	0.521	488	1760	1830	1910	1980	2070	2150	2240	2330	2420	2520	2620
	BFL	0.695	357	1610	1670	1730	1790	1860	1930	2000	2070	2150	2220	2300
	6	2.17	288	1520	1570	1620	1680	1730	1790	1850	1910	1980	2040	2110
	7	3.81	220	1420	1460	1500	1540	1590	1640	1690	1740	1790	1840	1900
W18×55	TFL	0	810	1880	1970	2070	2170	2270	2380	2490	2610	2730	2850	2980
(890)	2	0.158	691	1800	1890	1970	2070	2160	2260	2360	2470	2580	2690	2810
	3	0.315	573	1710	1790	1870	1950	2030	2120	2220	2310	2410	2510	2620
	4	0.473	454	1600	1670	1740	1810	1880	1960	2040	2120	2210	2300	2390
	BFL	0.630	336	1470	1520	1580	1640	1700	1760	1830	1900	1970	2040	2110
	6	2.16	269	1380	1430	1480	1530	1580	1630	1690	1750	1810	1870	1930
	7	3.86	202	1290	1320	1360	1400	1440	1480	1530	1580	1620	1670	1720
W18×50	TFL	0	733	1690	1770	1850	1940	2040	2140	2240	2340	2450	2560	2680
(800)	2	0.143	626	1620	1690	1770	1850	1940	2030	2120	2220	2320	2420	2530
	3	0.285	520	1540	1600	1680	1750	1830	1910	1990	2080	2170	2260	2360
	4	0.428	413	1440	1500	1560	1620	1690	1760	1830	1910	1990	2070	2150
	BFL	0.570	306	1320	1370	1420	1470	1530	1590	1650	1710	1770	1840	1900
	6	2.10	245	1240	1290	1330	1370	1420	1470	1520	1570	1630	1680	1740
	7	3.83	183	1150	1190	1220	1260	1290	1330	1370	1420	1460	1500	1550
W18×46	TFL	0	677	1540	1610	1690	1770	1860	1950	2040	2140	2240	2340	2450
(712)	2	0.151	585	1480	1550	1620	1700	1780	1860	1950	2040	2130	2230	2320
	3	0.303	494	1410	1470	1540	1610	1680	1760	1840	1920	2000	2090	2180
	4	0.454	402	1330	1380	1440	1500	1570	1640	1700	1780	1850	1930	2010
	BFL	0.605	310	1230	1280	1330	1380	1430	1490	1550	1610	1670	1740	1800
	6	2.37	240	1140	1180	1220	1270	1310	1360	1410	1460	1510	1570	1620
	7	4.33	169	1040	1070	1100	1140	1170	1210	1240	1280	1320	1360	1410
W18×40	TFL	0	588	1320	1380	1450	1520	1600	1680	1760	1840	1930	2020	2110
(612)	2	0.131	509	1270	1330	1390	1460	1530	1600	1670	1750	1830	1910	2000
	3	0.263	430	1210	1260	1320	1380	1450	1510	1580	1650	1720	1800	1880
	4	0.394	351	1140	1190	1240	1290	1350	1410	1470	1530	1590	1660	1730
	BFL	0.525	272	1060	1100	1140	1190	1240	1280	1340	1390	1440	1500	1560
	6	2.29	210	983	1020	1050	1090	1130	1170	1210	1260	1300	1350	1400
	7	4.28	147	894	920	948	977	1010	1040	1070	1100	1140	1170	1210

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

W18–W16

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W18×35	TFL	0	515	1120	1170	1230	1300	1360	1430	1500	1570	1650	1720	1800
(510)	2	0.106	451	1080	1130	1190	1240	1300	1370	1430	1500	1570	1640	1720
	3	0.213	387	1030	1080	1130	1180	1240	1300	1360	1420	1480	1550	1620
	4	0.319	323	977	1020	1070	1120	1170	1220	1270	1330	1390	1450	1510
	BFL	0.425	260	917	955	995	1040	1080	1130	1170	1220	1270	1320	1380
	6	2.38	194	842	873	906	940	975	1010	1050	1090	1130	1170	1220
	7	4.56	129	753	776	800	825	851	878	906	935	965	996	1030
W16×45	TFL	0	663	1260	1330	1400	1470	1550	1630	1720	1810	1900	1990	2090
(586)	2	0.141	564	1200	1270	1330	1400	1470	1550	1630	1710	1790	1880	1970
	3	0.283	464	1140	1200	1250	1320	1380	1450	1520	1590	1670	1740	1830
	4	0.424	365	1060	1110	1160	1220	1270	1330	1390	1450	1520	1580	1650
	BFL	0.565	266	971	1010	1050	1090	1140	1190	1230	1280	1340	1390	1450
	6	1.81	216	916	950	985	1020	1060	1100	1140	1190	1230	1280	1330
	7	3.26	166	855	882	911	941	973	1010	1040	1070	1110	1150	1190
W16×40	TFL	0	589	1110	1170	1230	1300	1370	1440	1510	1590	1670	1760	1840
(518)	2	0.126	501	1060	1120	1170	1230	1300	1360	1430	1510	1580	1660	1740
	3	0.253	412	1000	1050	1110	1160	1220	1280	1340	1400	1470	1540	1610
	4	0.379	324	936	979	1020	1070	1120	1170	1230	1280	1340	1400	1460
	BFL	0.505	236	855	890	926	964	1000	1040	1090	1130	1180	1230	1280
	6	1.73	191	807	836	867	900	934	969	1010	1040	1080	1120	1170
	7	3.18	147	754	778	803	829	857	886	916	947	979	1010	1050
W16×36	TFL	0	529	969	1020	1080	1140	1200	1260	1330	1400	1470	1550	1630
(448)	2	0.108	453	929	979	1030	1090	1140	1200	1260	1330	1390	1460	1540
	3	0.215	378	883	927	975	1020	1080	1130	1180	1240	1300	1370	1430
	4	0.323	303	828	867	908	951	996	1040	1090	1140	1200	1250	1310
	BFL	0.430	228	762	795	829	864	901	940	981	1020	1070	1110	1160
	6	1.82	180	713	740	769	799	830	863	897	932	969	1010	1050
	7	3.45	132	656	678	700	724	749	774	801	829	858	888	919
W16×31	TFL	0	456	826	872	921	972	1030	1080	1140	1200	1260	1330	1390
(375)	2	0.110	396	794	837	882	930	979	1030	1080	1140	1200	1260	1320
	3	0.220	335	757	796	837	881	926	973	1020	1070	1130	1180	1240
	4	0.330	274	713	748	785	823	863	905	948	993	1040	1090	1140
	BFL	0.440	213	662	692	723	755	789	824	861	900	939	981	1020
	6	1.99	164	613	638	664	691	719	748	779	811	844	878	914
	7	3.79	114	555	574	593	614	635	657	680	705	729	755	782

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

W16–W14

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W16×26 (301)	TFL	0	384	673	712	753	795	840	886	935	985	1040	1090	1150
	2	0.0863	337	649	685	723	763	805	848	893	940	989	1040	1090
	3	0.173	289	621	654	689	726	764	804	845	888	933	980	1030
	4	0.259	242	589	619	650	683	718	754	791	830	870	912	955
	BFL	0.345	194	551	577	604	633	663	694	726	760	795	832	869
	6	2.04	145	505	526	549	572	596	622	648	676	705	734	765
	7	4.00	96	450	465	482	499	517	535	554	575	595	617	640
W14×38 (385)	TFL	0	558	842	894	949	1010	1070	1130	1200	1260	1340	1410	1490
	2	0.129	471	803	851	901	954	1010	1070	1130	1190	1260	1320	1390
	3	0.258	384	758	800	845	891	941	992	1050	1100	1160	1220	1280
	4	0.386	297	703	739	777	817	858	902	948	996	1050	1100	1150
	BFL	0.515	209	634	662	692	723	756	791	827	864	903	943	985
	6	1.42	174	602	627	653	680	709	739	770	803	837	872	909
	7	2.55	140	568	589	611	634	658	684	710	738	766	796	827
W14×34 (340)	TFL	0	500	744	790	839	890	944	1000	1060	1120	1180	1250	1320
	2	0.114	423	710	753	797	844	894	945	999	1050	1110	1170	1240
	3	0.228	347	671	709	749	791	835	881	929	979	1030	1090	1140
	4	0.341	270	623	656	690	726	764	803	844	887	932	978	1030
	BFL	0.455	193	565	591	618	646	676	708	740	774	810	847	885
	6	1.41	159	535	557	581	605	631	659	687	716	747	779	812
	7	2.60	125	502	520	540	560	582	604	628	652	677	704	731
W14×30 (291)	TFL	0	442	643	683	726	771	818	868	919	973	1030	1090	1150
	2	0.0963	378	615	653	692	734	777	823	870	920	972	1030	1080
	3	0.193	313	583	616	652	689	728	769	812	857	903	951	1000
	4	0.289	248	544	573	604	636	670	706	743	781	822	863	907
	BFL	0.385	183	497	521	546	572	600	629	659	690	723	757	793
	6	1.48	147	467	487	508	531	554	579	605	631	659	688	719
	7	2.82	111	432	448	466	484	503	522	543	565	587	611	635
W14×26 (245)	TFL	0	385	554	589	626	666	707	750	795	842	891	942	994
	2	0.105	332	531	564	598	635	673	713	754	798	843	890	939
	3	0.210	279	504	534	565	598	633	669	707	747	788	830	875
	4	0.315	226	473	500	527	556	587	619	652	687	723	760	799
	BFL	0.420	174	437	459	482	507	533	559	587	617	647	679	712
	6	1.67	135	405	424	443	463	485	507	531	555	580	607	634
	7	3.18	96.1	368	382	397	413	430	447	465	484	503	523	544

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

I_{LB}

W14–W12

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W14×22	TFL	0	325	455	484	515	548	583	619	657	696	737	780	824
(199)	2	0.0838	283	437	465	494	524	556	590	625	662	700	740	781
	3	0.168	241	417	442	469	496	526	557	589	622	657	694	731
	4	0.251	199	393	416	439	464	491	518	547	577	608	640	674
	BFL	0.335	157	366	385	405	427	449	473	497	523	550	577	606
	6	1.69	119	336	352	369	386	405	424	444	466	487	510	534
	7	3.34	81.2	301	313	326	339	352	367	382	398	414	431	449
W12×30	TFL	0	440	532	569	608	649	693	739	787	837	889	944	1000
(238)	2	0.110	368	505	539	575	613	652	694	738	784	831	881	933
	3	0.220	296	474	504	536	569	604	641	679	720	762	806	852
	4	0.330	225	437	462	488	516	546	577	609	643	679	716	754
	BFL	0.440	153	390	409	429	450	473	496	521	547	574	602	632
	6	1.12	131	373	390	408	427	447	468	490	513	537	562	588
	7	1.94	110	355	370	386	403	420	438	458	478	499	520	543
W12×26	TFL	0	382	455	487	521	557	595	634	676	719	764	812	861
(204)	2	0.0950	321	434	463	494	526	561	597	635	674	716	759	804
	3	0.190	259	407	433	460	489	520	552	585	620	657	695	735
	4	0.285	197	375	397	420	444	470	497	525	554	585	617	651
	BFL	0.380	136	336	353	371	389	409	430	452	474	498	523	549
	6	1.08	116	321	336	352	368	386	404	424	444	465	487	510
	7	1.95	95.6	305	317	331	345	360	376	393	410	428	447	467
W12×22	TFL	0	324	372	399	428	458	490	524	559	596	635	675	717
(156)	2	0.106	281	356	381	408	437	466	498	531	565	601	638	677
	3	0.213	238	339	362	386	412	439	468	498	529	562	596	631
	4	0.319	196	318	339	361	384	408	433	460	488	517	547	579
	BFL	0.425	153	294	312	330	350	370	392	415	438	463	489	516
	6	1.66	117	270	285	300	316	333	351	370	390	410	431	454
	7	3.04	81	242	253	265	277	290	303	317	332	347	364	380
W12×19	TFL	0	279	312	335	360	386	413	442	472	504	537	571	607
(130)	2	0.0875	244	300	322	345	369	394	421	449	479	510	542	575
	3	0.175	209	286	306	327	349	373	397	423	450	479	508	539
	4	0.263	174	270	288	307	327	348	370	393	417	443	469	497
	BFL	0.350	139	251	267	283	300	318	338	358	379	401	424	447
	6	1.65	104	229	242	255	269	284	300	316	333	351	370	389
	7	3.12	69.7	203	212	222	232	243	255	267	280	293	306	321

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

W12–W10

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W12×16 (103)	TFL	0	236	254	273	294	316	339	363	388	415	442	471	501
	2	0.0663	209	245	263	282	303	324	347	371	396	422	449	477
	3	0.133	183	235	252	270	289	309	330	352	375	399	425	451
	4	0.199	156	223	238	255	272	291	310	330	351	373	396	420
	BFL	0.265	130	210	224	239	254	270	288	306	324	344	365	386
	6	1.70	94.4	189	200	212	225	238	251	266	281	297	313	331
	7	3.32	58.9	163	171	179	188	197	207	217	228	239	250	262
W12×14 (88.6)	TFL	0	208	220	237	255	274	295	316	338	361	386	411	438
	2	0.0563	185	212	229	246	264	283	303	324	345	368	392	417
	3	0.113	163	204	219	235	252	270	288	308	328	350	372	395
	4	0.169	141	195	209	223	239	255	272	290	309	329	349	371
	BFL	0.225	118	184	196	209	223	238	253	269	286	304	322	341
	6	1.69	85.2	165	175	186	197	208	221	234	247	261	276	291
	7	3.36	51.9	141	148	155	163	171	179	188	198	207	217	228
W10×26 (144)	TFL	0	381	339	368	398	430	464	500	537	577	619	662	708
	2	0.110	317	322	347	375	404	435	467	501	537	575	615	656
	3	0.220	254	300	323	347	373	400	429	459	491	524	559	595
	4	0.330	190	274	293	313	334	357	381	406	432	460	489	519
	BFL	0.440	127	242	256	271	287	304	322	341	361	381	403	426
	6	0.898	111	232	245	259	273	288	305	322	339	358	378	398
	7	1.51	95.1	222	233	245	258	272	286	301	317	334	351	369
W10×22 (118)	TFL	0	324	281	304	330	357	386	416	448	481	516	553	591
	2	0.0900	273	267	289	312	336	363	390	419	450	482	516	551
	3	0.180	221	250	269	290	312	335	359	385	413	441	471	502
	4	0.270	169	230	246	263	282	301	322	344	367	391	416	443
	BFL	0.360	117	204	217	230	245	260	276	293	311	329	349	369
	6	0.953	99.2	194	205	217	230	243	258	273	288	305	322	340
	7	1.71	81.1	183	193	203	214	225	237	250	263	277	292	307
W10×19 (96.3)	TFL	0	281	239	259	282	305	330	356	384	413	444	476	509
	2	0.0988	241	228	247	267	289	312	336	362	389	417	447	477
	3	0.198	201	215	232	251	270	291	313	336	361	386	413	440
	4	0.296	162	200	216	232	249	267	286	307	328	350	374	398
	BFL	0.395	122	183	195	208	223	238	254	270	288	307	326	346
	6	1.28	96.1	169	179	191	203	215	229	243	258	273	290	307
	7	2.31	70.2	153	162	170	180	190	200	211	223	235	248	261

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

W10

Table 3–20 (continued)
Lower Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections

Shape[d]	PNA[c]	$Y1$[a]	ΣQ_n	$Y2$[b], in.										
		in.	kip	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
W10×17	TFL	0	250	206	224	244	265	287	310	334	360	387	415	445
(81.9)	2	0.0825	217	197	214	233	252	272	294	317	341	366	392	419
	3	0.165	183	187	202	219	236	255	275	295	317	340	364	389
	4	0.248	150	175	189	203	219	236	253	271	291	311	332	354
	BFL	0.330	117	161	173	185	199	213	227	243	259	277	295	313
	6	1.31	89.8	148	157	168	179	190	202	215	229	243	258	274
	7	2.46	62.4	132	139	147	155	164	173	183	193	204	215	227
W10×15	TFL	0	221	177	193	210	228	248	268	290	312	336	361	387
(68.9)	2	0.0675	194	170	185	201	218	236	255	275	296	319	342	366
	3	0.135	167	162	176	191	206	223	240	259	278	299	320	343
	4	0.203	140	153	165	179	193	208	223	240	258	276	295	316
	BFL	0.270	113	142	153	165	177	190	204	218	234	250	267	284
	6	1.35	83.8	128	137	147	157	167	179	190	203	216	230	244
	7	2.60	55.1	112	118	125	133	140	148	157	166	176	186	196
W10×12	TFL	0	177	139	152	165	180	195	211	228	246	265	285	306
(53.8)	2	0.0525	156	134	145	158	172	186	201	217	234	252	271	290
	3	0.105	135	127	138	150	163	176	190	205	221	237	254	272
	4	0.158	114	120	130	141	152	164	177	191	205	220	235	251
	BFL	0.210	93.6	113	121	131	141	152	163	175	187	200	214	228
	6	1.31	68.9	101	109	116	124	133	142	152	162	172	183	195
	7	2.61	44.2	87.8	92.9	98.3	104	110	117	124	131	138	146	155

[a] $Y1$ = distance from top of the steel beam to plastic neutral axis.
[b] $Y2$ = distance from top of the steel beam to concrete flange force.
[c] See Figure 3–3c for PNA locations.
[d] Value in parentheses is I_x (in.^{4}) of non-composite steel shape.

F_u = 65 ksi

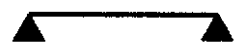
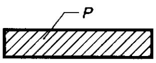
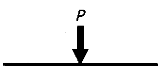
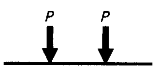
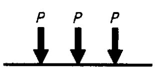
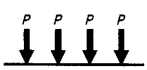
Table 3–21
Shear Stud
Nominal Horizontal Shear for One Stud, Q_n, kip

Q_N

Deck condition			Stud diameter, in.	Normal weight concrete w_c = 145 pcf, f'_c = 3 ksi	Normal weight concrete w_c = 145 pcf, f'_c = 4 ksi	Light weight concrete w_c = 110 pcf, f'_c = 3 ksi	Light weight concrete w_c = 110 pcf, f'_c = 4 ksi
No deck			3/8	5.26	6.53	4.28	5.31
			1/2	9.35	11.6	7.60	9.43
			5/8	14.6	18.1	11.9	14.7
			3/4	21.0	26.1	17.1	21.2
Deck Parallel	$\frac{w_r}{h_r} \geq 1.5$		3/8	5.26	5.38	4.28	5.31
			1/2	9.35	9.57	7.60	9.43
			5/8	14.6	15.0	11.9	14.7
			3/4	21.0	21.5	17.1	21.2
	$\frac{w_r}{h_r} < 1.5$		3/8	4.58	4.58	4.28	4.58
			1/2	8.14	8.14	7.60	8.14
			5/8	12.7	12.7	11.9	12.7
			3/4	18.3	18.3	17.1	18.3
Deck Perpendicular	Weak studs per rib	1	3/8	4.31	4.31	4.28	4.31
			1/2	7.66	7.66	7.66	7.66
			5/8	12.0	12.0	12.0	12.0
			3/4	17.2	17.2	17.2	17.2
		2	3/8	3.66	3.66	3.66	3.66
			1/2	6.51	6.51	6.51	6.51
			5/8	10.2	10.2	10.2	10.2
			3/4	14.6	14.6	14.6	14.6
		3	3/8	3.02	3.02	3.02	3.02
			1/2	5.36	5.36	5.36	5.36
			5/8	8.38	8.38	8.38	8.38
			3/4	12.1	12.1	12.1	12.1
	Strong studs per rib	1	3/8	5.26	5.38	4.28	5.31
			1/2	9.35	9.57	7.60	9.43
			5/8	14.6	15.0	11.9	14.7
			3/4	21.0	21.5	17.1	21.2
		2	3/8	4.58	4.58	4.28	4.58
			1/2	8.14	8.14	7.60	8.14
			5/8	12.7	12.7	11.9	12.7
			3/4	18.3	18.3	17.1	18.3
		3	3/8	3.77	3.77	3.77	3.77
			1/2	6.70	6.70	6.70	6.70
			5/8	10.5	10.5	10.5	10.5
			3/4	15.1	15.1	15.1	15.1

Note:
Tabulated values are applicable only to concrete made with ASTM C33 aggregates.
After-weld shear stud lengths assumed to be ≥ Deck height + 1.5 in.

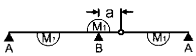
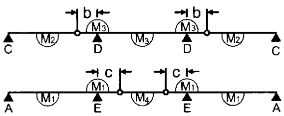
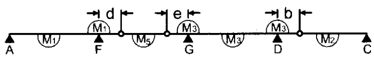
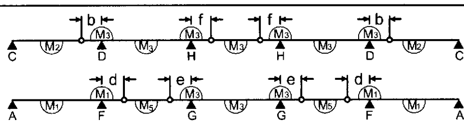
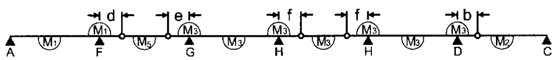
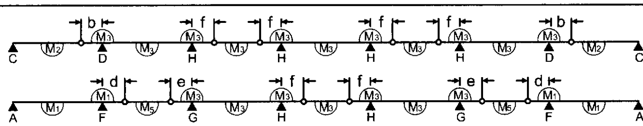
Table 3–22a
Concentrated Load Equivalents

n	Loading	Coeff.	Simple Beam 	Beam Fixed One End, Supported at Other 	Beam Fixed Both Ends 
∞		a	0.125	0.070	0.042
		b	—	0.125	0.083
		c	0.500	0.375	—
		d	—	0.625	0.500
		e	0.013	0.005	0.003
		f	1.000	1.000	0.667
		g	1.000	0.415	0.300
2		a	0.250	0.156	0.125
		b	—	0.188	0.125
		c	0.500	0.313	—
		d	—	0.688	0.500
		e	0.021	0.009	0.005
		f	2.000	1.500	1.000
		g	0.800	0.477	0.400
3		a	0.333	0.222	0.111
		b	—	0.333	0.222
		c	1.000	0.667	—
		d	—	1.333	1.000
		e	0.036	0.015	0.008
		f	2.667	2.667	1.778
		g	1.022	0.438	0.333
4		a	0.500	0.266	0.188
		b	—	0.469	0.313
		c	1.500	1.031	—
		d	—	1.969	1.500
		e	0.050	0.021	0.010
		f	4.000	3.750	2.500
		g	0.950	0.428	0.320
5		a	0.600	0.360	0.200
		b	—	0.600	0.400
		c	2.000	1.400	—
		d	—	2.600	2.000
		e	0.063	0.027	0.013
		f	4.800	4.800	3.200
		g	1.008	0.424	0.312

Maximum positive moment (kip-ft): aPL
Maximum negative moment (kip-ft): bPL
Pinned end reaction (kips): cP
Fixed end reaction (kips): dP
Maximum deflection (in.): ePl^3 / EI

Equivalent simple span uniform load (kips): fP
Deflection coefficient for equivalent simple span uniform load: g
Number of equal load spaces: n
Span of beam (ft): L
Span of beam (in.): l

Table 3–22b
Beam Diagrams and Formulas
Design Properties of Cantilevered Beams – Equal Loads, Equally Spaced

No. Spans	System
2	
3	
4	
5	
≥6 (even)	
≥7 (odd)	

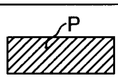
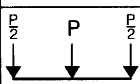
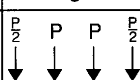
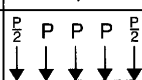
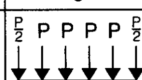
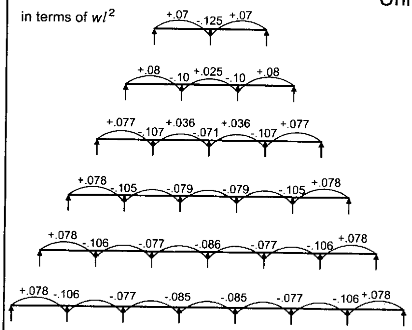
	n	∞	2	3	4	5
Typical Span Loading		 P	 $\frac{P}{2}$ P $\frac{P}{2}$	 $\frac{P}{2}$ P P $\frac{P}{2}$	 $\frac{P}{2}$ P P P $\frac{P}{2}$	 $\frac{P}{2}$ P P P P $\frac{P}{2}$
Moments	M_1	0.086×PL	0.167×PL	0.250×PL	0.333×PL	0.429×PL
	M_2	0.096×PL	0.188×PL	0.278×PL	0.375×PL	0.480×PL
	M_3	0.063×PL	0.125×PL	0.167×PL	0.250×PL	0.300×PL
	M_4	0.039×PL	0.083×PL	0.083×PL	0.167×PL	0.171×PL
	M_5	0.051×PL	0.104×PL	0.139×PL	0.208×PL	0.249×PL
Reactions	A	0.414×P	0.833×P	1.250×P	1.667×P	2.071×P
	B	1.172×P	2.333×P	3.500×P	4.667×P	5.857×P
	C	0.438×P	0.875×P	1.333×P	1.750×P	2.200×P
	D	1.063×P	2.125×P	3.167×P	4.250×P	5.300×P
	E	1.086×P	2.167×P	3.250×P	4.333×P	5.429×P
	F	1.109×P	2.208×P	3.333×P	4.417×P	5.557×P
	G	0.977×P	1.958×P	2.917×P	3.917×P	4.871×P
	H	1.000×P	2.000×P	3.000×P	4.000×P	5.000×P
Cantilever Dimensions	a	0.172×L	0.250×L	0.200×L	0.182×L	0.176×L
	b	0.125×L	0.200×L	0.143×L	0.143×L	0.130×L
	c	0.220×L	0.333×L	0.250×L	0.222×L	0.229×L
	d	0.204×L	0.308×L	0.231×L	0.211×L	0.203×L
	e	0.157×L	0.273×L	0.182×L	0.176×L	0.160×L
	f	0.147×L	0.250×L	0.167×L	0.167×L	0.150×L

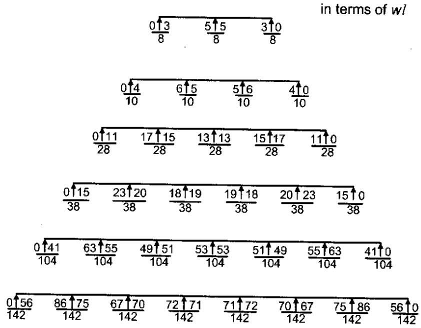
Table 3–22c
Continuous Beams
Moments and Shear Coefficients – Equal Spans, Equally Loaded

Uniform Load

Moment in terms of wl^2

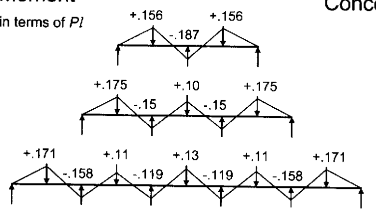


Shear in terms of wl

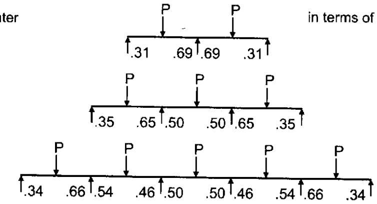


Concentrated Loads at center

Moment in terms of Pl

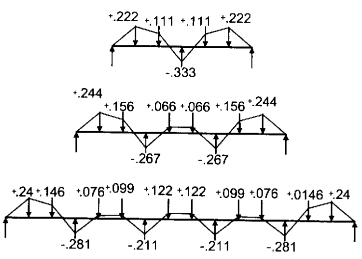


Shear in terms of P

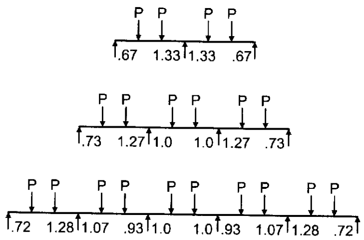


Concentrated Loads at third points

Moment in terms of Pl

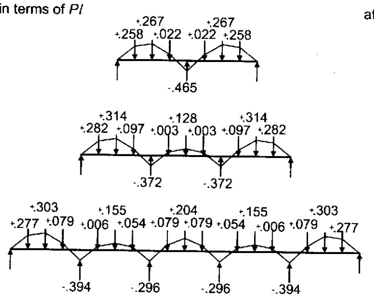


Shear in terms of P



Concentrated Loads at quarter points

Moment in terms of Pl



Shear in terms of P

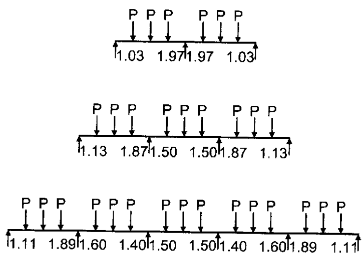
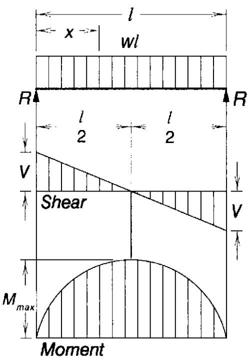


Table 3–23
Shears, Moments, and Deflections

1. SIMPLE BEAM — UNIFORMLY DISTRIBUTED LOAD



Total Equiv. Uniform Load .... $= wl$

$R = V$ .... $= \dfrac{wl}{2}$

V_x .... $= w\left(\dfrac{l}{2} - x\right)$

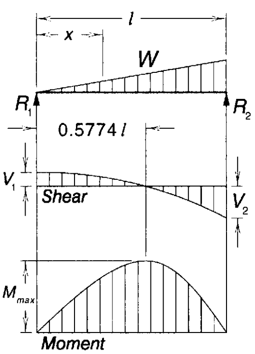
M_{max} (at center) .... $= \dfrac{wl^2}{8}$

M_x .... $= \dfrac{wx}{2}(l - x)$

Δ_{max} (at center) .... $= \dfrac{5wl^4}{384EI}$

Δ_x .... $= \dfrac{wx}{24EI}\left(l^3 - 2lx^2 + x^3\right)$

2. SIMPLE BEAM — LOAD INCREASING UNIFORMLY TO ONE END



Total Equiv. Uniform Load .... $= \dfrac{16W}{9\sqrt{3}} = 1.03\,W$

$R_1 = V_1$ .... $= \dfrac{W}{3}$

$R_2 = V_2 = V_{max}$ .... $= \dfrac{2W}{3}$

V_x .... $= \dfrac{W}{3} - \dfrac{Wx^2}{l^2}$

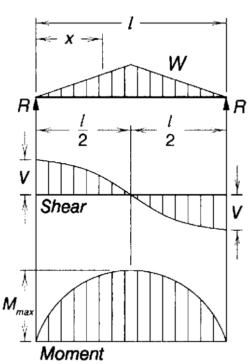
M_{max} $\left(\text{at } x = \dfrac{l}{\sqrt{3}} = 0.557\,l\right)$ .... $= \dfrac{2Wl}{9\sqrt{3}} = 0.128\,Wl$

M_x .... $= \dfrac{Wx}{3l^2}\left(l^2 - x^2\right)$

Δ_{max} $\left(\text{at } x = l\sqrt{1 - \sqrt{\dfrac{8}{15}}} = 0.519\,l\right)$ .... $= 0.0130\,\dfrac{Wl^3}{EI}$

Δ_x .... $= \dfrac{Wx}{180EIl^2}\left(3x^4 - 10l^2x^2 + 7l^4\right)$

3. SIMPLE BEAM — LOAD INCREASING UNIFORMLY TO CENTER



Total Equiv. Uniform Load .... $= \dfrac{4W}{3}$

$R = V$ .... $= \dfrac{W}{2}$

V_x (when $x < \dfrac{l}{2}$) .... $= \dfrac{W}{2l^2}\left(l^2 - 4x^2\right)$

M_{max} (at center) .... $= \dfrac{Wl}{6}$

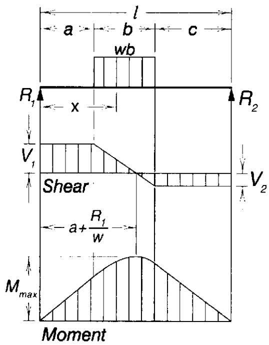
M_x (when $x < \dfrac{l}{2}$) .... $= Wx\left(\dfrac{1}{2} - \dfrac{2x^2}{3l^2}\right)$

Δ_{max} (at center) .... $= \dfrac{Wl^3}{60EI}$

Δ_x (when $x < \dfrac{l}{2}$) .... $= \dfrac{Wx}{480EIl^2}\left(5l^2 - 4x^2\right)^2$

Table 3–23 (continued)
Shears, Moments, and Deflections

4. SIMPLE BEAM — UNIFORM LOAD PARTIALLY DISTRIBUTED



$R_1 = V_1$ (max. when $a < c$) .... $= \frac{wb}{2l}(2c+b)$

$R_2 = V_2$ (max. when $a > c$) .... $= \frac{wb}{2l}(2a+b)$

V_x (when $x > a$ and $< (a+b)$) .... $= R_1 - w(x-a)$

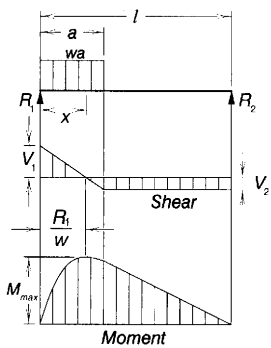
M_{max} $\left(\text{at } x = a + \frac{R_1}{w}\right)$ .... $= R_1\left(a + \frac{R_1}{2w}\right)$

M_x (when $x < a$) .... $= R_1 x$

M_x (when $x > a$ and $< (a+b)$) .... $= R_1 x - \frac{w}{2}(x-a)^2$

M_x (when $x > (a+b)$) .... $= R_2(l-x)$

5. SIMPLE BEAM — UNIFORM LOAD PARTIALLY DISTRIBUTED AT ONE END



$R_1 = V_1 = V_{max}$ .... $= \frac{wa}{2l}(2l-a)$

$R_2 = V_2$ .... $= \frac{wa^2}{2l}$

V_x (when $x < a$) .... $= R_1 - wx$

M_{max} $\left(\text{at } x = \frac{R_1}{w}\right)$ .... $= \frac{R_1^2}{2w}$

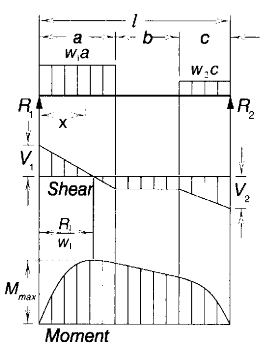
M_x (when $x < a$) .... $= R_1 x - \frac{wx^2}{2}$

M_x (when $x > a$) .... $= R_2(l-x)$

Δ_x (when $x < a$) .... $= \frac{wx}{24EIl}\left(a^2(2l-a)^2 - 2ax^2(2l-a) + lx^3\right)$

Δ_x (when $x > a$) .... $= \frac{wa^2(l-x)}{24EIl}\left(4xl - 2x^2 - a^2\right)$

6. SIMPLE BEAM — UNIFORM LOAD PARTIALLY DISTRIBUTED AT EACH END



$R_1 = V_1$ .... $= \frac{w_1 a(2l-a) + w_2 c^2}{2l}$

$R_2 = V_2$ .... $= \frac{w_2 c(2l-c) + w_1 a^2}{2l}$

V_x (when $x < a$) .... $= R_1 - w_1 x$

V_x (when $a < x < (a+b)$) .... $= R_1 - w_1 a$

V_x (when $x > (a+b)$) .... $= R_2 - w_2(l-x)$

M_{max} $\left(\text{at } x = \frac{R_1}{w_1}, \text{when } R_1 < w_1 a\right)$ .... $= \frac{R_1^2}{2w_1}$

M_{max} $\left(\text{at } x = l - \frac{R_2}{w_2}, \text{when } R_2 < w_2 c\right)$ $= \frac{R_2^2}{2w_2}$

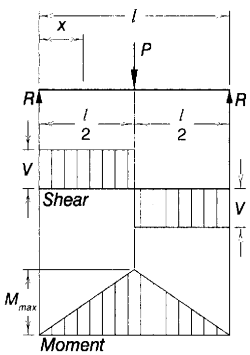
M_x (when $x < a$) .... $= R_1 x - \frac{w_1 x^2}{2}$

M_x (when $a < x < (a+b)$) .... $= R_1 x - \frac{w_1 a}{2}(2x-a)$

M_x (when $x > (a+b)$) .... $= R_2(l-x) - \frac{w_2(l-x)^2}{2}$

Table 3–23 (continued)
Shears, Moments, and Deflections

7. SIMPLE BEAM — CONCENTRATED LOAD AT CENTER



Total Equiv. Uniform Load .... $= 2P$

$R = V$ .... $= \frac{P}{2}$

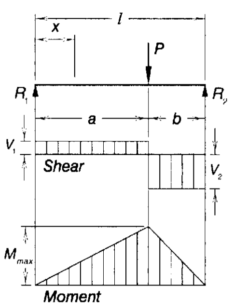
M_{max} (at point of load) .... $= \frac{Pl}{4}$

M_x (when $x < \frac{l}{2}$) .... $= \frac{Px}{2}$

Δ_{max} (at point of load) .... $= \frac{Pl^3}{48EI}$

Δ_x (when $x < \frac{l}{2}$) .... $= \frac{Px}{48EI}\left(3l^2 - 4x^2\right)$

8. SIMPLE BEAM — CONCENTRATED LOAD AT ANY POINT



Total Equiv. Uniform Load .... $= \frac{8Pab}{l^2}$

$R_1 = V_1$ ($= V_{max}$ when $a < b$) .... $= \frac{Pb}{l}$

$R_2 = V_2$ ($= V_{max}$ when $a > b$) .... $= \frac{Pa}{l}$

M_{max} (at point of load) .... $= \frac{Pab}{l}$

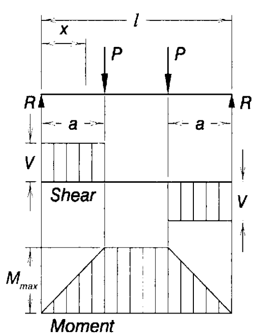
M_x (when $x < a$) .... $= \frac{Pbx}{l}$

Δ_{max} $\left(\text{at } x = \sqrt{\frac{a(a+2b)}{3}}, \text{ when } a > b\right)$ .... $= \frac{Pab(a+2b)\sqrt{3a(a+2b)}}{27EIl}$

Δ_a (at point of load) .... $= \frac{Pa^2b^2}{3EIl}$

Δ_x (when $x < a$) .... $= \frac{Pbx}{6EIl}\left(l^2 - b^2 - x^2\right)$

9. SIMPLE BEAM — TWO EQUAL CONCENTRATED LOADS SYMMETRICALLY PLACED



Total Equiv. Uniform Load .... $= \frac{8Pa}{l}$

$R = V$ .... $= P$

M_{max} (between loads) .... $= Pa$

M_x (when $x < a$) .... $= Px$

Δ_{max} (at center) .... $= \frac{Pa}{24EI}\left(3l^2 - 4a^2\right)$

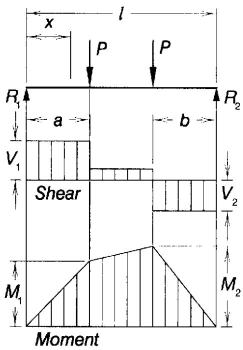
Δ_{max} (when $a = \frac{l}{3}$) .... $= \frac{Pl^3}{28EI}$

Δ_x (when $x < a$) .... $= \frac{Px}{6EI}\left(3la - 3a^2 - x^2\right)$

Δ_x (when $a < x < (l - a)$) .... $= \frac{Pa}{6EI}\left(3lx - 3x^2 - a^2\right)$

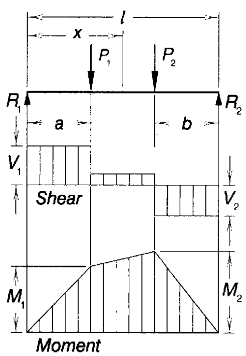
Table 3–23 (continued)
Shears, Moments, and Deflections

10. SIMPLE BEAM — TWO EQUAL CONCENTRATED LOADS UNSYMMETRICALLY PLACED



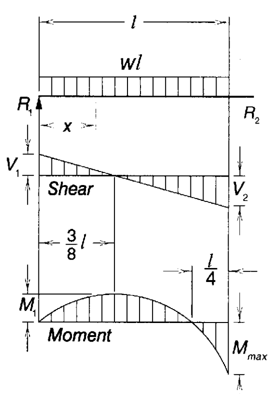
$R_1 = V_1$ ($= V_{max}$ when $a < b$)	$= \frac{P}{l}(l - a + b)$
$R_2 = V_2$ ($= V_{max}$ when $a > b$)	$= \frac{P}{l}(l - b + a)$
V_x (when $a < x < (l - b)$)	$= \frac{P}{l}(b - a)$
M_1 ($= M_{max}$ when $a > b$)	$= R_1 a$
M_2 ($= M_{max}$ when $a < b$)	$= R_2 b$
M_x (when $x < a$)	$= R_1 x$
M_x (when $a < x < (l - b)$)	$= R_1 x - P(x - a)$

11. SIMPLE BEAM — TWO UNEQUAL CONCENTRATED LOADS UNSYMMETRICALLY PLACED



$R_1 = V_1$	$= \frac{P_1(l - a) + P_2 b}{l}$
$R_2 = V_2$	$= \frac{P_1 a + P_2(l - b)}{l}$
V_x (when $a < x < (l - b)$)	$= R_1 - P_1$
M_1 ($= M_{max}$ when $R_1 < P_1$)	$= R_1 a$
M_2 ($= M_{max}$ when $R_2 < P_2$)	$= R_2 b$
M_x (when $x < a$)	$= R_1 x$
M_x (when $a < x < (l - b)$)	$= R_1 x - P_1(x - a)$

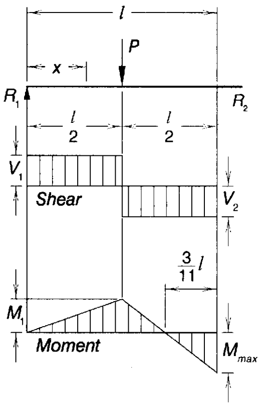
12. BEAM FIXED AT ONE END, SUPPORTED AT OTHER — UNIFORMLY DISTRUBTED LOAD



Total Equiv. Uniform Load	$= wl$
$R_1 = V_1$	$= \frac{3wl}{8}$
$R_2 = V_2 = V_{max}$	$= \frac{5wl}{8}$
V_x	$= R_1 - wx$
M_{max}	$= \frac{wl^2}{8}$
M_1 (at $x = \frac{3}{8}l$)	$= \frac{9}{128}wl^2$
M_x	$= R_1 x - \frac{wx^2}{2}$
Δ_{max} (at $x = \frac{l}{16}(1 + \sqrt{33}) = 0.422\,l$)	$= \frac{wl^4}{185EI}$
Δ_x	$= \frac{wx}{48EI}(l^3 - 3lx^2 + 2x^3)$

Table 3–23 (continued)
Shears, Moments, and Deflections

13. BEAM FIXED AT ONE END, SUPPORTED AT OTHER — CONCENTRATED LOAD AT CENTER



Total Equiv. Uniform Load .... $= \frac{3P}{2}$

$R_1 = V_1$ .... $= \frac{5P}{16}$

$R_2 = V_2 = V_{max}$ .... $= \frac{11P}{16}$

M_{max} (at fixed end) .... $= \frac{3Pl}{16}$

M_1 (at point of load) .... $= \frac{5Pl}{32}$

M_x (at $x < \frac{l}{2}$) .... $= \frac{5Px}{16}$

M_x (when $x > \frac{l}{2}$) .... $= P\left(\frac{l}{2} - \frac{11x}{16}\right)$

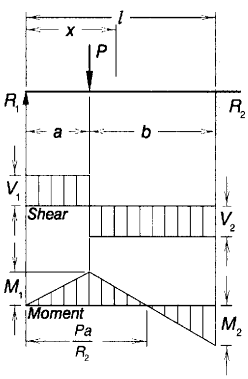
Δ_{max} (at $x = \frac{l}{\sqrt{5}} = 0.447l$) .... $= \frac{Pl^3}{48EI\sqrt{5}} = 0.00932\frac{Pl^3}{EI}$

Δ_x (at point of load) .... $= \frac{7Pl^3}{768EI}$

Δ_x (at $x < \frac{l}{2}$) .... $= \frac{Px}{96EI}\left(3l^2 - 5x^2\right)$

Δ_x (at $x > \frac{l}{2}$) .... $= \frac{P}{96EI}(x-l)^2(11x - 2l)$

14. BEAM FIXED AT ONE END, SUPPORTED AT THE OTHER — CONCENTRATED LOAD AT ANY POINT



$R_1 = V_1$ .... $= \frac{Pb^2}{2l^3}(a + 2l)$

$R_2 = V_2$ .... $= \frac{Pa}{2l^3}\left(3l^2 - a^2\right)$

M_1 (at point of load) .... $= R_1 a$

M_2 (at fixed end) .... $= \frac{Pab}{2l^2}(a + l)$

M_x (at $x < a$) .... $= R_1 x$

M_x (when $x > a$) .... $= R_1 x - P(x - a)$

Δ_{max} $\left(\text{when } a < 0.414l \text{ at } x = l\frac{\left(l^2 + a^2\right)}{\left(3l^2 - a^2\right)}\right)$ .. $= \frac{Pa}{3EI}\frac{\left(l^2 - a^2\right)^3}{\left(3l^2 - a^2\right)^2}$

Δ_{max} $\left(\text{when } a > 0.414l \text{ at } x = l\sqrt{\frac{a}{2l + a}}\right)$ ..... $= \frac{Pab^2}{6EI}\sqrt{\frac{a}{2l + a}}$

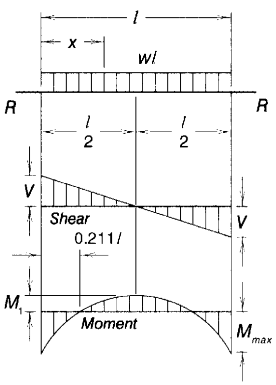
Δ_a (at point of load) .... $= \frac{Pa^2b^3}{12EIl^3}(3l + a)$

Δ_x (when $x < a$) .... $= \frac{Pb^2x}{12EIl^3}\left(3al^2 - 2lx^2 - ax^2\right)$

Δ_x (when $x > a$) .... $= \frac{Pa}{12EIl^3}(l - x)^2\left(3l^2x - a^2x - 2a^2l\right)$

Table 3–23 (continued)
Shears, Moments, and Deflections

15. BEAM FIXED AT BOTH ENDS — UNIFORMLY DISTRIBUTED LOADS



Total Equiv. Uniform Load .... $= \frac{2wl}{3}$

$R = V$ .... $= \frac{wl}{2}$

V_x .... $= w\left(\frac{l}{2} - x\right)$

M_{max} (at ends) .... $= \frac{wl^2}{12}$

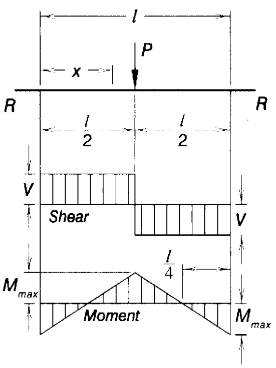
M_1 (at center) .... $= \frac{wl^2}{24}$

M_x .... $= \frac{w}{12}\left(6lx - l^2 - 6x^2\right)$

Δ_{max} (at center) .... $= \frac{wl^4}{384\,EI}$

Δ_x .... $= \frac{wx^2}{24\,EI}(l - x)^2$

16. BEAM FIXED AT BOTH ENDS — CONCENTRATED LOAD AT CENTER



Total Equiv. Uniform Load .... $= P$

$R = V$ .... $= \frac{P}{2}$

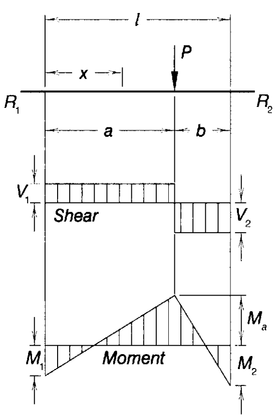
M_{max} (at center and ends) .... $= \frac{Pl}{8}$

M_x (when $x < \frac{l}{2}$) .... $= \frac{P}{8}(4x - l)$

Δ_{max} (at center) .... $= \frac{Pl^3}{192\,EI}$

Δ_x (when $x < \frac{l}{2}$) .... $= \frac{Px^2}{48\,EI}(3l - 4x)$

17. BEAM FIXED AT BOTH ENDS — CONCENTRATED LOAD AT ANY POINT



$R_1 = V_1$ ($= V_{max}$ when $a < b$) .... $= \frac{Pb^2}{l^3}(3a + b)$

$R_2 = V_2$ ($= V_{max}$ when $a > b$) .... $= \frac{Pa^2}{l^3}(a + 3b)$

M_1 ($= M_{max}$ when $a < b$) .... $= \frac{Pab^2}{l^2}$

M_2 ($= M_{max}$ when $a > b$) .... $= \frac{Pa^2b}{l^2}$

M_a (at point of load) .... $= \frac{2Pa^2b^2}{l^3}$

M_x (when $x < a$) .... $= R_1x - \frac{Pab^2}{l^2}$

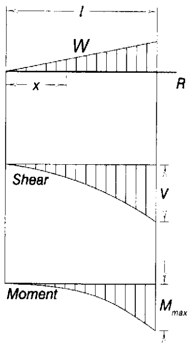
Δ_{max} (when $a > b$ at $x = \frac{2al}{3a + b}$) .... $= \frac{2Pa^3b^2}{3EI(3a + b)^2}$

Δ_a (at point of load) .... $= \frac{Pa^3b^3}{3EIl^3}$

Δ_x (when $x < a$) .... $= \frac{Pb^2x^2}{6EIl^3}(3al - 3ax - bx)$

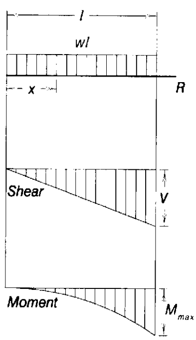
Table 3–23 (continued)
Shears, Moments, and Deflections

18. CANTILEVERED BEAM — LOAD INCREASING UNIFORMLY TO FIXED END



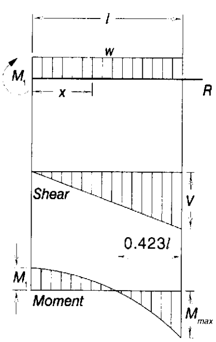
Total Equiv. Uniform Load	$= \frac{8}{3}W$
$R = V$	$= W$
V_x	$= W\frac{x^2}{l^2}$
M_{max} (at fixed end)	$= \frac{Wl}{3}$
M_x	$= \frac{Wx^3}{3l^2}$
Δ_{max} (at free end)	$= \frac{Wl^3}{15EI}$
Δ_x	$= \frac{W}{60EIl^2}\left(x^5 - 5l^4x + 4l^5\right)$

19. CANTILEVERED BEAM — UNIFORMLY DISTRIBUTED LOAD



Total Equiv. Uniform Load	$= 4wl$
$R = V$	$= wl$
V_x	$= wx$
M_{max} (at fixed end)	$= \frac{wl^2}{2}$
M_x	$= \frac{wx^2}{2}$
Δ_{max} (at free end)	$= \frac{wl^4}{8EI}$
Δ_x	$= \frac{w}{24EI}\left(x^4 - 4l^3x + 3l^4\right)$

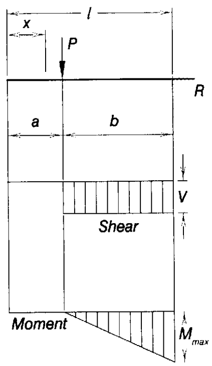
20. BEAM FIXED AT ONE END, FREE TO DEFLECT VERTICALLY BUT NOT ROTATE AT OTHER — UNIFORMLY DISTRIBUTED LOAD



Total Equiv. Uniform Load	$= \frac{8}{3}wl$
$R = V$	$= wl$
V_x	$= wx$
M_1 (at deflected end)	$= \frac{wl^2}{6}$
M_{max} (at fixed end)	$= \frac{wl^2}{3}$
M_x	$= \frac{w}{6}\left(l^2 - 3x^2\right)$
Δ_{max} (at deflected end)	$= \frac{wl^4}{24EI}$
Δ_x	$= \frac{w\left(l^2 - x^2\right)^2}{24EI}$

Table 3–23 (continued)
Shears, Moments, and Deflections

21. CANTILEVERED BEAM — CONCENTRATED LOAD AT ANY POINT



Total Equiv. Uniform Load .... $= \frac{8Pb}{l}$

$R = V$ .... $= P$

M_{max} (at fixed end) .... $= Pb$

M_x (when $x > a$) .... $= P(x-a)$

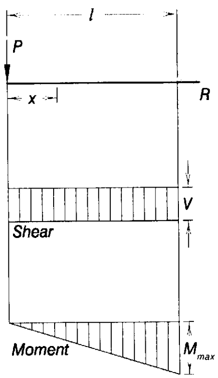
Δ_{max} (at free end) .... $= \frac{Pb^2}{6EI}(3l-b)$

Δ_a (at point of loa d) .... $= \frac{Pb^3}{3EI}$

Δ_x (when $x < a$) .... $= \frac{Pb^2}{6EI}(3l-3x-b)$

Δ_x (when $x > a$) .... $= \frac{P(l-x)^2}{6EI}(3b-l+x)$

22. CANTILEVERED BEAM — CONCENTRATED LOAD AT FREE END



Total Equiv. Uniform Load .... $= 8P$

$R = V$ .... $= P$

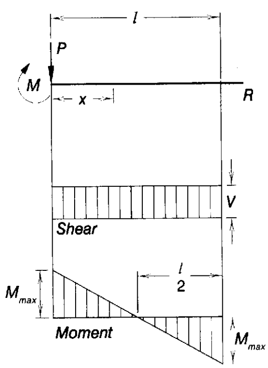
M_{max} (at fixed end) .... $= Pl$

M_x .... $= Px$

Δ_{max} (at free end) .... $= \frac{Pl^3}{3EI}$

Δ_x .... $= \frac{P}{6EI}\left(2l^3 - 3l^2x + x^3\right)$

23. BEAM FIXED AT ONE END, FREE TO DEFLECT VERTICALLY BUT NOT ROTATE AT OTHER — CONCENTRATED LOAD AT DEFLECTED END



Total Equiv. Uniform Load .... $= 4P$

$R = V$ .... $= P$

M_{max} (at both ends) .... $= \frac{Pl}{2}$

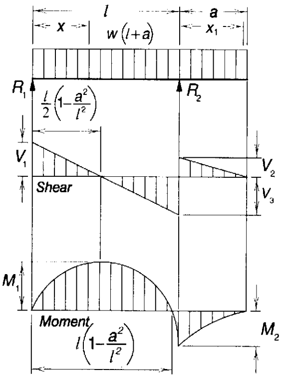
M_x .... $= P\left(\frac{l}{2} - x\right)$

Δ_{max} (at deflected end) .... $= \frac{Pl^3}{12EI}$

Δ_x .... $= \frac{P(l-x)^2}{12EI}(l+2x)$

Table 3–23 (continued)
Shears, Moments, and Deflections

24. BEAM OVERHANGING ONE SUPPORT — UNIFORMLY DISTRIBUTED LOAD



$R_1 = V_1$ .... $= \frac{w}{2l}\left(l^2 - a^2\right)$

$R_2 = V_2 + V_3$ .... $= \frac{w}{2l}(l+a)^2$

V_2 .... $= wa$

V_3 .... $= \frac{w}{2l}\left(l^2 + a^2\right)$

V_x (between supports) .... $= R_1 - wx$

V_{x_1} (for overhang) .... $= w(a - x_1)$

M_1 $\left(\text{at } x = \frac{l}{2}\left[1 - \frac{a^2}{l^2}\right]\right)$ .... $= \frac{w}{8l^2}(l+a)^2(l-a)^2$

M_2 (at R_2) .... $= \frac{wa^2}{2}$

M_x (between supports) .... $= \frac{wx}{2l}\left(l^2 - a^2 - xl\right)$

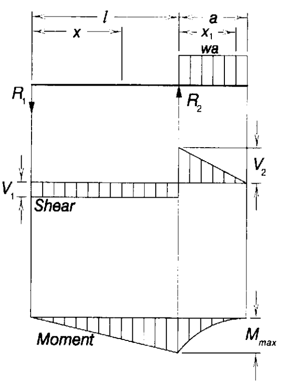
M_{x_1} (for overhang) .... $= \frac{w}{2}(a - x_1)^2$

Δ_x (between supports) .... $= \frac{wx}{24EIl}\left(l^4 - 2l^2x^2 + lx^3 - 2a^2l^2 + 2a^2x^2\right)$

Δ_{x_1} (for overhang) .... $= \frac{wx_1}{24EI}\left(4a^2l - l^3 + 6a^2x_1 - 4ax_1^2 + x_1^3\right)$

NOTE: For a negative value of Δ_x, deflection is upward.

25. BEAM OVERHANGING ONE SUPPORT — UNIFORMLY DISTRIBUTED LOAD ON OVERHANG



$R_1 = V_1$ .... $= \frac{wa^2}{2l}$

$R_2 = V_1 + V_2$ .... $= \frac{wa}{2l}(2l + a)$

V_2 .... $= wa$

V_{x_1} (for overhang) .... $= w(a - x_1)$

M_{max} (at R_2) .... $= \frac{wa^2}{2}$

M_x (between supports) .... $= \frac{wa^2x}{2l}$

M_{x_1} (for overhang) .... $= \frac{w}{2}(a - x_1)^2$

Δ_{max} $\left(\text{between supports at } x = \frac{l}{\sqrt{3}}\right) = \frac{wa^2l^2}{18\sqrt{3}EI} = 0.0321\frac{wa^2l^2}{EI}$

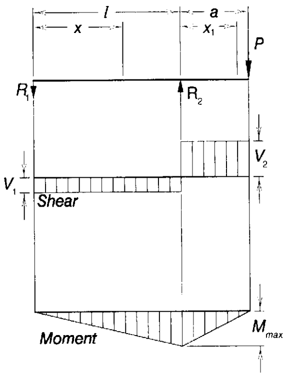
Δ_{max} (for overhang at $x_1 = a$) .... $= \frac{wa^3}{24EI}(4l + 3a)$

Δ_x (between supports) .... $= \frac{wa^2x}{12EIl}\left(l^2 - x^2\right)$

Δ_{x_1} (for overhang) .... $= \frac{wx_1}{24EI}\left(4a^2l + 6a^2x_1 - 4ax_1^2 + x_1^3\right)$

Table 3–23 (continued)
Shears, Moments, and Deflections

26. BEAM OVERHANGING ONE SUPPORT — CONCENTRATED LOAD AT END OF OVERHANG



$R_1 = V_1$ .... $= \frac{Pa}{l}$

$R_2 = V_1 + V_2$ .... $= \frac{P}{l}(l+a)$

V_2 .... $= P$

M_{max} (at R_2) .... $= Pa$

M_x (between supports) .... $= \frac{Pax}{l}$

M_{x_1} (for overhang) .... $= P(a - x_1)$

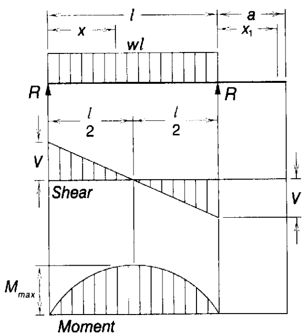
Δ_{max} $\left(\text{between supports at } x = \frac{l}{\sqrt{3}}\right)$ .... $= \frac{Pal^2}{9\sqrt{3}EI} = 0.0642\frac{Pal^2}{EI}$

Δ_{max} (for overhang at $x_1 = a$) .... $= \frac{Pa^2}{3EI}(l+a)$

Δ_x (between supports) .... $= \frac{Pax}{6EIl}\left(l^2 - x^2\right)$

Δ_{x_1} (for overhang) .... $= \frac{Px_1}{6EI}\left(2al + 3ax_1 - x_1^2\right)$

27. BEAM OVERHANGING ONE SUPPORT — UNIFORMLY DISTRIBUTED LOAD BETWEEN SUPPORTS



Total Equiv. Uniform Load .... $= wl$

$R = V$ .... $= \frac{wl}{2}$

V_x .... $= w\left(\frac{l}{2} - x\right)$

M_{max} (at center) .... $= \frac{wl^2}{8}$

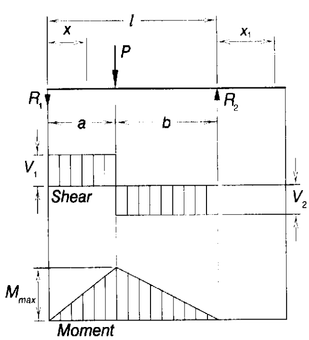
M_x .... $= \frac{wx}{2}(l - x)$

Δ_{max} (at center) .... $= \frac{5wl^4}{384EI}$

Δ_x .... $= \frac{wx}{24EI}\left(l^3 - 2lx^2 + x^3\right)$

Δ_{x_1} .... $= \frac{wl^3 x_1}{24EI}$

28. BEAM OVERHANGING ONE SUPPORT — CONCENTRATED LOAD AT ANY POINT BETWEEN SUPPORTS



Total Equiv. Uniform Load .... $= \frac{8Pab}{l^2}$

$R_1 = V_1$ ($= V_{max}$ when $a < b$) .... $= \frac{Pb}{l}$

$R_2 = V_2$ ($= V_{max}$ when $a > b$) .... $= \frac{Pa}{l}$

M_{max} (at point of load) .... $= \frac{Pab}{l}$

M_x (when $x < a$) .... $= \frac{Pbx}{l}$

Δ_{max} $\left(\text{at } x = \sqrt{\frac{a(a+2b)}{3}} \text{ when } a > b\right)$ .... $= \frac{Pab(a+2b)\sqrt{3a(a+2b)}}{27EIl}$

Δ_a (at point of load) .... $= \frac{Pa^2b^2}{3EIl}$

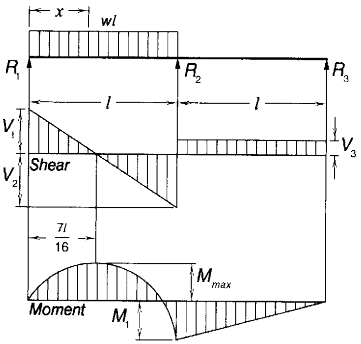
Δ_x (when $x < a$) .... $= \frac{Pbx}{6EIl}\left(l^2 - b^2 - x^2\right)$

Δ_x (when $x > a$) .... $= \frac{Pa(l-x)}{6EIl}\left(2lx - x^2 - a^2\right)$

Δ_{x_1} .... $= \frac{Pabx_1}{6EIl}(l+a)$

Table 3–23 (continued)
Shears, Moments, and Deflections

29. CONTINUOUS BEAM — TWO EQUAL SPANS — UNIFORM LOAD ON ONE SPAN



Total Equiv. Uniform Load .... $= \frac{49}{64} wl$

$R_1 = V_1$ .... $= \frac{7}{16} wl$

$R_2 = V_2 + V_3$ .... $= \frac{5}{8} wl$

$R_3 = V_3$ .... $= -\frac{1}{16} wl$

V_2 .... $= \frac{9}{16} wl$

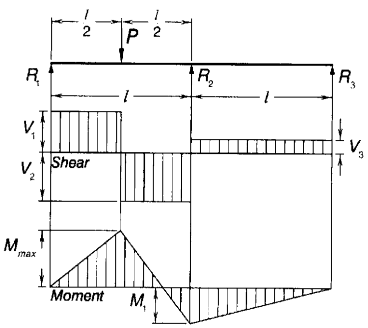
M_{max} (at $x = \frac{7}{16} l$) .... $= \frac{49}{512} wl^2$

M_1 (at support R_2) .... $= \frac{1}{16} wl^2$

M_x (when $x < l$) .... $= \frac{wx}{16}(7l - 8x)$

Δ_{max} (at 0.472 l from R_1) .... $= \frac{0.0092\, wl^4}{EI}$

30. CONTINUOUS BEAM — TWO EQUAL SPANS — CONCENTRATED LOAD AT CENTER OF ONE SPAN



Total Equiv. Uniform Load .... $= \frac{13}{8} P$

$R_1 = V_1$ .... $= \frac{13}{32} P$

$R_2 = V_2 + V_3$ .... $= \frac{11}{16} P$

$R_3 = V_3$ .... $= -\frac{3}{32} P$

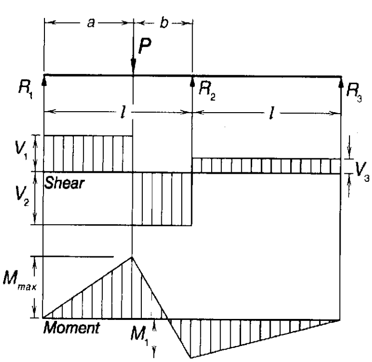
V_2 .... $= \frac{19}{32} P$

M_{max} (at point of load) .... $= \frac{13}{64} Pl$

M_1 (at support R_2) .... $= \frac{3}{32} Pl$

Δ_{max} (at 0.480 l from R_1) .... $= \frac{0.015\, Pl^3}{EI}$

31. CONTINUOUS BEAM — TWO EQUAL SPANS — CONCENTRATED LOAD AT ANY POINT



$R_1 = V_1$ .... $= \frac{Pb}{4l^3}\left(4l^2 - a(l + a)\right)$

$R_2 = V_2 + V_3$ .... $= \frac{Pa}{2l^3}\left(2l^2 + b(l + a)\right)$

$R_3 = V_3$ .... $= -\frac{Pab}{4l^3}(l + a)$

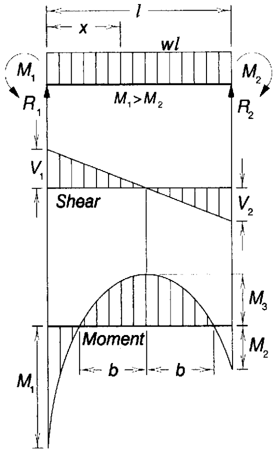
V_2 .... $= \frac{Pa}{4l^3}\left(4l^2 + b(l + a)\right)$

M_{max} (at point of load) .... $= \frac{Pab}{4l^3}\left(4l^2 - a(l + a)\right)$

M_1 (at support R_2) .... $= \frac{Pab}{4l^2}(l + a)$

Table 3–23 (continued)
Shears, Moments, and Deflections

32. BEAM — UNIFORMLY DISTRIBUTED LOAD AND VARIABLE END MOMENTS



$R_1 = V_1$ .... $= \frac{wl}{2} + \frac{M_1 - M_2}{l}$

$R_2 = V_2$ .... $= \frac{wl}{2} - \frac{M_1 - M_2}{l}$

V_x .... $= w\left(\frac{l}{2} - x\right) + \frac{M_1 - M_2}{l}$

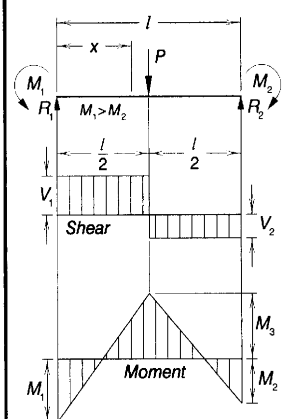
M_3 (at $x = \frac{l}{2} + \frac{M_1 - M_2}{wl}$) .... $= \frac{wl^2}{8} - \frac{M_1 + M_2}{2} + \frac{(M_1 - M_2)^2}{2wl^2}$

M_x .... $= \frac{wx}{2}(l - x) + \left(\frac{M_1 - M_2}{l}\right)x - M_1$

b (to locate inflection points) .... $= \sqrt{\frac{l^2}{4} - \left(\frac{M_1 + M_2}{w}\right) + \left(\frac{M_1 - M_2}{wl}\right)^2}$

$$\Delta_x = \frac{wx}{24EI}\left[x^3 - \left(2l + \frac{4M_1}{wl} - \frac{4M_2}{wl}\right)x^2 + \frac{12M_1}{w}x + l^3 - \frac{8M_1 l}{w} - \frac{4M_2 l}{w}\right]$$

33. BEAM — CONCENTRATED LOAD AT CENTER AND VARIABLE END MOMENTS



$R_1 = V_1$ .... $= \frac{P}{2} + \frac{M_1 - M_2}{l}$

$R_2 = V_2$ .... $= \frac{P}{2} - \frac{M_1 - M_2}{l}$

M_3 (at center) .... $= \frac{Pl}{4} - \frac{M_1 + M_2}{2}$

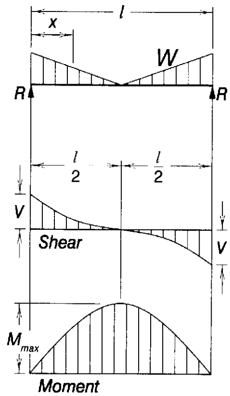
M_x (when $x < \frac{l}{2}$) .... $= \left(\frac{P}{2} + \frac{M_1 - M_2}{l}\right)x - M_1$

M_x (when $x > \frac{l}{2}$) .... $= \frac{P}{2}(l - x) + \frac{(M_1 - M_2)x}{l} - M_1$

Δ_x (when $x < \frac{l}{2}$) $= \frac{Px}{48EI}\left(3l^2 - 4x^2 - \frac{8(l - x)}{Pl}\left[M_1(2l - x) + M_2(l + x)\right]\right)$

Table 3–23 (continued)
Shears, Moments, and Deflections

34. SIMPLE BEAM — LOAD INCREASING UNIFORMLY FROM CENTER



Total Equiv. Uniform Load .... $= \dfrac{2W}{3}$

$R = V$ .... $= \dfrac{W}{2}$

V_x (when $x < \dfrac{l}{2}$) .... $= \dfrac{W}{2}\left(\dfrac{l-2x}{l}\right)^2$

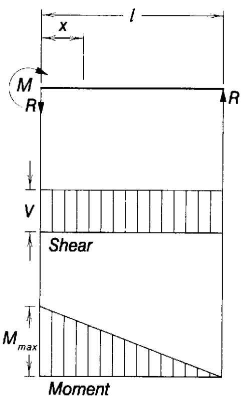
M_{max} (at center) .... $= \dfrac{Wl}{12}$

M_x (when $x < \dfrac{l}{2}$) .... $= \dfrac{W}{2}\left(x - \dfrac{2x^2}{l} + \dfrac{4x^3}{3l^2}\right)$

Δ_{max} (at center) .... $= \dfrac{3Wl^3}{320EI}$

Δ_x (when $x < \dfrac{l}{2}$) .... $= \dfrac{W}{12EI}\left(x^3 - \dfrac{x^4}{l} + \dfrac{2x^5}{5l^2} - \dfrac{3l^2x}{8}\right)$

35. SIMPLE BEAM — CONCENTRATED MOMENT AT END



Total Equiv. Uniform Load .... $= \dfrac{8M}{l}$

$R = V$ .... $= \dfrac{M}{l}$

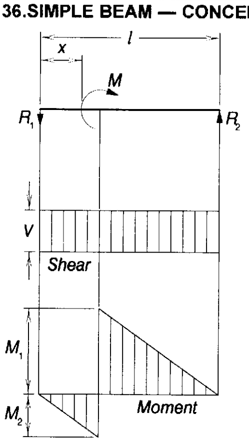
M_{max} .... $= M$

M_x .... $= M\left(1 - \dfrac{x}{l}\right)$

Δ_{max} (at $x = 0.423\,l$) .... $= 0.0642\dfrac{Ml^2}{EI}$

Δ_x .... $= \dfrac{M}{6EI}\left(3x^2 - \dfrac{x^3}{l} - 2lx\right)$

36. SIMPLE BEAM — CONCENTRATED MOMENT AT ANY POINT



Total Equiv. Uniform Load .... $= \dfrac{8M}{l}$

$R = V$ .... $= \dfrac{M}{l}$

M_x (when $x < a$) .... $= Rx$

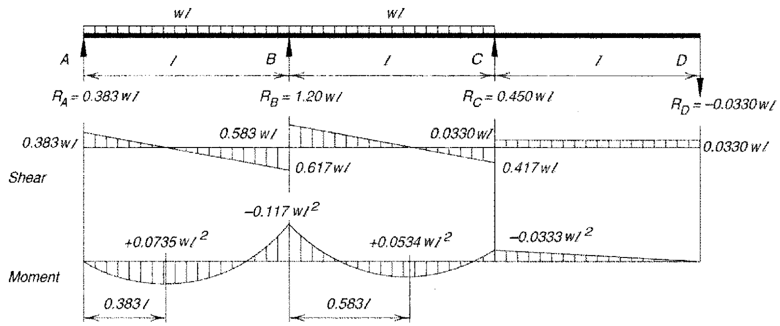
M_x (when $x > a$) .... $= M + Rx$

Δ_x (when $x < a$) .... $= \dfrac{M}{6EI}\left[\left(6a - \dfrac{3a^2}{l} - 2l\right)x - \dfrac{x^3}{l}\right]$

Δ_x .... $= \dfrac{M}{6EI}\left[3\left(a^2 + x^2\right) - \dfrac{x^3}{l} - \left(2l + \dfrac{3a^2}{l}\right)x\right]$

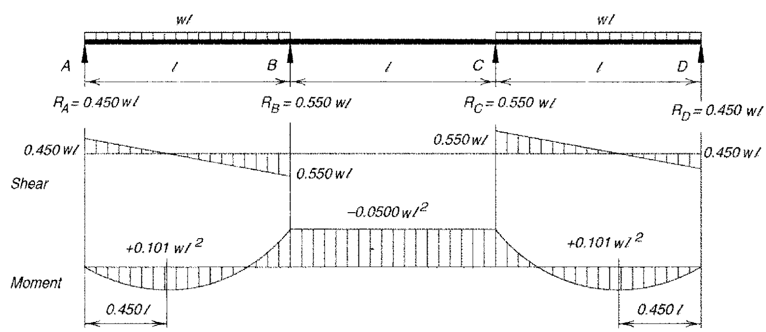
Table 3–23 (continued)
Shears, Moments, and Deflections

37. CONTINUOUS BEAM—THREE EQUAL SPANS—ONE END SPAN UNLOADED



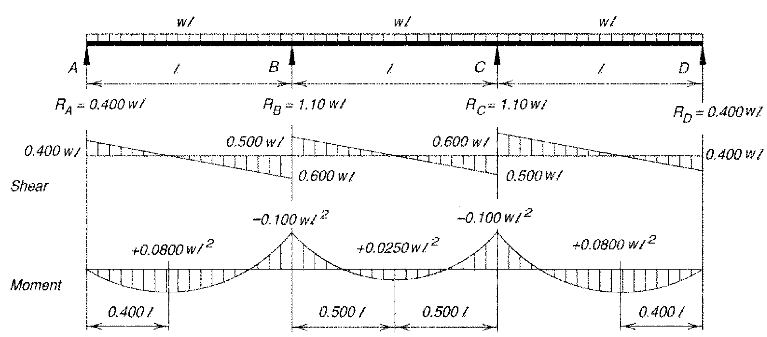
Δ_{max} (0.430 l from A) = 0.0059 wl^4/EI

38. CONTINUOUS BEAM—THREE EQUAL SPANS—END SPANS LOADED



Δ_{max} (0.479 l from A or D) = 0.0099 wl^4/EI

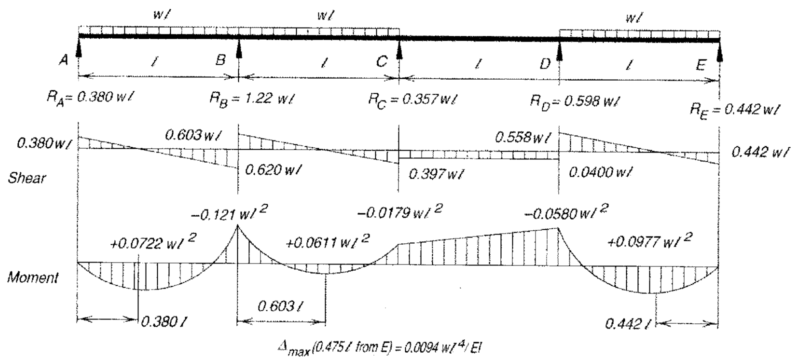
39. CONTINUOUS BEAM—THREE EQUAL SPANS—ALL SPANS LOADED



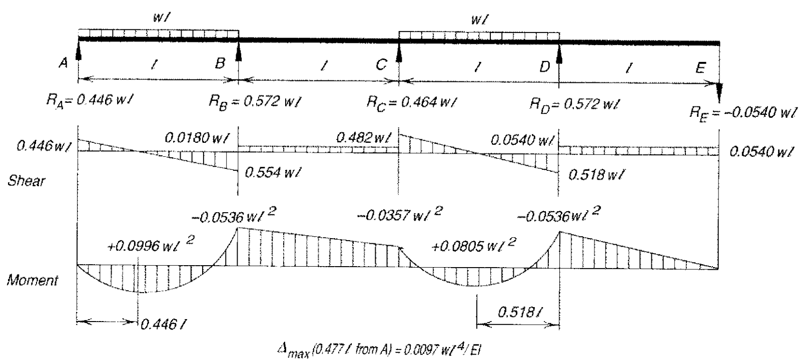
Δ_{max} (0.446 l from A or D) = 0.0069 wl^4/EI

Table 3–23 (continued)
Shears, Moments, and Deflections

40. CONTINUOUS BEAM—FOUR EQUAL SPANS—THIRD SPAN UNLOADED



41. CONTINUOUS BEAM—FOUR EQUAL SPANS—LOAD FIRST AND THIRD SPANS



42. CONTINUOUS BEAM—FOUR EQUAL SPANS—ALL SPANS LOADED

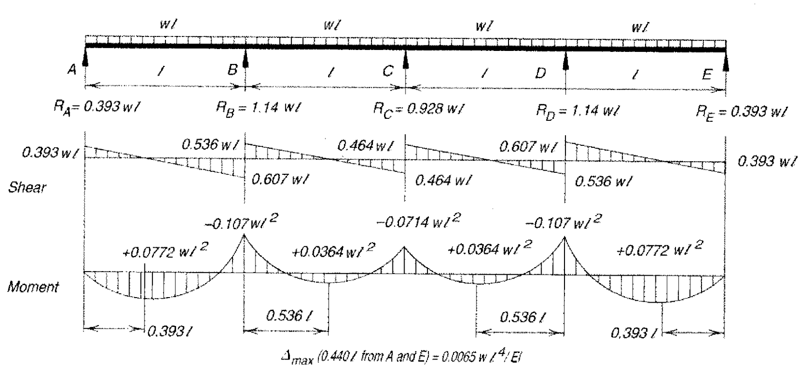
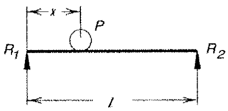


Table 3–23 (continued)
Shears, Moments, and Deflections

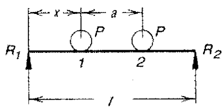
43. SIMPLE BEAM—ONE CONCENTRATED MOVING LOAD



$$R_{1\,max} = V_{1\,max}(\text{at } x = 0) \ldots\ldots = P$$

$$M_{max}\left(\text{at point of load, when } x = \frac{l}{2}\right) \ldots\ldots = \frac{Pl}{4}$$

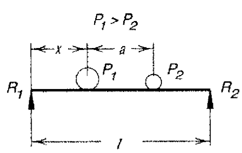
44. SIMPLE BEAM—TWO EQUAL CONCENTRATED MOVING LOADS



$$R_{1\,max} = V_{1\,max}(\text{at } x = 0) \ldots\ldots = P\left(2 - \frac{a}{l}\right)$$

$$M_{max}\begin{cases}\left[\begin{array}{l}\text{when } a < (2-\sqrt{2})l = 0.586l \\ \text{under load 1 at } x = \frac{1}{2}\left(l - \frac{a}{2}\right)\end{array}\right] \ldots\ldots = \frac{P}{2l}\left(l - \frac{a}{2}\right)^2 \\ \left[\begin{array}{l}\text{when } a > (2-\sqrt{2})l = 0.586l \\ \text{with one load at center of span (Case 43)}\end{array}\right] \ldots\ldots = \frac{Pl}{4}\end{cases}$$

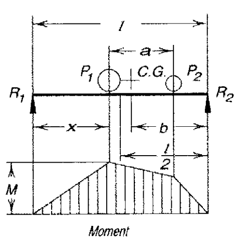
45. SIMPLE BEAM—TWO UNEQUAL CONCENTRATED MOVING LOADS



$$R_{1\,max} = V_{1\,max}(\text{at } x = 0) \ldots\ldots = P_1 + P_2\frac{l-a}{l}$$

$$M_{max}\begin{cases}\left[\text{under } P_1\text{, at } x = \frac{1}{2}\left(l - \frac{P_2 a}{P_1 + P_2}\right)\right] \ldots\ldots = (P_1 + P_2)\frac{x^2}{l} \\ \left[\begin{array}{l}M_{max} \text{ may occur with larger} \\ \text{load at center of span and other} \\ \text{load off span (Case 43)}\end{array}\right] \ldots\ldots = \frac{P_1 l}{4}\end{cases}$$

GENERAL RULES FOR SIMPLE BEAMS CARRYING MOVING CONCENTRATED LOADS



The maximum shear due to moving concentrated loads occurs at one support when one of the loads is at that support. With several moving loads, the location that will produce maximum shear must be determined by trial.

The maximum bending moment produced by moving concentrated loads occurs under one of the loads when that load is as far from one support as the center of gravity of all the moving loads on the beam is from the other support.

In the accompanying diagram, the maximum bending moment occurs under load P_1 when $x = b$. It should also be noted that this condition occurs when the center-line of the span is midway between the center of gravity of loads and the nearest concentrated load.

PART 4

DESIGN OF COMPRESSION MEMBERS

SCOPE

The specification requirements and other design considerations summarized in this Part apply to the design of members subject to axial compression. For the design of members subject to eccentric compression or combined axial compression and flexure, see Part 6. For compression members that are part of a seismic force resisting system in which the seismic response modification factor, R, is taken greater than 3, the requirements in the AISC *Seismic Provisions for Structural Steel Buildings* also apply. The AISC *Seismic Provisions for Structural Steel Buildings* is available in Part 6 of the AISC *Seismic Design Manual* from the American Institute of Steel Construction, Inc. at www.aisc.org.

AVAILABLE COMPRESSIVE STRENGTH

The available strength of compression members, ϕP_n or P_n/Ω, which must equal or exceed the required strength, P_u or P_a, respectively, is determined according to AISC Specification Chapter E.

LOCAL BUCKLING

Determining the Width-Thickness Ratios of the Cross-Section

Steel compression members are classified on the basis of the width-thickness ratios of the various elements of the cross-section. The width-thickness ratio is calculated for each element of the cross-section per AISC Specification Section B4.

Determining the Slenderness of the Cross-Section

When the width-thickness ratios of all compression elements are less than λ_r, the cross-section is non-slender, and Q, the reduction factor for slender compression elements (elastic local buckling effects), equals 1.0. When the width-thickness ratio of a compression element is greater than λ_r, the cross-section is a slender-element cross-section and $Q < 1.0$ must be included in the calculation of the available compressive strength. Q is determined per AISC Specification Section E7, and λ_r is determined per AISC Specification Section B4 and Table B4.1.

EFFECTIVE LENGTH AND COLUMN SLENDERNESS

Columns are designed for their slenderness, KL/r, per AISC Specification Section E2. The effective length, KL, is equal to L, the physical length between braced points (see AISC Specification Appendix 6) multiplied by K, which is determined per AISC Specification Section C2. In many cases, the stability provisions in AISC Specification Chapter C and Appendix 7 allow the use of $K = 1$. Otherwise, guidance on the proper selection of a value for K is given in AISC Commentary Section C, including the following:

1. For columns with idealized end conditions, recommended vales of K can be determined from AISC Commentary Table C-C2.1.
2. For columns in braced frames (or steel frames that lean on shear walls or another similar structural system) and compression members in trusses, K is normally taken as unity per AISC Specification Section C1.3a, unless a smaller value can be justified by

analysis. Although the alignment chart in AISC Commentary Figure C-C2.3 (sidesway inhibited—braced frames) could be used for that purpose, it should be noted that the stability bracing provisions in AISC Appendix 6 are based upon the use of $K = 1$.

3. For columns in moment frames, the alignment charts in AISC Commentary Figure C-C2.4 (sidesway uninhibited—moment frames) can be used. Per AISC Commentary Section C2, the stiffness reduction factor, τ_a, can be used in the determination of K for columns controlled by inelastic buckling.

As indicated in the User Note in AISC Specification Section E2, compression-member slenderness, KL/r, should preferably be limited to a maximum of 200. Note that this recommendation does not apply to members that are primarily tension members, but subject to incidental compression under other load combinations.

Further information is available in the SSRC *Guide to Stability Design Criteria for Metal Structures* (Galambos, 1998).

COMPOSITE COMPRESSION MEMBERS

For the design of reinforced-concrete-encased and concrete-filled steel compression members, see AISC Specification Section I2. See also AISC Design Guide No. 6 *Load and Resistance Factor Design of W-Shapes Encased in Concrete* (Griffis, 1992). For further information on composite design and construction, see also Viest et al. (1997).

STEEL COMPRESSION—MEMBER SELECTION TABLES

Table 4–1. W-Shapes in Axial Compression

Available strengths in axial compression are given for W-shapes with $F_y = 50$ ksi (ASTM A992). The tabulated values are given for the effective length with respect to the Y-Y axis $(KL)_y$. However, the effective length with respect to the X-X axis $(KL)_x$ must also be investigated. To determine the available strength in axial compression, the table should be entered at the larger of $(KL)_y$ and $(KL)_{y\,eq}$, where

$$(KL)_{y\,eq} = \frac{(KL)_x}{\dfrac{r_x}{r_y}}$$

Values of the ratio r_x/r_y and other properties useful in the design of W-shape compression members are listed at the bottom of Table 4–1. The variables P_{wo} and P_{wi} can be used in the calculation of the web local yielding available strength (AISC Specification Equation J10-2) for the column as follows:

LRFD	ASD
$\phi R_n = P_{wo} + P_{wi}N$	$R_n/\Omega = P_{wo} + P_{wi}N$

The variable P_{wb} can be used in the calculation of the available web compression buckling strength (AISC Specification Equation J10-8) for the column as follows:

LRFD	ASD
$\phi R_n = P_{wb}$	$R_n/\Omega = P_{wb}$

The variable P_{fb} can be used in the calculation of the available flange local bending strength (AISC Specification Equation J10-1) for the column as follows:

LRFD	ASD
$\phi R_n = P_{fb}$	$R_n/\Omega = P_{fb}$

Table 4–2. HP-Shapes in Axial Compression

Table 4–2 is similar to Table 4–1, except it covers HP-shapes with $F_y = 50$ ksi (ASTM A572 grade 50).

Table 4–3. Rectangular HSS in Axial Compression

Available strengths in axial compression are given for rectangular HSS with $F_y = 46$ ksi (ASTM A500 grade B). The tabulated values are given for the effective length with respect to the Y-Y axis $(KL)_y$. However, the effective length with respect to the X-X axis $(KL)_x$ must also be investigated. To determine the available strength in axial compression, the table should be entered at the larger of $(KL)_y$ and $(KL)_{y\,eq}$, where

$$(KL)_{y\,eq} = \frac{(KL)_x}{\dfrac{r_x}{r_y}}$$

Values of the ratio r_x/r_y and other properties useful in the design of rectangular HSS compression members are listed at the bottom of Table 4–3.

Table 4–4. Square HSS in Axial Compression

Table 4–4 is similar to Table 4–3, except that it covers square HSS.

Table 4–5. Round HSS in Axial Compression

Available strengths in axial compression are given for round HSS with $F_y = 42$ ksi (ASTM A500 grade B). To determine the available strength in axial compression, the table should be entered at KL. Other properties useful in the design of compression members are listed at the bottom of the available column strength tables.

Table 4–6. Pipe in Axial Compression

Table 4–6 is similar to Table 4-5, except it covers pipe with $F_y = 35$ ksi (ASTM A53 grade B).

Table 4–7. WT-Shapes in Axial Compression

Available strengths in axial compression are given for WT-shapes with $F_y = 50$ ksi (ASTM A992). Separate tabulated values are given for the effective lengths with respect to the

X-X and Y-Y axes, $(KL)_x$ and $(KL)_y$, respectively. Other properties useful in the design of WT-shape compression members are listed at the bottom of Table 4-7.

Table 4–8. Equal-Leg Double Angles in Axial Compression

Available strengths in axial compression are given for equal-leg double angles with $F_y = 36$ ksi (ASTM A36), assuming $^3/_8$-in. separation between the angles. These values can be used conservatively when a larger separation is provided. Alternatively, the value of $(KL)_y$ can be multiplied by the ratio of (r_y for a $^3/_8$-in. separation) to (r_y for the actual separation).

Separate tabulated values are given for the effective lengths with respect to the X-X and Y-Y axes, $(KL)_x$ and $(KL)_y$, respectively. For buckling about the X-X axis, the available strength is not affected by the number of intermediate connectors. However, for buckling about the Y-Y axis, the effects of shear deformations of the intermediate connectors must be considered. The tabulated values for $(KL)_y$ have been adjusted for the shear deformations in accordance with AISC Specification equation E6-2, which is applicable to welded and pretensioned bolted intermediate shear connectors. The number of intermediate connectors, n, is given in the table and the line of demarcation between the required connector values is dashed. Intermediate connectors are selected such that the available compression buckling strength about the Y-Y axis is equal to or greater than 90 percent of that for compression buckling of the two angles as a unit. If fewer connectors or snug-tightened bolted intermediate connectors are used, the available strength must be recalculated per AISC Specification Section E6. Per AISC Specification Section E6.2, the slenderness of the individual components of the built-up member based upon the distance between intermediate connectors, a, must not exceed three-quarters of the controlling slenderness of the overall built-up compression member.

Other properties useful in the design of double-angle compression members are listed at the bottom of Table 4–8.

Table 4–9. LLBB Double Angles in Axial Compression

Table 4–9 is the same as Table 4–8, except that it provides available strengths in axial compression for double angles with long legs back to back.

Table 4–10. SLBB Double Angles in Axial Compression

Table 4–10 is the same as Table 4–8, except that it provides available strengths in axial compression for double angles with short legs back to back.

Table 4–11. Concentrically Loaded Single Angles in Axial Compression

Available strengths in axial compression are given for single angles, loaded through the centroid of the cross-section, with $F_y = 36$ ksi (ASTM A36) based upon the effective length with respect to the Z-Z axis $(KL)_z$. Single angles may be assumed to be loaded through the centroid when the requirements of AISC Specification Section E5 are met, as in these cases the eccentricity is accounted for and the slenderness is reduced by the restraining effects of the support at both ends of the member.

Table 4–12. Eccentrically Loaded Single Angles in Axial Compression

Available strengths in axial compression are given for single angles with $F_y = 36$ ksi (ASTM A36). These tables present a lower-bound available axial strength for eccentrically loaded single angles without consideration of end restraint (Sakla, 2001) and may be used in the design of single angle compression members when the requirements of Specification Section E5 can not be met.

In the development of this table, KL is assumed to be the same on all axes (r_x, r_y, r_z, and r_w). To determine the available strength in axial compression, the table should be entered at the largest effective length between brace points. These tables consider combined biaxial bending about the principal axes with axial compression. The long leg of the angle is assumed to be attached to a gusset with a thickness of 1.5t. The tabulated values assume a load placed at the center of the gusset plate, at a distance of 0.75t from the long leg of the angle.

COMPOSITE COMPRESSION—MEMBER SELECTION TABLES

Table 4–13. Rectangular HSS Filled with 4-ksi Normal-Weight Concrete in Axial Compression

Available strengths in axial compression are given for rectangular HSS with $F_y = 46$ ksi (ASTM A500 grade B) filled with 4-ksi normal-weight concrete. The tabulated values are given for the effective length with respect to the Y-Y axis $(KL)_y$. However, the effective length with respect to the X-X axis $(KL)_x$ must also be investigated. To determine the available strength in axial compression, the table should be entered at the larger of $(KL)_y$ and $(KL)_{y\,eq}$, where

$$(KL)_{y\,eq} = \frac{(KL)_x}{\dfrac{r_{mx}}{r_{my}}}$$

Values of the ratio r_{mx}/r_{my} and other properties useful in the design of composite HSS compression members are listed at the bottom of Table 4–13. The variables r_{mx} and r_{my} are the radii of gyration for the composite cross-section. The ratio r_{mx}/r_{my} is determined as

$$\frac{r_{mx}}{r_{my}} = \sqrt{\frac{P_{ex}(K_x L_x)^2}{P_{ey}(K_y L_y)^2}}$$

Table 4–14. Square HSS Filled with 4-ksi Normal-Weight Concrete in Axial Compression

Table 4–14 is the same as Table 4–13, except that it provides available strengths in axial compression for square HSS filled with 4-ksi normal-weight concrete.

Table 4–15. Rectangular HSS Filled with 5-ksi Normal-Weight Concrete in Axial Compression

Table 4–15 is the same as Table 4–13, except that it provides available strengths in axial compression for rectangular HSS filled with 5-ksi normal-weight concrete.

Table 4–16. Square HSS Filled with 5-ksi Normal-Weight Concrete in Axial Compression

Table 4–16 is the same as Table 4–13, except that it provides available strengths in axial compression for square HSS filled with 5-ksi normal-weight concrete.

Table 4–17. Round HSS Filled with 4-ksi Normal-Weight Concrete in Axial Compression

Available strengths in axial compression are given for round HSS with F_y = 42 ksi (ASTM A500 grade B) filled with 4-ksi normal-weight concrete. To determine the available strength in axial compression, the table should be entered at the largest effective length, *KL*. Other properties useful in the design of compression members are listed at the bottom of the column available strength tables.

Table 4–18. Round HSS Filled with 5-ksi Normal-Weight Concrete in Axial Compression

Table 4–18 is the same as Table 4–17, except that it provides available strengths in axial compression for round HSS filled with 5-ksi normal-weight concrete.

Table 4–19. Pipe Filled with 4-ksi Normal-Weight Concrete in Axial Compression

Available strengths in axial compression are given for pipe with F_y = 35 ksi (ASTM A53 grade B) filled with 4-ksi normal-weight concrete. To determine the available strength in axial compression, the table should be entered at the largest effective length, *KL*. Other properties useful in the design of compression members are listed at the bottom of the column available strength tables.

Table 4–20. Pipe Filled with 5-ksi Normal-Weight Concrete in Axial Compression

Table 4–21 is the same as Table 4–20, except that it provides available strengths in axial compression for pipe filled with 5-ksi normal-weight concrete.

Table 4–21. Stiffness Reduction Factor τ_a

When column buckling occurs in the inelastic range, the use of the alignment charts in Chapter C of the Commentary usually gives conservative results. For more accurate solutions, inelastic *K*-factors can be determined from the alignment chart by using τ_a times the elastic modulus, E_c, of the columns in the equation for *G*. The stiffness reduction factor, τ_a, is the ratio of the tangent modulus, E_T , to the elastic modulus, *E*. Values are tabulated for steels with F_y = 35 ksi, 36 ksi, 42 ksi, 46 ksi, and 50 ksi.

Table 4–22. Available Critical Stress for Compression Members

Table 4–22 provides the available critical stress for various ratios of *Kl/r*, for materials with a minimum specified yield strength of 35 ksi, 36 ksi, 42 ksi, 46 ksi, and 50 ksi.

PART 4 REFERENCES

Galambos, T.V., 1998, *Guide to Stability Design Criteria for Metal Structures*, Fifth Edition, John Wiley and Sons, Inc., New York, NY.

Griffis, L.G., 1992, AISC Design Guide No. 6 *Load and Resistance Factor Design of W-Shapes Encased in Concrete*, AISC, Chicago, IL.

Sakla, S., 2001, "Tables for the Design Strength of Eccentrically-Loaded Single Angle Struts," *Engineering Journal*, Vol. 38, No. 3 (3rd Qtr), pp. 127-136, AISC, Chicago, IL.

Viest, I.M., J.P. Colaco, R.W. Furlong, L.G. Griffis, R.T. Leon, and L.A. Wyllie, 1997, *Composite Construction Design for Buildings*, ASCE, New York, NY.

West, M.A. and J.M. Fisher, 2003, AISC Design Guide No. 3 *Serviceability Design Considerations for Low-Rise Buildings*, AISC, Chicago, IL.

W14

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

F_y = 50 ksi

Shape		W14×											
Wt/ft		730[h]		665[h]		605[h]		550[h]		500[h]		455[h]	
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	6440	9670	5870	8820	5330	8010	4850	7290	4400	6610	4010	6030
	11	6070	9130	5530	8310	5010	7530	4550	6840	4120	6200	3750	5640
	12	6010	9030	5470	8220	4950	7440	4500	6760	4070	6120	3710	5570
	13	5940	8920	5400	8110	4890	7350	4440	6670	4020	6040	3660	5500
	14	5860	8810	5330	8010	4820	7250	4380	6580	3960	5950	3600	5420
	15	5780	8690	5250	7890	4750	7140	4310	6480	3900	5860	3550	5330
	16	5690	8560	5170	7770	4680	7030	4240	6380	3840	5770	3490	5240
	17	5610	8430	5090	7650	4600	6920	4170	6270	3770	5660	3420	5150
	18	5510	8290	5000	7520	4520	6790	4100	6160	3700	5560	3360	5050
	19	5420	8140	4910	7380	4440	6670	4020	6040	3630	5450	3290	4950
	20	5320	7990	4820	7240	4350	6540	3940	5920	3550	5340	3220	4840
	22	5110	7670	4620	6950	4170	6260	3770	5660	3390	5100	3080	4620
	24	4890	7340	4420	6640	3980	5980	3590	5400	3230	4860	2920	4400
	26	4660	7000	4200	6320	3780	5680	3410	5120	3060	4600	2770	4160
	28	4420	6650	3990	5990	3580	5380	3220	4840	2890	4340	2610	3920
	30	4180	6290	3760	5660	3370	5070	3030	4560	2720	4080	2450	3680
	32	3940	5930	3540	5320	3170	4760	2840	4270	2540	3820	2290	3440
	34	3700	5560	3320	4990	2960	4450	2650	3990	2370	3560	2130	3200
	36	3460	5200	3100	4650	2760	4140	2460	3700	2200	3300	1970	2960
	38	3220	4850	2880	4330	2560	3840	2280	3430	2030	3050	1820	2730
	40	2990	4500	2670	4010	2360	3550	2100	3160	1870	2800	1670	2510
	42	2770	4160	2460	3690	2170	3270	1930	2900	1710	2570	1520	2290
	44	2550	3830	2260	3390	1990	2990	1760	2650	1560	2340	1390	2080
	46	2330	3510	2060	3100	1820	2730	1610	2420	1420	2140	1270	1910
	48	2140	3220	1900	2850	1670	2510	1480	2220	1310	1960	1160	1750
	50	1970	2970	1750	2630	1540	2310	1360	2050	1200	1810	1070	1610
Properties													
P_{wo} (kips)		2820	4230	2410	3620	2060	3090	1750	2630	1500	2240	1280	1920
P_{wi} (kips/in.)		102	154	94.3	142	86.5	130	79.3	119	73.0	110	67.2	101
P_{wb} (kips)		43900	66000	34400	51700	26500	39900	20500	30700	15900	24000	12400	18700
P_{fb} (kips)		4510	6780	3820	5750	3240	4870	2730	4100	2290	3450	1930	2900
L_p (ft)		16.6		16.3		16.1		15.9		15.6		15.5	
L_r (ft)		275		253		232		213		196		179	
A_g (in.^{2})		215		196		178		162		147		134	
I_x (in.^{4})		14300		12400		10800		9430		8210		7190	
I_y (in.^{4})		4720		4170		3680		3250		2880		2560	
r_y (in.)		4.69		4.62		4.55		4.49		4.43		4.38	
Ratio r_x/r_y		1.74		1.73		1.71		1.70		1.69		1.67	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		409000		355000		309000		270000		235000		206000	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		135000		119000		105000		93000		82400		73300	

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

[h] Flange thickness is greater than 2 in. Special requirements may apply per AISC Specification Section A3.1c.

F_y = 50 ksi

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

W14

Shape	W14×											
Wt/ft	426[h]		398[h]		370[h]		342[h]		311[h]		283[h]	
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	3740	5620	3500	5260	3260	4900	3020	4540	2740	4110	2490	3750
11	3500	5260	3270	4920	3040	4570	2820	4230	2550	3830	2320	3480
12	3450	5190	3230	4850	3000	4510	2780	4180	2510	3780	2280	3430
13	3410	5120	3180	4780	2960	4450	2740	4120	2470	3720	2250	3380
14	3350	5040	3130	4710	2910	4380	2700	4050	2440	3660	2210	3330
15	3300	4960	3080	4630	2870	4310	2650	3980	2390	3600	2180	3270
16	3240	4870	3030	4550	2810	4230	2600	3910	2350	3530	2130	3210
17	3180	4790	2970	4470	2760	4150	2550	3840	2300	3460	2090	3150
18	3120	4690	2920	4380	2710	4070	2500	3760	2260	3390	2050	3080
19	3060	4600	2850	4290	2650	3980	2450	3680	2210	3320	2000	3010
20	2990	4500	2790	4200	2590	3890	2390	3600	2160	3240	1960	2940
22	2860	4290	2660	4000	2470	3710	2280	3420	2050	3080	1860	2790
24	2710	4080	2530	3800	2340	3520	2160	3240	1940	2920	1760	2640
26	2560	3850	2390	3590	2210	3320	2040	3060	1830	2750	1660	2490
28	2410	3630	2250	3380	2080	3120	1910	2870	1710	2580	1550	2330
30	2260	3400	2100	3160	1940	2920	1790	2680	1600	2400	1450	2170
32	2110	3170	1960	2950	1810	2720	1660	2500	1490	2230	1340	2020
34	1960	2950	1820	2730	1670	2520	1540	2310	1370	2060	1240	1860
36	1810	2730	1680	2530	1540	2320	1420	2130	1260	1900	1140	1710
38	1670	2510	1550	2320	1420	2130	1300	1950	1160	1740	1040	1560
40	1530	2300	1410	2130	1300	1950	1180	1780	1050	1580	944	1420
42	1390	2090	1290	1930	1180	1770	1070	1610	954	1430	857	1290
44	1270	1910	1170	1760	1070	1610	979	1470	870	1310	781	1170
46	1160	1750	1070	1610	980	1470	896	1350	796	1200	714	1070
48	1070	1600	985	1480	900	1350	823	1240	731	1100	656	986
50	983	1480	907	1360	830	1250	758	1140	673	1010	604	909
Properties												
P_{wo} (kips)	1140	1700	1020	1520	899	1350	787	1180	672	1010	574	860
P_{wi} (kips/in.)	62.5	93.8	59.0	88.5	55.2	82.8	51.3	77.0	47.0	70.5	43.0	64.5
P_{wb} (kips)	10000	15000	8410	12600	6880	10300	5540	8330	4250	6390	3260	4900
P_{fb} (kips)	1720	2590	1510	2280	1320	1990	1140	1720	956	1440	802	1210
L_p (ft)	15.3		15.2		15.1		15.0		14.8		14.7	
L_r (ft)	169		158		148		137		125		114	
A_g (in.^{2})	125		117		109		101		91.4		83.3	
I_x (in.^{4})	6600		6000		5440		4900		4330		3840	
I_y (in.^{4})	2360		2170		1990		1810		1610		1440	
r_y (in.)	4.34		4.31		4.27		4.24		4.20		4.17	
Ratio r_x/r_y	1.67		1.66		1.66		1.65		1.64		1.63	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})	189000		172000		156000		140000		124000		110000	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})	67500		62100		57000		51800		46100		41200	

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

[h] Flange thickness is greater than 2 in. Special requirements may apply per AISC Specification Section A3.1c.

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

W14

$F_y = 50$ ksi

Shape		W14×											
Wt/ft		257		233		211		193		176		159	
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	2260	3400	2050	3080	1850	2790	1700	2550	1550	2330	1400	2100
	6	2210	3330	2000	3010	1810	2720	1660	2500	1510	2280	1370	2050
	7	2200	3300	1990	2990	1800	2700	1650	2480	1500	2260	1350	2040
	8	2180	3270	1970	2960	1780	2680	1630	2450	1490	2230	1340	2020
	9	2150	3230	1950	2930	1760	2650	1610	2430	1470	2210	1330	1990
	10	2130	3200	1920	2890	1740	2620	1590	2400	1450	2180	1310	1970
	11	2100	3160	1900	2860	1720	2580	1570	2360	1430	2150	1290	1940
	12	2070	3110	1870	2810	1690	2540	1550	2330	1410	2120	1270	1910
	13	2040	3060	1840	2770	1670	2500	1520	2290	1390	2090	1250	1880
	14	2000	3010	1810	2720	1640	2460	1500	2250	1360	2050	1230	1850
	15	1970	2960	1780	2680	1610	2420	1470	2210	1340	2010	1210	1810
	16	1930	2900	1750	2620	1580	2370	1440	2170	1310	1970	1180	1780
	17	1890	2850	1710	2570	1540	2320	1410	2120	1280	1930	1160	1740
	18	1850	2780	1670	2510	1510	2270	1380	2070	1250	1890	1130	1700
	19	1810	2720	1630	2460	1470	2220	1350	2030	1230	1840	1100	1660
	20	1770	2660	1600	2400	1440	2160	1310	1980	1190	1800	1080	1620
	22	1680	2520	1510	2270	1360	2050	1250	1870	1130	1700	1020	1530
	24	1590	2380	1430	2150	1290	1930	1170	1760	1060	1600	958	1440
	26	1490	2240	1340	2020	1210	1810	1100	1660	998	1500	897	1350
	28	1390	2100	1250	1890	1130	1690	1030	1540	930	1400	835	1260
	30	1300	1950	1170	1750	1050	1570	954	1430	862	1300	774	1160
	32	1200	1810	1080	1620	967	1450	881	1320	795	1200	713	1070
	34	1110	1670	994	1490	890	1340	809	1220	730	1100	654	983
	36	1020	1530	910	1370	814	1220	740	1110	666	1000	596	896
	38	928	1390	830	1250	741	1110	673	1010	605	909	541	812
	40	841	1260	751	1130	669	1010	607	913	546	820	488	733
Properties													
P_{wo} (kips)		487	731	413	620	352	529	302	453	264	396	222	333
P_{wi} (kips/in.)		39.2	58.8	35.7	53.5	32.7	49.0	29.7	44.5	27.7	41.5	24.8	37.3
P_{wb} (kips)		2460	3700	1860	2790	1430	2150	1070	1610	868	1300	627	943
P_{fb} (kips)		668	1000	554	832	455	684	388	583	321	483	265	398
L_p (ft)		14.6		14.5		14.4		14.3		14.2		14.1	
L_r (ft)		104		94.9		86.4		79.7		73.2		66.7	
A_g (in.^{2})		75.6		68.5		62.0		56.8		51.8		46.7	
I_x (in.^{4})		3400		3010		2660		2400		2140		1900	
I_y (in.^{4})		1290		1150		1030		931		838		748	
r_y (in.)		4.13		4.10		4.07		4.05		4.02		4.00	
Ratio r_x/r_y		1.62		1.62		1.61		1.60		1.60		1.60	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		97300		86200		76100		68700		61300		54400	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		36900		32900		29500		26600		24000		21400	

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

F_y = 50 ksi

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

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**
Effective length KL (ft) with respect to least radius of gyration r_y	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	**1220**	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	**685**	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

Property	145		132		120		109		99		90	
P_{wo} (kips)	**191**	287	**175**	263	**151**	227	**128**	191	**111**	167	**95.9**	144
P_{wi} (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
P_{wb} (kips)	**477**	717	**407**	612	**312**	468	**220**	330	**173**	260	**129**	194
P_{fb} (kips)	**222**	334	**199**	298	**165**	249	**138**	208	**114**	171	**94.3**	142
L_p (ft)	14.1		13.3		13.2		13.2		13.5		15.2	
L_r (ft)	61.7		56.0		52.0		48.4		45.3		42.6	
A_g (in.^{2})	42.7		38.8		35.3		32.0		29.1		26.5	
I_x (in.^{4})	1710		1530		1380		1240		1110		999	
I_y (in.^{4})	677		548		495		447		402		362	
r_y (in.)	3.98		3.76		3.74		3.73		3.71		3.70	
Ratio r_x/r_y	1.59		1.67		1.67		1.67		1.66		1.66	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})	48900		43800		39500		35500		31800		28600	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})	19400		15700		14200		12800		11500		10400	

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

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

W14

F_y = 50 ksi

Shape		W14×													
Wt/ft		82		74		68		61		53		48		43[c]	
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	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	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	720	1080	652	980	598	899	536	806	467	702	423	636	374	562
	6	677	1020	613	922	562	844	504	757	421	633	382	573	340	511
	7	662	995	600	901	549	826	492	740	406	610	368	552	327	491
	8	645	970	584	878	535	804	480	721	389	585	352	529	313	470
	9	627	942	568	853	520	781	465	700	371	557	335	504	298	447
	10	607	912	549	826	503	755	450	677	351	528	317	477	281	423
	11	585	880	530	797	485	728	434	652	331	497	299	449	264	397
	12	563	846	510	766	466	700	417	626	310	465	279	420	247	371
	13	539	810	488	734	446	670	399	599	288	433	260	391	230	345
	14	515	774	466	701	425	639	380	572	267	401	240	361	212	319
	15	490	736	444	667	404	608	362	543	246	369	221	332	195	293
	16	465	698	421	632	383	576	342	515	225	338	202	304	178	267
	17	439	660	398	598	362	544	323	486	205	308	184	276	161	242
	18	413	621	374	563	340	512	304	457	185	278	166	250	145	218
	19	388	583	351	528	319	480	285	428	166	250	149	224	130	196
	20	363	546	329	494	298	448	266	400	150	226	135	202	118	177
	22	314	473	285	428	258	387	230	345	124	186	111	167	97.2	146
	24	268	403	243	365	219	329	195	293	104	157	93.5	140	81.7	123
	26	228	343	207	311	187	281	166	250	88.8	133	79.6	120	69.6	105
	28	197	296	178	268	161	242	143	215	76.6	115	68.7	103	60.0	90.2
	30	172	258	155	234	140	211	125	187	66.7	100	59.8	89.9	52.3	78.6
	32	151	227	137	205	123	185	110	165	58.6	88.1				
	34	134	201	121	182	109	164	97.1	146						
	36	119	179	108	162	97.4	146	86.6	130						
	38	107	161	96.8	146	87.4	131	77.7	117						
	40	96.5	145	87.4	131	78.9	119	70.2	105						
Properties															
P_{wo} (kips)		123	184	103	155	90.7	136	77.3	116	77.1	116	67.2	101	57.0	85.5
P_{wi} (kips/in.)		17.0	25.5	15.0	22.5	13.8	20.8	12.5	18.8	12.3	18.5	11.3	17.0	10.2	15.3
P_{wb} (kips)		201	302	138	208	108	163	79.9	120	76.8	115	59.6	89.5	43.0	64.6
P_{fb} (kips)		137	206	115	173	97.0	146	77.8	117	81.5	123	66.2	99.6	52.6	79.0
L_p (ft)		8.76		8.76		8.69		8.65		6.78		6.75		6.68	
L_r (ft)		33.1		31.0		29.3		27.5		22.2		21.1		20.0	
A_g (in.^{2})		24.0		21.8		20.0		17.9		15.6		14.1		12.6	
I_x (in.^{4})		881		795		722		640		541		484		428	
I_y (in.^{4})		148		134		121		107		57.7		51.4		45.2	
r_y (in.)		2.48		2.48		2.46		2.45		1.92		1.91		1.89	
Ratio r_x/r_y		2.44		2.44		2.44		2.44		3.07		3.06		3.08	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		25200		22800		20700		18300		15500		13900		12300	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		4240		3840		3460		3060		1650		1470		1290	

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

[c] Shape is slender for compression with F_y = 50 ksi.

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

F_y = 50 ksi

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

W12

Shape		W12×											
Wt/ft		336[h]		305[h]		279[h]		252[h]		230[h]		210	
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	2960	4440	2680	4030	2450	3690	2220	3330	2030	3050	1850	2780
	6	2870	4310	2600	3910	2370	3570	2140	3220	1960	2940	1790	2680
	7	2830	4260	2570	3860	2340	3520	2120	3180	1930	2910	1760	2650
	8	2800	4200	2530	3810	2310	3470	2090	3140	1910	2870	1740	2610
	9	2760	4140	2500	3750	2280	3420	2050	3090	1880	2820	1710	2570
	10	2710	4070	2450	3690	2240	3360	2020	3030	1840	2770	1680	2520
	11	2660	4000	2410	3620	2190	3300	1980	2970	1800	2710	1640	2470
	12	2610	3920	2360	3540	2150	3230	1940	2910	1770	2650	1610	2410
	13	2550	3830	2310	3460	2100	3150	1890	2840	1720	2590	1570	2360
	14	2490	3740	2250	3380	2050	3080	1840	2770	1680	2520	1530	2290
	15	2430	3650	2190	3290	1990	3000	1790	2690	1630	2450	1480	2230
	16	2360	3550	2130	3200	1940	2910	1740	2620	1590	2380	1440	2160
	17	2300	3450	2070	3110	1880	2820	1690	2540	1540	2310	1390	2100
	18	2230	3350	2000	3010	1820	2730	1630	2450	1480	2230	1350	2020
	19	2160	3240	1940	2910	1760	2640	1580	2370	1430	2150	1300	1950
	20	2080	3130	1870	2810	1700	2550	1520	2280	1380	2070	1250	1880
	22	1940	2910	1740	2610	1570	2360	1400	2110	1270	1910	1150	1730
	24	1790	2690	1600	2400	1440	2170	1290	1930	1170	1750	1050	1580
	26	1640	2460	1460	2190	1320	1980	1170	1760	1060	1590	955	1430
	28	1490	2240	1330	1990	1190	1790	1060	1590	954	1430	859	1290
	30	1350	2020	1190	1790	1070	1610	948	1430	854	1280	767	1150
	32	1210	1820	1070	1600	954	1430	842	1270	756	1140	678	1020
	34	1070	1610	947	1420	845	1270	746	1120	670	1010	600	902
	36	958	1440	844	1270	754	1130	665	1000	597	898	535	805
	38	860	1290	758	1140	676	1020	597	897	536	806	480	722
	40	776	1170	684	1030	610	918	539	810	484	727	434	652
Properties													
P_{wo} (kips)		1050	1580	895	1340	782	1170	662	993	571	857	491	737
P_{wi} (kips/in.)		59.2	88.8	54.2	81.3	51.0	76.5	46.5	69.8	42.8	64.3	39.3	59.0
P_{wb} (kips)		9960	15000	7640	11500	6380	9590	4840	7270	3780	5680	2930	4400
P_{fb} (kips)		1630	2460	1370	2060	1140	1720	947	1420	802	1210	676	1020
L_p (ft)		12.3		12.1		11.9		11.8		11.7		11.6	
L_r (ft)		150		137		126		114		105		96.0	
A_g (in.^{2})		98.8		89.6		81.9		74.0		67.7		61.8	
I_x (in.^{4})		4060		3550		3110		2720		2420		2140	
I_y (in.^{4})		1190		1050		937		828		742		664	
r_y (in.)		3.47		3.42		3.38		3.34		3.31		3.28	
Ratio r_x/r_y		1.85		1.84		1.82		1.81		1.80		1.80	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		116000		102000		89000		77900		69300		61300	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		34100		30100		26800		23700		21200		19000	

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

[h] Flange thickness is greater than 2 in. Special requirements may apply per AISC Specification Section A3.1c.

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	829	1250	730	1100
	16	1300	1950	1150	1730	1030	1540	913	1370	802	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	941	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
$\Omega_c = 1.67$	$\phi_c = 0.90$

F_y = 50 ksi

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

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	735	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	243	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
$\Omega_c = 1.67$	$\phi_c = 0.90$

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

W12

F_y = 50 ksi

Shape		W12×									
Wt/ft		58		53		50		45		40	
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	510	767	466	701	437	657	393	590	350	526
	6	481	722	438	659	396	595	356	534	316	475
	7	470	707	429	644	382	574	343	516	305	458
	8	459	689	418	628	367	551	329	495	292	439
	9	446	670	406	610	350	526	314	472	279	419
	10	432	649	393	590	332	499	298	448	264	397
	11	417	627	379	569	314	471	281	422	249	375
	12	401	603	364	547	294	443	264	396	234	351
	13	385	578	349	525	275	413	246	370	218	328
	14	368	553	333	501	255	384	228	343	202	304
	15	350	527	317	477	236	354	211	317	186	280
	16	333	500	301	452	217	326	193	291	171	257
	17	315	473	284	427	198	297	176	265	156	234
	18	297	446	268	402	180	270	160	241	141	212
	19	279	420	251	378	162	244	144	217	127	191
	20	262	393	235	353	146	220	130	196	115	172
	22	227	342	204	306	121	182	108	162	94.8	142
	24	195	293	174	261	102	153	90.4	136	79.6	120
	26	166	249	148	222	86.6	130	77.0	116	67.9	102
	28	143	215	127	192	74.6	112	66.4	99.8	58.5	88.0
	30	125	187	111	167	65.0	97.7	57.9	87.0	51.0	76.6
	32	109	165	97.6	147	57.1	85.9	50.9	76.4	44.8	67.3
	34	97.0	146	86.5	130						
	36	86.5	130	77.1	116						
	38	77.6	117	69.2	104						
	40	70.1	105	62.5	93.9						
Properties											
P_{wo} (kips)		74.4	112	67.6	101	70.3	105	60.0	90.0	49.9	74.9
P_{wi} (kips/in.)		12.0	18.0	11.5	17.3	12.3	18.5	11.2	16.8	9.83	14.8
P_{wb} (kips)		83.2	125	73.2	110	88.5	133	65.7	98.7	44.8	67.4
P_{fb} (kips)		76.6	115	61.9	93.0	76.6	115	61.9	93.0	49.6	74.6
L_p (ft)		8.87		8.76		6.92		6.89		6.85	
L_r (ft)		29.9		28.2		23.9		22.4		21.1	
A_g (in.^{2})		17.0		15.6		14.6		13.1		11.7	
I_x (in.^{4})		475		425		391		348		307	
I_y (in.^{4})		107		95.8		56.3		50.0		44.1	
r_y (in.)		2.51		2.48		1.96		1.95		1.94	
Ratio r_x/r_y		2.10		2.11		2.64		2.64		2.64	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		13600		12200		11200		9960		8790	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		3060		2740		1610		1430		1260	

ASD	LRFD	Note: Heavy line indicates Kl/r equal to or greater than 200.
$\Omega_c = 1.67$	$\phi_c = 0.90$	

F_y = 50 ksi

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

W10

Shape	W10×											
Wt/ft	112		100		88		77		68		60	
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	986	1480	880	1320	775	1170	678	1020	598	899	528	794
6	936	1410	834	1250	734	1100	641	963	565	850	499	750
7	918	1380	818	1230	720	1080	628	944	554	833	489	734
8	898	1350	800	1200	703	1060	614	922	541	813	477	717
9	876	1320	780	1170	685	1030	598	898	527	792	464	698
10	852	1280	758	1140	666	1000	580	872	511	768	450	677
11	826	1240	734	1100	645	969	561	844	495	744	436	655
12	799	1200	709	1070	623	936	542	814	477	717	420	631
13	770	1160	683	1030	600	901	521	783	459	690	404	606
14	740	1110	656	986	575	865	500	751	440	661	387	581
15	709	1070	628	944	551	827	477	718	420	632	369	555
16	678	1020	600	901	525	789	455	684	400	602	351	528
17	646	970	571	858	499	751	432	650	380	571	333	501
18	613	922	542	814	474	712	409	615	360	541	315	474
19	581	873	512	770	448	673	386	581	339	510	297	447
20	549	825	483	726	422	634	364	546	319	480	279	420
22	485	729	426	640	371	558	319	479	280	421	244	367
24	424	637	371	558	323	485	276	415	242	364	211	317
26	365	549	319	479	277	416	236	355	207	311	180	270
28	315	473	275	413	239	358	204	306	178	268	155	233
30	274	412	239	360	208	312	178	267	155	234	135	203
32	241	362	210	316	183	274	156	234	137	205	119	179
34	214	321	186	280	162	243	138	208	121	182	105	158
36	191	286	166	250	144	217	123	185	108	162	93.9	141
38	171	257	149	224	129	195	111	166	96.9	146	84.2	127
40	154	232	135	202	117	176	99.8	150	87.4	131	76.0	114

Properties

Property	112		100		88		77		68		60	
P_{wo} (kips)	220	330	184	275	150	225	121	182	99.5	149	82.6	124
P_{wi} (kips/in.)	25.2	37.8	22.7	34.0	20.2	30.3	17.7	26.5	15.7	23.5	14.0	21.0
P_{wb} (kips)	948	1420	692	1040	488	733	328	493	229	344	163	245
P_{fb} (kips)	292	439	235	353	183	276	142	213	111	167	86.5	130
L_p (ft)	9.47		9.36		9.29		9.18		9.15		9.08	
L_r (ft)	64.3		57.7		51.1		45.2		40.6		36.6	
A_g (in.^{2})	32.9		29.4		25.9		22.6		20.0		17.6	
I_x (in.^{4})	716		623		534		455		394		341	
I_y (in.^{4})	236		207		179		154		134		116	
r_y (in.)	2.68		2.65		2.63		2.60		2.59		2.57	
Ratio r_x/r_y	1.74		1.74		1.73		1.73		1.71		1.71	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})	20500		17800		15300		13000		11300		9760	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})	6750		5920		5120		4410		3840		3320	

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

W10

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

F_y = 50 ksi

Shape		W10×									
Wt/ft		54		49		45		39		33	
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	**474**	712	**432**	649	**397**	597	**343**	516	**291**	437
	6	**447**	672	**407**	612	**361**	543	**312**	469	**263**	395
	7	**438**	658	**399**	599	**349**	525	**301**	452	**253**	381
	8	**428**	643	**389**	585	**336**	505	**289**	435	**243**	365
	9	**416**	625	**378**	569	**321**	483	**276**	415	**232**	348
	10	**404**	607	**367**	551	**306**	460	**263**	395	**220**	330
	11	**390**	586	**355**	533	**290**	435	**248**	373	**207**	311
	12	**376**	565	**341**	513	**273**	410	**233**	351	**194**	292
	13	**361**	543	**328**	493	**256**	384	**218**	328	**181**	272
	14	**346**	520	**314**	471	**238**	358	**203**	305	**168**	253
	15	**330**	496	**299**	450	**221**	332	**188**	282	**155**	233
	16	**314**	472	**284**	428	**204**	306	**173**	260	**142**	213
	17	**298**	448	**270**	405	**187**	281	**158**	238	**130**	195
	18	**282**	423	**255**	383	**171**	256	**144**	216	**117**	177
	19	**265**	399	**240**	360	**155**	233	**130**	195	**106**	159
	20	**249**	375	**225**	338	**140**	210	**117**	176	**95.4**	143
	22	**218**	327	**196**	295	**116**	174	**97.0**	146	**78.8**	118
	24	**188**	282	**169**	254	**97.1**	146	**81.5**	122	**66.2**	99.5
	26	**160**	241	**144**	216	**82.7**	124	**69.4**	104	**56.4**	84.8
	28	**138**	208	**124**	186	**71.3**	107	**59.9**	90.0	**48.7**	73.1
	30	**120**	181	**108**	162	**62.1**	93.4	**52.2**	78.4	**42.4**	63.7
	32	**106**	159	**94.9**	143	**54.6**	82.1	**45.8**	68.9	**37.2**	56.0
	34	**93.7**	141	**84.0**	126						
	36	**83.6**	126	**75.0**	113						
	38	**75.0**	113	**67.3**	101						
	40	**67.7**	102	**60.7**	91.3						
Properties											
P_{wo} (kips)		**68.8**	103	**60.1**	90.1	**65.3**	98.0	**54.1**	81.1	**45.2**	67.8
P_{wi} (kips/in.)		**12.3**	18.5	**11.3**	17.0	**11.7**	17.5	**10.5**	15.8	**9.67**	14.5
P_{wb} (kips)		**112**	168	**86.5**	130	**94.4**	142	**68.8**	103	**53.7**	80.7
P_{fb} (kips)		**70.8**	106	**58.7**	88.2	**71.9**	108	**52.6**	79.0	**35.4**	53.2
L_p (ft)		9.04		8.97		7.10		6.99		6.85	
L_r (ft)		33.7		31.6		26.9		24.2		21.8	
A_g (in.^{2})		15.8		14.4		13.3		11.5		9.71	
I_x (in.^{4})		303		272		248		209		171	
I_y (in.^{4})		103		93.4		53.4		45.0		36.6	
r_y (in.)		2.56		2.54		2.01		1.98		1.94	
Ratio r_x/r_y		1.71		1.71		2.15		2.16		2.16	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		8670		7790		7100		5980		4890	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		2950		2670		1530		1290		1050	

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 50 ksi

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

W8

Shape		W8×											
Wt/ft		67		58		48		40		35		31	
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	589	886	512	769	422	634	351	528	308	463	273	410
	6	542	814	469	706	387	581	321	482	281	422	249	374
	7	525	790	455	684	375	563	310	467	272	408	241	362
	8	507	762	439	660	361	543	299	449	261	393	232	348
	9	487	733	422	634	347	521	286	430	250	376	222	333
	10	466	701	403	606	331	497	273	410	238	358	211	317
	11	444	667	383	576	314	473	259	389	226	340	200	300
	12	421	632	363	545	297	447	244	367	213	320	188	283
	13	397	596	342	514	280	420	229	344	200	300	177	265
	14	372	560	320	482	262	394	214	322	187	280	165	248
	15	348	523	299	449	244	367	199	299	173	260	153	230
	16	323	486	278	417	226	340	184	276	160	241	141	212
	17	299	450	257	386	209	314	169	254	147	221	130	195
	18	276	415	236	355	192	288	155	233	135	202	118	178
	19	253	380	216	325	175	263	141	212	122	184	108	162
	20	231	347	197	296	159	239	127	192	111	166	97.1	146
	22	191	287	162	244	132	198	105	158	91.4	137	80.3	121
	24	160	241	137	205	111	166	88.5	133	76.8	115	67.4	101
	26	137	205	116	175	94.2	142	75.4	113	65.4	98.3	57.5	86.4
	28	118	177	100	151	81.2	122	65.0	97.8	56.4	84.8	49.6	74.5
	30	103	154	87.4	131	70.7	106	56.7	85.2	49.1	73.9	43.2	64.9
	32	90.2	136	76.8	115	62.2	93.4	49.8	74.8	43.2	64.9	37.9	57.0
	34	79.9	120	68.0	102	55.1	82.8	44.1	66.3				
Properties													
P_{wo} (kips)		126	189	102	154	71.9	108	57.2	85.9	45.9	68.9	39.4	59.1
P_{wi} (kips/in.)		19.0	28.5	17.0	25.5	13.3	20.0	12.0	18.0	10.3	15.5	9.50	14.3
P_{wb} (kips)		505	760	362	544	175	262	127	191	81.3	122	63.2	94.9
P_{fb} (kips)		164	246	123	185	87.8	132	58.7	88.2	45.9	68.9	35.4	53.2
L_p (ft)		7.49		7.42		7.35		7.21		7.17		7.18	
L_r (ft)		47.7		41.7		35.2		29.9		27.0		24.8	
A_g (in.^{2})		19.7		17.1		14.1		11.7		10.3		9.12	
I_x (in.^{4})		272		228		184		146		127		110	
I_y (in.^{4})		88.6		75.1		60.9		49.1		42.6		37.1	
r_y (in.)		2.12		2.10		2.08		2.04		2.03		2.02	
Ratio r_x/r_y		1.75		1.74		1.74		1.73		1.73		1.72	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		7790		6530		5270		4180		3630		3150	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		2540		2150		1740		1410		1220		1060	

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

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

HP14–HP12

Table 4–2
Available Strength in Axial Compression, kips
HP Shapes

F_y = 50 ksi

Shape		HP14×								HP12×			
Wt/ft		117		102		89		73[c]		84		74	
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	1030	1550	899	1350	782	1180	622	935	737	1110	653	981
	6	1000	1500	873	1310	759	1140	604	908	706	1060	625	939
	7	990	1490	863	1300	751	1130	597	898	695	1040	615	924
	8	978	1470	853	1280	741	1110	590	886	682	1020	603	907
	9	964	1450	841	1260	731	1100	581	874	668	1000	591	888
	10	950	1430	828	1240	719	1080	572	860	653	981	577	867
	11	933	1400	813	1220	706	1060	562	845	636	956	562	845
	12	916	1380	798	1200	693	1040	551	829	619	930	547	822
	13	898	1350	782	1170	678	1020	540	812	600	902	530	797
	14	878	1320	764	1150	663	996	528	793	581	873	513	770
	15	857	1290	746	1120	647	972	515	774	561	842	495	743
	16	836	1260	727	1090	630	947	502	754	540	811	476	715
	17	814	1220	707	1060	613	921	488	734	518	779	457	687
	18	791	1190	687	1030	595	894	474	713	497	747	438	658
	19	767	1150	666	1000	577	867	460	691	475	714	418	628
	20	743	1120	645	969	558	839	445	669	453	681	398	599
	22	694	1040	602	904	520	781	415	623	409	615	359	540
	24	644	967	557	838	481	723	384	577	366	549	321	482
	26	593	891	513	771	442	664	353	530	324	486	283	426
	28	543	816	469	705	403	606	322	484	283	426	248	372
	30	494	742	426	640	366	550	292	439	247	371	216	324
	32	446	671	384	577	329	495	263	396	217	326	190	285
	34	400	602	344	517	294	442	235	354	192	289	168	252
	36	357	537	307	461	262	394	210	316	171	258	150	225
	38	321	482	275	414	235	354	188	283	154	231	134	202
	40	289	435	248	373	212	319	170	256	139	209	121	182
Properties													
P_{wo} (kips)		201	302	162	242	135	202	99.9	150	157	235	132	199
P_{wi} (kips/in.)		26.8	40.3	23.5	35.3	20.5	30.8	16.8	25.3	22.8	34.3	20.2	30.3
P_{wb} (kips)		792	1190	532	799	353	531	195	294	573	861	394	593
P_{fb} (kips)		121	182	93.0	140	70.8	106	47.7	71.7	87.8	132	69.6	105
L_p (ft)		12.9		15.5		17.9		21.3		10.4		11.9	
L_r (ft)		50.5		45.7		41.7		37.6		41.4		37.9	
A_g (in.^{2})		34.4		30.0		26.1		21.4		24.6		21.8	
I_x (in.^{4})		1220		1050		904		729		650		569	
I_y (in.^{4})		443		380		326		261		213		186	
r_y (in.)		3.59		3.56		3.53		3.49		2.94		2.92	
Ratio r_x/r_y		1.66		1.66		1.67		1.67		1.75		1.75	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		34900		30100		25900		20900		18600		16300	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		12700		10900		9330		7470		6100		5320	

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

[c] Shape is slender for compression with $F_y = 50$ ksi.

F_y = 50 ksi

Table 4–2 (continued)
Available Strength in Axial Compression, kips
HP Shapes

HP12–HP8

Shape		HP12×				HP10×				HP8×	
Wt/ft		63		53		57		42		36	
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	551	829	460	692	502	755	370	556	316	476
	6	527	792	440	661	472	709	347	521	286	430
	7	518	779	432	650	461	693	338	509	276	415
	8	508	764	424	638	449	675	329	495	265	398
	9	497	748	415	624	436	655	319	480	253	380
	10	486	730	405	609	421	633	309	464	240	361
	11	473	711	394	593	406	611	297	446	226	340
	12	459	690	383	576	390	586	285	428	212	319
	13	445	669	371	558	373	561	272	409	198	298
	14	430	646	359	539	356	535	259	390	184	276
	15	414	623	346	519	338	509	246	370	170	255
	16	398	599	332	499	321	482	233	350	156	234
	17	382	574	318	479	303	455	219	329	142	214
	18	365	549	305	458	285	428	206	309	129	194
	19	349	524	291	437	267	401	192	289	116	175
	20	332	499	276	416	249	374	179	269	105	158
	22	298	448	248	373	215	323	154	231	86.7	130
	24	265	399	221	332	182	274	130	195	72.8	109
	26	234	351	195	292	155	234	111	167	62.0	93.3
	28	203	306	169	254	134	201	95.5	144	53.5	80.4
	30	177	266	147	221	117	176	83.2	125	46.6	70.0
	32	156	234	130	195	103	154	73.1	110	41.0	61.6
	34	138	207	115	172	90.9	137	64.8	97.4		
	36	123	185	102	154	81.1	122	57.8	86.9		
	38	110	166	91.8	138	72.8	109	51.9	78.0		
	40	99.6	150	82.9	125	65.7	98.7	46.8	70.4		
Properties											
P_{wo} (kips)		107	161	81.6	122	118	177	77.8	117	83.4	125
P_{wi} (kips/in.)		17.2	25.8	14.5	21.8	18.8	28.3	13.8	20.8	14.8	22.3
P_{wb} (kips)		243	366	147	220	397	597	157	237	241	362
P_{fb} (kips)		49.6	74.6	35.4	53.2	59.7	89.8	33.0	49.6	37.1	55.7
L_p (ft)		14.4		16.7		8.65		12.3		6.90	
L_r (ft)		34.0		31.1		34.9		28.3		27.3	
A_g (in.^{2})		18.4		15.5		16.8		12.4		10.6	
I_x (in.^{4})		472		393		294		210		119	
I_y (in.^{4})		153		127		101		71.7		40.3	
r_y (in.)		2.88		2.86		2.45		2.41		1.95	
Ratio r_x/r_y		1.76		1.76		1.71		1.71		1.72	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		13500		11200		8410		6010		3410	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		4380		3630		2890		2050		1150	

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	Note: Heavy line indicates Kl/r equal to or greater than 200.

Table 4–3
Available Strength in Axial Compression, kips
Rectangular HSS

HSS20–HSS16

F_y = 46 ksi

Shape		HSS20×12×								HSS16×12×			
		5/8		1/2[c]		3/8[c]		5/16[c]		5/8		1/2	
t_{design}, in.		0.581		0.465		0.349		0.291		0.581		0.465	
Wt/ft		127		103		78.4		65.8		110		89.6	
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	963	1450	741	1110	495	745	374	562	835	1260	678	1020
	6	949	1430	733	1100	491	738	371	558	823	1240	668	1000
	7	945	1420	731	1100	489	735	370	557	818	1230	665	999
	8	939	1410	727	1090	487	733	369	555	813	1220	661	993
	9	933	1400	724	1090	485	730	368	553	807	1210	656	986
	10	926	1390	720	1080	483	726	367	551	801	1200	651	978
	11	918	1380	715	1070	480	722	366	549	794	1190	645	970
	12	909	1370	710	1070	478	718	364	547	786	1180	639	961
	13	900	1350	705	1060	475	713	362	544	778	1170	633	951
	14	891	1340	699	1050	471	708	360	542	769	1160	626	940
	15	881	1320	693	1040	468	703	358	539	760	1140	618	929
	16	870	1310	686	1030	464	697	356	536	750	1130	610	918
	17	859	1290	679	1020	460	691	354	532	740	1110	602	905
	18	847	1270	672	1010	456	685	352	529	729	1100	594	892
	19	834	1250	664	998	451	679	349	525	718	1080	585	879
	20	821	1230	656	986	447	672	346	521	706	1060	575	865
	21	808	1210	648	973	442	664	344	516	694	1040	566	850
	22	794	1190	639	960	437	657	341	512	682	1020	556	836
	23	780	1170	630	946	432	649	337	507	669	1010	546	820
	24	766	1150	620	932	426	641	334	502	656	986	535	805
	25	751	1130	610	917	420	632	330	496	642	966	525	789
	26	736	1110	600	902	415	623	326	490	629	945	514	772
	27	721	1080	588	883	409	614	322	483	615	924	503	756
	28	705	1060	575	864	402	605	317	477	601	903	492	739
	29	689	1040	563	846	396	595	313	470	587	882	480	722
	30	673	1010	550	826	389	585	308	463	572	860	469	704
	32	641	963	524	787	376	564	298	448	543	817	445	669
	34	608	914	498	748	361	543	288	433	514	773	422	634
	36	575	864	471	708	346	520	277	417	485	729	398	599
	38	542	815	445	669	331	497	266	400	456	685	375	563
	40	510	766	419	629	315	473	254	383	427	641	352	528

Properties

	HSS20×12×5/8	HSS20×12×1/2	HSS20×12×3/8	HSS20×12×5/16	HSS16×12×5/8	HSS16×12×1/2
A_g (in.^{2})	35.0	28.3	21.5	18.1	30.3	24.6
I_x (in.^{4})	1880	1550	1200	1010	1090	904
I_y (in.^{4})	851	705	547	464	700	581
r_x/r_y	1.48	1.48	1.48	1.48	1.25	1.25
r_y (in.)	4.93	4.99	5.04	5.07	4.80	4.86

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

[c] Shape is slender for compression with F_y = 46 ksi.

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS16

Shape	HSS16×12×				HSS16×8×							
	3/8[c]		5/16[c]		5/8		1/2		3/8[c]		5/16[c]	
t_{design}, in.	0.349		0.291		0.581		0.465		0.349		0.291	
Wt/ft	68.3		57.4		93.1		75.9		58.1		48.9	
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	480	722	365	549	707	1060	576	865	403	606	311	467
6	475	714	362	544	684	1030	558	838	395	593	304	458
7	473	711	361	543	676	1020	551	829	391	588	302	454
8	471	708	360	541	667	1000	544	818	388	583	300	451
9	468	704	359	539	657	987	536	806	384	577	297	446
10	466	700	357	537	646	971	527	792	379	570	294	442
11	463	696	355	534	634	952	518	778	374	562	290	436
12	459	691	354	531	621	933	507	762	369	554	287	431
13	456	685	352	528	607	912	496	746	363	545	283	425
14	452	679	349	525	592	890	485	728	356	536	278	418
15	448	673	347	522	577	867	472	710	350	525	273	411
16	444	667	345	518	561	843	460	691	342	515	268	404
17	439	660	342	514	544	818	447	671	335	503	263	396
18	434	653	339	510	527	792	433	651	327	491	258	387
19	429	645	336	505	510	766	419	630	319	479	252	379
20	424	637	333	500	492	739	405	609	310	466	246	370
21	418	628	330	495	474	712	391	587	301	452	240	360
22	412	620	326	490	456	685	376	565	291	437	233	350
23	406	611	322	483	438	658	362	544	280	421	226	340
24	400	601	317	477	419	630	347	522	269	404	219	330
25	393	591	313	470	401	603	332	500	258	388	212	319
26	387	581	308	462	383	576	318	478	247	371	205	308
27	380	571	303	455	365	549	303	456	236	355	197	296
28	373	560	298	447	347	522	289	434	225	339	189	284
29	366	549	292	439	330	496	275	413	215	323	181	273
30	358	538	287	431	313	470	261	392	204	307	173	260
32	342	514	276	415	279	420	234	352	184	276	156	235
34	325	488	264	397	248	372	208	313	164	246	140	210
36	307	461	252	379	221	332	186	279	146	220	125	187
38	289	434	240	360	198	298	167	250	131	197	112	168
40	272	408	227	341	179	269	150	226	118	178	101	152

Properties

	HSS16×12×3/8	HSS16×12×5/16	HSS16×8×5/8	HSS16×8×1/2	HSS16×8×3/8	HSS16×8×5/16
A_g (in.^{2})	18.7	15.7	25.7	20.9	16.0	13.4
I_x (in.^{4})	702	595	815	679	531	451
I_y (in.^{4})	452	384	274	230	181	155
r_x/r_y	1.25	1.25	1.72	1.72	1.71	1.71
r_y (in.)	4.91	4.94	3.27	3.32	3.37	3.40

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

[c] Shape is slender for compression with F_y = 46 ksi.

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS16–HSS14

F_y = 46 ksi

Shape	HSS16×8×		HSS14×10×									
	1/4 [c]		5/8		1/2		3/8 [c]		5/16 [c]		1/4 [c]	
t_{design}, in.	0.233		0.581		0.465		0.349		0.291		0.233	
Wt/ft	39.5		93.1		75.9		58.1		48.9		39.5	
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	225	338	707	1060	576	865	431	647	336	505	238	358
6	221	332	692	1040	563	847	423	637	331	498	235	354
7	220	330	686	1030	559	840	421	633	329	495	235	353
8	218	328	680	1020	554	833	418	628	327	492	234	351
9	216	325	673	1010	549	825	415	623	325	488	232	349
10	214	322	665	1000	542	815	411	618	322	484	231	347
11	212	319	657	987	536	805	407	611	319	480	230	345
12	210	315	648	973	528	794	402	605	316	475	228	343
13	207	311	638	959	521	783	398	598	313	470	226	340
14	204	307	627	943	512	770	392	590	309	465	224	337
15	201	302	616	926	504	757	386	580	305	459	222	334
16	198	298	605	909	494	743	379	569	301	453	220	331
17	195	293	593	891	485	729	372	559	297	446	218	327
18	191	287	580	872	475	714	364	547	292	439	215	324
19	187	282	567	853	464	698	356	536	287	432	213	320
20	183	276	554	833	454	682	349	524	282	424	210	316
21	179	270	540	812	443	666	340	512	277	416	207	311
22	175	263	526	791	432	649	332	499	271	408	204	307
23	171	257	512	769	420	632	323	486	266	399	201	302
24	166	250	497	748	409	614	315	473	260	391	197	296
25	162	243	483	726	397	597	306	460	254	381	193	290
26	157	236	468	703	385	579	297	446	248	372	189	283
27	152	228	453	681	373	561	288	433	241	362	184	277
28	147	220	438	659	361	543	279	419	235	353	180	270
29	142	213	423	636	349	525	270	406	228	343	175	264
30	136	205	408	614	337	507	261	392	221	332	171	257
32	125	188	378	569	313	471	243	365	206	309	161	242
34	114	171	349	525	290	435	225	338	191	287	151	228
36	102	154	321	482	266	400	207	312	176	265	141	213
38	91.7	138	293	440	244	367	190	286	162	243	131	197
40	82.8	124	266	400	222	334	174	261	148	222	121	181

Properties

	HSS16×8×1/4	HSS14×10×5/8	HSS14×10×1/2	HSS14×10×3/8	HSS14×10×5/16	HSS14×10×1/4
A_g (in.^{2})	10.8	25.7	20.9	16.0	13.4	10.8
I_x (in.^{4})	368	687	573	447	380	310
I_y (in.^{4})	127	407	341	267	227	186
r_x/r_y	1.70	1.30	1.30	1.29	1.29	1.29
r_y (in.)	3.42	3.98	4.04	4.09	4.12	4.14

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

[c] Shape is slender for compression with F_y = 46 ksi.

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS12

Shape		HSS12×10×								HSS12×8×			
		1/2		3/8		5/16[c]		1/4[c]		5/8		1/2	
t_{design}, in.		0.465		0.349		0.291		0.233		0.581		0.465	
Wt/ft		69.1		52.9		44.6		36.0		76.1		62.3	
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	524	788	401	603	328	493	234	351	579	870	473	711
	6	513	771	392	590	322	484	231	347	559	840	457	688
	7	509	765	389	585	320	481	230	346	552	830	452	679
	8	504	758	386	580	318	478	229	344	544	818	446	670
	9	499	750	382	574	315	474	227	342	535	805	439	659
	10	493	741	378	567	312	469	226	340	526	790	431	648
	11	487	731	373	560	309	465	224	337	515	774	422	635
	12	480	721	368	553	306	459	223	335	504	757	413	621
	13	472	710	362	544	302	454	221	332	492	739	404	607
	14	465	698	356	536	298	448	219	328	479	720	394	592
	15	456	686	350	526	294	441	216	325	466	700	383	576
	16	448	673	344	517	289	434	214	321	452	679	372	559
	17	439	659	337	506	284	427	211	318	438	658	361	542
	18	429	645	330	496	278	418	209	313	423	636	349	525
	19	420	631	323	485	272	409	206	309	408	613	337	507
	20	410	616	315	474	266	400	203	304	393	591	325	489
	21	399	600	307	462	260	390	199	300	378	568	313	470
	22	389	584	300	450	253	380	196	294	362	545	301	452
	23	378	568	292	438	246	370	192	288	347	521	288	433
	24	367	552	283	426	240	360	187	281	331	498	276	414
	25	356	536	275	414	233	350	183	275	316	475	263	396
	26	345	519	267	401	226	339	178	268	301	452	251	377
	27	334	502	259	389	219	329	174	261	286	429	239	359
	28	323	485	250	376	212	318	169	254	271	407	227	341
	29	312	469	242	363	205	308	164	247	256	385	215	323
	30	301	452	233	351	198	297	159	239	242	364	204	306
	32	278	418	217	325	184	276	149	224	214	322	181	272
	34	257	386	200	301	170	255	138	208	190	285	160	241
	36	235	354	184	276	156	235	128	192	169	254	143	215
	38	215	323	168	253	143	215	117	176	152	228	128	193
	40	195	292	153	230	130	196	107	160	137	206	116	174

Properties

Property	HSS12×10×1/2	HSS12×10×3/8	HSS12×10×5/16	HSS12×10×1/4	HSS12×8×5/8	HSS12×8×1/2
A_g (in.^{2})	19.0	14.6	12.2	9.90	21.0	17.2
I_x (in.^{4})	395	310	264	216	397	333
I_y (in.^{4})	298	234	200	164	210	178
r_x/r_y	1.15	1.15	1.15	1.15	1.37	1.37
r_y (in.)	3.96	4.01	4.04	4.07	3.16	3.21

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

[c] Shape is slender for compression with F_y = 46 ksi.

HSS12

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

F_y = 46 ksi

Shape		HSS12×8×								HSS12×6×			
		3/8		5/16[c]		1/4[c]		3/16[c]		5/8		1/2	
t_{design}, in.		0.349		0.291		0.233		0.174		0.581		0.465	
Wt/ft		47.8		40.4		32.6		24.8		67.6		55.5	
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	362	545	296	444	218	327	136	204	515	774	422	634
	6	351	527	288	433	213	320	134	201	484	728	398	598
	7	347	521	286	429	211	317	133	200	474	712	390	586
	8	342	514	283	425	209	314	132	199	462	694	380	571
	9	337	506	279	420	207	311	131	198	449	674	370	556
	10	331	498	275	414	204	307	130	196	435	653	359	539
	11	325	488	271	408	202	303	129	194	419	630	346	521
	12	318	478	267	401	199	299	128	192	403	606	334	502
	13	311	467	262	393	195	294	127	190	386	581	320	482
	14	303	456	256	385	192	289	125	188	369	555	307	461
	15	296	444	250	375	188	283	124	186	351	528	292	440
	16	287	432	243	365	184	277	122	183	333	501	278	418
	17	279	419	236	354	180	271	120	180	315	474	264	396
	18	270	406	229	344	176	265	118	177	297	446	249	374
	19	261	393	221	332	172	258	116	174	279	419	234	352
	20	252	379	214	321	167	251	114	171	261	392	220	331
	21	243	365	206	309	162	244	111	167	243	366	206	309
	22	234	351	198	298	157	236	109	164	226	340	192	288
	23	224	337	190	286	152	228	106	160	210	315	178	268
	24	215	323	183	274	147	220	103	155	193	290	165	248
	25	206	309	175	263	141	212	100	151	178	268	152	229
	26	196	295	167	251	136	204	96.9	146	165	247	141	211
	27	187	281	159	239	130	195	93.6	141	153	229	130	196
	28	178	267	152	228	124	186	90.1	135	142	213	121	182
	29	169	254	144	217	118	177	86.6	130	132	199	113	170
	30	160	241	137	205	112	168	83.1	125	124	186	106	159
	32	143	215	122	184	100	151	75.8	114	109	163	92.9	140
	34	127	191	109	163	89.2	134	68.4	103	96.2	145	82.3	124
	36	113	170	96.8	146	79.6	120	61.0	91.7	85.8	129	73.4	110
	38	102	153	86.9	131	71.4	107	54.7	82.3	77.0	116	65.9	99.0
	40	91.6	138	78.4	118	64.4	96.9	49.4	74.2	59.4	89.3	59.4	89.3

Properties

	3/8	5/16	1/4	3/16	5/8	1/2
A_g (in.^{2})	13.2	11.1	8.96	6.76	18.7	15.3
I_x (in.^{4})	262	224	184	140	321	271
I_y (in.^{4})	140	120	98.8	75.7	107	91.1
r_x/r_y	1.37	1.37	1.36	1.36	1.73	1.73
r_y (in.)	3.27	3.29	3.32	3.35	2.39	2.44

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

[c] Shape is slender for compression with F_y = 46 ksi.

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS12–HSS10

Shape		HSS12×6×								HSS10×8×			
		3/8		5/16[c]		1/4[c]		3/16[c]		5/8		1/2	
t_{design}, in.		0.349		0.291		0.233		0.174		0.581		0.465	
Wt/ft		42.7		36.1		29.2		22.2		67.6		55.5	
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	324	487	264	396	192	289	126	189	515	774	422	634
	6	306	460	253	380	185	278	122	183	496	746	407	612
	7	300	451	249	374	183	274	121	181	490	736	402	604
	8	293	441	244	367	180	270	119	179	483	725	396	596
	9	286	429	239	360	177	265	117	176	474	713	390	586
	10	277	417	234	351	173	260	115	173	465	699	382	575
	11	268	403	227	341	169	254	113	170	455	684	375	563
	12	259	389	219	329	165	248	111	166	445	669	366	551
	13	249	374	211	317	160	241	108	163	434	652	357	537
	14	239	359	202	304	156	234	105	159	422	634	348	523
	15	228	343	194	291	150	226	103	154	410	616	338	508
	16	217	326	185	278	145	218	99.6	150	397	597	328	493
	17	206	310	176	264	139	209	96.4	145	384	577	318	477
	18	195	294	166	250	133	201	93.0	140	370	557	307	461
	19	184	277	157	236	127	191	89.5	135	357	536	296	445
	20	173	261	148	223	121	182	85.9	129	343	515	285	428
	21	163	245	139	209	114	172	82.1	123	329	494	274	411
	22	152	229	130	196	107	161	78.2	118	315	473	262	394
	23	142	213	122	183	100	150	74.2	112	301	452	251	377
	24	132	198	113	170	93.3	140	70.1	105	287	431	240	360
	25	122	183	105	158	86.7	130	66.0	99.1	273	410	228	343
	26	113	169	96.9	146	80.1	120	61.7	92.7	259	389	217	326
	27	104	157	89.9	135	74.3	112	57.3	86.1	245	369	206	310
	28	97.1	146	83.6	126	69.1	104	53.3	80.0	232	349	195	294
	29	90.5	136	77.9	117	64.4	96.8	49.6	74.6	219	329	185	278
	30	84.6	127	72.8	109	60.2	90.4	46.4	69.7	206	310	174	262
	32	74.3	112	64.0	96.2	52.9	79.5	40.8	61.3	182	273	154	231
	34	65.9	99.0	56.7	85.2	46.8	70.4	36.1	54.3	161	242	136	205
	36	58.7	88.3	50.6	76.0	41.8	62.8	32.2	48.4	143	216	122	183
	38	52.7	79.2	45.4	68.2	37.5	56.4	28.9	43.5	129	194	109	164
	40	47.6	71.5	41.0	61.6	33.8	50.9	26.1	39.2	116	175	98.6	148

Properties

	HSS12×6×3/8	HSS12×6×5/16	HSS12×6×1/4	HSS12×6×3/16	HSS10×8×5/8	HSS10×8×1/2
A_g (in.^{2})	11.8	9.92	8.03	6.06	18.7	15.3
I_x (in.^{4})	215	184	151	116	253	214
I_y (in.^{4})	72.9	62.8	51.9	40.0	178	151
r_x/r_y	1.72	1.71	1.71	1.70	1.19	1.19
r_y (in.)	2.49	2.52	2.54	2.57	3.09	3.14

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

[c] Shape is slender for compression with F_y = 46 ksi.

HSS10

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

F_y = 46 ksi

Shape		HSS10×8×								HSS10×6×	
		3/8		5/16		1/4[c]		3/16[c]		5/8	
t_{design}, in.		0.349		0.291		0.233		0.174		0.581	
Wt/ft		42.7		36.1		29.2		22.2		59.1	
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	324	487	273	411	212	318	133	201	451	678
	6	313	471	264	397	206	310	131	197	423	636
	7	309	465	261	392	204	307	130	196	413	621
	8	305	458	257	387	202	303	129	195	403	605
	9	300	451	253	381	199	300	128	193	391	587
	10	295	443	249	374	197	295	127	191	378	568
	11	289	434	244	367	193	291	126	189	364	547
	12	283	425	239	359	190	286	124	187	349	525
	13	276	415	233	351	187	280	123	185	334	502
	14	269	404	228	342	183	275	121	182	319	479
	15	262	393	221	333	179	269	119	179	303	455
	16	254	382	215	323	174	262	117	176	286	431
	17	246	370	209	314	170	255	115	173	270	406
	18	238	358	202	303	164	247	113	170	254	382
	19	230	346	195	293	159	239	111	166	238	357
	20	222	333	188	283	153	230	108	163	222	334
	21	213	320	181	272	148	222	105	159	206	310
	22	205	308	174	261	142	213	103	154	191	287
	23	196	295	167	251	136	205	99.4	149	177	265
	24	188	282	160	240	130	196	95.9	144	162	244
	25	179	269	152	229	125	187	92.4	139	149	225
	26	171	256	145	218	119	179	88.8	133	138	208
	27	162	244	138	208	113	170	85.2	128	128	192
	28	154	231	131	198	108	162	81.5	122	119	179
	29	146	219	125	187	102	154	77.7	117	111	167
	30	138	207	118	177	96.8	146	73.9	111	104	156
	32	122	184	105	158	86.4	130	66.3	99.6	91.2	137
	34	108	163	92.9	140	76.5	115	58.7	88.3	80.8	121
	36	96.7	145	82.9	125	68.2	103	52.4	78.8	72.0	108
	38	86.8	130	74.4	112	61.2	92.0	47.0	70.7	64.7	97.2
	40	78.3	118	67.1	101	55.3	83.1	42.4	63.8		

Properties

	3/8	5/16	1/4[c]	3/16[c]	5/8
A_g (in.^{2})	11.8	9.92	8.03	6.06	16.4
I_x (in.^{4})	169	145	119	91.4	201
I_y (in.^{4})	120	103	84.7	65.1	89.4
r_x/r_y	1.19	1.19	1.19	1.19	1.50
r_y (in.)	3.19	3.22	3.25	3.28	2.34

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS10

Shape	HSS10×6×									
	1/2		3/8		5/16		1/4[c]		3/16[c]	
t_{design}, in.	0.465		0.349		0.291		0.233		0.174	
Wt/ft	48.7		37.6		31.8		25.8		19.7	
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	371	557	286	429	241	362	186	279	123	185
6	349	524	269	405	228	342	178	268	119	179
7	341	513	264	396	223	335	175	263	117	176
8	333	500	257	387	218	327	172	259	116	174
9	323	486	250	376	212	319	168	253	114	171
10	313	470	243	365	206	309	164	247	111	167
11	302	454	235	353	199	299	160	241	109	164
12	290	436	226	340	192	288	155	234	106	160
13	278	418	217	326	184	277	150	226	103	155
14	266	400	208	312	177	265	144	217	100	151
15	253	380	198	298	169	253	138	207	97.0	146
16	240	361	188	283	160	241	131	197	93.5	141
17	227	341	179	268	152	229	125	187	90.0	135
18	214	322	169	253	144	216	118	177	86.2	130
19	201	302	159	239	136	204	111	167	82.4	124
20	188	283	149	224	128	192	105	158	78.4	118
21	175	264	139	210	120	180	98.4	148	74.3	112
22	163	245	130	195	112	168	92.0	138	70.1	105
23	151	227	121	182	104	156	85.8	129	65.8	98.8
24	139	209	112	168	96.4	145	79.7	120	61.4	92.3
25	128	193	103	155	89.0	134	73.7	111	56.9	85.6
26	119	178	95.4	143	82.3	124	68.1	102	52.6	79.1
27	110	165	88.5	133	76.3	115	63.2	95.0	48.8	73.4
28	102	154	82.3	124	71.0	107	58.8	88.3	45.4	68.2
29	95.3	143	76.7	115	66.1	99.4	54.8	82.3	42.3	63.6
30	89.1	134	71.6	108	61.8	92.9	51.2	76.9	39.5	59.4
32	78.3	118	63.0	94.6	54.3	81.6	45.0	67.6	34.7	52.2
34	69.4	104	55.8	83.8	48.1	72.3	39.8	59.9	30.8	46.3
36	61.9	93.0	49.8	74.8	42.9	64.5	35.5	53.4	27.5	41.3
38	55.5	83.5	44.7	67.1	38.5	57.9	31.9	47.9	24.6	37.0
40			40.3	60.6	34.8	52.3	28.8	43.3	22.2	33.4

Properties

	1/2	3/8	5/16	1/4[c]	3/16[c]
A_g (in.^{2})	13.5	10.4	8.76	7.10	5.37
I_x (in.^{4})	171	137	118	96.9	74.6
I_y (in.^{4})	76.8	61.8	53.3	44.1	34.1
r_x/r_y	1.49	1.49	1.48	1.48	1.48
r_y (in.)	2.39	2.44	2.47	2.49	2.52

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	[c] Shape is slender for compression with F_y = 46 ksi. Note: Heavy line indicates Kl/r equal to or greater than 200.

HSS10–HSS9

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

F_y = 46 ksi

Shape		HSS10×5×								HSS9×7×	
		3/8		5/16		1/4[c]		3/16[c]		5/8	
t_{design}, in.		0.349		0.291		0.233		0.174		0.581	
Wt/ft		35.1		29.7		24.1		18.4		59.1	
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	266	400	225	338	173	260	114	171	451	678
	6	245	368	208	312	163	245	108	163	430	646
	7	238	358	202	303	159	240	106	160	422	634
	8	230	345	195	293	155	234	104	156	414	622
	9	221	332	188	282	151	227	102	153	404	608
	10	211	318	180	270	146	219	98.8	148	394	592
	11	201	303	171	258	140	211	95.7	144	383	576
	12	191	287	163	245	133	200	92.4	139	371	558
	13	180	271	154	231	126	190	88.9	134	359	539
	14	169	255	145	218	119	179	85.1	128	346	520
	15	159	238	136	204	112	168	81.1	122	333	500
	16	148	222	127	190	104	157	77.0	116	319	480
	17	137	206	118	177	96.9	146	72.6	109	305	459
	18	126	190	109	163	89.7	135	68.1	102	291	438
	19	116	174	99.9	150	82.7	124	63.5	95.4	277	416
	20	106	159	91.5	138	75.9	114	58.7	88.2	263	395
	21	96.1	144	83.3	125	69.3	104	53.8	80.8	249	374
	22	87.6	132	75.9	114	63.1	94.9	49.0	73.6	235	353
	23	80.1	120	69.4	104	57.8	86.8	44.8	67.4	221	332
	24	73.6	111	63.8	95.8	53.0	79.7	41.2	61.9	207	311
	25	67.8	102	58.8	88.3	48.9	73.5	37.9	57.0	194	291
	26	62.7	94.2	54.3	81.7	45.2	67.9	35.1	52.7	181	272
	27	58.1	87.4	50.4	75.7	41.9	63.0	32.5	48.9	168	253
	28	54.1	81.3	46.9	70.4	39.0	58.6	30.2	45.5	156	235
	29	50.4	75.7	43.7	65.6	36.3	54.6	28.2	42.4	146	219
	30	47.1	70.8	40.8	61.3	34.0	51.0	26.3	39.6	136	205
	32	41.4	62.2	35.9	53.9	29.8	44.8	23.2	34.8	120	180
	34	36.7	55.1	31.8	47.8	26.4	39.7	20.5	30.8	106	159
	36									94.6	142
	38									84.9	128
	40									76.6	115
Properties											
A_g (in.^{2})		9.67		8.17		6.63		5.02		16.4	
I_x (in.^{4})		120		104		85.8		66.2		174	
I_y (in.^{4})		40.6		35.2		29.3		22.7		117	
r_x/r_y		1.72		1.72		1.71		1.71		1.22	
r_y (in.)		2.05		2.07		2.10		2.13		2.68	

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS9

Shape	HSS9×7×									
	1/2		3/8		5/16		1/4[c]		3/16[c]	
t_{design}, in.	0.465		0.349		0.291		0.233		0.174	
Wt/ft	48.7		37.6		31.8		25.8		19.7	
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	371	557	286	429	241	362	195	292	129	194
6	354	532	273	410	231	347	187	281	126	189
7	348	523	269	404	227	341	184	277	125	187
8	341	513	264	396	223	335	181	272	123	185
9	334	502	258	388	218	328	177	267	122	183
10	326	489	252	379	213	321	173	261	120	181
11	317	476	246	369	208	313	169	254	118	178
12	307	462	239	359	202	304	164	247	116	174
13	298	447	231	348	196	295	160	240	113	170
14	287	432	224	336	190	285	154	232	110	166
15	277	416	216	324	183	275	149	224	107	161
16	266	400	207	312	176	265	144	216	104	157
17	255	383	199	299	169	254	138	208	101	152
18	243	366	191	286	162	244	132	199	97.7	147
19	232	349	182	273	155	233	127	190	94.2	142
20	221	331	173	260	148	222	121	182	90.5	136
21	209	314	165	247	140	211	115	173	86.8	130
22	198	297	156	235	133	200	109	164	83.0	125
23	187	280	147	222	126	190	104	156	79.1	119
24	175	264	139	209	119	179	97.8	147	75.0	113
25	165	247	131	197	112	169	92.2	139	70.8	106
26	154	232	123	185	105	158	86.8	130	66.6	100
27	144	216	115	173	98.7	148	81.4	122	62.6	94.1
28	134	201	107	161	92.2	139	76.2	114	58.7	88.2
29	125	187	99.8	150	85.9	129	71.0	107	54.7	82.2
30	116	175	93.3	140	80.3	121	66.3	99.7	51.1	76.9
32	102	154	82.0	123	70.6	106	58.3	87.6	44.9	67.5
34	90.7	136	72.6	109	62.5	93.9	51.6	77.6	39.8	59.8
36	80.9	122	64.8	97.3	55.7	83.8	46.1	69.2	35.5	53.4
38	72.6	109	58.1	87.4	50.0	75.2	41.3	62.1	31.9	47.9
40	65.5	98.5	52.5	78.8	45.2	67.9	37.3	56.1	28.8	43.2

Properties

	1/2	3/8	5/16	1/4[c]	3/16[c]
A_g (in.^{2})	13.5	10.4	8.76	7.10	5.37
I_x (in.^{4})	149	119	102	84.1	64.7
I_y (in.^{4})	100	80.4	69.2	57.2	44.1
r_x/r_y	1.22	1.21	1.21	1.21	1.21
r_y (in.)	2.73	2.78	2.81	2.84	2.87

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

[c] Shape is slender for compression with F_y = 46 ksi.

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS9

F_y = 46 ksi

Shape	HSS9×5×											
	5/8		1/2		3/8		5/16		1/4[c]		3/16[c]	
t_{design}, in.	0.581		0.465		0.349		0.291		0.233		0.174	
Wt/ft	50.6		41.9		32.5		27.6		22.4		17.1	
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	387	582	319	480	247	371	209	314	169	254	112	169
6	352	529	292	439	227	341	192	289	157	236	106	160
7	340	512	283	425	220	331	187	281	152	229	104	156
8	327	492	273	410	212	319	180	271	147	221	102	153
9	313	470	261	393	204	307	174	261	142	213	98.9	149
10	298	448	249	375	195	293	166	250	136	204	95.9	144
11	282	424	237	355	186	279	158	238	129	195	92.7	139
12	265	399	223	336	176	264	150	226	123	185	89.2	134
13	249	374	210	316	166	249	142	213	116	175	85.4	128
14	232	348	196	295	156	234	133	200	109	164	81.4	122
15	215	323	183	275	145	218	125	187	103	154	77.2	116
16	198	298	169	254	135	203	116	174	95.6	144	72.8	109
17	182	273	156	234	125	188	108	162	88.8	133	68.3	103
18	166	249	143	215	115	173	99.2	149	82.1	123	63.4	95.2
19	150	226	130	196	105	158	91.1	137	75.6	114	58.4	87.8
20	136	204	118	177	96.1	144	83.3	125	69.2	104	53.7	80.6
21	123	185	107	161	87.2	131	75.6	114	63.0	94.7	49.0	73.6
22	112	168	97.5	147	79.4	119	68.9	104	57.4	86.3	44.6	67.1
23	103	154	89.2	134	72.7	109	63.1	94.8	52.5	79.0	40.8	61.4
24	94.2	142	81.9	123	66.7	100	57.9	87.0	48.2	72.5	37.5	56.4
25	86.8	130	75.5	113	61.5	92.4	53.4	80.2	44.5	66.8	34.6	51.9
26	80.2	121	69.8	105	56.9	85.5	49.3	74.2	41.1	61.8	31.9	48.0
27	74.4	112	64.7	97.3	52.7	79.2	45.8	68.8	38.1	57.3	29.6	44.5
28	69.2	104	60.2	90.5	49.0	73.7	42.6	64.0	35.4	53.3	27.5	41.4
29	64.5	96.9	56.1	84.3	45.7	68.7	39.7	59.6	33.0	49.7	25.7	38.6
30	60.3	90.6	52.4	78.8	42.7	64.2	37.1	55.7	30.9	46.4	24.0	36.1
32	53.0	79.6	46.1	69.3	37.5	56.4	32.6	49.0	27.1	40.8	21.1	31.7
34							28.9	43.4	24.0	36.1	18.7	28.1

Properties

	5/8	1/2	3/8	5/16	1/4	3/16
A_g (in.^{2})	14.0	11.6	8.97	7.59	6.17	4.67
I_x (in.^{4})	133	115	92.5	79.8	66.1	51.1
I_y (in.^{4})	52.0	45.2	36.8	32.0	26.6	20.7
r_x/r_y	1.60	1.59	1.58	1.58	1.58	1.57
r_y (in.)	1.92	1.97	2.03	2.05	2.08	2.10

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

[c] Shape is slender for compression with F_y = 46 ksi.

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

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS8

Shape		HSS8×6×									
		5/8		1/2		3/8		5/16		1/4	
t_{design}, in.		0.581		0.465		0.349		0.291		0.233	
Wt/ft		50.6		41.9		32.5		27.6		22.4	
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	387	582	319	480	247	371	209	314	170	255
	6	362	544	299	450	232	349	197	296	160	241
	7	353	530	293	440	227	341	193	289	157	236
	8	343	516	285	428	221	333	188	282	153	230
	9	332	499	276	415	215	323	183	274	149	224
	10	321	482	267	401	208	313	177	266	144	217
	11	308	463	257	386	201	302	171	257	139	209
	12	295	444	247	371	193	290	164	247	134	202
	13	282	423	236	354	185	278	157	237	129	193
	14	268	402	225	338	177	265	150	226	123	185
	15	253	381	213	321	168	252	143	215	117	176
	16	239	359	202	303	159	239	136	204	112	168
	17	225	338	190	286	150	226	129	193	106	159
	18	210	316	179	268	142	213	121	182	99.8	150
	19	196	295	167	251	133	200	114	171	93.9	141
	20	182	274	156	234	124	187	107	161	88.1	132
	21	169	254	145	217	116	174	99.7	150	82.3	124
	22	156	234	134	201	108	162	92.8	139	76.7	115
	23	143	214	123	185	99.7	150	86.0	129	71.3	107
	24	131	197	113	170	91.7	138	79.4	119	65.9	99.1
	25	121	182	104	157	84.5	127	73.1	110	60.8	91.3
	26	112	168	96.6	145	78.2	117	67.6	102	56.2	84.4
	27	104	156	89.5	135	72.5	109	62.7	94.3	52.1	78.3
	28	96.3	145	83.3	125	67.4	101	58.3	87.6	48.4	72.8
	29	89.8	135	77.6	117	62.8	94.4	54.4	81.7	45.1	67.9
	30	83.9	126	72.5	109	58.7	88.2	50.8	76.3	42.2	63.4
	32	73.7	111	63.7	95.8	51.6	77.6	44.6	67.1	37.1	55.7
	34	65.3	98.1	56.5	84.9	45.7	68.7	39.5	59.4	32.8	49.4
	36	58.2	87.5	50.4	75.7	40.8	61.3	35.3	53.0	29.3	44.0
	38			45.2	67.9	36.6	55.0	31.7	47.6	26.3	39.5
	40							28.6	42.9	23.7	35.7

Properties

Property	5/8	1/2	3/8	5/16	1/4
A_g (in.^{2})	14.0	11.6	8.97	7.59	6.17
I_x (in.^{4})	114	98.2	79.1	68.3	56.6
I_y (in.^{4})	72.3	62.5	50.6	43.8	36.4
r_x/r_y	1.26	1.25	1.25	1.25	1.25
r_y (in.)	2.27	2.32	2.38	2.40	2.43

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	Note: Heavy line indicates *Kl/r* equal to or greater than 200.

HSS8

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

F_y = 46 ksi

Shape		HSS8×6×		HSS8×4×							
		3/16[c]		5/8		1/2		3/8		5/16	
t_{design}, in.		0.174		0.581		0.465		0.349		0.291	
Wt/ft		17.1		42.1		35.1		27.4		23.3	
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	120	180	323	485	268	403	209	314	177	266
	6	114	172	277	416	232	349	182	274	155	234
	7	113	169	262	394	221	332	174	261	148	223
	8	110	166	246	370	208	312	164	247	140	211
	9	108	163	229	344	194	292	154	232	132	198
	10	106	159	211	317	180	270	143	216	123	185
	11	103	154	193	290	165	249	133	199	114	172
	12	99.6	150	175	263	151	227	122	183	105	158
	13	96.4	145	157	236	137	205	111	167	95.9	144
	14	92.9	140	140	211	123	184	100	151	87.0	131
	15	89.2	134	124	186	109	164	89.9	135	78.3	118
	16	85.3	128	109	163	96.3	145	79.9	120	70.0	105
	17	80.9	122	96.2	145	85.3	128	70.8	106	62.0	93.2
	18	76.5	115	85.8	129	76.1	114	63.1	94.9	55.3	83.1
	19	72.1	108	77.0	116	68.3	103	56.7	85.2	49.6	74.6
	20	67.7	102	69.5	105	61.7	92.7	51.1	76.9	44.8	67.3
	21	63.4	95.3	63.1	94.8	55.9	84.1	46.4	69.7	40.6	61.1
	22	59.2	88.9	57.5	86.4	51.0	76.6	42.3	63.5	37.0	55.6
	23	55.0	82.7	52.6	79.0	46.6	70.1	38.7	58.1	33.9	50.9
	24	51.0	76.7	48.3	72.6	42.8	64.4	35.5	53.4	31.1	46.7
	25	47.1	70.7	44.5	66.9	39.5	59.3	32.7	49.2	28.7	43.1
	26	43.5	65.4			36.5	54.8	30.3	45.5	26.5	39.8
	27	40.4	60.6							24.6	36.9
	28	37.5	56.4								
	29	35.0	52.6								
	30	32.7	49.1								
	32	28.7	43.2								
	34	25.4	38.2								
	36	22.7	34.1								
	38	20.4	30.6								
	40	18.4	27.6								
Properties											
A_g (in.^{2})		4.67		11.7		9.74		7.58		6.43	
I_x (in.^{4})		43.7		82.0		71.8		58.7		51.0	
I_y (in.^{4})		28.2		26.6		23.6		19.6		17.2	
r_x/r_y		1.25		1.75		1.74		1.73		1.72	
r_y (in.)		2.46		1.51		1.56		1.61		1.63	

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS8–HSS7

Shape		HSS8×4×						HSS7×5×			
		1/4		3/16[c]		1/8[c]		1/2		3/8	
t_{design}, in.		0.233		0.174		0.116		0.465		0.349	
Wt/ft		19.0		14.5		9.85		35.1		27.4	
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	144	217	100	151	55.9	84.0	268	403	209	314
	6	127	191	91.8	138	52.1	78.3	244	367	191	287
	7	121	182	88.7	133	50.8	76.3	236	354	185	277
	8	115	173	85.3	128	49.2	74.0	226	340	178	267
	9	108	163	81.4	122	47.5	71.4	216	325	170	256
	10	101	152	77.2	116	45.6	68.5	206	309	162	244
	11	94.2	142	72.5	109	43.5	65.4	195	293	154	232
	12	86.9	131	67.1	101	41.3	62.1	183	275	145	219
	13	79.6	120	61.6	92.6	39.0	58.6	171	258	137	205
	14	72.4	109	56.2	84.4	36.5	54.8	160	240	128	192
	15	65.4	98.3	50.9	76.5	33.9	50.9	148	222	119	178
	16	58.6	88.1	45.8	68.8	31.2	46.9	136	205	110	165
	17	52.1	78.3	40.8	61.4	28.4	42.6	125	188	101	152
	18	46.5	69.8	36.4	54.7	25.5	38.3	114	171	92.6	139
	19	41.7	62.7	32.7	49.1	22.8	34.3	103	155	84.4	127
	20	37.6	56.6	29.5	44.3	20.6	31.0	92.9	140	76.4	115
	21	34.1	51.3	26.8	40.2	18.7	28.1	84.3	127	69.3	104
	22	31.1	46.8	24.4	36.7	17.0	25.6	76.8	115	63.1	94.8
	23	28.5	42.8	22.3	33.5	15.6	23.4	70.3	106	57.7	86.8
	24	26.1	39.3	20.5	30.8	14.3	21.5	64.5	97.0	53.0	79.7
	25	24.1	36.2	18.9	28.4	13.2	19.8	59.5	89.4	48.9	73.4
	26	22.3	33.5	17.5	26.2	12.2	18.3	55.0	82.7	45.2	67.9
	27	20.7	31.0	16.2	24.3	11.3	17.0	51.0	76.7	41.9	63.0
	28			15.1	22.6	10.5	15.8	47.4	71.3	39.0	58.6
	29							44.2	66.4	36.3	54.6
	30							41.3	62.1	33.9	51.0
	32									29.8	44.8

Properties

	HSS8×4×1/4	HSS8×4×3/16	HSS8×4×1/8	HSS7×5×1/2	HSS7×5×3/8
A_g (in.^{2})	5.24	3.98	2.70	9.74	7.58
I_x (in.^{4})	42.5	33.1	22.9	60.6	49.5
I_y (in.^{4})	14.4	11.3	7.90	35.6	29.3
r_x/r_y	1.72	1.71	1.70	1.30	1.30
r_y (in.)	1.66	1.69	1.71	1.91	1.97

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS7

F_y = 46 ksi

Shape		HSS7×5×								HSS7×4×	
		5/16		1/4		3/16[c]		1/8[c]		1/2	
t_{design}, in.		0.291		0.233		0.174		0.116		0.465	
Wt/ft		23.3		19.0		14.5		9.85		31.7	
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	177	266	144	217	107	161	59.0	88.7	243	365
	6	162	244	132	199	100	151	56.6	85.0	209	314
	7	157	236	128	193	97.7	147	55.7	83.7	198	298
	8	151	228	124	186	94.5	142	54.7	82.1	186	280
	9	145	218	119	179	90.8	136	53.5	80.4	174	261
	10	139	208	114	171	86.9	131	52.1	78.4	161	242
	11	132	198	108	163	82.8	124	50.7	76.1	147	221
	12	125	187	102	154	78.5	118	48.9	73.5	134	201
	13	117	176	96.5	145	74.1	111	46.9	70.5	121	182
	14	110	165	90.5	136	69.6	105	44.7	67.2	108	163
	15	102	154	84.5	127	65.1	97.8	42.5	63.8	96.0	144
	16	94.8	142	78.4	118	60.6	91.0	40.1	60.3	84.4	127
	17	87.4	131	72.5	109	56.1	84.3	37.7	56.6	74.8	112
	18	80.3	121	66.7	100	51.7	77.8	35.2	52.9	66.7	100
	19	73.3	110	61.1	91.9	47.5	71.4	32.6	49.1	59.9	90.0
	20	66.5	100	55.6	83.6	43.4	65.2	30.1	45.2	54.0	81.2
	21	60.4	90.7	50.5	75.9	39.4	59.2	27.4	41.2	49.0	73.7
	22	55.0	82.7	46.0	69.1	35.9	53.9	25.0	37.5	44.7	67.1
	23	50.3	75.6	42.1	63.2	32.8	49.3	22.8	34.3	40.9	61.4
	24	46.2	69.5	38.6	58.1	30.1	45.3	21.0	31.5	37.5	56.4
	25	42.6	64.0	35.6	53.5	27.8	41.8	19.3	29.0	34.6	52.0
	26	39.4	59.2	32.9	49.5	25.7	38.6	17.9	26.8		
	27	36.5	54.9	30.5	45.9	23.8	35.8	16.6	24.9		
	28	33.9	51.0	28.4	42.7	22.1	33.3	15.4	23.2		
	29	31.6	47.6	26.5	39.8	20.6	31.0	14.4	21.6		
	30	29.6	44.4	24.7	37.2	19.3	29.0	13.4	20.2		
	32	26.0	39.1	21.7	32.7	17.0	25.5	11.8	17.7		
	34					15.0	22.6	10.4	15.7		

Properties

	5/16	1/4	3/16	1/8	1/2
A_g (in.^{2})	6.43	5.24	3.98	2.70	8.81
I_x (in.^{4})	43.0	35.9	27.9	19.3	50.7
I_y (in.^{4})	25.5	21.3	16.6	11.6	20.7
r_x/r_y	1.30	1.30	1.29	1.29	1.56
r_y (in.)	1.99	2.02	2.05	2.07	1.53

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

F_y = 46 ksi

HSS7

Shape		HSS7×4×									
		3/8		5/16		1/4		3/16[c]		1/8[c]	
t_{design}, in.		0.349		0.291		0.233		0.174		0.116	
Wt/ft		24.9		21.2		17.3		13.3		9.00	
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	189	285	161	242	131	197	97.7	147	55.1	82.9
	6	165	248	141	212	115	173	88.1	132	50.9	76.5
	7	157	236	134	202	110	165	84.2	127	49.4	74.3
	8	148	222	127	191	104	157	79.9	120	47.7	71.8
	9	139	208	119	179	98.0	147	75.3	113	45.9	68.9
	10	129	194	111	167	91.5	138	70.4	106	43.8	65.8
	11	119	179	102	154	84.8	127	65.4	98.3	41.6	62.5
	12	109	163	94.0	141	78.0	117	60.4	90.7	39.2	58.8
	13	98.7	148	85.6	129	71.3	107	55.3	83.1	36.6	55.0
	14	88.9	134	77.4	116	64.6	97.2	50.3	75.6	34.0	51.0
	15	79.5	120	69.5	104	58.2	87.5	45.4	68.3	31.2	46.9
	16	70.4	106	61.8	92.9	52.0	78.2	40.8	61.3	28.3	42.6
	17	62.4	93.7	54.7	82.3	46.1	69.3	36.2	54.5	25.4	38.1
	18	55.6	83.6	48.8	73.4	41.1	61.8	32.3	48.6	22.6	34.0
	19	49.9	75.0	43.8	65.9	36.9	55.5	29.0	43.6	20.3	30.5
	20	45.1	67.7	39.6	59.5	33.3	50.1	26.2	39.3	18.3	27.6
	21	40.9	61.4	35.9	53.9	30.2	45.4	23.7	35.7	16.6	25.0
	22	37.2	56.0	32.7	49.1	27.5	41.4	21.6	32.5	15.2	22.8
	23	34.1	51.2	29.9	45.0	25.2	37.9	19.8	29.8	13.9	20.8
	24	31.3	47.0	27.5	41.3	23.1	34.8	18.2	27.3	12.7	19.1
	25	28.8	43.3	25.3	38.0	21.3	32.1	16.8	25.2	11.7	17.6
	26	26.7	40.1	23.4	35.2	19.7	29.6	15.5	23.3	10.8	16.3
	27					18.3	27.5	14.4	21.6	10.1	15.1
	28									9.35	14.1

Properties

	3/8	5/16	1/4	3/16	1/8
A_g (in.^{2})	6.88	5.85	4.77	3.63	2.46
I_x (in.^{4})	41.8	36.5	30.5	23.8	16.6
I_y (in.^{4})	17.3	15.2	12.8	10.00	7.03
r_x/r_y	1.56	1.55	1.55	1.54	1.54
r_y (in.)	1.58	1.61	1.64	1.66	1.69

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS6

F_y = 46 ksi

Shape		HSS6×5×											
		1/2		3/8		5/16		1/4		3/16		1/8[c]	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Wt/ft		31.7		24.9		21.2		17.3		13.3		9.00	
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	243	365	189	285	161	242	131	197	100	150	58.0	87.1
	1	242	364	189	284	161	241	131	197	99.7	150	57.9	87.0
	2	240	361	187	282	159	240	130	195	99.0	149	57.7	86.7
	3	237	356	185	278	157	237	128	193	97.8	147	57.3	86.1
	4	232	349	182	273	155	232	126	190	96.2	145	56.8	85.3
	5	226	340	177	267	151	227	123	186	94.1	141	56.1	84.3
	6	220	330	172	259	147	221	120	181	91.7	138	55.2	83.0
	7	212	318	167	250	142	214	116	175	88.8	134	54.2	81.5
	8	203	305	160	241	137	206	112	169	85.7	129	53.1	79.8
	9	194	291	153	230	131	197	108	162	82.3	124	51.8	77.8
	10	184	276	146	219	125	188	103	154	78.6	118	50.3	75.6
	11	174	261	138	207	118	178	97.4	146	74.7	112	48.6	73.1
	12	163	245	130	195	112	168	92.0	138	70.7	106	46.6	70.0
	13	152	228	122	183	105	157	86.5	130	66.6	100	44.4	66.7
	14	141	212	113	171	97.8	147	80.9	122	62.4	93.7	42.0	63.2
	15	130	196	105	158	90.9	137	75.3	113	58.2	87.4	39.6	59.5
	16	119	180	97.0	146	84.0	126	69.7	105	54.0	81.1	37.1	55.8
	17	109	164	89.0	134	77.2	116	64.3	96.6	49.9	74.9	34.5	51.8
	18	98.9	149	81.2	122	70.6	106	58.9	88.6	45.8	68.9	31.8	47.7
	19	89.1	134	73.7	111	64.3	96.6	53.8	80.8	41.9	63.0	29.1	43.8
	20	80.4	121	66.5	99.9	58.1	87.3	48.7	73.2	38.1	57.3	26.6	40.0
	21	72.9	110	60.3	90.6	52.7	79.2	44.2	66.4	34.6	52.0	24.1	36.2
	22	66.5	99.9	54.9	82.6	48.0	72.2	40.3	60.5	31.5	47.4	22.0	33.0
	23	60.8	91.4	50.3	75.6	43.9	66.0	36.9	55.4	28.8	43.3	20.1	30.2
	24	55.9	83.9	46.2	69.4	40.4	60.7	33.8	50.9	26.5	39.8	18.5	27.7
	25	51.5	77.4	42.6	64.0	37.2	55.9	31.2	46.9	24.4	36.7	17.0	25.6
	26	47.6	71.5	39.3	59.1	34.4	51.7	28.8	43.3	22.6	33.9	15.7	23.6
	27	44.1	66.3	36.5	54.8	31.9	47.9	26.7	40.2	20.9	31.4	14.6	21.9
	28	41.0	61.7	33.9	51.0	29.6	44.6	24.9	37.4	19.4	29.2	13.6	20.4
	29	38.3	57.5	31.6	47.5	27.6	41.5	23.2	34.8	18.1	27.3	12.6	19.0
	30	35.7	53.7	29.5	44.4	25.8	38.8	21.7	32.6	16.9	25.5	11.8	17.8

Properties

	1/2	3/8	5/16	1/4	3/16	1/8[c]
A_g (in.^{2})	8.81	6.88	5.85	4.77	3.63	2.46
I_x (in.^{4})	41.1	33.9	29.6	24.7	19.3	13.4
I_y (in.^{4})	30.8	25.5	22.3	18.7	14.6	10.2
r_x/r_y	1.16	1.15	1.15	1.15	1.15	1.15
r_y (in.)	1.87	1.92	1.95	1.98	2.01	2.03

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

[c] Shape is slender for compression with F_y = 46 ksi.

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS6

Shape	HSS6×4×											
	1/2		3/8		5/16		1/4		3/16		1/8[c]	
t_{design}, in.	0.465		0.349		0.291		0.233		0.174		0.116	
Wt/ft	28.3		22.3		19.1		15.6		12.0		8.15	
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	217	326	170	256	145	218	119	178	90.4	136	54.1	81.3
1	216	325	170	255	144	217	118	177	90.0	135	54.0	81.1
2	213	321	167	252	143	215	117	175	89.1	134	53.6	80.5
3	209	314	164	247	140	210	115	172	87.5	131	52.9	79.5
4	203	305	160	240	136	205	112	168	85.3	128	52.0	78.1
5	195	293	154	231	132	198	108	162	82.5	124	50.8	76.3
6	186	279	147	221	126	190	104	156	79.3	119	49.4	74.2
7	176	264	140	210	120	180	98.6	148	75.7	114	47.7	71.7
8	165	248	132	198	113	170	93.2	140	71.6	108	45.9	68.9
9	153	230	123	185	106	159	87.5	131	67.4	101	43.8	65.8
10	141	212	114	171	98.4	148	81.5	122	62.9	94.5	41.5	62.4
11	129	194	105	158	90.7	136	75.3	113	58.3	87.6	39.1	58.7
12	117	176	95.6	144	83.0	125	69.1	104	53.6	80.5	36.5	54.8
13	105	158	86.5	130	75.3	113	62.9	94.5	48.9	73.6	33.8	50.7
14	93.6	141	77.6	117	67.8	102	56.8	85.4	44.4	66.7	30.9	46.4
15	82.5	124	69.1	104	60.6	91.1	51.0	76.6	39.9	60.0	27.9	41.9
16	72.5	109	60.9	91.5	53.6	80.6	45.3	68.1	35.7	53.6	25.0	37.6
17	64.2	96.5	53.9	81.1	47.5	71.4	40.1	60.3	31.6	47.5	22.2	33.4
18	57.3	86.1	48.1	72.3	42.4	63.7	35.8	53.8	28.2	42.4	19.8	29.8
19	51.4	77.3	43.2	64.9	38.0	57.2	32.1	48.3	25.3	38.1	17.8	26.7
20	46.4	69.8	39.0	58.6	34.3	51.6	29.0	43.6	22.9	34.4	16.0	24.1
21	42.1	63.3	35.3	53.1	31.1	46.8	26.3	39.5	20.7	31.2	14.6	21.9
22	38.4	57.6	32.2	48.4	28.4	42.6	24.0	36.0	18.9	28.4	13.3	19.9
23	35.1	52.7	29.5	44.3	26.0	39.0	21.9	33.0	17.3	26.0	12.1	18.2
24	32.2	48.4	27.1	40.7	23.8	35.8	20.1	30.3	15.9	23.9	11.1	16.8
25	29.7	44.6	24.9	37.5	22.0	33.0	18.6	27.9	14.6	22.0	10.3	15.4
26					20.3	30.5	17.2	25.8	13.5	20.3	9.50	14.3
27									12.5	18.8	8.81	13.2
Properties												
A_g (in.^{2})	7.88		6.18		5.26		4.30		3.28		2.23	
I_x (in.^{4})	34.0		28.3		24.8		20.9		16.4		11.4	
I_y (in.^{4})	17.8		14.9		13.2		11.1		8.76		6.15	
r_x/r_y	1.38		1.38		1.37		1.37		1.37		1.36	
r_y (in.)	1.50		1.55		1.58		1.61		1.63		1.66	

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS6

F_y = 46 ksi

Shape		HSS6×3×											
		1/2		3/8		5/16		1/4		3/16		1/8[c]	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Wt/ft		24.9		19.7		16.9		13.9		10.7		8.15	
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	191	288	151	227	129	194	106	159	80.8	121	47.7	71.7
	1	190	285	150	225	128	192	105	158	80.3	121	47.5	71.4
	2	186	279	147	221	125	189	103	155	78.8	118	46.9	70.5
	3	178	268	142	213	121	182	99.7	150	76.4	115	46.0	69.1
	4	169	254	135	203	116	174	95.2	143	73.1	110	44.7	67.1
	5	158	237	126	190	109	163	89.8	135	69.1	104	43.0	64.6
	6	145	218	117	176	101	152	83.6	126	64.5	97.0	41.0	61.6
	7	131	197	107	160	92.4	139	76.8	115	59.5	89.4	38.7	58.1
	8	117	175	95.9	144	83.4	125	69.6	105	54.2	81.4	36.1	54.2
	9	102	154	85.0	128	74.3	112	62.3	93.7	48.7	73.2	33.2	49.9
	10	88.2	133	74.2	112	65.3	98.2	55.1	82.8	43.3	65.0	30.1	45.2
	11	75.0	113	64.0	96.1	56.6	85.1	48.0	72.2	37.9	57.0	26.7	40.1
	12	63.0	94.7	54.2	81.5	48.3	72.7	41.3	62.1	32.9	49.4	23.2	34.9
	13	53.7	80.6	46.2	69.4	41.2	61.9	35.2	52.9	28.1	42.2	20.0	30.0
	14	46.3	69.5	39.8	59.9	35.5	53.4	30.4	45.6	24.2	36.4	17.2	25.9
	15	40.3	60.6	34.7	52.2	30.9	46.5	26.5	39.8	21.1	31.7	15.0	22.5
	16	35.4	53.2	30.5	45.8	27.2	40.9	23.3	34.9	18.5	27.9	13.2	19.8
	17	31.4	47.2	27.0	40.6	24.1	36.2	20.6	31.0	16.4	24.7	11.7	17.5
	18	28.0	42.1	24.1	36.2	21.5	32.3	18.4	27.6	14.7	22.0	10.4	15.6
	19			21.6	32.5	19.3	29.0	16.5	24.8	13.2	19.8	9.34	14.0
	20							14.9	22.4	11.9	17.8	8.43	12.7
	21											7.65	11.5
Properties													
A_g (in.^{2})		6.95		5.48		4.68		3.84		2.93		2.00	
I_x (in.^{4})		26.8		22.7		20.1		17.0		13.4		9.43	
I_y (in.^{4})		8.69		7.48		6.67		5.70		4.55		3.23	
r_x/r_y		1.76		1.74		1.73		1.73		1.72		1.71	
r_y (in.)		1.12		1.17		1.19		1.22		1.25		1.27	

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS5

Shape	HSS5×4×											
	1/2		3/8		5/16		1/4		3/16		1/8[c]	
t_{design}, in.	0.465		0.349		0.291		0.233		0.174		0.116	
Wt/ft	24.9		19.7		16.9		13.9		10.7		7.30	
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	191	288	151	227	129	194	106	159	80.8	121	52.6	79.0
1	191	286	150	226	128	193	105	158	80.5	121	52.4	78.8
2	188	282	148	223	127	191	104	156	79.6	120	52.0	78.1
3	184	276	145	218	124	187	102	153	78.1	117	51.2	77.0
4	178	268	141	212	121	182	99.2	149	76.0	114	50.2	75.4
5	171	257	136	204	116	175	95.8	144	73.5	110	48.9	73.4
6	163	244	130	195	111	167	91.7	138	70.5	106	47.3	71.1
7	153	230	123	185	106	159	87.2	131	67.1	101	45.4	68.3
8	143	215	115	173	99.4	149	82.2	124	63.4	95.2	43.4	65.2
9	133	199	107	161	92.7	139	76.9	116	59.4	89.3	40.9	61.5
10	122	183	99.1	149	85.8	129	71.3	107	55.3	83.1	38.2	57.3
11	111	166	90.7	136	78.8	118	65.7	98.7	51.0	76.7	35.3	53.1
12	99.7	150	82.3	124	71.8	108	60.0	90.2	46.8	70.3	32.5	48.8
13	89.0	134	74.1	111	64.8	97.5	54.4	81.8	42.5	63.9	29.6	44.5
14	78.8	118	66.1	99.4	58.1	87.3	48.9	73.5	38.4	57.7	26.8	40.3
15	68.9	104	58.5	87.9	51.6	77.6	43.7	65.6	34.4	51.7	24.1	36.2
16	60.6	91.1	51.4	77.2	45.5	68.3	38.6	58.0	30.5	45.9	21.5	32.3
17	53.7	80.7	45.5	68.4	40.3	60.5	34.2	51.3	27.0	40.6	19.1	28.6
18	47.9	72.0	40.6	61.0	35.9	54.0	30.5	45.8	24.1	36.2	17.0	25.5
19	43.0	64.6	36.4	54.8	32.2	48.4	27.3	41.1	21.6	32.5	15.3	22.9
20	38.8	58.3	32.9	49.4	29.1	43.7	24.7	37.1	19.5	29.4	13.8	20.7
21	35.2	52.9	29.8	44.8	26.4	39.7	22.4	33.6	17.7	26.6	12.5	18.8
22	32.1	48.2	27.2	40.8	24.0	36.1	20.4	30.7	16.1	24.3	11.4	17.1
23	29.3	44.1	24.9	37.4	22.0	33.1	18.7	28.1	14.8	22.2	10.4	15.6
24	26.9	40.5	22.8	34.3	20.2	30.4	17.1	25.8	13.6	20.4	9.56	14.4
25			21.0	31.6	18.6	28.0	15.8	23.7	12.5	18.8	8.81	13.2
26							14.6	22.0	11.6	17.4	8.14	12.2
27											7.55	11.4
Properties												
A_g (in.^{2})	6.95		5.48		4.68		3.84		2.93		2.00	
I_x (in.^{4})	21.2		17.9		15.8		13.4		10.6		7.42	
I_y (in.^{4})	14.9		12.6		11.1		9.46		7.48		5.27	
r_x/r_y	1.19		1.19		1.19		1.19		1.19		1.19	
r_y (in.)	1.46		1.52		1.54		1.57		1.60		1.62	

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

HSS5

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

F_y = 46 ksi

Shape		HSS5×3×											
		1/2		3/8		5/16		1/4		3/16		1/8[c]	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Wt/ft		21.5		17.2		14.8		12.2		9.43		6.45	
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	166	249	132	198	113	170	92.9	140	71.2	107	46.2	69.4
	1	164	247	131	197	112	169	92.2	139	70.7	106	46.0	69.1
	2	160	241	128	192	110	165	90.4	136	69.4	104	45.3	68.1
	3	154	232	123	185	106	159	87.3	131	67.2	101	44.2	66.5
	4	146	219	117	176	101	151	83.3	125	64.2	96.4	42.8	64.3
	5	135	203	109	164	94.6	142	78.4	118	60.5	91.0	40.9	61.5
	6	124	186	101	152	87.5	131	72.7	109	56.3	84.7	38.6	58.1
	7	111	167	91.6	138	79.8	120	66.6	100	51.8	77.8	35.9	53.9
	8	98.6	148	82.0	123	71.7	108	60.1	90.4	47.0	70.6	32.7	49.1
	9	85.9	129	72.2	109	63.6	95.5	53.6	80.5	42.1	63.2	29.4	44.2
	10	73.6	111	62.7	94.3	55.5	83.5	47.1	70.8	37.2	55.9	26.1	39.2
	11	61.9	93.1	53.7	80.7	47.9	71.9	40.8	61.4	32.4	48.7	22.9	34.4
	12	52.0	78.2	45.3	68.0	40.6	61.0	34.9	52.4	27.9	42.0	19.8	29.8
	13	44.3	66.6	38.6	58.0	34.6	52.0	29.7	44.6	23.8	35.8	17.0	25.5
	14	38.2	57.4	33.3	50.0	29.8	44.8	25.6	38.5	20.5	30.8	14.6	22.0
	15	33.3	50.0	29.0	43.6	26.0	39.0	22.3	33.5	17.9	26.9	12.7	19.2
	16	29.3	44.0	25.5	38.3	22.8	34.3	19.6	29.5	15.7	23.6	11.2	16.8
	17	25.9	39.0	22.6	33.9	20.2	30.4	17.4	26.1	13.9	20.9	9.92	14.9
	18	23.1	34.8	20.1	30.2	18.0	27.1	15.5	23.3	12.4	18.7	8.85	13.3
	19			18.1	27.1	16.2	24.3	13.9	20.9	11.1	16.7	7.95	11.9
	20									10.1	15.1	7.17	10.8
Properties													
A_g (in.^{2})		6.02		4.78		4.10		3.37		2.58		1.77	
I_x (in.^{4})		16.4		14.1		12.6		10.7		8.53		6.03	
I_y (in.^{4})		7.18		6.25		5.60		4.81		3.85		2.75	
r_x/r_y		1.51		1.50		1.50		1.49		1.49		1.48	
r_y (in.)		1.09		1.14		1.17		1.19		1.22		1.25	

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS5–HSS4

Shape		HSS5×2$^1/_2$×						HSS4×3×					
		$^1/_4$		$^3/_{16}$		$^1/_8$^{c}		$^3/_8$		$^5/_{16}$		$^1/_4$	
t_{design}, in.		0.233		0.174		0.116		0.349		0.291		0.233	
Wt/ft		11.3		8.79		6.02		14.6		12.7		10.5	
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	86.4	130	66.4	99.8	43.0	64.6	113	169	96.9	146	80.0	120
	1	85.6	129	65.8	98.9	42.7	64.2	112	168	96.2	145	79.4	119
	2	83.1	125	64.0	96.2	41.9	63.0	109	164	94.0	141	77.7	117
	3	79.2	119	61.1	91.9	40.5	60.9	105	158	90.5	136	75.0	113
	4	74.0	111	57.3	86.1	38.6	58.0	99.2	149	85.9	129	71.3	107
	5	67.8	102	52.7	79.3	36.2	54.5	92.4	139	80.3	121	66.9	100
	6	60.9	91.6	47.6	71.6	33.2	49.9	84.7	127	73.9	111	61.8	92.8
	7	53.7	80.7	42.3	63.5	29.6	44.5	76.4	115	67.0	101	56.3	84.6
	8	46.4	69.8	36.8	55.3	25.9	39.0	67.9	102	59.8	89.9	50.5	75.9
	9	39.4	59.2	31.5	47.3	22.3	33.6	59.4	89.2	52.6	79.1	44.7	67.2
	10	32.7	49.1	26.4	39.7	18.9	28.4	51.1	76.8	45.6	68.6	39.0	58.6
	11	27.0	40.6	21.8	32.8	15.7	23.6	43.2	65.0	39.0	58.5	33.5	50.4
	12	22.7	34.1	18.4	27.6	13.2	19.9	36.3	54.6	32.8	49.3	28.4	42.6
	13	19.3	29.1	15.6	23.5	11.3	16.9	31.0	46.5	27.9	42.0	24.2	36.3
	14	16.7	25.1	13.5	20.3	9.71	14.6	26.7	40.1	24.1	36.2	20.8	31.3
	15	14.5	21.8	11.7	17.7	8.46	12.7	23.3	35.0	21.0	31.5	18.2	27.3
	16	12.8	19.2	10.3	15.5	7.43	11.2	20.4	30.7	18.4	27.7	16.0	24.0
	17			9.15	13.7	6.58	9.90	18.1	27.2	16.3	24.6	14.1	21.3
	18							16.1	24.3	14.6	21.9	12.6	19.0
	19											11.3	17.0

Properties

	HSS5×2$^1/_2$×$^1/_4$	HSS5×2$^1/_2$×$^3/_{16}$	HSS5×2$^1/_2$×$^1/_8$	HSS4×3×$^3/_8$	HSS4×3×$^5/_{16}$	HSS4×3×$^1/_4$
A_g (in.^{2})	3.14	2.41	1.65	4.09	3.52	2.91
I_x (in.^{4})	9.40	7.51	5.34	7.93	7.14	6.15
I_y (in.^{4})	3.13	2.53	1.82	5.01	4.52	3.91
r_x/r_y	1.73	1.72	1.71	1.26	1.26	1.25
r_y (in.)	0.999	1.02	1.05	1.11	1.13	1.16

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

^{c} Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

HSS4

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

F_y = 46 ksi

Shape	HSS4×3×				HSS4×2½×							
	3/16		1/8		3/8		5/16		1/4		3/16	
t_{design}, in.	0.174		0.116		0.349		0.291		0.233		0.174	
Wt/ft	8.15		5.60		13.4		11.6		9.63		7.51	
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	61.6	92.6	42.3	63.6	103	155	88.9	134	73.6	111	56.8	85.4
1	61.2	92.0	42.0	63.2	102	153	87.9	132	72.9	109	56.3	84.6
2	59.9	90.1	41.2	61.9	98.3	148	85.1	128	70.6	106	54.7	82.2
3	57.9	87.1	39.9	59.9	92.9	140	80.6	121	67.1	101	52.1	78.3
4	55.2	83.0	38.1	57.2	85.7	129	74.8	112	62.5	93.9	48.7	73.1
5	51.9	78.0	35.9	53.9	77.4	116	67.8	102	57.0	85.6	44.6	67.0
6	48.1	72.3	33.4	50.2	68.3	103	60.2	90.5	50.9	76.5	40.1	60.2
7	44.0	66.2	30.7	46.1	58.8	88.4	52.4	78.7	44.6	67.0	35.3	53.1
8	39.7	59.7	27.8	41.8	49.6	74.5	44.5	66.9	38.2	57.5	30.5	45.9
9	35.3	53.1	24.8	37.3	40.9	61.4	37.1	55.7	32.1	48.3	25.9	38.9
10	31.0	46.6	21.9	33.0	33.1	49.8	30.2	45.4	26.4	39.7	21.5	32.3
11	26.9	40.4	19.1	28.7	27.4	41.1	25.0	37.5	21.8	32.8	17.8	26.7
12	22.9	34.4	16.4	24.7	23.0	34.6	21.0	31.5	18.3	27.6	14.9	22.5
13	19.5	29.3	14.0	21.0	19.6	29.5	17.9	26.9	15.6	23.5	12.7	19.1
14	16.8	25.3	12.1	18.1	16.9	25.4	15.4	23.2	13.5	20.2	11.0	16.5
15	14.6	22.0	10.5	15.8	14.7	22.1	13.4	20.2	11.7	17.6	9.56	14.4
16	12.9	19.3	9.24	13.9					10.3	15.5	8.40	12.6
17	11.4	17.1	8.18	12.3								
18	10.2	15.3	7.30	11.0								
19	9.13	13.7	6.55	9.84								
20			5.91	8.88								

Properties

	HSS4×3×3/16	HSS4×3×1/8	HSS4×2½×3/8	HSS4×2½×5/16	HSS4×2½×1/4	HSS4×2½×3/16
A_g (in.^{2})	2.24	1.54	3.74	3.23	2.67	2.06
I_x (in.^{4})	4.93	3.52	6.77	6.13	5.32	4.30
I_y (in.^{4})	3.16	2.27	3.17	2.89	2.53	2.06
r_x/r_y	1.25	1.25	1.46	1.46	1.45	1.44
r_y (in.)	1.19	1.21	0.922	0.947	0.973	0.999

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

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

F_y = 46 ksi

Table 4–3 (continued)
Available Strength in Axial Compression, kips
Rectangular HSS

HSS4

Shape		HSS4×2½×		HSS4×2×									
		1/8		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.116		0.349		0.291		0.233		0.174		0.116	
Wt/ft		5.17		12.1		10.5		8.78		6.87		4.75	
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	39.1	58.8	93.3	140	80.8	122	67.2	101	52.0	78.2	35.9	54.0
	1	38.7	58.2	91.6	138	79.5	119	66.1	99.4	51.3	77.0	35.4	53.2
	2	37.7	56.6	86.7	130	75.5	113	63.0	94.7	49.0	73.7	33.9	51.0
	3	36.0	54.1	79.2	119	69.3	104	58.2	87.4	45.5	68.3	31.6	47.5
	4	33.7	50.7	69.7	105	61.5	92.5	52.0	78.2	40.9	61.5	28.7	43.1
	5	31.1	46.7	59.1	88.9	52.8	79.3	45.1	67.7	35.8	53.8	25.3	38.0
	6	28.1	42.2	48.4	72.8	43.8	65.8	37.8	56.8	30.4	45.6	21.6	32.5
	7	24.9	37.4	38.2	57.4	35.0	52.7	30.7	46.2	25.0	37.6	18.0	27.1
	8	21.7	32.6	29.4	44.1	27.2	40.9	24.1	36.2	19.9	30.0	14.6	22.0
	9	18.5	27.9	23.2	34.9	21.5	32.3	19.1	28.6	15.8	23.7	11.6	17.4
	10	15.6	23.4	18.8	28.2	17.4	26.1	15.4	23.2	12.8	19.2	9.38	14.1
	11	12.9	19.4	15.5	23.3	14.4	21.6	12.8	19.2	10.5	15.9	7.75	11.6
	12	10.8	16.3	13.0	19.6	12.1	18.2	10.7	16.1	8.86	13.3	6.51	9.79
	13	9.22	13.9							7.55	11.3	5.55	8.34
	14	7.95	12.0										
	15	6.93	10.4										
	16	6.09	9.15										
	17	5.39	8.11										
Properties													
A_g (in.²)		1.42		3.39		2.94		2.44		1.89		1.30	
I_x (in.⁴)		3.09		5.60		5.13		4.49		3.66		2.65	
I_y (in.⁴)		1.49		1.80		1.67		1.48		1.22		0.898	
r_x/r_y		1.44		1.76		1.75		1.74		1.73		1.72	
r_y (in.)		1.03		0.729		0.754		0.779		0.804		0.830	

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

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

Table 4–4
Available Strength in Axial Compression, kips
Square HSS

HSS16–HSS14

F_y = 46 ksi

Shape		HSS16×16×						HSS14×14×					
		1/2		3/8[c]		5/16[c]		5/8		1/2		3/8[c]	
t_{design}, in.		0.465		0.349		0.291		0.581		0.465		0.349	
Wt/ft		103		78.4		65.8		110		89.6		68.2	
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	781	1170	521	783	380	571	835	1260	678	1020	499	750
	6	774	1160	518	779	378	569	825	1240	670	1010	495	744
	7	771	1160	518	778	378	568	822	1240	668	1000	494	742
	8	769	1160	516	776	377	567	818	1230	664	998	492	740
	9	765	1150	515	774	376	566	813	1220	661	993	490	737
	10	762	1150	514	772	376	564	808	1210	657	987	488	734
	11	758	1140	512	770	375	563	803	1210	652	980	486	731
	12	754	1130	511	768	374	562	797	1200	647	973	484	727
	13	749	1130	509	765	373	560	790	1190	642	965	481	723
	14	744	1120	507	762	371	558	783	1180	637	957	478	719
	15	739	1110	505	759	370	556	776	1170	631	948	475	715
	16	733	1100	503	755	369	554	768	1150	625	939	472	710
	17	728	1090	500	752	367	552	760	1140	618	929	469	704
	18	721	1080	498	748	366	550	751	1130	611	919	465	699
	19	715	1070	495	744	364	547	742	1120	604	908	461	693
	20	708	1060	492	740	363	545	733	1100	596	896	455	684
	21	701	1050	489	735	361	542	723	1090	589	885	449	675
	22	694	1040	486	731	359	539	713	1070	581	873	443	666
	23	686	1030	483	726	357	536	702	1060	572	860	437	657
	24	679	1020	479	720	355	533	691	1040	564	847	431	647
	25	670	1010	476	715	353	530	680	1020	555	834	424	637
	26	662	995	472	709	350	527	669	1010	546	820	417	627
	27	654	983	468	704	348	523	658	988	537	807	410	617
	28	645	970	464	698	346	520	646	971	527	792	403	606
	29	636	956	460	691	343	516	634	953	518	778	396	596
	30	627	943	456	685	340	512	622	935	508	764	389	585
	32	608	915	446	671	335	503	597	897	488	734	374	562
	34	589	886	437	656	329	494	572	859	468	703	359	539
	36	570	856	426	640	323	485	546	821	447	672	343	516
	38	549	826	415	624	316	475	520	782	427	641	328	493
	40	529	795	403	606	309	464	494	743	406	610	312	469

Properties

	HSS16×16×1/2	HSS16×16×3/8	HSS16×16×5/16	HSS14×14×5/8	HSS14×14×1/2	HSS14×14×3/8
A_g (in.^{2})	28.3	21.5	18.1	30.3	24.6	18.7
$I_x = I_y$ (in.^{4})	1130	873	739	897	743	577
$r_x = r_y$ (in.^{4})	6.31	6.37	6.39	5.44	5.49	5.55

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

[c] Shape is slender for compression with F_y = 46 ksi.

F_y = 46 ksi

Table 4–4 (continued)
Available Strength in Axial Compression, kips
Square HSS

HSS14–HSS12

Shape		HSS14×14×		HSS12×12×									
		5/16[c]		5/8		1/2		3/8		5/16[c]		1/4[c]	
t_{design}, in.		0.291		0.581		0.465		0.349		0.291		0.233	
Wt/ft		57.3		93.1		75.9		58.0		48.8		39.4	
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	
Effective length KL (ft) with respect to least radius of gyration r_y	0	367	552	707	1060	576	865	439	660	350	526	240	
	6	365	549	696	1050	567	852	433	650	347	521	238	
	7	364	547	691	1040	563	847	430	647	345	519	237	
	8	363	546	687	1030	560	841	427	642	344	517	236	
	9	362	544	682	1020	555	835	424	638	342	515	236	
	10	361	543	676	1020	551	828	421	632	341	512	235	
	11	360	541	669	1010	546	820	417	627	339	509	233	
	12	358	538	662	995	540	812	413	621	336	505	232	
	13	357	536	655	984	534	803	408	614	334	502	231	
	14	355	534	647	972	528	793	404	607	331	498	230	
	15	353	531	638	960	521	783	399	599	328	494	228	
	16	351	528	630	946	514	772	393	591	325	489	226	
	17	349	525	620	932	506	761	388	583	322	484	225	
	18	347	521	610	917	499	750	382	574	319	479	223	
	19	344	518	600	902	491	737	376	565	315	474	221	
	20	342	514	590	886	482	725	370	555	311	468	219	
	21	339	510	579	870	474	712	363	546	306	460	217	
	22	337	506	568	853	465	698	356	536	300	451	214	
	23	334	502	556	836	455	685	350	525	295	443	212	
	24	331	497	544	818	446	670	342	515	289	434	209	
	25	328	492	533	800	436	656	335	504	283	425	207	
	26	324	487	520	782	427	641	328	493	277	416	204	
	27	321	482	508	763	417	626	321	482	271	407	201	
	28	317	477	495	745	407	611	313	470	264	397	198	
	29	314	471	483	726	397	596	305	459	258	388	195	
	30	310	465	470	706	386	581	298	447	251	378	192	
	32	302	453	444	668	366	550	282	424	238	358	185	
	34	293	440	419	629	345	519	267	401	225	339	177	
	36	284	426	393	590	324	487	251	377	212	319	170	
	38	274	411	367	552	304	456	235	354	199	300	161	
	40	263	396	342	514	283	426	220	331	186	280	152	

Properties

	HSS14×14×5/16	HSS12×12×5/8	HSS12×12×1/2	HSS12×12×3/8	HSS12×12×5/16	HSS12×12×1/4
A_g (in.^{2})	15.7	25.7	20.9	16.0	13.4	10.8
$I_x = I_y$ (in.^{4})	490	548	457	357	304	248
$r_x = r_y$ (in.^{4})	5.58	4.62	4.68	4.73	4.76	4.79

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

[c] Shape is slender for compression with F_y = 46 ksi.

Table 4–4 (continued)
Available Strength in Axial Compression, kips
Square HSS

HSS12–HSS10

F_y = 46 ksi

Shape	HSS12×12×		HSS10×10×									
	3/16[c]		5/8		1/2		3/8		5/16		1/4[c]	
t_{design}, in.	0.174		0.581		0.465		0.349		0.291		0.233	
Wt/ft	29.8		76.1		62.3		47.8		40.3		32.6	
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	142	214	579	870	473	711	362	545	305	459	228	342
6	141	212	565	850	462	695	354	533	299	449	224	337
7	141	212	560	842	458	689	351	528	296	445	223	336
8	141	211	555	834	454	682	348	523	293	441	222	334
9	140	211	548	824	449	675	344	518	290	436	221	331
10	140	210	542	814	443	666	340	511	287	431	219	329
11	139	209	534	803	437	657	336	505	283	426	217	326
12	139	209	526	790	431	648	331	497	279	419	215	323
13	138	208	517	777	424	637	326	490	275	413	213	320
14	138	207	508	763	417	626	320	481	270	406	211	316
15	137	206	498	749	409	614	314	473	265	399	208	313
16	136	205	488	733	401	602	308	463	260	391	205	309
17	136	204	477	717	392	589	302	454	255	383	202	304
18	135	202	466	701	383	576	295	444	250	375	199	300
19	134	201	455	683	374	562	289	434	244	366	196	295
20	133	200	443	666	365	548	282	423	238	358	193	289
21	132	198	431	648	355	534	274	412	232	349	188	283
22	131	197	419	629	345	519	267	401	226	339	183	276
23	130	195	406	611	335	504	260	390	220	330	178	268
24	129	194	394	592	325	489	252	379	213	321	173	261
25	128	192	381	573	315	474	244	367	207	311	168	253
26	127	190	368	554	305	458	236	355	200	301	163	245
27	125	188	355	534	295	443	229	344	194	291	158	237
28	124	186	343	515	284	427	221	332	187	282	153	229
29	123	184	330	496	274	412	213	320	181	272	147	221
30	121	182	317	476	264	396	205	309	174	262	142	214
32	118	178	292	439	243	366	190	285	161	242	132	198
34	115	173	267	401	223	335	175	262	149	223	121	182
36	111	167	243	366	204	306	160	240	136	205	111	167
38	108	162	220	331	185	278	146	219	124	187	102	153
40	104	156	198	298	167	251	132	198	112	169	92.2	139
Properties												
A_g (in.^{2})	8.15		21.0		17.2		13.2		11.1		8.96	
$I_x = I_y$ (in.^{4})	189		304		256		202		172		141	
$r_x = r_y$ (in.^{4})	4.82		3.80		3.86		3.92		3.94		3.97	

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

[c] Shape is slender for compression with F_y = 46 ksi.

F_y = 46 ksi

Table 4-4 (continued)
Available Strength in Axial Compression, kips
Square HSS

HSS10–HSS9

Shape		HSS10×10×		HSS9×9×									
		3/16[c]		5/8		1/2		3/8		5/16		1/4[c]	
t_{design}, in.		0.174		0.581		0.465		0.349		0.291		0.233	
Wt/ft		24.7		67.6		55.5		42.7		36.0		29.2	
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	137	206	515	774	422	634	324	487	273	411	219	330
	6	136	204	500	751	410	616	315	473	266	399	215	323
	7	135	203	494	743	405	609	312	469	263	395	213	320
	8	135	203	488	734	401	602	308	463	260	391	211	317
	9	134	202	481	723	395	594	304	457	257	386	208	313
	10	133	200	473	712	389	585	299	450	253	380	205	308
	11	133	199	465	699	382	575	295	443	249	374	202	303
	12	132	198	456	686	375	564	289	435	244	367	198	298
	13	131	196	447	672	368	553	284	426	240	360	194	292
	14	130	195	437	657	360	541	278	417	235	353	190	286
	15	129	193	426	641	351	528	271	408	230	345	186	280
	16	127	191	415	624	343	515	265	398	224	337	182	273
	17	126	189	404	607	334	501	258	388	218	328	177	267
	18	125	187	392	590	324	487	251	377	213	319	173	260
	19	123	185	380	572	315	473	244	367	207	310	168	252
	20	122	183	368	553	305	458	236	355	200	301	163	245
	21	120	180	356	534	295	443	229	344	194	292	158	237
	22	118	178	343	515	285	428	221	333	188	282	153	230
	23	117	175	330	496	274	413	214	321	181	273	148	222
	24	115	172	317	477	264	397	206	309	175	263	143	214
	25	113	169	305	458	254	382	198	298	168	253	137	206
	26	111	166	292	439	244	366	190	286	162	243	132	199
	27	108	163	279	420	233	351	183	274	155	233	127	191
	28	106	159	267	401	223	335	175	263	149	224	122	183
	29	104	156	254	382	213	320	167	251	142	214	116	175
	30	101	152	242	363	203	305	160	240	136	204	111	167
	32	96.0	144	218	327	184	276	145	217	124	186	101	152
	34	90.3	136	195	293	165	248	130	196	112	168	91.6	138
	36	84.2	127	174	261	147	221	117	175	99.9	150	82.1	123
	38	77.7	117	156	234	132	198	105	157	89.6	135	73.7	111
	40	70.6	106	141	211	119	179	94.4	142	80.9	122	66.5	100

Properties

	HSS10×10×3/16	HSS9×9×5/8	HSS9×9×1/2	HSS9×9×3/8	HSS9×9×5/16	HSS9×9×1/4
A_g (in.^{2})	6.76	18.7	15.3	11.8	9.92	8.03
$I_x = I_y$ (in.^{4})	108	216	183	145	124	102
$r_x = r_y$ (in.^{4})	4.00	3.40	3.45	3.51	3.54	3.56

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

[c] Shape is slender for compression with F_y = 46 ksi.

Table 4–4 (continued)
Available Strength in Axial Compression, kips
Square HSS

HSS9–HSS8

F_y = 46 ksi

Shape		HSS9×9×				HSS8×8×							
		3/16[c]		1/8[c]		5/8		1/2		3/8		5/16	
t_{design}, in.		0.174		0.116		0.581		0.465		0.349		0.291	
Wt/ft		22.2		15.0		59.1		48.7		37.6		31.8	
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	134	201	64.3	96.7	451	678	371	557	286	429	241	362
	6	132	198	63.8	95.8	434	652	357	537	275	414	233	350
	7	131	197	63.6	95.5	428	643	352	529	272	409	230	345
	8	131	196	63.3	95.2	421	632	347	521	268	402	226	340
	9	130	195	63.0	94.8	413	621	341	512	263	396	223	335
	10	129	193	62.7	94.3	405	608	334	502	258	388	218	328
	11	128	192	62.4	93.8	395	594	327	491	253	380	214	322
	12	126	190	62.0	93.2	386	580	319	479	247	371	209	314
	13	125	188	61.6	92.6	375	564	311	467	241	362	204	307
	14	124	186	61.2	91.9	365	548	302	454	234	352	199	299
	15	122	184	60.7	91.2	353	531	293	440	228	342	193	290
	16	121	181	60.2	90.5	342	513	284	426	221	332	187	281
	17	119	179	59.6	89.6	330	495	274	412	213	321	181	272
	18	117	176	59.1	88.8	317	477	264	397	206	310	175	263
	19	115	173	58.4	87.8	305	458	254	382	198	298	169	253
	20	113	170	57.8	86.8	292	439	244	367	191	287	162	244
	21	111	166	57.1	85.8	279	420	234	351	183	275	156	234
	22	108	163	56.4	84.7	267	401	223	336	175	263	149	224
	23	106	159	55.6	83.5	254	382	213	320	168	252	143	215
	24	103	155	54.8	82.3	241	363	203	305	160	240	136	205
	25	101	151	53.9	81.0	229	344	193	290	152	229	130	195
	26	97.8	147	53.0	79.7	216	325	183	275	144	217	123	186
	27	94.8	143	52.1	78.3	204	307	173	260	137	206	117	176
	28	91.7	138	51.1	76.8	193	289	163	245	130	195	111	167
	29	88.5	133	50.1	75.2	181	272	154	231	122	184	105	158
	30	85.0	128	49.0	73.6	169	255	145	217	115	173	98.9	149
	32	77.4	116	46.7	70.1	149	224	127	191	102	153	87.3	131
	34	70.1	105	44.1	66.3	132	198	113	169	89.9	135	77.3	116
	36	63.0	94.7	41.4	62.2	118	177	100	151	80.2	121	69.0	104
	38	56.5	85.0	38.3	57.6	106	159	90.1	135	72.0	108	61.9	93.0
	40	51.0	76.7	34.9	52.5	95.3	143	81.3	122	65.0	97.6	55.9	83.9

Properties

	3/16	1/8	5/8	1/2	3/8	5/16
A_g (in.^{2})	6.06	4.09	16.4	13.5	10.4	8.76
$I_x = I_y$ (in.^{4})	78.2	53.5	146	125	100	85.6
$r_x = r_y$ (in.^{4})	3.59	3.62	2.99	3.04	3.10	3.13

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

[c] Shape is slender for compression with F_y = 46 ksi.

F_y = 46 ksi

Table 4-4 (continued)
Available Strength in Axial Compression, kips
Square HSS

HSS8–HSS7

Shape		HSS8×8×						HSS7×7×					
		1/4		3/16[c]		1/8[c]		5/8		1/2		3/8	
t_{design}, in.		0.233		0.174		0.116		0.581		0.465		0.349	
Wt/ft		25.8		19.6		13.3		50.6		41.9		32.5	
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	
Effective length KL (ft) with respect to least radius of gyration r_y	0	196	294	130	195	63.1	94.9	387	582	319	480	247	
	6	189	284	127	191	62.3	93.7	367	552	304	457	235	
	7	186	280	126	190	62.0	93.2	360	542	298	448	231	
	8	184	276	125	188	61.7	92.7	353	530	292	439	227	
	9	181	272	124	186	61.3	92.2	344	517	285	429	222	
	10	177	267	122	184	60.9	91.5	334	503	278	418	216	
	11	174	261	121	182	60.4	90.8	324	488	270	406	210	
	12	170	255	119	179	59.9	90.0	314	472	261	393	204	
	13	166	249	117	177	59.3	89.1	303	455	252	379	197	
	14	162	243	115	174	58.7	88.2	291	437	243	365	190	
	15	157	236	113	170	58.0	87.2	279	419	233	351	183	
	16	152	229	111	167	57.3	86.1	266	401	224	336	175	
	17	148	222	109	163	56.5	84.9	254	382	213	321	168	
	18	143	214	106	159	55.7	83.7	241	363	203	306	160	
	19	138	207	103	155	54.8	82.3	229	344	193	290	152	
	20	132	199	100	151	53.8	80.9	216	325	183	275	145	
	21	127	191	97.0	146	52.8	79.4	204	306	173	260	137	
	22	122	184	93.1	140	51.8	77.8	191	287	163	244	129	
	23	117	176	89.2	134	50.7	76.2	179	269	153	230	122	
	24	112	168	85.3	128	49.5	74.4	167	251	143	215	114	
	25	106	160	81.4	122	48.3	72.5	156	234	134	201	107	
	26	101	152	77.5	116	47.0	70.6	144	217	124	187	100	
	27	96.2	145	73.7	111	45.6	68.5	134	201	115	173	93.0	
	28	91.2	137	69.9	105	44.1	66.3	124	187	107	161	86.5	
	29	86.3	130	66.2	99.5	42.6	64.1	116	174	99.9	150	80.6	
	30	81.4	122	62.6	94.0	41.0	61.7	108	163	93.4	140	75.3	
	32	72.0	108	55.5	83.3	37.6	56.5	95.2	143	82.1	123	66.2	
	34	63.8	95.9	49.1	73.8	33.7	50.7	84.3	127	72.7	109	58.7	
	36	56.9	85.5	43.8	65.9	30.1	45.2	75.2	113	64.8	97.5	52.3	
	38	51.1	76.8	39.3	59.1	27.0	40.6	67.5	101	58.2	87.5	47.0	
	40	46.1	69.3	35.5	53.3	24.4	36.6	60.9	91.6	52.5	78.9	42.4	

Properties

	HSS8×8×1/4	HSS8×8×3/16	HSS8×8×1/8	HSS7×7×5/8	HSS7×7×1/2	HSS7×7×3/8
A_g (in.^{2})	7.10	5.37	3.62	14.0	11.6	8.97
$I_x = I_y$ (in.^{4})	70.7	54.4	37.4	93.4	80.5	65.0
$r_x = r_y$ (in.^{4})	3.15	3.18	3.21	2.58	2.63	2.69

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

[c] Shape is slender for compression with F_y = 46 ksi.

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

Square HSS

HSS7–HSS6

F_y = 46 ksi

Shape		HSS7×7×								HSS6×6×			
		5/16		1/4		3/16[c]		1/8[c]		5/8		1/2	
t_{design}, in.		0.291		0.233		0.174		0.116		0.581		0.465	
Wt/ft		27.5		22.4		17.1		11.6		42.1		35.1	
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	209	314	170	255	124	187	61.6	92.6	323	485	268	403
	6	199	300	162	244	120	181	60.4	90.8	300	451	250	376
	7	196	295	160	240	119	179	60.0	90.1	292	439	244	366
	8	192	289	156	235	118	177	59.5	89.4	283	426	237	356
	9	188	283	153	230	116	174	58.9	88.5	273	411	229	344
	10	183	276	149	225	114	171	58.3	87.6	263	395	221	332
	11	178	268	145	219	111	166	57.6	86.5	252	378	212	318
	12	173	260	141	212	107	161	56.8	85.3	240	361	202	304
	13	168	252	137	206	104	156	55.9	84.0	228	343	193	290
	14	162	243	132	199	101	151	55.0	82.6	216	324	183	275
	15	156	234	127	191	97.0	146	54.0	81.1	203	306	173	260
	16	150	225	122	184	93.3	140	52.9	79.5	191	287	163	244
	17	143	215	117	176	89.5	134	51.7	77.8	178	268	152	229
	18	137	206	112	168	85.6	129	50.5	75.9	166	249	142	214
	19	130	196	107	161	81.7	123	49.2	73.9	154	231	132	199
	20	124	186	102	153	77.8	117	47.8	71.8	142	213	123	184
	21	117	176	96.4	145	73.9	111	46.3	69.5	130	196	113	170
	22	111	167	91.2	137	70.0	105	44.7	67.2	119	179	104	156
	23	105	157	86.1	129	66.2	99.4	43.0	64.6	109	164	95.2	143
	24	98.3	148	81.1	122	62.4	93.7	41.2	61.9	100	150	87.5	131
	25	92.2	139	76.1	114	58.6	88.1	39.3	59.1	92.2	139	80.6	121
	26	86.2	130	71.3	107	55.0	82.7	37.4	56.1	85.2	128	74.5	112
	27	80.3	121	66.6	100	51.4	77.3	35.3	53.0	79.0	119	69.1	104
	28	74.7	112	61.9	93.1	47.9	72.0	33.0	49.7	73.5	110	64.3	96.6
	29	69.6	105	57.7	86.8	44.7	67.1	30.8	46.3	68.5	103	59.9	90.0
	30	65.1	97.8	54.0	81.1	41.7	62.7	28.8	43.3	64.0	96.2	56.0	84.1
	32	57.2	86.0	47.4	71.3	36.7	55.1	25.3	38.0	56.3	84.6	49.2	73.9
	34	50.7	76.2	42.0	63.1	32.5	48.8	22.4	33.7	49.8	74.9	43.6	65.5
	36	45.2	67.9	37.5	56.3	29.0	43.6	20.0	30.0	44.5	66.8	38.9	58.4
	38	40.6	61.0	33.6	50.5	26.0	39.1	17.9	27.0				
	40	36.6	55.0	30.4	45.6	23.5	35.3	16.2	24.3				

Properties

	5/16	1/4	3/16[c]	1/8[c]	5/8	1/2
A_g (in.^{2})	7.59	6.17	4.67	3.16	11.7	9.74
$I_x = I_y$ (in.^{4})	56.1	46.5	36.0	24.8	55.2	48.3
$r_x = r_y$ (in.^{4})	2.72	2.75	2.77	2.80	2.17	2.23

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

[c] Shape is slender for compression with F_y = 46 ksi.

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

F_y = 46 ksi

Table 4–4 (continued)
Available Strength in Axial Compression, kips
Square HSS

HSS6

Shape		HSS6×6× 3/8		HSS6×6× 5/16		HSS6×6× 1/4		HSS6×6× 3/16		HSS6×6× 1/8[c]	
t_{design}, in.		0.349		0.291		0.233		0.174		0.116	
Wt/ft		27.4		23.3		19.0		14.5		9.85	
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	209	314	177	266	144	217	110	165	59.5	89.4
	6	195	293	166	249	135	203	103	155	57.6	86.6
	7	190	286	162	243	132	199	101	151	57.0	85.6
	8	185	278	158	237	129	193	98.1	147	56.2	84.4
	9	179	270	153	230	125	188	95.2	143	55.3	83.1
	10	173	260	148	222	121	182	92.1	138	54.3	81.6
	11	167	250	142	214	116	175	88.9	134	53.2	80.0
	12	160	240	136	205	112	168	85.4	128	52.0	78.1
	13	152	229	130	196	107	161	81.8	123	50.6	76.1
	14	145	218	124	186	102	153	78.0	117	49.2	73.9
	15	137	206	118	177	96.8	145	74.2	112	47.6	71.6
	16	130	195	111	167	91.6	138	70.4	106	45.9	69.0
	17	122	183	105	157	86.4	130	66.5	99.9	44.1	66.3
	18	114	172	98.3	148	81.2	122	62.5	94.0	42.1	63.3
	19	107	160	91.9	138	76.1	114	58.7	88.2	40.1	60.2
	20	99.2	149	85.7	129	71.0	107	54.8	82.4	37.8	56.8
	21	91.9	138	79.5	120	66.0	99.2	51.1	76.8	35.2	53.0
	22	84.8	128	73.6	111	61.2	91.9	47.4	71.3	32.8	49.3
	23	77.9	117	67.7	102	56.5	84.9	43.9	65.9	30.4	45.7
	24	71.5	107	62.2	93.4	51.9	78.0	40.4	60.7	28.0	42.1
	25	65.9	99.1	57.3	86.1	47.8	71.8	37.2	55.9	25.8	38.8
	26	60.9	91.6	53.0	79.6	44.2	66.4	34.4	51.7	23.9	35.9
	27	56.5	84.9	49.1	73.8	41.0	61.6	31.9	47.9	22.1	33.3
	28	52.5	79.0	45.7	68.7	38.1	57.3	29.7	44.6	20.6	30.9
	29	49.0	73.6	42.6	64.0	35.5	53.4	27.6	41.6	19.2	28.8
	30	45.8	68.8	39.8	59.8	33.2	49.9	25.8	38.8	17.9	26.9
	32	40.2	60.5	35.0	52.6	29.2	43.9	22.7	34.1	15.8	23.7
	34	35.6	53.6	31.0	46.6	25.8	38.8	20.1	30.2	14.0	21.0
	36	31.8	47.8	27.6	41.5	23.1	34.6	17.9	27.0	12.4	18.7
	38	28.5	42.9	24.8	37.3	20.7	31.1	16.1	24.2	11.2	16.8

Properties

	3/8	5/16	1/4	3/16	1/8[c]
A_g (in.^{2})	7.58	6.43	5.24	3.98	2.70
$I_x = I_y$ (in.^{4})	39.5	34.3	28.6	22.3	15.5
$r_x = r_y$ (in.^{4})	2.28	2.31	2.34	2.37	2.39

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

[c] Shape is slender for compression with F_y = 46 ksi.

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

F_y = 46 ksi

HSS5½–HSS5

Square HSS

Shape		HSS5½×5½×										HSS5×5×	
		3/8		5/16		1/4		3/16		1/8[c]		1/2	
t_{design}, in.		0.349		0.291		0.233		0.174		0.116		0.465	
Wt/ft		24.9		21.2		17.3		13.2		9.00		28.3	
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	189	285	161	242	131	197	100	150	58.1	87.4	217	326
	1	189	284	161	241	131	197	99.8	150	58.1	87.3	216	325
	2	188	282	160	240	130	196	99.1	149	57.9	87.0	214	322
	3	186	279	158	237	129	194	98.1	147	57.5	86.5	211	318
	4	183	275	155	234	127	191	96.7	145	57.1	85.8	207	311
	5	179	269	152	229	125	187	94.9	143	56.5	84.9	202	303
	6	175	263	149	224	122	183	92.8	139	55.8	83.8	195	293
	7	170	255	145	217	118	178	90.3	136	54.9	82.5	188	283
	8	164	247	140	210	115	172	87.5	132	53.9	81.0	180	270
	9	158	237	135	203	111	166	84.5	127	52.8	79.3	171	257
	10	151	228	129	195	106	160	81.3	122	51.5	77.4	162	243
	11	144	217	124	186	102	153	77.8	117	50.1	75.3	152	229
	12	137	206	118	177	96.7	145	74.2	111	48.5	72.9	142	214
	13	130	195	111	167	91.7	138	70.4	106	46.8	70.4	132	199
	14	122	183	105	158	86.6	130	66.6	100	45.0	67.6	122	184
	15	114	172	98.5	148	81.4	122	62.7	94.3	42.9	64.5	112	169
	16	107	160	92.1	138	76.2	115	58.8	88.4	40.5	60.8	102	154
	17	99.1	149	85.7	129	71.0	107	54.9	82.6	37.9	56.9	93.0	140
	18	91.6	138	79.4	119	65.9	99.1	51.1	76.8	35.3	53.0	83.8	126
	19	84.3	127	73.2	110	61.0	91.6	47.3	71.1	32.7	49.2	75.2	113
	20	77.2	116	67.2	101	56.1	84.3	43.6	65.6	30.3	45.5	67.9	102
	21	70.3	106	61.4	92.2	51.4	77.3	40.1	60.3	27.9	41.9	61.6	92.6
	22	64.0	96.3	55.9	84.0	46.8	70.4	36.6	55.0	25.5	38.3	56.1	84.3
	23	58.6	88.1	51.2	76.9	42.9	64.4	33.5	50.3	23.3	35.0	51.3	77.2
	24	53.8	80.9	47.0	70.6	39.4	59.2	30.8	46.2	21.4	32.2	47.2	70.9
	25	49.6	74.5	43.3	65.1	36.3	54.5	28.3	42.6	19.7	29.7	43.5	65.3
	26	45.9	68.9	40.0	60.2	33.5	50.4	26.2	39.4	18.2	27.4	40.2	60.4
	27	42.5	63.9	37.1	55.8	31.1	46.7	24.3	36.5	16.9	25.4	37.3	56.0
	28	39.5	59.4	34.5	51.9	28.9	43.5	22.6	34.0	15.7	23.6	34.6	52.1
	29	36.9	55.4	32.2	48.4	27.0	40.5	21.1	31.7	14.7	22.0	32.3	48.5
	30	34.4	51.8	30.1	45.2	25.2	37.9	19.7	29.6	13.7	20.6	30.2	45.4

Properties

Property	3/8	5/16	1/4	3/16	1/8[c]	HSS5×5×1/2
A_g (in.^{2})	6.88	5.85	4.77	3.63	2.46	7.88
$I_x = I_y$ (in.^{4})	29.7	25.9	21.7	17.0	11.8	26.0
$r_x = r_y$ (in.^{4})	2.08	2.11	2.13	2.16	2.19	1.82

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

[c] Shape is slender for compression with $F_y = 46$ ksi.

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

F_y = 46 ksi

Table 4–4 (continued)
Available Strength in Axial Compression, kips
Square HSS

HSS5–HSS4½

Shape	HSS5×5×										HSS4½×4½×	
	3/8		5/16		1/4		3/16		1/8[c]		1/2	
t_{design}, in.	0.349		0.291		0.233		0.174		0.116		0.465	
Wt/ft	22.3		19.0		15.6		12.0		8.15		24.9	
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	170	256	145	218	119	178	90.4	136	56.5	84.9	191	288
1	170	255	145	217	118	178	90.1	135	56.4	84.8	191	287
2	168	253	143	216	117	176	89.5	134	56.1	84.4	189	283
3	166	250	142	213	116	174	88.3	133	55.7	83.7	185	278
4	163	245	139	209	114	171	86.8	130	55.1	82.8	180	271
5	159	239	136	204	111	167	84.8	128	54.3	81.7	174	262
6	154	232	132	198	108	162	82.5	124	53.4	80.3	167	252
7	149	223	127	191	104	157	79.9	120	52.3	78.6	159	240
8	143	214	122	184	100	151	76.9	116	51.0	76.6	151	227
9	136	205	117	175	96.0	144	73.7	111	49.5	74.4	142	213
10	129	194	111	167	91.4	137	70.2	106	47.8	71.9	132	198
11	122	183	105	158	86.5	130	66.6	100	45.7	68.6	122	183
12	114	172	98.6	148	81.5	122	62.8	94.4	43.2	64.9	112	168
13	107	160	92.2	139	76.4	115	59.0	88.6	40.6	61.0	102	153
14	99.1	149	85.8	129	71.2	107	55.1	82.8	38.0	57.1	92.3	139
15	91.5	138	79.4	119	66.0	99.2	51.2	76.9	35.4	53.2	82.8	124
16	84.0	126	73.0	110	60.9	91.5	47.3	71.1	32.8	49.3	73.7	111
17	76.7	115	66.9	100	55.9	84.0	43.6	65.5	30.2	45.4	65.3	98.1
18	69.6	105	60.9	91.5	51.0	76.7	39.9	59.9	27.7	41.7	58.2	87.5
19	62.7	94.3	55.0	82.7	46.4	69.7	36.3	54.6	25.3	38.1	52.3	78.6
20	56.6	85.1	49.7	74.7	41.8	62.9	32.8	49.3	23.0	34.5	47.2	70.9
21	51.4	77.2	45.1	67.7	37.9	57.0	29.8	44.8	20.8	31.3	42.8	64.3
22	46.8	70.3	41.1	61.7	34.6	51.9	27.1	40.8	19.0	28.5	39.0	58.6
23	42.8	64.3	37.6	56.5	31.6	47.5	24.8	37.3	17.4	26.1	35.7	53.6
24	39.3	59.1	34.5	51.9	29.0	43.7	22.8	34.3	16.0	24.0	32.8	49.2
25	36.2	54.5	31.8	47.8	26.8	40.2	21.0	31.6	14.7	22.1	30.2	45.4
26	33.5	50.4	29.4	44.2	24.7	37.2	19.4	29.2	13.6	20.4	27.9	42.0
27	31.1	46.7	27.3	41.0	22.9	34.5	18.0	27.1	12.6	18.9		
28	28.9	43.4	25.3	38.1	21.3	32.1	16.8	25.2	11.7	17.6		
29	26.9	40.5	23.6	35.5	19.9	29.9	15.6	23.5	10.9	16.4		
40	25.2	37.8	22.1	33.2	18.6	27.9	14.6	21.9	10.2	15.3		
Properties												
A_g (in.^{2})	6.18		5.26		4.30		3.28		2.23		6.95	
$I_x = I_y$ (in.^{4})	21.7		19.0		16.0		12.6		8.80		18.1	
$r_x = r_y$ (in.^{4})	1.87		1.90		1.93		1.96		1.99		1.61	

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

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

HSS4½–HSS4

Square HSS

F_y = 46 ksi

Shape		HSS4½×4½×										HSS4×4×	
		3/8		5/16		1/4		3/16		1/8[c]		1/2	
t_{design}, in.		0.349		0.291		0.233		0.174		0.116		0.465	
Wt/ft		19.7		16.9		13.9		10.7		7.30		21.5	
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	151	227	129	194	106	159	80.8	121	54.4	81.8	166	249
	1	150	226	129	193	105	158	80.5	121	54.3	81.6	165	248
	2	149	224	127	191	104	157	79.8	120	54.0	81.1	163	244
	3	146	220	125	188	103	154	78.5	118	53.4	80.3	159	238
	4	143	215	122	184	100	151	76.8	115	52.5	78.8	153	230
	5	138	208	119	178	97.4	146	74.7	112	51.0	76.7	147	221
	6	133	200	114	172	94.0	141	72.1	108	49.3	74.2	139	209
	7	127	191	109	164	90.1	135	69.2	104	47.4	71.3	131	196
	8	121	182	104	156	85.8	129	66.0	99.3	45.3	68.1	121	182
	9	114	171	98.2	148	81.2	122	62.6	94.1	43.0	64.7	112	168
	10	107	160	92.1	138	76.3	115	59.0	88.6	40.6	61.0	102	153
	11	99.1	149	85.9	129	71.3	107	55.2	83.0	38.1	57.2	91.8	138
	12	91.5	138	79.5	119	66.2	99.4	51.3	77.2	35.5	53.3	82.1	123
	13	83.9	126	73.1	110	61.0	91.7	47.5	71.3	32.9	49.4	72.6	109
	14	76.4	115	66.7	100	55.9	84.0	43.6	65.5	30.3	45.5	63.6	95.6
	15	69.1	104	60.5	91.0	50.8	76.4	39.8	59.8	27.7	41.7	55.4	83.3
	16	62.0	93.2	54.5	82.0	46.0	69.1	36.1	54.2	25.2	37.9	48.7	73.2
	17	55.2	82.9	48.7	73.2	41.3	62.0	32.5	48.9	22.8	34.3	43.1	64.8
	18	49.2	74.0	43.5	65.3	36.8	55.3	29.1	43.7	20.5	30.7	38.5	57.8
	19	44.2	66.4	39.0	58.6	33.0	49.7	26.1	39.2	18.4	27.6	34.5	51.9
	20	39.9	59.9	35.2	52.9	29.8	44.8	23.5	35.4	16.6	24.9	31.2	46.8
	21	36.2	54.3	31.9	48.0	27.0	40.6	21.4	32.1	15.0	22.6	28.3	42.5
	22	32.9	49.5	29.1	43.7	24.6	37.0	19.5	29.3	13.7	20.6	25.8	38.7
	23	30.1	45.3	26.6	40.0	22.5	33.9	17.8	26.8	12.5	18.8	23.6	35.4
	24	27.7	41.6	24.4	36.7	20.7	31.1	16.4	24.6	11.5	17.3		
	25	25.5	38.3	22.5	33.9	19.1	28.7	15.1	22.7	10.6	15.9		
	26	23.6	35.5	20.8	31.3	17.6	26.5	13.9	20.9	9.80	14.7		
	27	21.9	32.9	19.3	29.0	16.4	24.6	12.9	19.4	9.09	13.7		
	28			18.0	27.0	15.2	22.9	12.0	18.1	8.45	12.7		
	29							11.2	16.8	7.88	11.8		

Properties

	3/8	5/16	1/4	3/16	1/8	HSS4×4×1/2
A_g (in.^{2})	5.48	4.68	3.84	2.93	2.00	6.02
$I_x = I_y$ (in.^{4})	15.3	13.5	11.4	9.02	6.35	11.9
$r_x = r_y$ (in.^{4})	1.67	1.70	1.73	1.75	1.78	1.41

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

[c] Shape is slender for compression with F_y = 46 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

Table 4–4 (continued)
Available Strength in Axial Compression, kips
Square HSS

F_y = 46 ksi

HSS4

Shape		HSS4×4×									
		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.349		0.291		0.233		0.174		0.116	
Wt/ft		17.2		14.8		12.2		9.40		6.45	
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	132	198	113	170	92.9	140	71.2	107	48.7	73.2
	1	131	197	112	169	92.5	139	70.9	107	48.5	72.9
	2	129	194	111	167	91.3	137	70.1	105	47.9	72.0
	3	127	190	109	163	89.4	134	68.7	103	47.0	70.7
	4	123	184	105	158	86.8	131	66.8	100	45.7	68.8
	5	118	177	101	152	83.6	126	64.4	96.7	44.2	66.4
	6	112	168	96.6	145	79.9	120	61.6	92.6	42.3	63.6
	7	106	159	91.3	137	75.6	114	58.4	87.8	40.2	60.5
	8	98.7	148	85.5	129	71.0	107	55.0	82.7	38.0	57.0
	9	91.4	137	79.4	119	66.2	99.4	51.4	77.2	35.5	53.4
	10	83.9	126	73.1	110	61.1	91.8	47.6	71.5	33.0	49.6
	11	76.3	115	66.8	100	56.0	84.1	43.7	65.7	30.4	45.7
	12	68.8	103	60.4	90.8	50.8	76.4	39.8	59.9	27.8	41.8
	13	61.5	92.4	54.2	81.5	45.8	68.8	36.0	54.1	25.2	37.9
	14	54.4	81.8	48.2	72.4	40.9	61.5	32.3	48.6	22.7	34.1
	15	47.6	71.6	42.4	63.7	36.2	54.4	28.7	43.2	20.3	30.5
	16	41.9	62.9	37.3	56.0	31.8	47.8	25.3	38.1	17.9	27.0
	17	37.1	55.7	33.0	49.6	28.2	42.4	22.4	33.7	15.9	23.9
	18	33.1	49.7	29.4	44.3	25.1	37.8	20.0	30.1	14.2	21.3
	19	29.7	44.6	26.4	39.7	22.6	33.9	18.0	27.0	12.7	19.1
	20	26.8	40.3	23.9	35.9	20.4	30.6	16.2	24.4	11.5	17.3
	21	24.3	36.5	21.6	32.5	18.5	27.8	14.7	22.1	10.4	15.7
	22	22.1	33.3	19.7	29.6	16.8	25.3	13.4	20.1	9.49	14.3
	23	20.3	30.5	18.0	27.1	15.4	23.1	12.3	18.4	8.68	13.0
	24	18.6	28.0	16.6	24.9	14.1	21.3	11.3	16.9	7.97	12.0
	25					13.0	19.6	10.4	15.6	7.35	11.0
	26									6.79	10.2

Properties

	3/8	5/16	1/4	3/16	1/8
A_g (in.^{2})	4.78	4.10	3.37	2.58	1.77
$I_x = I_y$ (in.^{4})	10.3	9.14	7.80	6.21	4.40
$r_x = r_y$ (in.^{4})	1.47	1.49	1.52	1.55	1.58

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

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

Table 4-4 (continued)
Available Strength in Axial Compression, kips
Square HSS

HSS3½

F_y = 46 ksi

Shape		HSS3½×3½×									
		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.349		0.291		0.233		0.174		0.116	
Wt/ft		14.6		12.7		10.5		8.13		5.60	
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	113	169	96.9	146	80.0	120	61.6	92.6	42.3	63.6
	1	112	168	96.3	145	79.6	120	61.3	92.1	42.1	63.2
	2	110	165	94.6	142	78.2	118	60.3	90.6	41.4	62.3
	3	107	160	91.9	138	76.1	114	58.7	88.3	40.4	60.7
	4	102	153	88.2	133	73.2	110	56.6	85.0	39.0	58.6
	5	96.6	145	83.7	126	69.6	105	53.9	81.0	37.2	55.9
	6	90.4	136	78.5	118	65.4	98.4	50.8	76.4	35.2	52.8
	7	83.5	125	72.8	109	60.9	91.5	47.4	71.3	32.9	49.4
	8	76.2	115	66.7	100	56.0	84.1	43.8	65.8	30.5	45.8
	9	68.7	103	60.4	90.8	50.9	76.5	39.9	60.0	27.9	41.9
	10	61.2	91.9	54.1	81.3	45.8	68.8	36.1	54.2	25.3	38.0
	11	53.8	80.9	47.8	71.9	40.7	61.2	32.3	48.5	22.7	34.2
	12	46.8	70.3	41.8	62.9	35.8	53.8	28.5	42.9	20.2	30.4
	13	40.1	60.3	36.1	54.2	31.1	46.8	25.0	37.5	17.8	26.7
	14	34.6	52.0	31.1	46.8	26.8	40.3	21.6	32.4	15.4	23.2
	15	30.1	45.3	27.1	40.7	23.4	35.1	18.8	28.2	13.4	20.2
	16	26.5	39.8	23.8	35.8	20.5	30.9	16.5	24.8	11.8	17.8
	17	23.5	35.2	21.1	31.7	18.2	27.4	14.6	22.0	10.5	15.7
	18	20.9	31.4	18.8	28.3	16.2	24.4	13.0	19.6	9.33	14.0
	19	18.8	28.2	16.9	25.4	14.6	21.9	11.7	17.6	8.38	12.6
	20	16.9	25.5	15.2	22.9	13.2	19.8	10.6	15.9	7.56	11.4
	21	15.4	23.1	13.8	20.8	11.9	17.9	9.59	14.4	6.86	10.3
	22					10.9	16.3	8.74	13.1	6.25	9.39

Properties

	3/8	5/16	1/4	3/16	1/8
A_g (in.^{2})	4.09	3.52	2.91	2.24	1.54
$I_x = I_y$ (in.^{4})	6.49	5.84	5.04	4.05	2.90
$r_x = r_y$ (in.^{4})	1.26	1.29	1.32	1.35	1.37

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

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

F_y = 46 ksi

Table 4–4 (continued)
Available Strength in Axial Compression, kips
Square HSS

HSS3

Shape		HSS3×3×									
		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.349		0.291		0.233		0.174		0.116	
Wt/ft		12.1		10.5		8.78		6.85		4.75	
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	93.3	140	80.8	122	67.2	101	52.0	78.2	35.9	54.0
	1	92.5	139	80.2	121	66.7	100	51.6	77.6	35.7	53.6
	2	90.1	135	78.2	118	65.1	97.9	50.5	75.9	34.9	52.5
	3	86.3	130	75.1	113	62.6	94.1	48.7	73.1	33.7	50.6
	4	81.2	122	70.9	107	59.3	89.1	46.2	69.4	32.1	48.2
	5	75.1	113	65.8	98.9	55.2	83.0	43.2	64.9	30.1	45.2
	6	68.3	103	60.1	90.3	50.7	76.2	39.8	59.8	27.8	41.8
	7	61.0	91.6	54.0	81.2	45.8	68.8	36.1	54.3	25.4	38.1
	8	53.5	80.5	47.7	71.7	40.7	61.2	32.3	48.6	22.8	34.3
	9	46.2	69.4	41.5	62.4	35.7	53.6	28.5	42.8	20.2	30.4
	10	39.2	58.9	35.5	53.3	30.7	46.2	24.7	37.2	17.7	26.6
	11	32.6	49.0	29.8	44.8	26.1	39.2	21.2	31.8	15.2	22.9
	12	27.4	41.2	25.0	37.6	21.9	32.9	17.8	26.8	12.9	19.4
	13	23.3	35.1	21.3	32.1	18.7	28.0	15.2	22.8	11.0	16.5
	14	20.1	30.2	18.4	27.6	16.1	24.2	13.1	19.7	9.49	14.3
	15	17.5	26.4	16.0	24.1	14.0	21.1	11.4	17.2	8.27	12.4
	16	15.4	23.2	14.1	21.2	12.3	18.5	10.00	15.1	7.27	10.9
	17	13.6	20.5	12.5	18.7	10.9	16.4	8.89	13.4	6.44	9.68
	18			11.1	16.7	9.73	14.6	7.93	11.9	5.74	8.63
	19							7.12	10.7	5.15	7.75

Properties					
A_g (in.^{2})	3.39	2.94	2.44	1.89	1.30
$I_x = I_y$ (in.^{4})	3.78	3.45	3.02	2.46	1.78
$r_x = r_y$ (in.^{4})	1.06	1.08	1.11	1.14	1.17

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	Note: Heavy line indicates Kl/r equal to or greater than 200.

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

F_y = 46 ksi

HSS2½–HSS2¼

Square HSS

Shape	HSS2½×2½×								HSS2¼×2¼×	
	5/16		1/4		3/16		1/8		1/4	
t_{design}, in.	0.291		0.233		0.174		0.116		0.233	
Wt/ft	8.40		7.08		5.57		3.90		6.23	
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	64.8	97.4	54.3	81.7	42.4	63.8	29.5	44.4	47.9	72.0
1	64.0	96.2	53.7	80.7	42.0	63.1	29.2	43.9	47.2	71.0
2	61.7	92.7	51.9	77.9	40.6	61.0	28.3	42.6	45.2	67.9
3	57.9	87.0	48.9	73.5	38.4	57.8	26.9	40.4	41.9	63.0
4	53.1	79.7	45.0	67.7	35.6	53.5	25.0	37.6	37.8	56.7
5	47.4	71.3	40.5	60.9	32.2	48.4	22.8	34.2	33.0	49.6
6	41.3	62.1	35.6	53.5	28.5	42.9	20.3	30.5	28.0	42.1
7	35.1	52.8	30.6	46.0	24.7	37.2	17.7	26.7	23.1	34.7
8	29.1	43.8	25.6	38.5	21.0	31.5	15.2	22.8	18.4	27.7
9	23.5	35.3	21.0	31.5	17.4	26.1	12.7	19.1	14.6	21.9
10	19.0	28.6	17.0	25.5	14.1	21.2	10.4	15.7	11.8	17.7
11	15.7	23.6	14.0	21.1	11.7	17.5	8.61	12.9	9.76	14.7
12	13.2	19.9	11.8	17.7	9.81	14.7	7.24	10.9	8.20	12.3
13	11.3	16.9	10.1	15.1	8.36	12.6	6.17	9.27	6.99	10.5
14	9.71	14.6	8.67	13.0	7.21	10.8	5.32	7.99		
15			7.55	11.4	6.28	9.44	4.63	6.96		
16							4.07	6.12		

Properties

	HSS2½×2½×5/16	HSS2½×2½×1/4	HSS2½×2½×3/16	HSS2½×2½×1/8	HSS2¼×2¼×1/4
A_g (in.^{2})	2.35	1.97	1.54	1.07	1.74
$I_x = I_y$ (in.^{4})	1.82	1.63	1.35	0.998	1.13
$r_x = r_y$ (in.^{4})	0.880	0.908	0.937	0.965	0.806

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

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

Table 4–4 (continued)
Available Strength in Axial Compression, kips
Square HSS

F_y = 46 ksi

HSS2¼–HSS2

Shape		HSS2¼×2¼×				HSS2×2×					
		3/16		1/8		1/4		3/16		1/8	
t_{design}, in.		0.174		0.116		0.233		0.174		0.116	
Wt/ft		4.94		3.47		5.38		4.30		3.04	
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	37.7	56.6	26.3	39.6	41.5	62.4	32.9	49.4	23.1	34.8
	1	37.1	55.8	26.0	39.0	40.7	61.2	32.3	48.5	22.7	34.2
	2	35.6	53.5	25.0	37.6	38.4	57.7	30.6	45.9	21.6	32.5
	3	33.2	49.9	23.4	35.2	34.8	52.3	27.9	42.0	19.9	29.9
	4	30.1	45.3	21.4	32.1	30.4	45.6	24.6	37.0	17.7	26.6
	5	26.6	40.0	19.0	28.6	25.5	38.3	20.9	31.5	15.2	22.9
	6	22.8	34.3	16.5	24.8	20.5	30.9	17.2	25.8	12.7	19.0
	7	19.1	28.6	13.9	20.9	15.9	23.9	13.6	20.4	10.2	15.3
	8	15.5	23.3	11.5	17.2	12.2	18.3	10.4	15.7	7.93	11.9
	9	12.3	18.5	9.17	13.8	9.63	14.5	8.26	12.4	6.26	9.42
	10	9.95	15.0	7.43	11.2	7.80	11.7	6.69	10.1	5.07	7.63
	11	8.22	12.4	6.14	9.23	6.44	9.68	5.53	8.31	4.19	6.30
	12	6.91	10.4	5.16	7.75			4.64	6.98	3.52	5.30
	13	5.89	8.85	4.40	6.61						
	14			3.79	5.70						

Properties

	HSS2¼×2¼×3/16	HSS2¼×2¼×1/8	HSS2×2×1/4	HSS2×2×3/16	HSS2×2×1/8
A_g (in.^{2})	1.37	0.956	1.51	1.19	0.840
$I_x = I_y$ (in.^{4})	0.953	0.712	0.747	0.641	0.486
$r_x = r_y$ (in.^{4})	0.835	0.863	0.704	0.733	0.761

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

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

Table 4–5
Available Strength in Axial Compression, kips
Round HSS

F_y = 42 ksi

HSS18.000–HSS16.000

Shape	HSS18.000×				HSS16.000×							
	0.500		0.375		0.625		0.500		0.438		0.375	
t_{design}, in.	0.465		0.349		0.581		0.465		0.407		0.349	
Wt/ft	93.5		70.7		103		82.8		72.9		62.6	
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	644	968	487	732	708	1060	571	858	501	754	432	649
6	639	960	483	726	700	1050	565	849	496	746	427	642
7	637	957	481	723	698	1050	563	846	494	743	426	640
8	635	954	480	721	694	1040	560	842	492	740	424	637
9	632	950	478	718	691	1040	557	838	490	736	422	634
10	630	946	476	715	687	1030	554	833	487	732	419	630
11	627	942	474	712	683	1030	551	828	484	728	417	626
12	623	937	471	708	678	1020	547	822	481	723	414	622
13	620	931	468	704	673	1010	543	816	477	718	411	618
14	616	926	466	700	668	1000	539	810	474	712	408	613
15	612	919	462	695	662	995	534	803	470	706	404	608
16	607	913	459	690	656	986	530	796	465	700	401	602
17	603	906	456	685	650	976	524	788	461	693	397	597
18	598	899	452	680	643	966	519	780	456	686	393	591
19	593	891	448	674	636	956	513	772	451	679	389	584
20	588	883	444	668	628	945	508	763	446	671	385	578
21	582	875	440	662	621	933	502	754	441	663	380	571
22	576	866	436	655	613	921	495	744	436	655	375	564
23	570	857	432	649	605	909	489	735	430	646	370	557
24	564	848	427	642	596	896	482	725	424	637	365	549
25	558	839	422	635	588	884	475	714	418	628	360	542
26	551	829	417	627	579	870	468	704	412	619	355	534
27	545	819	412	620	570	857	461	693	406	610	350	526
28	538	809	407	612	561	843	454	682	399	600	344	517
29	531	798	402	604	551	829	446	671	393	590	339	509
30	524	787	397	596	542	814	438	659	386	580	333	500
32	509	765	386	580	522	785	423	636	372	560	321	483
34	494	742	374	563	502	755	407	611	358	538	309	465
36	478	719	363	545	482	724	390	587	344	517	297	446
38	462	695	351	527	461	693	374	562	329	495	284	428
40	446	670	338	509	440	661	357	537	315	473	272	409

Properties

	HSS18.000×0.500	HSS18.000×0.375	HSS16.000×0.625	HSS16.000×0.500	HSS16.000×0.438	HSS16.000×0.375
A_g (in.^{2})	25.6	19.4	28.1	22.7	19.9	17.2
I (in.^{4})	985	754	838	685	606	526
r (in.)	6.20	6.24	5.46	5.49	5.51	5.53

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

F_y = 42 ksi

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

HSS16.000–HSS14.000

Shape	HSS16.000×				HSS14.000×							
	0.312		0.250		0.625		0.500		0.375		0.312	
t_{design}, in.	0.291		0.233		0.581		0.465		0.349		0.291	
Wt/ft	52.3		42.1		89.4		72.2		54.6		45.7	
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	361	543	290	436	616	926	497	747	376	566	315	474
6	357	537	287	432	607	913	490	737	371	558	311	467
7	356	535	286	430	604	908	488	733	369	555	309	465
8	355	533	285	428	601	903	485	729	367	552	308	462
9	353	530	284	426	597	897	482	724	365	549	306	460
10	351	528	282	424	592	890	478	719	362	545	304	456
11	349	524	280	421	587	883	475	713	360	540	301	453
12	347	521	279	419	582	875	470	707	356	536	299	449
13	344	517	277	416	576	866	466	700	353	531	296	445
14	341	513	275	413	570	857	461	693	349	525	293	440
15	339	509	272	409	564	848	456	685	346	519	290	435
16	336	504	270	406	557	837	451	677	342	513	286	430
17	332	500	267	402	550	827	445	669	337	507	283	425
18	329	495	265	398	542	815	439	660	333	500	279	419
19	326	489	262	394	535	804	433	650	328	493	275	414
20	322	484	259	389	527	791	426	641	323	486	271	408
21	318	478	256	385	518	779	419	630	318	479	267	401
22	314	473	253	380	509	766	413	620	313	471	263	395
23	310	466	250	375	501	752	405	609	308	463	258	388
24	306	460	246	370	491	739	398	598	303	455	254	381
25	302	454	243	365	482	725	391	587	297	446	249	374
26	298	447	239	360	473	710	383	576	291	438	244	367
27	293	440	236	355	463	696	375	564	285	429	240	360
28	288	434	232	349	453	681	367	552	280	420	235	353
29	284	427	228	343	443	666	359	540	274	411	230	345
30	279	419	225	338	433	650	351	528	268	402	225	338
32	269	405	217	326	412	620	335	503	255	384	214	322
34	259	390	209	314	391	588	318	478	243	365	204	307
36	249	374	201	302	371	557	302	453	230	346	194	291
38	239	359	192	289	350	526	285	428	218	327	183	275
40	228	343	184	277	329	494	268	403	205	308	173	259

Properties

	HSS16.000×0.312	HSS16.000×0.250	HSS14.000×0.625	HSS14.000×0.500	HSS14.000×0.375	HSS14.000×0.312
A_g (in.^{2})	14.4	11.5	24.5	19.8	15.0	12.5
I (in.^{4})	443	359	552	453	349	295
r (in.)	5.55	5.58	4.75	4.79	4.83	4.85

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

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

F_y = 42 ksi

HSS14.000–
HSS10.750

Shape	HSS14.000×		HSS12.750×						HSS10.750×			
	0.250		0.500		0.375		0.250		0.500		0.375	
t_{design}, in.	0.233		0.465		0.349		0.233		0.465		0.349	
Wt/ft	36.7		65.5		49.6		33.4		54.8		41.6	
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	253	381	451	678	342	514	230	346	378	568	287	431
6	250	376	444	667	336	506	227	341	369	554	280	421
7	249	374	441	663	334	503	225	339	366	550	278	417
8	247	372	438	658	332	499	224	336	362	544	275	413
9	246	370	435	653	329	495	222	334	358	538	272	409
10	244	367	431	647	327	491	220	331	353	531	269	404
11	242	364	426	641	323	486	218	328	349	524	265	398
12	240	361	422	634	320	481	216	325	343	516	261	392
13	238	358	417	627	316	476	214	321	338	507	257	386
14	236	354	412	619	312	470	211	317	332	498	252	379
15	233	350	406	611	308	463	208	313	325	489	248	372
16	230	346	400	602	304	457	205	309	319	479	243	365
17	228	342	394	593	299	450	202	304	312	468	237	357
18	225	338	388	583	295	443	199	299	304	457	232	349
19	221	333	381	573	290	435	196	294	297	446	227	341
20	218	328	374	563	285	428	192	289	289	435	221	332
21	215	323	367	552	279	420	189	284	282	423	215	323
22	212	318	360	541	274	411	185	278	274	411	209	314
23	208	313	352	530	268	403	181	273	265	399	203	305
24	204	307	345	518	262	394	178	267	257	387	197	296
25	201	302	337	506	257	386	174	261	249	374	191	287
26	197	296	329	494	251	377	170	255	241	362	184	277
27	193	290	321	482	245	368	166	249	232	349	178	268
28	189	284	313	470	238	358	162	243	224	337	172	258
29	185	278	304	458	232	349	158	237	216	324	166	249
30	181	272	296	445	226	340	153	231	207	311	159	239
32	173	260	279	420	214	321	145	218	191	287	147	221
34	165	247	263	395	201	302	137	206	175	263	135	203
36	156	235	246	370	188	283	128	193	159	239	123	185
38	148	222	230	345	176	265	120	180	144	216	112	168
40	139	210	213	321	164	246	112	168	130	195	101	151

Properties

	HSS14.000×0.250	HSS12.750×0.500	HSS12.750×0.375	HSS12.750×0.250	HSS10.750×0.500	HSS10.750×0.375
A_g (in.^{2})	10.1	17.9	13.6	9.16	15.0	11.4
I (in.^{4})	239	339	262	180	199	154
r (in.)	4.87	4.35	4.39	4.43	3.64	3.68

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

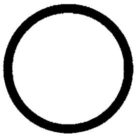
F_y = 42 ksi

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

HSS10.750–
HSS10.000

Shape	HSS10.750×		HSS10.000×									
	0.250		0.625		0.500		0.375		0.312		0.250	
t_{design}, in.	0.233		0.581		0.465		0.349		0.291		0.233	
Wt/ft	28.1		62.6		50.8		38.6		32.3		26.1	
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	194	291	432	650	350	527	266	400	223	336	180	270
6	189	[illegible]	420	632	341	512	259	389	217	327	175	263
7	188	282	416	625	337	507	256	385	215	323	173	261
8	186	279	411	618	333	501	254	381	213	320	171	258
9	184	276	405	609	329	494	250	376	210	316	169	254
10	182	273	399	600	324	487	247	371	207	311	167	251
11	179	269	393	590	319	479	243	365	204	306	164	247
12	177	265	386	580	313	471	239	359	200	301	162	243
13	174	261	378	568	307	462	234	352	197	296	159	238
14	171	257	370	556	301	452	229	345	193	290	155	234
15	168	252	362	543	294	442	224	337	189	283	152	229
16	164	247	353	530	287	432	219	329	184	277	149	224
17	161	242	344	517	280	421	214	321	180	270	145	218
18	157	237	334	502	272	409	208	313	175	263	141	213
19	154	231	325	488	265	398	202	304	170	256	138	207
20	150	225	315	473	257	386	196	295	165	249	134	201
21	146	219	305	458	249	374	190	286	160	241	130	195
22	142	214	294	442	241	362	184	277	155	233	126	189
23	138	207	284	427	232	349	178	268	150	226	121	183
24	134	201	274	411	224	337	172	258	145	218	117	176
25	130	195	263	396	216	324	166	249	140	210	113	170
26	126	189	253	380	207	312	159	240	134	202	109	164
27	121	183	242	364	199	299	153	230	129	194	105	157
28	117	176	232	349	191	286	147	221	124	186	101	151
29	113	170	222	333	182	274	141	211	119	179	96.4	145
30	109	164	212	318	174	262	134	202	114	171	92.3	139
32	101	151	192	288	158	238	122	184	104	156	84.2	127
34	92.5	139	173	259	143	215	111	166	93.8	141	76.3	115
36	84.5	127	154	232	128	192	99.4	149	84.3	127	68.7	103
38	76.9	116	138	208	115	172	89.2	134	75.7	114	61.7	92.7
40	69.5	104	125	188	104	156	80.5	121	68.3	103	55.6	83.6
Properties												
A_g (in.^{2})	7.70		17.2		13.9		10.6		8.88		7.15	
I (in.^{4})	106		191		159		123		105		85.3	
r (in.)	3.72		3.34		3.38		3.41		3.43		3.45	

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



HSS10.000–
HSS9.625

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

F_y = 42 ksi

Shape	HSS10.000×		HSS9.625×									
	0.188		0.500		0.375		0.312		0.250		0.188	
t_{design}, in.	0.174		0.465		0.349		0.291		0.233		0.174	
Wt/ft	19.7		48.8		37.1		31.1		25.1		19.0	
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	135	203	337	506	256	384	215	323	173	260	130	195
6	132	198	326	491	248	373	208	313	168	252	126	190
7	130	196	323	485	246	369	206	310	166	250	125	188
8	129	194	319	479	243	365	204	306	164	247	124	186
9	127	191	314	473	239	360	201	302	162	244	122	183
10	126	189	309	465	236	354	198	297	160	240	120	180
11	124	186	304	457	232	348	195	292	157	236	118	177
12	122	183	298	448	227	342	191	287	154	232	116	174
13	119	179	292	439	223	335	187	281	151	227	114	171
14	117	176	285	429	218	327	183	275	148	222	111	167
15	115	172	279	419	213	320	179	269	144	217	109	163
16	112	168	271	408	207	312	174	262	141	212	106	159
17	109	164	264	397	202	303	170	255	137	206	103	155
18	107	160	256	385	196	295	165	248	133	200	101	151
19	104	156	248	373	190	286	160	241	129	195	97.6	147
20	101	151	240	361	184	277	155	233	125	189	94.7	142
21	97.8	147	232	349	178	268	150	226	121	182	91.6	138
22	94.8	142	224	337	172	258	145	218	117	176	88.6	133
23	91.7	138	216	324	166	249	140	210	113	170	85.5	128
24	88.6	133	207	312	159	240	134	202	109	164	82.3	124
25	85.5	128	199	299	153	230	129	194	105	157	79.2	119
26	82.3	124	191	286	147	221	124	186	101	151	76.1	114
27	79.2	119	182	274	141	211	119	179	96.4	145	72.9	110
28	76.1	114	174	262	134	202	114	171	92.2	139	69.8	105
29	73.0	110	166	249	128	193	108	163	88.1	132	66.8	100
30	69.9	105	158	237	122	184	103	155	84.0	126	63.7	95.8
32	63.8	95.9	142	214	110	166	93.5	141	76.1	114	57.8	86.8
34	57.9	87.1	127	191	98.9	149	84.0	126	68.4	103	52.0	78.2
36	52.2	78.5	113	170	88.2	133	74.9	113	61.1	91.8	46.5	69.8
38	46.9	70.5	102	153	79.2	119	67.2	101	54.8	82.4	41.7	62.7
40	42.3	63.6	91.8	138	71.5	107	60.7	91.2	49.5	74.4	37.6	56.6

Properties

	HSS10.000×0.188	HSS9.625×0.500	HSS9.625×0.375	HSS9.625×0.312	HSS9.625×0.250	HSS9.625×0.188
A_g (in.^{2})	5.37	13.4	10.2	8.53	6.87	5.17
I (in.^{4})	64.8	141	110	93.0	75.9	57.7
r (in.)	3.47	3.24	3.28	3.30	3.32	3.34

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

F_y = 42 ksi

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

HSS8.625

Shape		HSS8.625×											
		0.625		0.500		0.375		0.322		0.250		0.188	
t_{design}, in.		0.581		0.465		0.349		0.300		0.233		0.174	
Wt/ft		53.5		43.4		33.1		28.6		22.4		17.0	
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	369	555	300	451	228	343	197	297	154	232	116	175
	6	355	534	289	434	220	330	190	286	149	224	112	169
	7	350	526	285	428	217	326	188	282	147	221	111	166
	8	344	518	280	421	214	321	185	278	145	218	109	164
	9	338	508	275	414	210	316	182	273	142	214	107	161
	10	331	498	270	405	206	309	178	268	140	210	105	158
	11	324	487	264	396	201	303	174	262	137	206	103	155
	12	316	475	257	387	197	296	170	256	134	201	101	151
	13	307	462	251	377	192	288	166	250	130	196	98.3	148
	14	298	448	244	366	186	280	162	243	127	191	95.7	144
	15	289	435	236	355	181	272	157	236	123	185	93.0	140
	16	280	420	229	344	175	263	152	228	119	180	90.2	136
	17	270	405	221	332	169	255	147	221	116	174	87.3	131
	18	260	390	213	320	163	246	142	213	112	168	84.3	127
	19	249	375	205	307	157	236	137	205	108	162	81.3	122
	20	239	359	196	295	151	227	131	197	103	155	78.2	118
	21	229	344	188	282	145	218	126	189	99.2	149	75.1	113
	22	218	328	180	270	139	208	120	181	95.0	143	71.9	108
	23	208	312	171	257	132	199	115	173	90.8	137	68.8	103
	24	197	297	163	245	126	189	110	165	86.7	130	65.7	98.7
	25	187	281	155	232	120	180	104	157	82.5	124	62.6	94.0
	26	177	266	147	220	114	171	99.1	149	78.4	118	59.5	89.4
	27	167	251	139	208	108	162	93.8	141	74.3	112	56.4	84.8
	28	157	237	131	196	102	153	88.7	133	70.3	106	53.5	80.3
	29	148	222	123	185	95.9	144	83.7	126	66.4	99.8	50.5	75.9
	30	138	208	115	174	90.2	136	78.8	118	62.6	94.1	47.7	71.6
	32	122	183	101	152	79.3	119	69.4	104	55.2	82.9	42.1	63.2
	34	108	162	89.9	135	70.3	106	61.5	92.4	48.9	73.4	37.3	56.0
	36	96.1	145	80.2	120	62.7	94.2	54.8	82.4	43.6	65.5	33.2	49.9
	38	86.3	130	72.0	108	56.3	84.6	49.2	73.9	39.1	58.8	29.8	44.8
	40	77.9	117	64.9	97.6	50.8	76.3	44.4	66.7	35.3	53.1	26.9	40.5

Properties

	0.625	0.500	0.375	0.322	0.250	0.188
A_g (in.^{2})	14.7	11.9	9.07	7.85	6.14	4.62
I (in.^{4})	119	100	77.8	68.1	54.1	41.3
r (in.)	2.85	2.89	2.93	2.95	2.97	2.99

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

Table 4–5 (continued)
Available Strength in Axial Compression, kips

$F_y = 42$ ksi

Round HSS

HSS7.625–
HSS7.500

Shape	HSS7.625×				HSS7.500×							
	0.375		0.328		0.500		0.375		0.312		0.250	
t_{design}, in.	0.349		0.305		0.465		0.349		0.291		0.233	
Wt/ft	29.1		25.6		37.4		28.6		24.0		19.4	
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	$\phi_c P_n$
Effective length KL (ft) with respect to least radius of gyration r_y	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
0	201	302	176	265	258	388	197	296	166	249	134	201
6	191	287	168	253	246	369	188	282	158	237	127	192
7	188	282	165	249	241	362	184	277	155	233	125	188
8	184	277	162	244	236	355	181	271	152	228	123	185
9	180	271	159	238	230	346	176	265	148	223	120	180
10	176	264	155	232	224	337	172	258	145	217	117	176
11	171	257	150	226	218	327	167	251	141	211	114	171
12	166	249	146	219	211	316	162	243	136	205	110	166
13	160	241	141	212	203	305	156	235	132	198	107	160
14	154	232	136	205	196	294	150	226	127	191	103	155
15	149	223	131	197	188	282	145	217	122	183	99.0	149
16	143	214	126	189	180	270	138	208	117	176	95.0	143
17	136	205	121	181	171	257	132	199	112	168	90.9	137
18	130	196	115	173	163	245	126	189	107	160	86.7	130
19	124	186	110	165	155	232	120	180	101	153	82.5	124
20	118	177	104	156	146	220	114	171	96.2	145	78.3	118
21	111	167	98.6	148	138	207	107	161	91.0	137	74.1	111
22	105	158	93.2	140	130	195	101	152	85.9	129	70.0	105
23	99.1	149	87.8	132	122	183	95.0	143	80.8	121	65.9	99.1
24	93.1	140	82.6	124	114	171	89.0	134	75.8	114	61.9	93.0
25	87.2	131	77.4	116	106	160	83.2	125	70.9	107	58.0	87.1
26	81.5	122	72.4	109	98.6	148	77.6	117	66.1	99.4	54.1	81.4
27	75.8	114	67.4	101	91.4	137	71.9	108	61.4	92.3	50.3	75.6
28	70.4	106	62.7	94.2	85.0	128	66.9	101	57.1	85.8	46.8	70.3
29	65.7	98.7	58.4	87.8	79.3	119	62.4	93.7	53.2	80.0	43.6	65.6
30	61.4	92.2	54.6	82.0	74.1	111	58.3	87.6	49.7	74.8	40.8	61.3
32	53.9	81.1	48.0	72.1	65.1	97.8	51.2	77.0	43.7	65.7	35.8	53.9
34	47.8	71.8	42.5	63.9	57.7	86.7	45.4	68.2	38.7	58.2	31.7	47.7
36	42.6	64.1	37.9	57.0	51.4	77.3	40.5	60.8	34.5	51.9	28.3	42.6
38	38.2	57.5	34.0	51.1	46.2	69.4	36.3	54.6	31.0	46.6	25.4	38.2
40	34.5	51.9	30.7	46.1	41.7	62.6	32.8	49.3	28.0	42.0	22.9	34.5

Properties

	HSS7.625×0.375	HSS7.625×0.328	HSS7.500×0.500	HSS7.500×0.375	HSS7.500×0.312	HSS7.500×0.250
A_g (in.^{2})	7.98	7.01	10.3	7.84	6.59	5.32
I (in.^{4})	52.9	47.1	63.9	50.2	42.9	35.2
r (in.)	2.58	2.59	2.49	2.53	2.55	2.57

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

F_y = 42 ksi

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

HSS7.500–HSS7.000

Shape		HSS7.500×		HSS7.000×							
		0.188		0.500		0.375		0.312		0.250	
t_{design}, in.		0.174		0.465		0.349		0.291		0.233	
Wt/ft		14.7		34.7		26.6		22.3		18.0	
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	101	151	240	361	183	276	154	232	125	187
	6	96.1	144	226	340	173	260	146	219	118	177
	7	94.4	142	221	333	170	255	143	215	116	174
	8	92.6	139	216	325	166	249	140	210	113	170
	9	90.5	136	210	316	161	242	136	204	110	165
	10	88.3	133	204	306	156	235	132	198	107	160
	11	85.9	129	197	296	151	227	128	192	103	155
	12	83.3	125	189	285	146	219	123	185	99.8	150
	13	80.6	121	182	273	140	211	118	178	96.0	144
	14	77.8	117	174	261	134	202	113	170	92.1	138
	15	74.9	113	166	249	128	193	108	163	88.0	132
	16	71.9	108	157	237	122	183	103	155	83.9	126
	17	68.8	103	149	224	116	174	98.0	147	79.8	120
	18	65.7	98.8	141	212	109	164	92.8	139	75.6	114
	19	62.6	94.1	132	199	103	155	87.5	132	71.4	107
	20	59.5	89.4	124	187	96.9	146	82.4	124	67.2	101
	21	56.3	84.7	116	174	90.8	136	77.2	116	63.1	94.8
	22	53.2	80.0	108	162	84.7	127	72.2	108	59.0	88.7
	23	50.2	75.4	100	151	78.9	119	67.3	101	55.1	82.8
	24	47.2	70.9	92.8	140	73.2	110	62.5	93.9	51.2	77.0
	25	44.2	66.4	85.5	129	67.5	101	57.7	86.8	47.4	71.3
	26	41.3	62.1	79.1	119	62.4	93.8	53.4	80.2	43.8	65.9
	27	38.5	57.9	73.3	110	57.9	87.0	49.5	74.4	40.6	61.1
	28	35.8	53.8	68.2	102	53.8	80.9	46.0	69.2	37.8	56.8
	29	33.4	50.1	63.6	95.5	50.2	75.4	42.9	64.5	35.2	53.0
	30	31.2	46.9	59.4	89.3	46.9	70.5	40.1	60.3	32.9	49.5
	32	27.4	41.2	52.2	78.5	41.2	61.9	35.2	53.0	28.9	43.5
	34	24.3	36.5	46.2	69.5	36.5	54.9	31.2	46.9	25.6	38.5
	36	21.7	32.5	41.3	62.0	32.6	48.9	27.8	41.9	22.9	34.4
	38	19.4	29.2	37.0	55.6	29.2	43.9	25.0	37.6	20.5	30.8
	40	17.5	26.4								

Properties					
A_g (in.^{2})	4.00	9.55	7.29	6.13	4.95
I (in.^{4})	26.9	51.2	40.4	34.6	28.4
r (in.)	2.59	2.32	2.35	2.37	2.39

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	Note: Heavy line indicates *Kl/r* equal to or greater than 200.

Table 4–5 (continued)
Available Strength in Axial Compression, kips

F_y = 42 ksi

Round HSS

HSS7.000–
HSS6.875

Shape	HSS7.000×				HSS6.875×					
	0.188		0.125		0.500		0.375		0.312	
t_{design}, in.	0.174		0.116		0.465		0.349		0.291	
Wt/ft	13.7		9.19		34.1		26.1		21.9	
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	93.8	141	63.1	94.8	236	354	180	270	151	228
6	88.9	134	59.8	89.9	221	333	170	255	143	215
7	87.1	131	58.6	88.1	217	325	166	249	140	210
8	85.2	128	57.3	86.2	211	317	162	243	136	205
9	83.0	125	55.9	84.0	205	308	157	237	133	199
10	80.6	121	54.3	81.7	198	298	152	229	129	193
11	78.1	117	52.7	79.2	191	288	147	221	124	187
12	75.4	113	50.9	76.5	184	277	142	213	120	180
13	72.6	109	49.0	73.7	176	265	136	204	115	173
14	69.7	105	47.1	70.8	168	253	130	195	110	165
15	66.7	100	45.1	67.8	160	241	124	186	105	158
16	63.6	95.6	43.1	64.7	152	228	118	177	99.8	150
17	60.5	91.0	41.0	61.6	144	216	111	168	94.5	142
18	57.4	86.3	38.9	58.5	135	203	105	158	89.3	134
19	54.3	81.6	36.8	55.3	127	191	99.0	149	84.1	126
20	51.1	76.9	34.7	52.2	119	178	92.8	139	78.9	119
21	48.1	72.2	32.7	49.1	111	166	86.7	130	73.8	111
22	45.0	67.7	30.6	46.0	103	154	80.7	121	68.8	103
23	42.0	63.2	28.6	43.1	95.2	143	74.9	113	63.9	96.1
24	39.2	58.8	26.7	40.1	87.6	132	69.2	104	59.2	89.0
25	36.3	54.6	24.8	37.3	80.7	121	63.8	95.9	54.6	82.0
26	33.6	50.5	23.0	34.5	74.7	112	59.0	88.7	50.5	75.8
27	31.1	46.8	21.3	32.0	69.2	104	54.7	82.2	46.8	70.3
28	29.0	43.5	19.8	29.7	64.4	96.7	50.9	76.4	43.5	65.4
29	27.0	40.6	18.4	27.7	60.0	90.2	47.4	71.3	40.6	61.0
30	25.2	37.9	17.2	25.9	56.1	84.3	44.3	66.6	37.9	57.0
32	22.2	33.3	15.2	22.8	49.3	74.1	38.9	58.5	33.3	50.1
34	19.6	29.5	13.4	20.2	43.7	65.6	34.5	51.8	29.5	44.3
36	17.5	26.3	12.0	18.0	38.9	58.5	30.8	46.2	26.3	39.6
38	15.7	23.6	10.7	16.2			27.6	41.5	23.6	35.5
40	14.2	21.3	9.70	14.6						

Properties

	HSS7.000×0.188	HSS7.000×0.125	HSS6.875×0.500	HSS6.875×0.375	HSS6.875×0.312
A_g (in.^{2})	3.73	2.51	9.36	7.16	6.02
I (in.^{4})	21.7	14.9	48.3	38.2	32.7
r (in.)	2.41	2.43	2.27	2.31	2.33

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

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

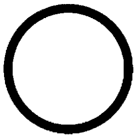
F_y = 42 ksi

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

HSS6.875–
HSS6.625

Shape	HSS6.875×				HSS6.625×					
	0.250		0.188		0.500		0.432		0.375	
t_{design}, in.	0.233		0.174		0.465		0.402		0.349	
Wt/ft	17.7		13.4		32.7		28.6		25.1	
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	122	184	92.1	138	226	340	198	297	173	260
6	115	173	87.0	131	212	318	185	278	162	244
7	113	170	85.3	128	207	311	181	272	159	238
8	110	166	83.3	125	201	302	176	264	154	232
9	107	161	81.1	122	195	293	171	256	150	225
10	104	157	78.7	118	188	283	165	248	145	217
11	101	151	76.1	114	181	272	159	238	139	209
12	97.1	146	73.4	110	173	260	152	229	134	201
13	93.3	140	70.6	106	165	249	145	218	128	192
14	89.3	134	67.7	102	157	237	138	208	122	183
15	85.3	128	64.6	97.2	149	224	131	197	116	174
16	81.1	122	61.6	92.5	141	212	124	186	109	164
17	77.0	116	58.4	87.8	132	199	117	176	103	155
18	72.8	109	55.3	83.1	124	187	110	165	96.9	146
19	68.6	103	52.2	78.4	116	174	102	154	90.7	136
20	64.4	96.8	49.1	73.8	108	162	95.5	143	84.5	127
21	60.3	90.7	46.0	69.1	99.9	150	88.6	133	78.6	118
22	56.3	84.6	43.0	64.6	92.3	139	81.9	123	72.7	109
23	52.4	78.8	40.1	60.2	84.7	127	75.4	113	67.1	101
24	48.6	73.0	37.2	55.9	77.8	117	69.2	104	61.6	92.6
25	44.8	67.4	34.4	51.6	71.7	108	63.8	95.9	56.8	85.3
26	41.4	62.3	31.8	47.7	66.3	99.6	59.0	88.7	52.5	78.9
27	38.4	57.8	29.5	44.3	61.5	92.4	54.7	82.2	48.7	73.1
28	35.7	53.7	27.4	41.2	57.2	85.9	50.9	76.4	45.2	68.0
29	33.3	50.1	25.5	38.4	53.3	80.1	47.4	71.3	42.2	63.4
30	31.1	46.8	23.9	35.9	49.8	74.8	44.3	66.6	39.4	59.2
32	27.4	41.1	21.0	31.5	43.8	65.8	38.9	58.5	34.6	52.1
34	24.2	36.4	18.6	27.9	38.8	58.3	34.5	51.8	30.7	46.1
36	21.6	32.5	16.6	24.9	34.6	52.0	30.8	46.2	27.4	41.1
38	19.4	29.2	14.9	22.4						
Properties										
A_g (in.^{2})	4.86		3.66		9.00		7.86		6.88	
I (in.^{4})	26.8		20.6		42.9		38.2		34.0	
r (in.)	2.35		2.37		2.18		2.20		2.22	

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	Note: Heavy line indicates Kl/r equal to or greater than 200.



HSS6.625

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

F_y = 42 ksi

Shape		HSS6.625×									
		0.312		0.280		0.250		0.188		0.125	
t_{design}, in.		0.291		0.260		0.233		0.174		0.116	
Wt/ft		21.1		19.0		17.0		12.9		8.69	
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	146	219	131	197	118	177	88.7	133	59.7	89.7
	6	137	205	123	185	111	166	83.4	125	56.2	84.4
	7	134	201	120	180	108	162	81.6	123	55.0	82.6
	8	130	196	117	176	105	158	79.5	120	53.6	80.6
	9	126	190	114	171	102	154	77.3	116	52.1	78.3
	10	122	184	110	165	99.0	149	74.8	112	50.5	75.9
	11	118	177	106	159	95.5	143	72.2	109	48.7	73.3
	12	113	170	102	153	91.7	138	69.4	104	46.9	70.5
	13	108	163	97.4	146	87.9	132	66.6	100	45.0	67.6
	14	103	155	92.9	140	83.8	126	63.6	95.5	43.0	64.6
	15	98.0	147	88.3	133	79.7	120	60.5	90.9	41.0	61.6
	16	92.8	139	83.7	126	75.6	114	57.4	86.3	38.9	58.5
	17	87.6	132	79.0	119	71.4	107	54.3	81.6	36.8	55.3
	18	82.3	124	74.3	112	67.2	101	51.1	76.9	34.7	52.2
	19	77.2	116	69.7	105	63.0	94.7	48.0	72.2	32.7	49.1
	20	72.0	108	65.1	97.8	58.9	88.6	44.9	67.6	30.6	46.0
	21	67.0	101	60.6	91.1	54.9	82.5	41.9	63.0	28.6	42.9
	22	62.1	93.4	56.2	84.5	51.0	76.6	39.0	58.6	26.6	40.0
	23	57.4	86.3	52.0	78.1	47.1	70.8	36.1	54.3	24.7	37.1
	24	52.7	79.3	47.8	71.8	43.4	65.2	33.3	50.0	22.8	34.2
	25	48.6	73.0	44.0	66.2	40.0	60.1	30.7	46.1	21.0	31.5
	26	44.9	67.5	40.7	61.2	36.9	55.5	28.3	42.6	19.4	29.2
	27	41.7	62.6	37.8	56.8	34.3	51.5	26.3	39.5	18.0	27.0
	28	38.7	58.2	35.1	52.8	31.9	47.9	24.4	36.7	16.7	25.1
	29	36.1	54.3	32.7	49.2	29.7	44.6	22.8	34.2	15.6	23.4
	30	33.8	50.7	30.6	46.0	27.8	41.7	21.3	32.0	14.6	21.9
	32	29.7	44.6	26.9	40.4	24.4	36.7	18.7	28.1	12.8	19.3
	34	26.3	39.5	23.8	35.8	21.6	32.5	16.6	24.9	11.3	17.1
	36	23.4	35.2	21.2	31.9	19.3	29.0	14.8	22.2	10.1	15.2
	38							13.3	19.9	9.08	13.7

Properties

	0.312	0.280	0.250	0.188	0.125
A_g (in.^{2})	5.79	5.20	4.68	3.53	2.37
I (in.^{4})	29.1	26.4	23.9	18.4	12.6
r (in.)	2.24	2.25	2.26	2.28	2.30

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 42 ksi

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

HSS6.000

Shape		HSS6.000×											
		0.500		0.375		0.312		0.280		0.250		0.188	
t_{design}, in.		0.465		0.349		0.291		0.260		0.233		0.174	
Wt/ft		29.4		22.5		19.0		17.1		15.4		11.7	
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	203	306	156	234	131	197	118	177	106	160	80.1	120
	1	203	305	155	234	131	197	118	177	106	159	79.9	120
	2	201	303	154	232	130	196	117	176	105	158	79.4	119
	3	199	299	153	230	129	193	116	174	104	157	78.6	118
	4	196	295	150	226	127	191	114	171	103	154	77.5	116
	5	192	289	147	222	124	187	112	168	101	151	76.0	114
	6	187	281	144	216	121	182	109	164	98.4	148	74.3	112
	7	182	273	140	210	118	177	106	160	95.7	144	72.3	109
	8	176	264	135	203	114	172	103	155	92.7	139	70.1	105
	9	169	254	130	196	110	166	99.1	149	89.4	134	67.7	102
	10	162	243	125	188	106	159	95.2	143	85.9	129	65.0	97.7
	11	154	232	119	179	101	152	91.0	137	82.1	123	62.3	93.6
	12	146	220	113	170	96.1	144	86.6	130	78.2	118	59.3	89.2
	13	138	207	107	161	91.0	137	82.1	123	74.1	111	56.3	84.7
	14	130	195	101	152	85.9	129	77.5	116	70.0	105	53.3	80.0
	15	121	182	94.8	143	80.6	121	72.8	109	65.8	98.9	50.1	75.3
	16	113	170	88.6	133	75.4	113	68.1	102	61.6	92.6	47.0	70.6
	17	105	158	82.3	124	70.2	106	63.5	95.4	57.5	86.4	43.9	65.9
	18	96.7	145	76.2	115	65.1	97.8	58.9	88.5	53.3	80.2	40.8	61.3
	19	88.9	134	70.2	106	60.1	90.3	54.4	81.8	49.3	74.1	37.8	56.8
	20	81.3	122	64.4	96.9	55.2	83.0	50.0	75.2	45.4	68.2	34.8	52.3
	21	73.8	111	58.8	88.3	50.5	75.8	45.8	68.8	41.6	62.5	32.0	48.0
	22	67.3	101	53.5	80.5	46.0	69.1	41.7	62.7	37.9	57.0	29.2	43.8
	23	61.5	92.5	49.0	73.6	42.1	63.2	38.2	57.4	34.7	52.1	26.7	40.1
	24	56.5	84.9	45.0	67.6	38.6	58.1	35.1	52.7	31.9	47.9	24.5	36.8
	25	52.1	78.3	41.5	62.3	35.6	53.5	32.3	48.6	29.4	44.1	22.6	33.9
	26	48.1	72.4	38.3	57.6	32.9	49.5	29.9	44.9	27.1	40.8	20.9	31.4
	28	41.5	62.4	33.1	49.7	28.4	42.7	25.8	38.7	23.4	35.2	18.0	27.1
	30	36.2	54.4	28.8	43.3	24.7	37.2	22.4	33.7	20.4	30.6	15.7	23.6
	32	31.8	47.8	25.3	38.0	21.7	32.7	19.7	29.6	17.9	26.9	13.8	20.7
	34									15.9	23.9	12.2	18.4

Properties

	0.500	0.375	0.312	0.280	0.250	0.188
A_g (in.^{2})	8.09	6.20	5.22	4.69	4.22	3.18
I (in.^{4})	31.2	24.8	21.3	19.3	17.6	13.5
r (in.)	1.96	2.00	2.02	2.03	2.04	2.06

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	Note: Heavy line indicates Kl/r equal to or greater than 200.

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

HSS6.000–
HSS5.563

F_y = 42 ksi

Shape	HSS6.000×		HSS5.563×									
	0.125		0.500		0.375		0.258		0.188		0.134	
t_{design}, in.	0.116		0.465		0.349		0.240		0.174		0.124	
Wt/ft	7.85		27.1		20.8		14.6		10.8		7.78	
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	$\phi_c P_n$
Effective length KL (ft) with respect to least radius of gyration r_y	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
0	53.9	81.1	187	282	144	216	101	152	74.1	111	53.3	80.1
1	53.8	80.9	187	281	143	216	101	151	73.9	111	53.2	79.9
2	53.5	80.4	185	278	142	214	99.9	150	73.4	110	52.8	79.3
3	52.9	79.6	183	275	140	211	98.7	148	72.5	109	52.2	78.4
4	52.2	78.4	179	270	138	207	97.0	146	71.3	107	51.3	77.1
5	51.2	77.0	175	263	135	203	94.8	143	69.7	105	50.2	75.4
6	50.1	75.3	170	255	131	197	92.3	139	67.9	102	48.9	73.5
7	48.8	73.3	164	247	127	190	89.3	134	65.8	98.8	47.4	71.2
8	47.3	71.1	158	237	122	183	86.1	129	63.4	95.3	45.7	68.7
9	45.7	68.7	151	226	117	175	82.5	124	60.8	91.4	43.9	66.0
10	44.0	66.1	143	215	111	167	78.7	118	58.1	87.3	42.0	63.1
11	42.1	63.3	135	203	105	158	74.7	112	55.2	82.9	39.9	60.0
12	40.2	60.4	127	191	99.0	149	70.5	106	52.2	78.4	37.8	56.8
13	38.2	57.4	119	178	92.8	139	66.2	99.6	49.1	73.8	35.6	53.5
14	36.1	54.3	110	166	86.5	130	61.9	93.1	46.0	69.1	33.4	50.1
15	34.1	51.2	102	153	80.3	121	57.6	86.6	42.8	64.4	31.1	46.8
16	32.0	48.0	93.8	141	74.1	111	53.3	80.2	39.7	59.7	28.9	43.4
17	29.9	44.9	85.8	129	68.0	102	49.1	73.8	36.7	55.1	26.7	40.1
18	27.8	41.8	78.1	117	62.1	93.3	45.0	67.7	33.7	50.6	24.6	36.9
19	25.8	38.8	70.5	106	56.4	84.8	41.1	61.7	30.8	46.3	22.5	33.8
20	23.8	35.8	63.7	95.7	50.9	76.5	37.2	55.9	27.9	42.0	20.5	30.7
21	21.9	32.9	57.7	86.8	46.2	69.4	33.7	50.7	25.3	38.1	18.6	27.9
22	20.0	30.1	52.6	79.1	42.1	63.3	30.7	46.2	23.1	34.7	16.9	25.4
23	18.3	27.5	48.1	72.3	38.5	57.9	28.1	42.2	21.1	31.7	15.5	23.2
24	16.8	25.3	44.2	66.4	35.4	53.1	25.8	38.8	19.4	29.2	14.2	21.4
25	15.5	23.3	40.7	61.2	32.6	49.0	23.8	35.8	17.9	26.9	13.1	19.7
26	14.3	21.5	37.7	56.6	30.1	45.3	22.0	33.1	16.5	24.8	12.1	18.2
28	12.4	18.6	32.5	48.8	26.0	39.0	19.0	28.5	14.3	21.4	10.4	15.7
30	10.8	16.2	28.3	42.5	22.6	34.0	16.5	24.8	12.4	18.7	9.09	13.7
32	9.46	14.2									7.99	12.0
34	8.38	12.6										

Properties

	HSS6.000×0.125	HSS5.563×0.500	HSS5.563×0.375	HSS5.563×0.258	HSS5.563×0.188	HSS5.563×0.134
A_g (in.^{2})	2.14	7.45	5.72	4.01	2.95	2.12
I (in.^{4})	9.28	24.4	19.5	14.2	10.7	7.84
r (in.)	2.08	1.81	1.85	1.88	1.91	1.92

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

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

F_y = 42 ksi

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

HSS5.500–HSS5.000

Shape		HSS5.500×						HSS5.000×					
		0.500		0.375		0.258		0.500		0.375		0.312	
t_{design}, in.		0.465		0.349		0.240		0.465		0.349		0.291	
Wt/ft		26.7		20.5		14.5		24.1		18.5		15.6	
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	185	278	142	213	99.7	150	167	250	128	193	108	163
	1	184	277	142	213	99.5	150	166	250	128	192	108	162
	2	183	275	141	211	98.7	148	164	247	127	190	107	161
	3	180	271	139	208	97.5	147	162	243	125	187	105	158
	4	177	266	136	205	95.7	144	158	237	122	183	103	155
	5	173	259	133	200	93.6	141	153	230	118	178	100	150
	6	167	252	129	194	91.0	137	147	222	114	171	96.6	145
	7	162	243	125	187	88.0	132	141	212	109	164	92.7	139
	8	155	233	120	180	84.7	127	134	201	104	157	88.3	133
	9	148	222	115	172	81.1	122	126	190	98.5	148	83.7	126
	10	140	211	109	164	77.3	116	119	178	92.6	139	78.8	118
	11	132	199	103	155	73.2	110	110	166	86.5	130	73.7	111
	12	124	187	96.9	146	69.1	104	102	153	80.3	121	68.5	103
	13	116	174	90.7	136	64.8	97.4	93.7	141	74.0	111	63.3	95.1
	14	108	162	84.4	127	60.5	90.9	85.5	128	67.8	102	58.1	87.3
	15	99.2	149	78.2	117	56.2	84.4	77.5	116	61.7	92.7	53.0	79.6
	16	91.1	137	72.0	108	51.9	78.0	69.7	105	55.8	83.8	48.0	72.1
	17	83.1	125	66.0	99.1	47.7	71.7	62.2	93.4	50.1	75.3	43.2	64.9
	18	75.5	113	60.1	90.3	43.6	65.6	55.4	83.3	44.7	67.1	38.6	58.0
	19	68.0	102	54.4	81.8	39.7	59.7	49.8	74.8	40.1	60.3	34.6	52.1
	20	61.3	92.2	49.1	73.8	35.9	53.9	44.9	67.5	36.2	54.4	31.3	47.0
	21	55.6	83.6	44.5	66.9	32.5	48.9	40.7	61.2	32.8	49.3	28.4	42.6
	22	50.7	76.2	40.6	61.0	29.6	44.6	37.1	55.8	29.9	44.9	25.8	38.8
	23	46.4	69.7	37.1	55.8	27.1	40.8	34.0	51.0	27.4	41.1	23.6	35.5
	24	42.6	64.0	34.1	51.3	24.9	37.4	31.2	46.9	25.1	37.8	21.7	32.6
	25	39.3	59.0	31.4	47.2	23.0	34.5	28.7	43.2	23.2	34.8	20.0	30.1
	26	36.3	54.6	29.1	43.7	21.2	31.9	26.6	39.9	21.4	32.2	18.5	27.8
	28	31.3	47.0	25.1	37.7	18.3	27.5						
	30			21.8	32.8	15.9	24.0						

Properties

	HSS5.500×0.500	HSS5.500×0.375	HSS5.500×0.258	HSS5.000×0.500	HSS5.000×0.375	HSS5.000×0.312
A_g (in.^{2})	7.36	5.65	3.97	6.62	5.10	4.30
I (in.^{4})	23.5	18.8	13.7	17.2	13.9	12.0
r (in.)	1.79	1.83	1.86	1.61	1.65	1.67

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

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

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

F_y = 42 ksi

HSS5.000–HSS4.500

Shape	HSS5.000×								HSS4.500×			
	0.258		0.250		0.188		0.125		0.375		0.337	
t_{design}, in.	0.240		0.233		0.174		0.116		0.349		0.313	
Wt/ft	13.1		12.7		9.67		6.51		16.5		15.0	
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	90.3	136	87.8	132	66.3	99.7	44.8	67.3	114	172	104	156
1	90.0	135	87.5	131	66.1	99.4	44.6	67.1	114	171	103	155
2	89.1	134	86.7	130	65.5	98.5	44.2	66.5	113	169	102	153
3	87.8	132	85.3	128	64.6	97.0	43.6	65.5	110	166	99.9	150
4	85.9	129	83.5	126	63.2	95.0	42.7	64.2	107	161	97.1	146
5	83.5	125	81.2	122	61.5	92.4	41.6	62.5	103	155	93.7	141
6	80.7	121	78.5	118	59.5	89.4	40.2	60.5	98.8	149	89.6	135
7	77.5	116	75.4	113	57.2	85.9	38.7	58.2	93.7	141	85.1	128
8	73.9	111	71.9	108	54.6	82.1	37.0	55.7	88.2	133	80.1	120
9	70.1	105	68.2	103	51.9	78.0	35.2	52.9	82.3	124	74.8	112
10	66.1	99.4	64.3	96.7	49.0	73.6	33.3	50.0	76.1	114	69.3	104
11	61.9	93.1	60.3	90.6	46.0	69.1	31.3	47.0	69.9	105	63.7	95.8
12	57.6	86.6	56.1	84.3	42.9	64.4	29.2	43.9	63.6	95.6	58.1	87.3
13	53.3	80.1	51.9	78.0	39.7	59.7	27.1	40.8	57.5	86.4	52.5	79.0
14	49.0	73.7	47.7	71.8	36.6	55.0	25.0	37.6	51.5	77.4	47.2	70.9
15	44.8	67.3	43.6	65.6	33.5	50.4	23.0	34.5	45.7	68.7	42.0	63.1
16	40.7	61.1	39.6	59.6	30.5	45.9	21.0	31.5	40.3	60.5	37.0	55.6
17	36.7	55.1	35.8	53.8	27.6	41.5	19.0	28.6	35.7	53.6	32.8	49.3
18	32.8	49.3	32.0	48.1	24.8	37.2	17.1	25.7	31.8	47.8	29.2	43.9
19	29.5	44.3	28.7	43.2	22.2	33.4	15.4	23.1	28.5	42.9	26.2	39.4
20	26.6	40.0	25.9	39.0	20.1	30.2	13.9	20.8	25.8	38.7	23.7	35.6
21	24.1	36.3	23.5	35.3	18.2	27.4	12.6	18.9	23.4	35.1	21.5	32.3
22	22.0	33.0	21.4	32.2	16.6	24.9	11.5	17.2	21.3	32.0	19.6	29.4
23	20.1	30.2	19.6	29.5	15.2	22.8	10.5	15.7	19.5	29.3	17.9	26.9
24	18.5	27.8	18.0	27.1	13.9	20.9	9.62	14.5	17.9	26.9	16.4	24.7
25	17.0	25.6	16.6	24.9	12.8	19.3	8.87	13.3				
26	15.7	23.6	15.3	23.1	11.9	17.8	8.20	12.3				
28	13.6	20.4	13.2	19.9	10.2	15.4	7.07	10.6				
Properties												
A_g (in.^{2})	3.59		3.49		2.64		1.78		4.55		4.12	
I (in.^{4})	10.2		9.94		7.69		5.31		9.87		9.07	
r (in.)	1.69		1.69		1.71		1.73		1.47		1.48	

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

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

F_y = 42 ksi

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

HSS4.500–HSS4.000

Shape		HSS4.500×						HSS4.000×			
		0.237		0.188		0.125		0.313		0.250	
t_{design}, in.		0.220		0.174		0.116		0.291		0.233	
Wt/ft		10.8		8.67		5.85		12.3		10.0	
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	74.4	112	59.5	89.4	40.2	60.4	85.3	128	69.3	104
	1	74.1	111	59.2	89.1	40.0	60.2	84.8	128	69.0	104
	2	73.3	110	58.6	88.0	39.6	59.5	83.5	126	68.0	102
	3	71.9	108	57.5	86.4	38.9	58.4	81.4	122	66.3	99.7
	4	69.9	105	56.0	84.1	37.9	56.9	78.6	118	64.0	96.3
	5	67.6	102	54.1	81.3	36.6	55.1	75.0	113	61.2	92.1
	6	64.8	97.3	51.9	78.0	35.2	52.9	70.9	107	58.0	87.2
	7	61.6	92.6	49.4	74.3	33.6	50.4	66.4	99.8	54.4	81.7
	8	58.1	87.4	46.7	70.2	31.8	47.7	61.5	92.4	50.5	75.8
	9	54.5	81.8	43.8	65.8	29.8	44.8	56.4	84.7	46.4	69.7
	10	50.6	76.1	40.8	61.3	27.8	41.8	51.1	76.9	42.2	63.4
	11	46.7	70.2	37.7	56.6	25.7	38.7	45.9	69.1	38.0	57.1
	12	42.7	64.2	34.5	51.9	23.7	35.6	40.8	61.4	33.9	51.0
	13	38.8	58.3	31.4	47.2	21.6	32.4	35.9	54.0	30.0	45.0
	14	35.0	52.6	28.4	42.7	19.5	29.4	31.2	47.0	26.1	39.3
	15	31.3	47.0	25.4	38.2	17.6	26.4	27.2	40.9	22.8	34.2
	16	27.7	41.6	22.6	34.0	15.7	23.5	23.9	36.0	20.0	30.1
	17	24.5	36.9	20.0	30.1	13.9	20.9	21.2	31.8	17.7	26.7
	18	21.9	32.9	17.9	26.8	12.4	18.6	18.9	28.4	15.8	23.8
	19	19.6	29.5	16.0	24.1	11.1	16.7	17.0	25.5	14.2	21.3
	20	17.7	26.6	14.5	21.7	10.0	15.1	15.3	23.0	12.8	19.3
	21	16.1	24.2	13.1	19.7	9.09	13.7	13.9	20.9	11.6	17.5
	22	14.6	22.0	11.9	18.0	8.28	12.4	12.7	19.0	10.6	15.9
	23	13.4	20.1	10.9	16.4	7.58	11.4				
	24	12.3	18.5	10.0	15.1	6.96	10.5				
	25	11.3	17.0	9.25	13.9	6.41	9.64				

Properties

	HSS4.500×0.237	HSS4.500×0.188	HSS4.500×0.125	HSS4.000×0.313	HSS4.000×0.250
A_g (in.^{2})	2.96	2.36	1.60	3.39	2.76
I (in.^{4})	6.79	5.54	3.84	5.87	4.91
r (in.)	1.52	1.53	1.55	1.32	1.33

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

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

Table 4–5 (continued)
Available Strength in Axial Compression, kips
Round HSS

HSS4.000

F_y = 42 ksi

Shape		HSS4.000×									
		0.237		0.226		0.220		0.188		0.125	
t_{design}, in.		0.220		0.210		0.205		0.174		0.116	
Wt/ft		9.53		9.12		8.89		7.66		5.18	
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	65.7	98.8	62.9	94.5	61.5	92.4	52.6	79.1	35.6	53.5
	1	65.4	98.3	62.6	94.1	61.2	91.9	52.3	78.7	35.4	53.3
	2	64.4	96.8	61.7	92.7	60.3	90.6	51.6	77.5	34.9	52.5
	3	62.8	94.5	60.2	90.4	58.8	88.4	50.4	75.7	34.1	51.3
	4	60.7	91.3	58.1	87.4	56.8	85.4	48.7	73.2	33.0	49.6
	5	58.1	87.3	55.6	83.6	54.4	81.7	46.6	70.1	31.7	47.6
	6	55.0	82.7	52.7	79.2	51.5	77.4	44.2	66.5	30.1	45.2
	7	51.6	77.5	49.4	74.3	48.4	72.7	41.5	62.4	28.3	42.5
	8	47.9	72.0	45.9	69.0	44.9	67.5	38.6	58.1	26.4	39.6
	9	44.1	66.2	42.2	63.5	41.3	62.1	35.6	53.5	24.4	36.6
	10	40.1	60.3	38.5	57.8	37.7	56.6	32.5	48.8	22.3	33.5
	11	36.2	54.4	34.7	52.2	34.0	51.1	29.3	44.1	20.2	30.3
	12	32.3	48.5	31.0	46.6	30.4	45.6	26.3	39.5	18.1	27.2
	13	28.5	42.9	27.4	41.2	26.9	40.4	23.3	35.0	16.1	24.2
	14	24.9	37.5	24.0	36.0	23.5	35.3	20.4	30.7	14.2	21.4
	15	21.7	32.6	20.9	31.4	20.5	30.8	17.8	26.7	12.4	18.6
	16	19.1	28.7	18.4	27.6	18.0	27.0	15.6	23.5	10.9	16.4
	17	16.9	25.4	16.3	24.4	15.9	24.0	13.9	20.8	9.65	14.5
	18	15.1	22.7	14.5	21.8	14.2	21.4	12.4	18.6	8.61	12.9
	19	13.5	20.3	13.0	19.6	12.8	19.2	11.1	16.7	7.72	11.6
	20	12.2	18.4	11.8	17.7	11.5	17.3	10.0	15.0	6.97	10.5
	21	11.1	16.7	10.7	16.0	10.4	15.7	9.08	13.6	6.32	9.50
	22	10.1	15.2	9.71	14.6	9.52	14.3	8.27	12.4	5.76	8.66

Properties

	0.237	0.226	0.220	0.188	0.125
A_g (in.^{2})	2.61	2.50	2.44	2.09	1.42
I (in.^{4})	4.68	4.50	4.41	3.83	2.67
r (in.)	1.34	1.34	1.34	1.35	1.37

ASD	LRFD	
Ω_c = 1.67	ϕ_c = 0.90	Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 35 ksi

Table 4–6
Available Strength in Axial Compression, kips
Pipe

PIPE 12–PIPE 8

Shape	Pipe 12				Pipe 10				Pipe 8			
	XS		Std		XS		Std		XXS		XS	
t_{design}, in.	0.465		0.349		0.465		0.340		0.816		0.465	
Wt/ft	65.5		49.6		54.8		40.5		72.5		43.4	
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	376	565	285	428	315	473	233	350	419	630	250	375
6	371	557	281	422	309	464	229	343	405	609	242	364
7	369	555	280	420	306	461	227	341	400	601	239	360
8	367	551	278	418	304	457	225	338	394	593	236	355
9	364	548	276	415	301	452	223	335	388	583	233	350
10	362	544	274	412	298	448	221	332	381	573	229	344
11	359	539	272	409	294	442	218	328	373	561	225	337
12	356	534	270	405	291	437	215	324	365	549	220	331
13	352	529	267	401	287	431	213	320	357	536	215	323
14	348	524	264	397	282	424	209	315	348	522	210	316
15	345	518	261	393	278	418	206	310	338	508	205	308
16	340	512	258	388	273	410	203	305	328	493	199	300
17	336	505	255	383	268	403	199	299	318	478	194	291
18	331	498	252	378	263	395	195	294	307	462	188	282
19	327	491	248	373	258	387	192	288	297	446	182	273
20	322	484	244	367	252	379	187	282	286	430	176	264
21	317	476	241	362	246	370	183	276	275	413	169	254
22	311	468	237	356	241	362	179	269	264	397	163	245
23	306	460	233	350	235	353	175	263	253	380	157	235
24	300	452	229	343	229	344	170	256	242	363	150	226
25	295	443	224	337	222	334	166	249	231	347	144	216
26	289	434	220	331	216	325	161	243	220	330	138	207
27	283	425	216	324	210	316	157	236	209	314	131	197
28	277	416	211	317	204	306	152	229	198	298	125	188
29	271	407	206	310	197	296	148	222	188	282	119	179
30	265	398	202	303	191	287	143	215	177	266	113	170
32	252	379	192	289	178	268	134	201	157	236	101	152
34	240	360	183	275	166	249	124	187	139	209	89.9	135
36	227	341	173	261	153	230	115	173	124	187	80.2	120
38	214	322	164	246	141	212	106	160	111	167	71.9	108
40	201	303	154	232	129	194	97.7	147	101	151	64.9	97.6

Properties

Property	Pipe 12 XS	Pipe 12 Std	Pipe 10 XS	Pipe 10 Std	Pipe 8 XXS	Pipe 8 XS
A_g (in.^{2})	17.9	13.6	15.0	11.1	20.0	11.9
I (in.^{4})	339	262	199	151	154	100
r (in.)	4.35	4.39	3.64	3.68	2.78	2.89

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

Table 4–6 (continued)
Available Strength in Axial Compression, kips

F_y = 35 ksi

PIPE 8–PIPE 5

Pipe

Shape	Pipe 8		Pipe 6						Pipe 5	
	Std		XXS		XS		Std		XXS	
t_{design}, in.	0.300		0.805		0.403		0.261		0.699	
Wt/ft	28.6		53.2		28.6		19.0		38.6	
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	165	247	308	463	165	248	109	164	224	337
6	160	240	290	435	156	235	104	156	205	309
7	158	237	283	426	153	230	102	153	199	299
8	156	234	276	415	150	225	99.7	150	192	288
9	154	231	268	403	146	220	97.3	146	184	277
10	151	227	260	390	142	213	94.6	142	176	264
11	148	223	251	377	137	207	91.8	138	167	251
12	146	219	241	362	133	200	88.7	133	158	237
13	143	214	231	347	128	192	85.6	129	148	223
14	139	209	220	331	123	184	82.3	124	139	209
15	136	204	210	315	117	176	78.9	119	129	195
16	132	199	199	299	112	168	75.4	113	120	180
17	129	193	188	283	107	160	71.9	108	111	166
18	125	188	177	266	101	152	68.3	103	102	153
19	121	182	166	250	95.5	144	64.7	97.3	92.9	140
20	117	176	156	234	90.0	135	61.2	91.9	84.3	127
21	113	170	145	218	84.6	127	57.6	86.6	76.4	115
22	109	164	135	203	79.3	119	54.1	81.4	69.7	105
23	105	158	125	188	74.0	111	50.7	76.2	63.7	95.8
24	101	152	115	173	68.9	104	47.4	71.2	58.5	88.0
25	96.7	145	106	159	64.0	96.1	44.1	66.3	53.9	81.1
26	92.6	139	97.9	147	59.1	88.9	40.9	61.4	49.9	75.0
27	88.6	133	90.8	137	54.8	82.4	37.9	57.0	46.2	69.5
28	84.5	127	84.5	127	51.0	76.6	35.2	53.0	43.0	64.6
29	80.5	121	78.7	118	47.5	71.4	32.9	49.4	40.1	60.2
30	76.6	115	73.6	111	44.4	66.7	30.7	46.1		
32	68.9	104	64.7	97.2	39.0	58.7	27.0	40.6		
34	61.5	92.4	57.3	86.1	34.6	52.0	23.9	35.9		
36	54.8	82.4			30.8	46.4	21.3	32.0		
38	49.2	74.0								
40	44.4	66.8								
Properties										
A_g (in.^{2})	7.85		14.7		7.88		5.22		10.7	
I (in.^{4})	68.1		63.5		38.3		26.5		32.2	
r (in.)	2.95		2.08		2.20		2.25		1.74	

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 35 ksi

Table 4–6 (continued)
Available Strength in Axial Compression, kips
Pipe

PIPE 5–PIPE 4

Shape		Pipe 5				Pipe 4					
		XS		Std		XXS		XS		Std	
t_{design}, in.		0.349		0.241		0.628		0.315		0.221	
Wt/ft		20.8		14.6		27.6		15.0		10.8	
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	120	180	84.5	127	160	241	86.8	130	62.2	93.6
	6	111	167	78.4	118	139	210	76.9	116	55.4	83.3
	7	108	162	76.3	115	133	199	73.6	111	53.2	79.9
	8	104	157	73.9	111	125	188	70.0	105	50.7	76.2
	9	101	151	71.4	107	117	176	66.2	99.4	48.0	72.1
	10	96.6	145	68.6	103	109	164	62.1	93.3	45.1	67.9
	11	92.3	139	65.7	98.7	101	151	57.9	87.0	42.2	63.4
	12	87.8	132	62.6	94.1	92.2	139	53.6	80.5	39.2	58.9
	13	83.2	125	59.5	89.4	83.8	126	49.3	74.1	36.2	54.4
	14	78.5	118	56.2	84.5	75.6	114	45.0	67.7	33.2	49.9
	15	73.7	111	52.9	79.5	67.6	102	40.9	61.4	30.2	45.4
	16	69.0	104	49.6	74.6	59.9	90.1	36.8	55.4	27.4	41.1
	17	64.2	96.5	46.3	69.6	53.1	79.8	32.9	49.5	24.6	37.0
	18	59.6	89.5	43.1	64.8	47.3	71.2	29.4	44.1	22.0	33.0
	19	55.0	82.6	39.9	60.0	42.5	63.9	26.4	39.6	19.7	29.6
	20	50.5	76.0	36.8	55.3	38.3	57.6	23.8	35.7	17.8	26.7
	21	46.2	69.5	33.8	50.8	34.8	52.3	21.6	32.4	16.1	24.2
	22	42.1	63.3	30.8	46.3	31.7	47.6	19.7	29.5	14.7	22.1
	23	38.5	57.9	28.2	42.4	29.0	43.6	18.0	27.0	13.4	20.2
	24	35.4	53.2	25.9	38.9			16.5	24.8	12.4	18.6
	25	32.6	49.0	23.9	35.9					11.4	17.1
	26	30.1	45.3	22.1	33.2						
	27	28.0	42.0	20.5	30.8						
	28	26.0	39.1	19.0	28.6						
	29	24.2	36.4	17.7	26.7						
	30	22.6	34.0	16.6	24.9						

Properties

	Pipe 5 XS	Pipe 5 Std	Pipe 4 XXS	Pipe 4 XS	Pipe 4 Std
A_g (in.^{2})	5.72	4.03	7.64	4.14	2.97
I (in.^{4})	19.5	14.3	14.7	9.12	6.82
r (in.)	1.85	1.88	1.39	1.48	1.51

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	Note: Heavy line indicates Kl/r equal to or greater than 200.

Table 4–6 (continued)
Available Strength in Axial Compression, kips
Pipe

PIPE 3½–PIPE 3

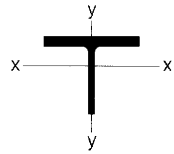
$F_y = 35$ ksi

Shape		Pipe 3½				Pipe 3					
		XS		Std		XXS		XS		Std	
t_{design}, in.		0.296		0.211		0.559		0.280		0.201	
Wt/ft		12.5		9.12		18.6		10.3		7.58	
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	72.1	108	52.6	79.1	108	163	59.3	89.1	43.6	65.5
	6	61.8	92.9	45.4	68.2	85.3	128	48.4	72.8	35.9	53.9
	7	58.5	87.9	43.0	64.7	78.3	118	45.0	67.6	33.5	50.3
	8	54.9	82.4	40.5	60.8	71.0	107	41.3	62.1	30.9	46.4
	9	51.0	76.7	37.8	56.7	63.5	95.4	37.5	56.4	28.2	42.3
	10	47.0	70.7	34.9	52.5	56.0	84.2	33.7	50.7	25.4	38.2
	11	43.0	64.6	32.1	48.2	48.8	73.3	30.0	45.0	22.7	34.1
	12	39.0	58.6	29.2	43.8	41.9	63.0	26.3	39.5	20.0	30.1
	13	35.0	52.7	26.3	39.6	35.7	53.7	22.8	34.3	17.5	26.3
	14	31.2	46.9	23.6	35.4	30.8	46.3	19.7	29.6	15.1	22.7
	15	27.5	41.4	20.9	31.5	26.8	40.3	17.1	25.8	13.2	19.8
	16	24.2	36.4	18.4	27.7	23.6	35.4	15.1	22.6	11.6	17.4
	17	21.4	32.2	16.3	24.5	20.9	31.4	13.3	20.1	10.3	15.4
	18	19.1	28.7	14.6	21.9			11.9	17.9	9.15	13.8
	19	17.2	25.8	13.1	19.6			10.7	16.1	8.21	12.3
	20	15.5	23.3	11.8	17.7						
	21	14.1	21.1	10.7	16.1						
	22			9.74	14.6						
Properties											
A_g (in.²)		3.44		2.51		5.16		2.83		2.08	
I (in.⁴)		5.94		4.52		5.79		3.70		2.85	
r (in.)		1.31		1.34		1.06		1.14		1.17	

ASD	LRFD	Note: Heavy line indicates Kl/r equal to or greater than 200.
$\Omega_c = 1.67$	$\phi_c = 0.90$	

F_y = 50 ksi

Table 4–7
Available Strength in Axial Compression, kips
WT Shapes



WT18

Shape		WT18×									
Wt/ft		151[c]		141[c]		131[c]		123.5[c]		115.5[c]	
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 indicated axis — X-X Axis	0	1210	1820	1050	1580	921	1380	813	1220	708	1060
	10	1170	1760	1020	1530	894	1340	791	1190	690	1040
	12	1150	1730	1010	1510	883	1330	782	1180	682	1030
	14	1130	1700	991	1490	869	1310	771	1160	673	1010
	16	1110	1670	972	1460	854	1280	758	1140	663	997
	18	1090	1630	952	1430	837	1260	744	1120	652	980
	20	1060	1590	930	1400	819	1230	729	1100	639	961
	22	1030	1550	906	1360	799	1200	712	1070	626	940
	24	999	1500	880	1320	778	1170	695	1040	611	919
	26	967	1450	853	1280	756	1140	676	1020	596	896
	28	933	1400	825	1240	732	1100	656	986	580	871
	30	897	1350	796	1200	708	1060	635	955	563	846
	32	861	1290	766	1150	682	1030	614	923	545	820
	34	824	1240	735	1100	657	987	592	890	527	793
	36	787	1180	703	1060	630	947	570	857	509	765
	40	712	1070	640	962	577	867	524	788	471	708
Y-Y Axis	0	1210	1820	1050	1580	921	1380	813	1220	708	1060
	10	1040	1560	902	1360	778	1170	682	1030	589	885
	12	1030	1540	890	1340	769	1160	675	1010	584	877
	14	1000	1510	873	1310	755	1140	665	999	576	865
	16	972	1460	849	1280	737	1110	651	978	565	849
	18	935	1410	820	1230	714	1070	632	950	551	828
	20	893	1340	786	1180	687	1030	610	917	534	803
	22	848	1270	749	1130	657	987	585	880	514	773
	24	800	1200	709	1070	624	938	558	839	492	740
	26	750	1130	668	1000	589	886	529	795	468	704
	28	699	1050	626	940	554	832	499	750	444	667
	30	649	975	583	876	518	778	468	704	418	628
	32	599	900	540	812	481	724	437	657	392	590
	34	549	825	498	749	446	670	406	611	366	550
	36	501	753	457	687	410	617	376	565	340	512
	40	411	618	379	569	342	514	317	476	290	436

Properties

	151[c]	141[c]	131[c]	123.5[c]	115.5[c]
A_g (in.^{2})	44.4	41.5	38.5	36.3	34.0
r_x (in.)	5.37	5.36	5.36	5.36	5.36
r_y (in.)	3.82	3.80	3.76	3.74	3.71

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

[c] Shape is slender for compression with F_y = 50 ksi.

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

WT18

F_y = 50 ksi

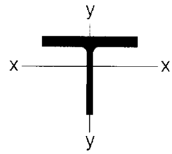
Shape		WT18×									
Wt/ft		128[c]		116[c]		105[c]		97[c]		91[c]	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis											
X-X Axis	0	1040	1560	846	1270	731	1100	599	901	511	769
	10	1010	1520	823	1240	713	1070	585	880	501	752
	12	996	1500	813	1220	704	1060	579	871	496	745
	14	980	1470	801	1200	695	1040	572	860	490	737
	16	963	1450	788	1180	684	1030	564	848	484	728
	18	943	1420	773	1160	672	1010	555	835	477	717
	20	922	1390	757	1140	659	990	546	820	470	706
	22	898	1350	740	1110	645	969	535	804	461	693
	24	874	1310	721	1080	629	946	524	787	452	680
	26	848	1270	702	1050	613	921	512	769	443	666
	28	820	1230	681	1020	596	896	499	750	433	651
	30	792	1190	660	992	578	869	486	730	422	635
	32	763	1150	638	958	560	841	472	709	411	618
	34	733	1100	615	924	541	813	457	687	400	601
	36	702	1060	591	889	521	784	443	665	388	583
	40	640	962	544	818	482	724	412	620	364	547
Y-Y Axis	0	1040	1560	846	1270	731	1100	599	901	511	769
	10	841	1260	684	1030	573	861	472	709	403	605
	12	800	1200	655	984	551	828	456	685	391	588
	14	749	1130	618	928	522	785	436	655	376	564
	16	692	1040	575	865	488	734	411	618	357	536
	18	632	949	530	796	451	678	383	576	335	503
	20	570	856	482	725	412	619	354	531	311	468
	22	508	763	434	652	372	559	323	485	286	431
	24	447	672	387	581	332	499	292	439	261	393
	26	389	585	341	512	294	442	261	393	236	355
	28	338	508	297	446	257	386	232	348	211	318
	30	296	445	260	391	226	339	204	306	187	282
	32	261	393	230	346	200	300	181	272	166	250
	34	232	349	205	308	178	267	161	242	148	223
	36	208	312	183	275	160	240	145	217	133	200
	40	169	254	149	224	130	196	118	178	109	164
Properties											
A_g (in.^{2})		37.7		34.1		30.9		28.5		26.8	
r_x (in.)		5.66		5.63		5.65		5.62		5.62	
r_y (in.)		2.65		2.62		2.58		2.56		2.55	

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

[c] Shape is slender for compression with F_y = 50 ksi.

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT18

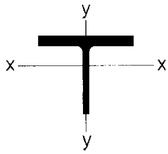
Shape		WT18×							
Wt/ft		85[c]		80[c]		75[c]		67.5[c]	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	424	637	367	552	322	484	271	408
	10	416	625	361	542	317	476	267	402
	12	412	620	358	538	315	473	265	399
	14	408	614	355	533	312	469	263	396
	16	404	607	351	528	309	464	261	392
	18	398	599	347	522	306	459	258	388
	20	393	590	342	515	302	454	255	384
	22	387	581	337	507	298	447	252	379
	24	380	571	332	499	293	441	249	374
	26	373	560	326	490	289	434	245	368
	28	365	549	320	481	284	426	241	362
	30	357	537	314	472	278	418	237	356
	32	349	525	307	462	273	410	233	350
	34	340	512	300	451	267	401	228	343
	36	331	498	293	440	261	392	223	336
	40	313	470	278	417	248	373	213	321
Y-Y Axis	0	424	637	367	552	322	484	271	408
	10	335	503	288	432	248	373	197	296
	12	327	491	281	423	243	366	193	290
	14	316	474	273	410	236	355	188	282
	16	302	454	262	394	228	342	181	273
	18	286	429	249	374	218	327	174	261
	20	268	402	235	353	206	309	165	248
	22	249	374	219	330	193	290	155	233
	24	229	344	203	305	180	270	144	217
	26	209	315	187	281	166	249	134	201
	28	190	285	170	256	152	228	122	184
	30	171	256	154	232	138	208	111	168
	32	152	228	138	208	125	187	100	151
	34	136	204	124	186	112	168	90.5	136
	36	122	183	111	167	101	151	81.9	123
	40	99.9	150	91.3	137	82.9	125		

Properties

	85	80	75	67.5
A_g (in.^{2})	25.0	23.5	22.1	19.9
r_x (in.)	5.61	5.61	5.62	5.66
r_y (in.)	2.53	2.50	2.47	2.38

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

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



WT16.5

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT16.5×									
Wt/ft		193.5[h]		177[h]		159		145.5[c]		131.5[c]	
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 indicated axis — X-X Axis	0	1710	2560	1560	2340	1400	2110	1270	1910	1050	1580
	10	1640	2460	1500	2250	1340	2020	1220	1830	1010	1520
	12	1610	2420	1470	2210	1320	1980	1200	1800	992	1490
	14	1570	2370	1440	2160	1290	1940	1170	1760	972	1460
	16	1540	2310	1400	2110	1260	1890	1140	1710	949	1430
	18	1490	2250	1360	2050	1220	1840	1110	1670	924	1390
	20	1450	2180	1320	1990	1180	1780	1070	1610	897	1350
	22	1400	2100	1280	1920	1140	1720	1040	1560	868	1300
	24	1350	2020	1230	1850	1100	1650	996	1500	837	1260
	26	1290	1940	1180	1770	1050	1580	954	1430	805	1210
	28	1240	1860	1130	1690	1010	1510	912	1370	772	1160
	30	1180	1770	1070	1610	957	1440	868	1300	738	1110
	32	1120	1680	1020	1530	908	1360	824	1240	703	1060
	34	1060	1600	965	1450	859	1290	779	1170	667	1000
	36	1000	1510	910	1370	809	1220	734	1100	632	950
	40	885	1330	802	1210	711	1070	645	970	561	843
Y-Y Axis	0	1710	2560	1560	2340	1400	2110	1270	1910	1050	1580
	10	1530	2300	1390	2090	1230	1850	1100	1660	903	1360
	12	1480	2230	1340	2020	1200	1800	1080	1620	888	1330
	14	1430	2150	1300	1950	1150	1730	1050	1570	865	1300
	16	1370	2060	1240	1860	1100	1660	1000	1510	835	1260
	18	1300	1960	1180	1780	1050	1580	957	1440	800	1200
	20	1230	1860	1120	1680	993	1490	905	1360	760	1140
	22	1160	1750	1050	1580	933	1400	850	1280	718	1080
	24	1090	1630	983	1480	872	1310	793	1190	673	1010
	26	1010	1520	914	1370	810	1220	735	1100	628	944
	28	936	1410	845	1270	748	1120	677	1020	582	875
	30	860	1290	776	1170	687	1030	620	931	536	806
	32	786	1180	708	1060	626	941	563	847	491	738
	34	714	1070	642	965	567	853	509	765	447	672
	36	644	968	578	869	510	766	457	686	404	608
	40	523	786	470	706	415	623	372	559	330	495

Properties

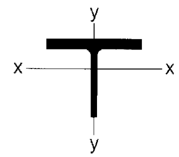
	193.5	177	159	145.5	131.5
A_g (in.^{2})	57.0	52.1	46.8	42.8	38.7
r_x (in.)	5.07	5.03	4.99	4.96	4.93
r_y (in.)	3.77	3.74	3.71	3.68	3.65

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

[h] Flange thickness is greater than 2 in. Special requirements may apply per AISC Specification Section A3.1c.
[c] Shape is slender for compression with F_y = 50 ksi.

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT16.5

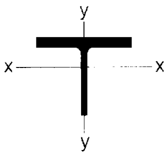
Shape			WT16.5×							
Wt/ft			120.5[c]		110.5[c]		100.5[c]		84.5[c]	
Design			P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
			ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis	X-X Axis	0	921	1380	782	1170	635	955	465	699
		10	888	1330	755	1130	616	926	454	682
		12	873	1310	744	1120	608	914	449	675
		14	857	1290	731	1100	598	899	443	666
		16	838	1260	716	1080	587	883	436	656
		18	817	1230	699	1050	575	864	429	645
		20	794	1190	681	1020	562	844	421	632
		22	770	1160	662	995	547	823	412	619
		24	744	1120	641	964	532	800	402	605
		26	717	1080	619	931	516	775	392	590
		28	688	1030	597	897	499	750	382	574
		30	659	991	574	862	481	724	371	557
		32	630	946	550	826	463	697	359	540
		34	599	901	525	789	445	669	348	523
		36	569	855	501	752	426	640	336	504
		40	508	764	451	678	388	583	311	467
	Y-Y Axis	0	921	1380	782	1170	635	955	465	699
		10	775	1160	649	975	521	783	382	574
		12	764	1150	641	963	516	775	369	555
		14	747	1120	629	945	508	763	353	530
		16	724	1090	612	920	497	747	334	501
		18	696	1050	591	889	483	726	312	469
		20	664	998	567	852	466	700	289	434
		22	629	945	539	810	446	670	265	398
		24	591	889	509	766	424	638	241	362
		26	553	831	479	719	401	603	217	326
		28	514	772	447	672	377	567	194	291
		30	474	713	415	623	353	530	171	257
		32	436	655	383	576	328	493	151	228
		34	398	598	352	529	304	457	135	203
		36	361	543	321	483	280	420	121	182
		40	295	443	264	397	233	351	98.5	148

Properties

	120.5	110.5	100.5	84.5
A_g (in.^{2})	35.5	32.6	29.6	24.8
r_x (in.)	4.96	4.95	4.95	5.12
r_y (in.)	3.62	3.59	3.56	2.50

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

[c] Shape is slender for compression with F_y = 50 ksi.



WT16.5

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT16.5×							
Wt/ft		76[c]		70.5[c]		65[c]		59[c]	
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	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	385	579	329	494	282	424	233	350
	10	377	566	322	484	276	416	229	344
	12	373	560	319	479	274	412	227	341
	14	368	554	315	474	271	408	225	338
	16	363	546	311	468	268	403	222	334
	18	358	538	307	461	265	398	220	330
	20	352	529	302	454	261	392	217	326
	22	345	518	297	446	257	386	214	321
	24	338	508	291	438	252	379	210	316
	26	330	496	285	429	247	372	207	311
	28	322	484	279	419	242	364	203	305
	30	314	471	272	409	237	356	199	299
	32	305	458	265	399	231	348	195	292
	34	296	445	258	388	225	339	190	286
	36	286	430	250	376	219	330	186	279
	40	267	402	235	353	207	311	176	265
Y-Y Axis	0	385	579	329	494	282	424	233	350
	10	308	463	259	389	216	324	171	257
	12	299	450	252	379	211	317	168	252
	14	288	433	244	366	204	307	163	245
	16	274	412	233	350	196	295	157	236
	18	258	388	221	332	186	280	150	225
	20	240	361	207	311	175	264	142	213
	22	222	334	192	289	164	246	133	200
	24	203	305	177	266	151	227	124	186
	26	184	277	161	243	139	208	114	171
	28	166	249	146	220	126	189	104	156
	30	148	222	131	197	114	171	94.4	142
	32	131	197	117	176	101	153	84.7	127
	34	117	176	104	157	90.9	137	76.2	115
	36	105	158	93.8	141	81.9	123	68.8	103
	40	85.8	129	76.9	116				

Properties

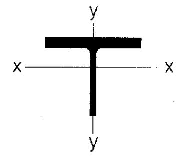
	76	70.5	65	59
A_g (in.^{2})	22.4	20.8	19.2	17.3
r_x (in.)	5.14	5.15	5.18	5.20
r_y (in.)	2.47	2.43	2.38	2.32

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

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

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT15

Shape		WT15×											
Wt/ft		195.5[h]		178.5[h]		163[h]		146		130.5		117.5[c]	
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 indicated axis — X-X Axis	0	1720	2590	1570	2360	1430	2160	1290	1930	1150	1730	989	1490
	10	1640	2460	1490	2240	1360	2050	1220	1830	1090	1640	939	1410
	12	1600	2410	1460	2200	1330	2000	1190	1790	1070	1600	918	1380
	14	1560	2350	1420	2140	1300	1950	1160	1740	1040	1560	894	1340
	16	1520	2280	1380	2070	1260	1890	1120	1690	1000	1510	866	1300
	18	1470	2210	1330	2000	1210	1820	1080	1630	969	1460	837	1260
	20	1410	2120	1280	1930	1170	1750	1040	1570	931	1400	804	1210
	22	1360	2040	1230	1850	1120	1680	997	1500	891	1340	770	1160
	24	1290	1950	1170	1760	1070	1600	950	1430	848	1280	735	1100
	26	1230	1850	1120	1680	1010	1520	901	1350	805	1210	698	1050
	28	1170	1760	1060	1590	958	1440	852	1280	760	1140	660	992
	30	1100	1660	996	1500	903	1360	802	1200	715	1070	622	934
	32	1040	1560	936	1410	847	1270	751	1130	669	1010	583	876
	34	971	1460	875	1320	792	1190	701	1050	624	938	545	819
	36	906	1360	816	1230	737	1110	651	979	580	871	507	762
	40	779	1170	699	1050	630	947	555	834	494	742	433	651
Y-Y Axis	0	1720	2590	1570	2360	1430	2160	1290	1930	1150	1730	989	1490
	10	1560	2340	1410	2120	1280	1920	1140	1710	1000	1510	854	1280
	12	1510	2260	1360	2050	1240	1860	1100	1650	970	1460	835	1260
	14	1450	2170	1310	1970	1190	1790	1050	1590	931	1400	808	1210
	16	1380	2080	1250	1880	1130	1700	1010	1510	887	1330	774	1160
	18	1310	1970	1190	1780	1070	1610	953	1430	840	1260	735	1110
	20	1240	1860	1120	1680	1010	1520	897	1350	790	1190	693	1040
	22	1160	1740	1050	1570	947	1420	839	1260	738	1110	648	974
	24	1080	1620	975	1470	880	1320	780	1170	685	1030	602	905
	26	1000	1500	902	1360	813	1220	719	1080	632	949	556	835
	28	920	1380	829	1250	746	1120	660	991	578	869	509	765
	30	841	1260	757	1140	680	1020	601	903	526	790	464	697
	32	764	1150	686	1030	616	926	544	817	475	714	419	630
	34	690	1040	619	930	555	834	488	733	425	639	376	565
	36	618	928	553	831	495	745	436	655	380	571	336	506
	40	501	753	449	675	402	604	354	532	309	464	274	412

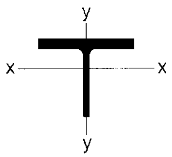
Properties

	195.5	178.5	163	146	130.5	117.5
A_g (in.^{2})	57.6	52.5	47.9	42.9	38.4	34.6
r_x (in.)	4.61	4.56	4.52	4.48	4.46	4.41
r_y (in.)	3.67	3.64	3.60	3.58	3.53	3.51

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

[h] Flange thickness is greater than 2 in. Special requirements may apply per AISC Specification Section A3.1c.

[c] Shape is slender for compression with F_y = 50 ksi.



WT15

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT15×									
Wt/ft		105.5[c]		95.5[c]		86.5[c]		74[c]		66[c]	
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 indicated axis											
X-X Axis	0	837	1260	687	1030	560	841	466	700	385	579
	10	797	1200	658	988	538	809	450	676	373	561
	12	781	1170	645	969	529	795	443	665	368	553
	14	761	1140	630	947	518	778	435	653	362	544
	16	740	1110	614	923	506	760	426	640	355	533
	18	716	1080	596	896	492	740	416	625	347	522
	20	690	1040	576	866	478	718	405	608	339	509
	22	663	996	555	835	462	695	393	591	330	496
	24	634	953	533	802	446	670	380	572	320	481
	26	604	908	510	767	428	644	367	552	310	466
	28	573	862	487	731	410	617	354	532	299	450
	30	542	815	462	695	392	589	340	510	288	434
	32	511	767	438	658	373	561	325	489	277	417
	34	479	720	413	621	354	532	310	466	266	399
	36	448	673	388	584	335	504	295	444	254	382
	40	387	581	340	511	297	446	266	399	230	346
Y-Y Axis	0	837	1260	687	1030	560	841	466	700	385	579
	10	707	1060	574	863	462	694	372	559	298	448
	12	694	1040	566	850	456	686	353	531	285	428
	14	676	1020	553	832	448	673	330	496	268	403
	16	651	979	536	806	437	656	304	457	249	374
	18	621	934	515	774	422	634	277	416	228	343
	20	588	884	491	737	405	608	248	373	206	310
	22	553	830	464	697	385	579	220	331	184	277
	24	515	775	435	654	364	547	193	291	162	244
	26	478	718	406	610	342	514	167	251	141	212
	28	440	661	376	566	319	479	145	218	123	185
	30	402	604	347	521	296	445	127	191	108	163
	32	365	549	317	477	273	411	112	169	95.6	144
	34	330	496	289	434	251	377	99.8	150	85.2	128
	36	296	444	261	392	229	344	89.3	134	76.3	115
	40	241	362	213	320	188	283				

Properties

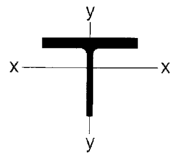
	105.5	95.5	86.5	74	66
A_g (in.^{2})	31.1	28.1	25.5	21.7	19.4
r_x (in.)	4.43	4.42	4.42	4.63	4.66
r_y (in.)	3.49	3.46	3.42	2.28	2.25

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

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

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



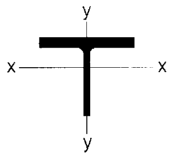
WT15

Shape		WT15×									
Wt/ft		62[c]		58[c]		54[c]		49.5[c]		45[c]	
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 indicated axis — X-X Axis	0	329	494	290	436	254	381	214	322	160	240
	10	319	480	283	425	247	371	209	315	157	236
	12	315	473	279	420	244	367	207	311	156	234
	14	310	466	275	414	241	362	205	308	154	231
	16	305	458	271	407	237	357	202	303	152	229
	18	299	449	266	399	233	351	199	299	150	226
	20	292	439	260	391	229	344	195	293	148	222
	22	285	429	254	382	224	337	191	288	146	219
	24	278	417	248	373	219	329	187	281	143	215
	26	270	405	241	363	213	321	183	275	140	211
	28	261	393	234	352	208	312	178	268	137	206
	30	253	380	227	341	201	303	174	261	134	202
	32	244	366	219	330	195	293	169	253	131	197
	34	234	352	212	318	189	284	164	246	128	192
	36	225	338	204	306	182	274	158	238	124	187
	40	206	309	187	282	168	253	147	222	117	176
Y-Y Axis	0	329	494	290	436	254	381	214	322	160	240
	10	254	382	220	331	186	280	152	229	115	173
	12	244	367	212	319	180	271	147	222	113	169
	14	231	348	202	304	172	258	141	212	109	164
	16	216	325	190	285	162	243	134	201	104	157
	18	200	300	176	264	151	226	125	188	99.1	149
	20	182	274	161	242	138	208	116	174	93.0	140
	22	164	247	145	219	126	189	106	159	86.4	130
	24	146	220	130	196	113	170	95.3	143	79.5	119
	26	129	194	115	173	100	151	85.1	128	72.4	109
	28	113	169	101	152	88.0	132	75.1	113	65.4	98.4
	30	98.9	149	88.9	134	77.7	117	66.6	100	58.5	87.9
	32	87.6	132	78.8	118	69.1	104	59.4	89.2	52.3	78.6
	34	78.1	117	70.3	106	61.8	92.8	53.2	79.9	47.0	70.6
	36	70.0	105	63.1	94.9						

Properties

	62	58	54	49.5	45
A_g (in.^{2})	18.2	17.1	15.9	14.5	13.2
r_x (in.)	4.66	4.67	4.69	4.71	4.69
r_y (in.)	2.23	2.19	2.15	2.10	2.09

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	[c] Shape is slender for compression with F_y = 50 ksi. Note: Heavy line indicates Kl/r equal to or greater than 200.



WT13.5

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT13.5×											
Wt/ft		129		117.5		108.5		97[c]		89[c]		80.5[c]	
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 indicated axis — X-X Axis	0	1140	1710	1040	1560	958	1440	823	1240	737	1110	607	912
	10	1070	1600	973	1460	896	1350	771	1160	693	1040	573	861
	12	1040	1560	945	1420	870	1310	749	1130	674	1010	559	839
	14	1000	1500	913	1370	840	1260	724	1090	652	980	542	815
	16	962	1450	878	1320	807	1210	696	1050	628	944	524	787
	18	921	1380	839	1260	771	1160	666	1000	602	905	504	757
	20	876	1320	799	1200	733	1100	634	953	574	863	482	725
	22	829	1250	756	1140	692	1040	600	902	545	819	460	691
	24	781	1170	711	1070	651	979	565	850	514	773	436	655
	26	732	1100	666	1000	609	915	530	796	483	726	412	619
	28	682	1030	621	933	566	851	494	742	451	679	387	582
	30	632	950	575	864	524	787	458	688	420	631	362	544
	32	583	877	530	797	482	725	422	635	389	584	337	507
	34	535	804	486	730	441	663	388	583	358	538	313	470
	36	488	734	443	666	402	604	354	532	328	493	289	434
	40	400	601	363	545	328	493	290	436	270	406	242	364
Y-Y Axis	0	1140	1710	1040	1560	958	1440	823	1240	737	1110	607	912
	10	1000	1510	907	1360	832	1250	705	1060	616	927	503	756
	12	964	1450	872	1310	799	1200	686	1030	602	905	494	742
	14	920	1380	831	1250	762	1150	659	991	581	873	479	720
	16	872	1310	787	1180	722	1080	626	941	553	832	460	691
	18	820	1230	740	1110	678	1020	590	886	522	785	437	657
	20	765	1150	690	1040	632	950	550	827	488	733	411	618
	22	709	1070	638	959	585	879	509	766	452	680	384	577
	24	652	980	586	881	537	808	468	703	416	625	355	534
	26	595	895	534	803	490	736	426	641	379	570	327	491
	28	539	811	483	727	443	665	386	580	343	516	298	448
	30	485	729	434	652	397	597	346	520	308	463	270	406
	32	432	650	386	580	353	530	308	462	274	412	243	365
	34	384	577	342	514	313	471	273	411	244	366	217	326
	36	343	515	306	460	280	421	244	367	218	328	194	292
	40	278	418	248	373	227	342	199	299	178	267	158	238

Properties

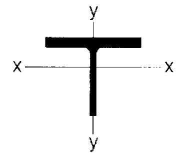
	129	117.5	108.5	97[c]	89[c]	80.5[c]
A_g (in.^{2})	38.0	34.7	32.0	28.6	26.2	23.8
r_x (in.)	4.02	4.00	3.96	3.94	3.97	3.95
r_y (in.)	3.36	3.33	3.32	3.29	3.25	3.23

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

[c] Shape is slender for compression with F_y = 50 ksi.

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT13.5

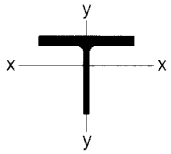
Shape		WT13.5×											
Wt/ft		73[c]		64.5[c]		57[c]		51[c]		47[c]		42[c]	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to indicated axis — X-X Axis	0	493	742	432	650	350	526	260	391	219	330	176	264
	10	469	704	412	620	336	504	251	377	212	319	171	257
	12	458	689	404	607	329	495	247	371	209	315	169	254
	14	446	670	394	592	322	484	242	364	206	310	166	250
	16	432	650	383	576	314	472	237	357	202	304	163	246
	18	417	627	371	558	305	459	232	348	198	297	160	241
	20	401	603	358	538	295	444	226	339	193	290	157	236
	22	384	578	344	517	285	428	219	329	188	282	153	230
	24	366	551	330	496	274	412	212	318	182	274	149	224
	26	348	523	315	473	263	395	204	307	176	265	145	218
	28	329	495	299	449	251	377	197	296	170	256	141	211
	30	310	466	283	426	239	359	189	284	164	247	136	204
	32	291	437	267	401	226	340	181	272	158	237	131	197
	34	272	408	251	377	214	322	172	259	151	227	126	190
	36	253	380	235	353	202	303	164	247	144	217	121	182
	40	216	325	204	306	177	266	147	221	131	197	111	167
Y-Y Axis	0	493	742	432	650	350	526	260	391	219	330	176	264
	10	406	610	341	513	270	406	203	305	168	253	130	196
	12	399	600	321	482	256	385	195	292	162	244	126	190
	14	390	586	296	445	239	359	184	277	154	232	121	182
	16	377	566	269	405	219	329	172	258	145	218	114	172
	18	361	542	242	363	198	297	158	237	134	201	107	161
	20	342	514	213	321	176	265	143	216	123	184	98.5	148
	22	322	483	186	280	155	233	129	194	111	167	89.8	135
	24	300	451	160	240	135	202	114	172	99.2	149	81.0	122
	26	278	418	137	206	116	174	100	151	87.8	132	72.3	109
	28	256	385	119	179	101	152	87.5	131	76.8	115	63.8	95.8
	30	234	352	104	156	88.4	133	76.8	115	67.6	102	56.3	84.7
	32	213	320	91.7	138	78.1	117	68.0	102	59.9	90.0	50.1	75.2
	34	192	288	81.5	122	69.5	104	60.5	91.0	53.4	80.3	44.7	67.3
	36	172	259	72.9	110	62.2	93.5						
	40	140	211										

Properties

	73	64.5	57	51	47	42
A_g (in.^{2})	21.6	18.9	16.8	15.0	13.8	12.4
r_x (in.)	3.95	4.13	4.15	4.14	4.16	4.18
r_y (in.)	3.20	2.21	2.18	2.15	2.12	2.07

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

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



WT12

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

$F_y = 50$ ksi

Shape		WT12×											
Wt/ft		185[h]		167.5[h]		153[h]		139.5[h]		125		114.5	
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 indicated axis — X-X Axis	0	1630	2450	1470	2210	1340	2020	1230	1840	1100	1650	1010	1510
	10	1510	2270	1370	2050	1240	1870	1130	1700	1010	1530	927	1390
	12	1470	2200	1320	1990	1200	1810	1100	1650	979	1470	894	1340
	14	1410	2120	1270	1910	1150	1740	1050	1580	939	1410	857	1290
	16	1350	2030	1210	1820	1100	1660	1000	1510	894	1340	816	1230
	18	1280	1930	1150	1730	1050	1570	950	1430	847	1270	771	1160
	20	1210	1820	1090	1640	986	1480	895	1340	796	1200	725	1090
	22	1140	1710	1020	1540	924	1390	837	1260	744	1120	676	1020
	24	1070	1600	953	1430	861	1290	778	1170	690	1040	627	942
	26	991	1490	884	1330	796	1200	719	1080	637	957	578	868
	28	915	1380	815	1220	733	1100	660	993	583	877	528	794
	30	840	1260	746	1120	670	1010	603	906	531	798	480	722
	32	767	1150	679	1020	608	914	546	821	480	722	434	652
	34	696	1050	615	924	549	826	492	740	431	648	389	585
	36	627	943	552	830	492	739	440	661	385	578	347	521
	40	508	764	447	672	398	599	356	535	312	468	281	422
Y-Y Axis	0	1630	2450	1470	2210	1340	2020	1230	1840	1100	1650	1010	1510
	10	1460	2190	1310	1980	1190	1790	1090	1630	968	1450	880	1320
	12	1400	2100	1260	1890	1140	1720	1040	1560	924	1390	840	1260
	14	1330	2000	1190	1800	1080	1630	983	1480	875	1320	795	1190
	16	1250	1880	1130	1690	1020	1530	924	1390	822	1240	746	1120
	18	1170	1760	1050	1580	952	1430	862	1300	766	1150	694	1040
	20	1090	1640	974	1460	881	1320	797	1200	707	1060	640	962
	22	1000	1510	896	1350	809	1220	730	1100	647	972	585	879
	24	917	1380	817	1230	736	1110	664	998	587	883	530	797
	26	831	1250	739	1110	665	1000	599	900	528	794	476	716
	28	748	1120	663	997	596	895	535	804	471	708	424	638
	30	667	1000	591	888	529	795	474	712	416	626	374	562
	32	590	886	521	782	466	700	417	627	366	551	329	495
	34	523	786	461	693	413	621	370	556	325	488	292	439
	36	466	701	412	619	368	554	330	496	290	436	260	392
	40	378	568	334	502	299	449	267	402	235	353	211	318

Properties

	185[h]	167.5[h]	153[h]	139.5[h]	125	114.5
A_g (in.^{2})	54.4	49.2	44.9	41.0	36.8	33.6
r_x (in.)	3.78	3.73	3.69	3.65	3.61	3.58
r_y (in.)	3.27	3.23	3.20	3.17	3.14	3.11

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

[h] Flange thickness is greater than 2 in. Special requirements may apply per AISC Specification Section A3.1c.

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

WT12

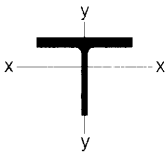
Shape			WT12×									
Wt/ft			103.5		96		88		81		73[c]	
Design			P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length KL (ft) with respect to indicated axis	X-X Axis	0	909	1370	843	1270	774	1160	715	1070	609	915
		10	836	1260	774	1160	710	1070	656	986	561	844
		12	806	1210	746	1120	684	1030	632	949	542	814
		14	771	1160	714	1070	654	984	604	908	519	780
		16	734	1100	678	1020	622	934	574	862	495	743
		18	693	1040	641	963	587	882	541	814	468	703
		20	651	978	601	903	550	826	507	762	440	661
		22	606	912	559	841	512	769	472	709	411	618
		24	562	844	517	778	473	711	436	655	381	573
		26	517	776	475	715	434	653	400	602	352	529
		28	472	709	434	652	396	595	365	548	322	484
		30	428	644	393	591	359	539	330	497	293	441
		32	386	581	354	532	323	485	297	446	265	398
		34	345	519	316	475	288	432	265	398	238	358
		36	308	463	282	424	257	386	236	355	212	319
		40	250	375	228	343	208	312	191	287	172	259
	Y-Y Axis	0	909	1370	843	1270	774	1160	715	1070	609	915
		10	788	1180	727	1090	661	993	604	907	507	761
		12	752	1130	693	1040	630	947	576	866	491	738
		14	711	1070	655	985	596	895	545	819	469	704
		16	667	1000	614	923	558	839	511	768	442	664
		18	620	932	571	857	518	779	475	714	411	618
		20	571	858	525	790	477	717	437	657	380	570
		22	522	784	479	720	435	653	399	600	347	521
		24	472	709	433	651	393	590	361	542	314	472
		26	423	636	388	584	352	528	323	486	282	423
		28	376	566	345	518	312	469	287	431	250	376
		30	331	497	303	455	273	411	252	378	220	331
		32	291	438	267	401	241	362	222	333	194	292
		34	258	388	237	356	214	321	197	296	173	259
		36	231	347	211	318	191	287	176	264	154	232
		40	187	281	171	258	155	233	143	215	125	189

Properties

	103.5	96	88	81	73[c]
A_g (in.^{2})	30.4	28.1	25.8	23.9	21.5
r_x (in.)	3.55	3.53	3.51	3.50	3.50
r_y (in.)	3.08	3.07	3.04	3.05	3.01

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

[c] Shape is slender for compression with F_y = 50 ksi.



WT12

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT12×									
Wt/ft		65.5[c]		58.5[c]		52[c]		51.5[c]		47[c]	
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 indicated axis — X-X Axis	0	511	768	408	613	317	476	354	532	296	445
	10	474	712	381	573	299	449	333	500	280	421
	12	458	689	370	556	291	438	324	487	273	411
	14	441	662	357	537	282	424	314	472	266	399
	16	421	633	343	516	273	410	303	455	257	386
	18	400	601	328	493	262	394	290	436	247	372
	20	378	568	311	468	250	376	277	417	237	356
	22	355	533	294	442	238	358	263	396	226	340
	24	331	497	276	415	226	339	249	374	215	323
	26	307	461	258	388	213	320	234	352	203	305
	28	283	425	240	361	200	300	219	330	191	287
	30	259	389	222	334	186	280	204	307	179	269
	32	236	355	204	307	173	260	189	285	167	251
	34	214	321	187	281	160	241	175	263	155	233
	36	192	288	170	255	148	222	160	241	144	216
	40	155	234	138	208	123	185	133	200	121	182
Y-Y Axis	0	511	768	408	613	317	476	354	532	296	445
	10	415	624	326	490	250	375	269	404	225	338
	12	404	608	320	480	246	369	247	372	210	315
	14	389	584	310	466	240	360	223	335	191	287
	16	368	554	296	445	232	348	198	297	171	257
	18	345	519	280	421	221	333	172	258	151	226
	20	320	481	262	394	209	315	147	221	131	196
	22	294	441	243	365	196	295	123	185	111	167
	24	267	401	223	335	182	273	104	157	94.3	142
	26	241	362	203	305	167	252	89.5	134	80.9	122
	28	215	323	183	275	153	230	77.5	116	70.2	105
	30	190	285	164	246	139	209	67.7	102	61.4	92.3
	32	168	252	145	218	125	188	59.7	89.7	54.2	81.4
	34	149	224	129	194	112	168				
	36	134	201	116	174	100	150				
	40	109	163	94.5	142	81.8	123				

Properties

Property	65.5	58.5	52	51.5	47
A_g (in.^{2})	19.3	17.2	15.3	15.1	13.8
r_x (in.)	3.52	3.51	3.51	3.67	3.67
r_y (in.)	2.97	2.94	2.91	1.99	1.98

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

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

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

WT12

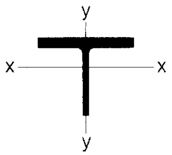
Shape		WT12×									
Wt/ft		42[c]		38[c]		34[c]		31[c]		27.5[c]	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	225	338	181	272	147	221	143	215	109	164
	10	215	323	174	261	142	213	138	207	105	159
	12	210	316	171	256	139	209	135	204	104	156
	14	205	308	167	251	137	205	133	200	102	154
	16	199	299	163	245	134	201	130	195	100	151
	18	193	290	158	238	130	196	126	190	98.0	147
	20	186	280	153	230	126	190	123	185	95.6	144
	22	179	269	148	222	123	184	119	179	93.0	140
	24	171	257	142	214	118	178	115	173	90.2	136
	26	163	245	136	205	114	171	110	166	87.3	131
	28	155	233	130	196	109	165	106	159	84.2	127
	30	147	220	124	186	105	157	101	152	81.1	122
	32	138	208	118	177	100	150	96.7	145	77.9	117
	34	130	195	111	167	95.2	143	91.9	138	74.6	112
	36	121	182	105	158	90.3	136	87.1	131	71.2	107
	40	105	158	92.4	139	80.5	121	77.5	116	64.4	96.8
Y-Y Axis	0	225	338	181	272	147	221	143	215	109	164
	10	172	259	137	206	108	162	90.4	136	68.3	103
	12	162	244	130	196	103	155	80.9	122	62.1	93.3
	14	150	226	122	183	97.0	146	70.3	106	55.0	82.6
	16	137	205	112	168	89.9	135	59.5	89.4	47.4	71.3
	18	122	184	101	152	82.1	123	49.0	73.7	39.8	59.9
	20	108	163	90.6	136	73.9	111	40.7	61.2	33.4	50.1
	22	94.1	141	79.8	120	65.6	98.6	34.3	51.5	28.2	42.4
	24	80.6	121	69.3	104	57.5	86.5				
	26	69.4	104	59.8	89.8	49.8	74.9				
	28	60.2	90.5	52.0	78.2	43.5	65.5				
	30	52.8	79.3	45.7	68.6	38.3	57.6				
	32	46.6	70.1	40.4	60.7						

Properties

	42	38	34	31	27.5
A_g (in.^{2})	12.4	11.2	10.00	9.11	8.10
r_x (in.)	3.67	3.68	3.70	3.79	3.80
r_y (in.)	1.95	1.92	1.87	1.38	1.34

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

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



WT10.5

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT10.5×											
Wt/ft		100.5		91		83		73.5		66		61[c]	
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 indicated axis — X-X Axis	0	886	1330	803	1210	731	1100	647	972	581	873	534	802
	10	794	1190	718	1080	652	980	579	870	519	780	477	716
	12	757	1140	684	1030	620	932	551	828	494	742	453	682
	14	715	1080	645	970	585	879	520	782	466	700	427	642
	16	670	1010	604	907	546	821	487	731	435	654	399	600
	18	622	935	560	841	505	759	451	678	403	606	370	556
	20	572	860	514	773	463	696	414	623	370	556	339	510
	22	522	785	468	704	421	633	377	567	337	506	308	463
	24	472	710	423	635	379	570	341	512	303	456	278	417
	26	423	636	378	568	338	509	305	458	271	407	248	373
	28	376	565	335	504	299	450	270	406	240	361	219	330
	30	331	497	294	442	262	393	237	356	210	316	192	289
	32	291	437	258	388	230	346	208	313	185	278	169	254
	34	257	387	229	344	204	306	185	277	164	246	149	225
	36	230	345	204	307	182	273	165	247	146	219	133	200
	40	186	280	165	249	147	221	133	200	118	178	108	162
Y-Y Axis	0	886	1330	803	1210	731	1100	647	972	581	873	534	802
	10	774	1160	697	1050	632	949	548	824	486	730	439	659
	12	737	1110	663	997	601	903	521	783	462	694	423	636
	14	695	1040	625	939	566	850	491	738	435	654	401	603
	16	649	976	584	877	528	794	458	688	406	610	375	563
	18	601	904	540	811	488	734	423	636	375	563	346	520
	20	552	829	495	744	447	672	387	582	343	515	316	475
	22	502	754	449	675	406	610	351	527	310	466	285	429
	24	452	679	404	607	365	548	315	473	278	418	255	383
	26	403	606	360	541	324	488	280	420	247	371	226	339
	28	356	536	318	477	286	430	246	370	217	326	197	296
	30	312	468	278	417	250	375	215	323	189	285	172	259
	32	274	412	244	367	220	330	189	284	167	251	152	229
	34	243	365	216	325	195	293	168	252	148	223	135	203
	36	217	326	193	290	174	262	150	225	132	199	121	181
	40	176	264	157	236	141	212	122	183	107	161	98.1	147

Properties

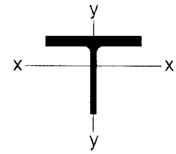
	100.5	91	83	73.5	66	61[c]
A_g (in.^{2})	29.6	26.8	24.4	21.6	19.4	17.9
r_x (in.)	3.10	3.07	3.04	3.08	3.06	3.04
r_y (in.)	3.02	3.00	2.99	2.95	2.93	2.91

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

[c] Shape is slender for compression with F_y = 50 ksi.

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT10.5

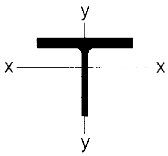
Shape		WT10.5×											
Wt/ft		55.5[c]		50.5[c]		46.5[c]		41.5[c]		36.5[c]		34[c]	
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	450	676	369	554	395	594	312	469	234	352	200	300
	10	405	608	335	504	359	539	286	430	217	327	187	280
	12	386	580	321	483	344	517	275	414	210	316	181	272
	14	366	549	305	459	327	492	263	396	202	304	175	263
	16	343	516	288	433	309	464	250	376	193	291	168	252
	18	319	480	270	406	289	435	236	354	184	276	160	241
	20	295	443	251	377	269	404	221	332	174	261	152	228
	22	270	405	231	348	248	372	205	308	163	245	144	216
	24	245	368	212	318	227	341	189	285	152	229	135	203
	26	220	331	192	289	206	310	174	261	141	212	126	189
	28	196	295	173	260	186	279	158	238	130	196	117	176
	30	173	261	155	233	166	249	143	215	120	180	108	162
	32	152	229	137	206	147	221	128	193	109	164	99.3	149
	34	135	203	122	183	130	196	114	172	98.8	149	90.7	136
	36	120	181	108	163	116	175	102	153	88.9	134	82.4	124
	40	97.6	147	87.8	132	94.0	141	82.6	124	72.0	108	67.1	101
Y-Y Axis	0	450	676	369	554	395	594	312	469	234	352	200	300
	10	366	551	299	449	275	414	222	334	171	257	147	220
	12	356	534	292	439	243	365	199	299	156	234	135	203
	14	340	510	282	423	209	314	174	261	139	209	122	183
	16	320	481	267	402	175	263	148	223	121	182	107	161
	18	297	447	251	377	143	214	124	186	104	156	92.8	140
	20	273	411	233	350	117	175	101	152	86.9	131	78.9	119
	22	249	374	214	321	97.1	146	84.5	127	72.6	109	66.1	99.3
	24	224	336	194	292	82.0	123	71.5	107	61.5	92.4	56.1	84.3
	26	200	300	175	264	70.1	105	61.2	92.0	52.7	79.3	48.1	72.3
	28	176	265	157	236	60.7	91.2	53.0	79.6	45.7	68.7	41.7	62.7
	30	155	232	139	209	53.0	79.6	46.3	69.6	39.9	60.0	36.5	54.9
	32	136	205	123	184								
	34	121	182	109	164								
	36	108	163	97.5	147								
	40	88.1	132	79.3	119								

Properties

	55.5	50.5	46.5	41.5	36.5	34
A_g (in.^{2})	16.3	14.9	13.7	12.2	10.7	10.00
r_x (in.)	3.03	3.01	3.25	3.22	3.21	3.20
r_y (in.)	2.90	2.89	1.84	1.83	1.81	1.80

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

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



WT10.5

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

$F_y = 50$ ksi

Shape		WT10.5×											
Wt/ft		31[c]		27.5[c]		24[c]		28.5[c]		25[c]		22[c]	
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 indicated axis: X-X Axis	0	159	239	126	190	97.5	147	148	223	117	176	89.2	134
	10	150	225	120	180	93.2	140	140	210	111	167	85.4	128
	12	146	219	117	176	91.3	137	136	205	109	164	83.7	126
	14	141	212	114	171	89.2	134	132	199	106	159	81.8	123
	16	136	205	110	166	86.7	130	128	192	103	155	79.7	120
	18	131	197	106	160	84.1	126	123	185	99.3	149	77.3	116
	20	125	188	102	154	81.2	122	118	177	95.5	144	74.8	112
	22	119	179	97.8	147	78.1	117	112	169	91.4	137	72.1	108
	24	113	169	93.2	140	74.9	113	106	160	87.2	131	69.2	104
	26	106	160	88.4	133	71.6	108	100	151	82.9	125	66.2	99.5
	28	99.6	150	83.6	126	68.1	102	94.3	142	78.4	118	63.1	94.9
	30	92.9	140	78.6	118	64.6	97.1	88.2	133	73.9	111	60.0	90.1
	32	86.3	130	73.7	111	61.0	91.7	82.1	123	69.3	104	56.8	85.3
	34	79.8	120	68.7	103	57.5	86.4	76.1	114	64.7	97.3	53.6	80.5
	36	73.4	110	63.8	96.0	53.9	81.0	70.2	106	60.3	90.6	50.4	75.7
	40	61.2	92.0	54.4	81.8	46.9	70.5	58.9	88.5	51.5	77.5	44.0	66.2
Y-Y Axis	0	159	239	126	190	97.5	147	148	223	117	176	89.2	134
	10	117	176	90.5	136	66.4	99.9	95.9	144	73.3	110	55.2	82.9
	12	109	164	85.2	128	63.0	94.7	83.3	125	64.3	96.6	49.2	73.9
	14	99.9	150	78.7	118	58.6	88.1	70.2	105	54.6	82.1	42.5	63.9
	16	89.5	135	71.2	107	53.5	80.4	57.4	86.2	45.0	67.6	35.7	53.7
	18	78.8	118	63.3	95.1	47.9	72.1	46.2	69.4	36.6	54.9	29.4	44.1
	20	68.2	102	55.3	83.2	42.2	63.5	37.9	57.0	30.2	45.4	24.4	36.7
	22	57.9	87.0	47.5	71.4	36.5	54.9	31.6	47.6				
	24	49.2	74.0	40.6	61.0	31.4	47.3						
	26	42.3	63.6	35.0	52.7	27.3	41.0						
	28	36.8	55.2	30.5	45.8								

Properties

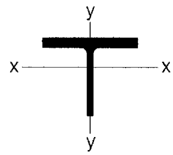
	31	27.5	24	28.5	25	22
A_g (in.^{2})	9.13	8.10	7.07	8.37	7.36	6.49
r_x (in.)	3.21	3.23	3.26	3.29	3.30	3.31
r_y (in.)	1.77	1.73	1.66	1.35	1.30	1.26

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

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

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



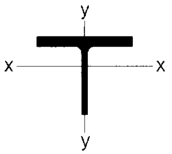
WT9

Shape		WT9×											
Wt/ft		87.5		79		71.5		65		59.5		53	
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 indicated axis — X-X Axis	0	768	1150	693	1040	630	946	572	860	525	789	466	701
	10	662	995	595	895	539	809	488	734	449	675	398	599
	12	620	932	557	837	503	756	455	684	420	631	372	559
	14	574	862	514	773	464	697	419	630	387	582	343	515
	16	525	789	469	705	422	634	381	573	352	530	312	468
	18	474	713	423	636	380	570	342	515	317	477	280	421
	20	423	636	377	566	337	507	304	456	282	424	249	374
	22	374	561	332	498	296	444	266	399	247	372	218	327
	24	326	490	288	433	256	385	230	345	214	322	188	283
	26	280	421	247	371	219	329	196	295	183	275	161	242
	28	241	363	213	320	189	284	169	254	158	238	139	209
	30	210	316	185	279	164	247	147	221	138	207	121	182
	32	185	278	163	245	144	217	129	195	121	182	106	160
	34	164	246	144	217	128	192	115	172	107	161	94.2	142
	36	146	220	129	194	114	172	102	154	95.6	144	84.0	126
	40	118	178	104	157	92.5	139	82.9	125	77.4	116	68.0	102
Y-Y Axis	0	768	1150	693	1040	630	946	572	860	525	789	466	701
	10	660	992	593	891	536	805	483	727	438	659	384	577
	12	621	934	558	838	504	757	454	683	412	619	361	543
	14	579	870	519	780	469	704	422	635	383	576	335	504
	16	533	802	478	718	431	648	388	583	352	529	308	463
	18	486	731	435	653	392	589	352	530	320	480	279	420
	20	438	658	391	588	352	529	316	475	287	431	250	376
	22	391	587	348	523	313	470	281	422	254	382	222	333
	24	344	517	306	460	275	413	246	370	223	335	194	292
	26	300	451	266	400	238	358	213	320	193	290	167	252
	28	259	389	230	345	206	309	184	276	167	250	145	217
	30	226	339	200	301	179	270	160	241	145	218	126	190
	32	199	298	176	265	158	237	141	212	128	192	111	167
	34	176	264	156	235	140	210	125	188	113	170	98.6	148
	36	157	236	139	209	125	188	112	168	101	152	88.0	132
	40	127	191	113	170	101	152	90.5	136	82.1	123	71.4	107

Properties

	87.5	79	71.5	65	59.5	53
A_g (in.^{2})	25.7	23.2	21.0	19.1	17.5	15.6
r_x (in.)	2.66	2.63	2.60	2.58	2.60	2.59
r_y (in.)	2.76	2.74	2.72	2.70	2.69	2.66

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



WT9

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

$F_y = 50$ ksi

Shape			WT9×											
Wt/ft			48.5		43[c]		38[c]		35.5[c]		32.5[c]		30[c]	
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 indicated axis	X-X Axis	0	427	642	356	535	275	414	301	453	251	377	210	316
		10	364	547	306	460	241	362	263	395	221	333	188	282
		12	339	510	286	430	227	341	248	372	210	315	178	268
		14	312	469	264	397	211	318	231	347	196	295	168	253
		16	284	426	241	363	195	293	213	320	182	274	157	236
		18	254	382	218	327	178	267	194	292	167	252	145	218
		20	225	338	194	291	161	241	175	263	152	229	133	200
		22	197	296	171	257	143	215	156	235	137	206	121	182
		24	170	255	148	223	127	190	138	208	122	184	109	164
		26	145	218	127	191	111	166	121	181	108	162	97.1	146
		28	125	188	110	165	95.6	144	104	157	94.1	142	85.8	129
		30	109	164	95.6	144	83.3	125	90.7	136	82.0	123	75.0	113
		32	95.6	144	84.0	126	73.2	110	79.8	120	72.1	108	65.9	99.1
		34	84.7	127	74.4	112	64.8	97.4	70.6	106	63.8	96.0	58.4	87.8
		36	75.5	114	66.4	99.8	57.8	86.9	63.0	94.7	57.0	85.6	52.1	78.3
		40	61.2	92.0	53.8	80.8	46.8	70.4	51.0	76.7	46.1	69.3	42.2	63.4
	Y-Y Axis	0	427	642	356	535	275	414	301	453	251	377	210	316
		10	349	525	287	431	221	331	201	302	172	258	147	221
		12	328	494	275	413	214	321	173	260	150	226	130	196
		14	305	459	258	387	203	305	145	218	127	192	112	169
		16	280	421	238	358	190	286	117	176	105	158	94.2	142
		18	254	382	217	326	175	263	93.7	141	84.8	127	77.0	116
		20	228	343	195	293	160	240	76.4	115	69.2	104	63.0	94.6
		22	202	303	173	260	144	216	63.5	95.4	57.6	86.5	52.4	78.7
		24	177	265	152	228	128	193	53.6	80.5	48.6	73.0	44.2	66.5
		26	152	229	132	198	113	170	45.8	68.8	41.5	62.4	37.8	56.9
		28	132	198	114	171	98.4	148	39.6	59.5	35.9	54.0	32.7	49.2
		30	115	173	99.5	150	86.1	129						
		32	101	152	87.7	132	75.9	114						
		34	89.8	135	77.9	117	67.5	101						
		36	80.2	120	69.6	105	60.3	90.7						
		40	65.1	97.8	56.5	85.0	49.0	73.7						

Properties

	48.5	43[c]	38[c]	35.5[c]	32.5[c]	30[c]
A_g (in.^{2})	14.3	12.7	11.2	10.4	9.55	8.82
r_x (in.)	2.56	2.55	2.54	2.74	2.72	2.71
r_y (in.)	2.65	2.63	2.61	1.70	1.69	1.68

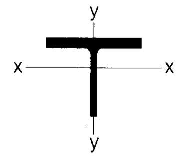
ASD	LRFD
$\Omega_c = 1.67$	$\phi_c = 0.90$

[c] Shape is slender for compression with $F_y = 50$ ksi.

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

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT9

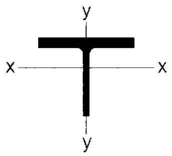
Shape		WT9×									
Wt/ft		27.5[c]		25[c]		23[c]		20[c]		17.5[c]	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis											
X-X Axis	0	178	268	137	206	129	194	87.2	131	70.8	106
	10	160	241	125	188	118	178	81.5	122	66.6	100
	12	153	230	120	181	114	171	79.1	119	64.8	97.3
	14	145	218	115	172	109	163	76.3	115	62.7	94.3
	16	136	204	109	163	103	155	73.2	110	60.4	90.8
	18	127	190	102	154	97.2	146	69.9	105	57.9	87.0
	20	117	176	95.5	144	91.0	137	66.4	99.7	55.2	83.0
	22	107	161	88.5	133	84.6	127	62.7	94.2	52.4	78.8
	24	97.1	146	81.5	123	78.1	117	58.8	88.4	49.5	74.4
	26	87.4	131	74.5	112	71.6	108	54.9	82.6	46.5	69.9
	28	78.1	117	67.6	102	65.1	97.9	51.0	76.7	43.5	65.4
	30	69.0	104	60.9	91.6	58.9	88.5	47.1	70.8	40.5	60.9
	32	60.7	91.2	54.5	81.9	52.9	79.4	43.3	65.1	37.5	56.3
	34	53.8	80.8	48.3	72.7	47.0	70.7	39.6	59.5	34.5	51.9
	36	47.9	72.1	43.1	64.8	41.9	63.0	35.9	54.0	31.7	47.6
	40	38.8	58.4	34.9	52.5	34.0	51.1	29.3	44.0	26.2	39.3
Y-Y Axis	0	178	268	137	206	129	194	87.2	131	70.8	106
	10	125	188	99.1	149	80.1	120	58.4	87.8	45.0	67.6
	12	112	168	90.3	136	67.5	101	51.1	76.8	39.5	59.4
	14	97.2	146	80.2	121	54.9	82.6	43.4	65.3	33.7	50.6
	16	82.5	124	69.8	105	43.3	65.1	35.9	54.0	27.9	41.9
	18	68.4	103	59.4	89.3	34.7	52.1	29.0	43.6	22.6	34.0
	20	56.0	84.2	49.5	74.4	28.3	42.6	23.8	35.7	18.7	28.1
	22	46.7	70.2	41.3	62.1						
	24	39.5	59.3	35.0	52.6						
	26	33.8	50.8	30.0	45.1						

Properties

	27.5	25	23	20	17.5
A_g (in.^{2})	8.10	7.33	6.77	5.88	5.15
r_x (in.)	2.71	2.70	2.77	2.76	2.79
r_y (in.)	1.67	1.65	1.29	1.27	1.22

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

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



WT8

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

$F_y = 50$ ksi

Shape		WT8×											
Wt/ft		50		44.5		38.5[c]		33.5[c]		28.5[c]		25[c]	
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 indicated axis													
X-X Axis	0	441	663	392	588	335	504	254	382	237	355	182	274
	10	360	541	319	479	273	410	211	318	199	300	157	236
	12	330	495	292	438	249	374	195	293	185	278	147	220
	14	297	446	262	394	223	336	177	266	169	254	136	204
	16	263	395	232	348	197	297	159	239	153	230	124	186
	18	229	344	202	303	171	258	140	210	136	204	112	168
	20	197	295	173	259	146	220	122	183	120	180	99.5	150
	22	166	249	145	218	123	185	104	157	104	156	87.6	132
	24	139	209	122	183	103	155	88.0	132	88.3	133	76.2	115
	26	119	178	104	156	87.9	132	75.0	113	75.2	113	65.3	98.2
	28	102	154	89.5	135	75.8	114	64.7	97.2	64.9	97.5	56.3	84.7
	30	89.0	134	78.0	117	66.0	99.3	56.3	84.7	56.5	85.0	49.1	73.8
	32	78.2	118	68.5	103	58.0	87.2	49.5	74.4	49.7	74.7	43.1	64.8
	34	69.3	104	60.7	91.2	51.4	77.3	43.9	65.9	44.0	66.1	38.2	57.4
	36	61.8	92.9	54.1	81.4	45.9	68.9	39.1	58.8	39.3	59.0	34.1	51.2
	40									31.8	47.8	27.6	41.5
Y-Y Axis	0	441	663	392	588	335	504	254	382	237	355	182	274
	10	363	546	319	479	270	406	205	308	154	231	122	184
	12	338	509	297	446	253	381	196	294	130	196	106	159
	14	311	467	273	410	233	351	183	274	107	161	88.7	133
	16	282	424	247	372	211	317	168	252	84.7	127	72.2	109
	18	253	380	221	332	188	283	152	228	67.5	101	57.7	86.8
	20	223	335	195	293	166	249	136	204	55.0	82.6	47.1	70.8
	22	194	292	170	255	144	216	120	180	45.6	68.6	39.2	58.8
	24	167	251	145	218	123	184	104	157	38.5	57.8	33.0	49.6
	26	142	214	124	186	105	158	89.7	135	32.8	49.4	28.2	42.4
	28	123	185	107	161	90.7	136	77.7	117				
	30	107	161	93.5	140	79.2	119	67.8	102				
	32	94.4	142	82.2	124	69.7	105	59.7	89.8				
	34	83.6	126	72.9	110	61.8	92.9	53.0	79.7				
	36	74.6	112	65.1	97.8	55.2	83.0	47.4	71.2				
	40	60.5	91.0	52.8	79.3	44.8	67.3	38.4	57.8				

Properties

	50	44.5	38.5	33.5	28.5	25
A_g (in.^{2})	14.7	13.1	11.3	9.84	8.39	7.37
r_x (in.)	2.28	2.27	2.24	2.22	2.41	2.40
r_y (in.)	2.51	2.49	2.47	2.46	1.60	1.59

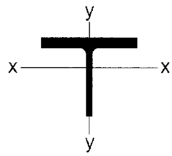
ASD	LRFD
$\Omega_c = 1.67$	$\phi_c = 0.90$

[c] Shape is slender for compression with $F_y = 50$ ksi.

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

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT8

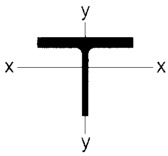
Shape		WT8×									
Wt/ft		22.5[c]		20[c]		18[c]		15.5[c]		13[c]	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	144	217	102	154	87.6	132	65.6	98.5	46.7	70.2
	10	126	190	91.8	138	79.2	119	60.3	90.6	43.6	65.5
	12	119	179	87.6	132	75.8	114	58.1	87.3	42.3	63.5
	14	111	167	82.8	124	71.9	108	55.6	83.6	40.7	61.2
	16	102	154	77.5	117	67.7	102	52.9	79.5	39.1	58.7
	18	93.4	140	72.0	108	63.2	95.0	49.9	75.1	37.3	56.0
	20	84.3	127	66.3	99.7	58.5	88.0	46.8	70.4	35.3	53.1
	22	75.4	113	60.5	91.0	53.8	80.9	43.7	65.6	33.3	50.1
	24	66.6	100	54.8	82.3	49.0	73.7	40.4	60.7	31.2	47.0
	26	58.3	87.6	49.1	73.8	44.3	66.6	37.2	55.8	29.1	43.8
	28	50.4	75.7	43.7	65.7	39.8	59.8	33.9	51.0	27.0	40.6
	30	43.9	65.9	38.4	57.8	35.4	53.2	30.8	46.3	24.9	37.4
	32	38.6	57.9	33.8	50.8	31.2	46.8	27.7	41.7	22.8	34.3
	34	34.2	51.3	29.9	45.0	27.6	41.5	24.8	37.3	20.8	31.3
	36	30.5	45.8	26.7	40.1	24.6	37.0	22.1	33.2	18.9	28.4
	40					19.9	30.0	17.9	26.9	15.3	23.1
Y-Y Axis	0	144	217	102	154	87.6	132	65.6	98.5	46.7	70.2
	10	99.4	149	74.6	112	61.4	92.3	41.7	62.6	29.2	43.9
	12	87.5	132	67.5	101	55.8	83.9	35.7	53.6	25.5	38.3
	14	74.8	112	59.6	89.6	49.5	74.3	29.5	44.4	21.5	32.3
	16	62.4	93.7	51.5	77.4	42.8	64.3	23.6	35.5	17.6	26.4
	18	50.6	76.0	43.5	65.4	36.2	54.4	19.0	28.5	14.2	21.4
	20	41.3	62.1	36.0	54.1	30.0	45.0				
	22	34.4	51.7	30.0	45.1	25.1	37.7				
	24	29.0	43.7	25.4	38.1	21.2	31.9				
	26	24.8	37.3	21.7	32.7						

Properties

Property	22.5	20	18	15.5	13
A_g (in.^{2})	6.63	5.89	5.29	4.56	3.84
r_x (in.)	2.39	2.37	2.41	2.45	2.47
r_y (in.)	1.57	1.56	1.52	1.17	1.12

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

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



WT7

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT7×											
Wt/ft		66		60		54.5		49.5		45		41	
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 indicated axis — X-X Axis	0	580	872	529	795	480	721	436	656	396	596	360	541
	10	408	613	369	555	330	497	300	450	270	406	265	398
	12	349	525	315	473	281	422	254	382	229	343	231	348
	14	291	437	261	393	231	347	209	314	187	282	197	296
	16	235	353	210	316	185	277	167	250	149	223	164	246
	18	186	280	167	250	146	219	132	198	117	176	133	199
	20	151	227	135	203	118	178	107	160	95.1	143	107	161
	22	125	187	111	168	97.6	147	88.1	132	78.6	118	88.8	133
	24	105	158	93.7	141	82.0	123	74.1	111	66.1	99.3	74.6	112
	26	89.3	134	79.8	120	69.9	105	63.1	94.8	56.3	84.6	63.6	95.6
	28	77.0	116	68.8	103	60.3	90.6					54.8	82.4
	30											47.8	71.8
Y-Y Axis	0	580	872	529	795	480	721	436	656	396	596	360	541
	10	533	802	484	728	438	659	396	595	358	538	298	447
	12	516	776	469	705	424	638	383	576	346	520	276	416
	14	497	747	451	678	408	613	369	555	333	501	253	381
	16	475	715	432	649	390	587	353	530	319	479	229	344
	18	452	680	410	617	371	558	335	504	303	455	204	307
	20	428	643	388	583	351	527	317	476	286	430	180	270
	22	402	604	364	548	329	495	298	447	269	404	156	235
	24	376	564	340	511	308	462	278	417	251	377	133	200
	26	349	524	316	475	285	429	258	387	233	350	114	171
	28	322	484	291	438	263	396	237	357	214	322	98.2	148
	30	296	444	267	402	241	363	218	327	196	295	85.6	129
	32	270	405	244	366	220	331	198	298	179	268	75.3	113
	34	245	367	221	332	199	299	179	269	162	243	66.7	100
	36	220	331	198	298	179	269	161	242	145	218	59.5	89.5
	40	178	268	161	242	145	218	130	196	118	177	48.2	72.5

Properties

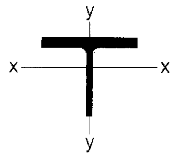
	66	60	54.5	49.5	45	41
A_g (in.^{2})	19.4	17.7	16.0	14.6	13.2	12.0
r_x (in.)	1.73	1.71	1.68	1.67	1.66	1.85
r_y (in.)	3.76	3.74	3.73	3.71	3.70	2.48

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

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

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT7

Shape		WT7×											
Wt/ft		37		34		30.5[c]		26.5[c]		24[c]		21.5[c]	
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 indicated axis — X-X Axis	0	326	490	299	450	261	392	223	336	187	281	147	220
	10	237	356	217	326	190	285	168	253	143	216	116	174
	12	206	310	188	283	165	248	148	223	128	192	104	157
	14	175	262	159	239	140	210	128	192	111	167	92.5	139
	16	144	217	131	197	116	174	108	162	95.0	143	80.3	121
	18	116	174	105	158	93.2	140	88.8	133	79.4	119	68.5	103
	20	93.9	141	85.2	128	75.5	113	72.0	108	64.9	97.5	57.3	86.1
	22	77.6	117	70.4	106	62.4	93.7	59.5	89.4	53.6	80.6	47.3	71.1
	24	65.2	98.0	59.2	88.9	52.4	78.8	50.0	75.1	45.1	67.7	39.8	59.8
	26	55.6	83.5	50.4	75.8	44.7	67.1	42.6	64.0	38.4	57.7	33.9	50.9
	28	47.9	72.0	43.5	65.3	38.5	57.9	36.7	55.2	33.1	49.8	29.2	43.9
	30	41.7	62.7	37.9	56.9	33.5	50.4	32.0	48.1	28.8	43.3	25.4	38.2
Y-Y Axis	0	326	490	299	450	261	392	223	336	187	281	147	220
	10	269	404	245	368	212	318	166	250	140	211	112	169
	12	250	375	227	342	199	299	148	222	126	189	102	154
	14	229	344	208	313	183	275	128	193	111	166	91.3	137
	16	207	311	188	283	165	249	109	164	95.0	143	79.8	120
	18	184	277	168	252	147	222	90.8	136	79.9	120	68.4	103
	20	162	244	147	221	130	195	74.1	111	65.8	98.9	57.6	86.5
	22	141	211	128	192	112	169	61.4	92.3	54.6	82.0	47.8	71.8
	24	120	180	109	164	95.9	144	51.7	77.7	46.0	69.1	40.3	60.6
	26	102	154	92.9	140	81.9	123	44.1	66.3	39.3	59.0	34.4	51.7
	28	88.5	133	80.2	121	70.8	106	38.1	57.3	33.9	50.9	29.7	44.7
	30	77.1	116	69.9	105	61.7	92.8	33.2	49.9	29.6	44.4	25.9	39.0
	32	67.8	102	61.5	92.4	54.3	81.6	29.2	43.9				
	34	60.1	90.4	54.5	81.9	48.2	72.4						
	36	53.6	80.6	48.7	73.1	43.0	64.6						
	40	43.5	65.4	39.4	59.3	34.9	52.4						

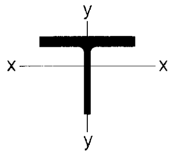
Properties

	37	34	30.5[c]	26.5[c]	24[c]	21.5[c]
A_g (in.^{2})	10.9	9.99	8.96	7.80	7.07	6.31
r_x (in.)	1.82	1.81	1.80	1.88	1.88	1.86
r_y (in.)	2.48	2.46	2.45	1.92	1.91	1.89

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

[c] Shape is slender for compression with F_y = 50 ksi.

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



WT7

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT7×									
Wt/ft		19[c]		17[c]		15[c]		13[c]		11[c]	
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 indicated axis — X-X Axis	0	127	190	100	150	80.7	121	61.9	93.1	43.6	65.5
	10	105	157	84.5	127	69.5	104	54.6	82.1	39.3	59.1
	12	96.2	145	78.5	118	65.0	97.7	51.7	77.6	37.6	56.5
	14	87.1	131	71.9	108	60.2	90.4	48.4	72.7	35.6	53.5
	16	77.6	117	65.0	97.7	55.0	82.7	44.9	67.5	33.5	50.3
	18	68.1	102	58.0	87.2	49.7	74.7	41.2	61.9	31.2	46.9
	20	58.9	88.5	51.0	76.7	44.3	66.6	37.5	56.3	28.8	43.3
	22	50.2	75.4	44.3	66.6	39.1	58.8	33.7	50.7	26.4	39.7
	24	42.2	63.4	37.9	56.9	34.1	51.2	30.0	45.1	24.0	36.1
	26	35.9	54.0	32.3	48.5	29.3	44.0	26.5	39.8	21.7	32.6
	28	31.0	46.6	27.8	41.8	25.2	37.9	23.1	34.7	19.4	29.1
	30	27.0	40.6	24.2	36.4	22.0	33.1	20.1	30.2	17.2	25.9
	32	23.7	35.7	21.3	32.0	19.3	29.1	17.7	26.5	15.1	22.7
	34	21.0	31.6	18.9	28.4	17.1	25.7	15.6	23.5	13.4	20.1
Y-Y Axis	0	127	190	100	150	80.7	121	61.9	93.1	43.6	65.5
	10	86.3	130	69.5	104	55.0	82.7	35.6	53.5	25.6	38.5
	12	75.0	113	61.4	92.3	49.2	73.9	28.9	43.4	21.3	32.0
	14	63.2	95.0	52.7	79.3	42.6	64.1	22.4	33.7	17.1	25.6
	16	51.8	77.9	44.1	66.3	36.0	54.1	17.4	26.1	13.4	20.1
	18	41.5	62.4	35.9	54.0	29.6	44.5	13.9	20.9		
	20	33.9	50.9	29.4	44.1	24.3	36.5				
	22	28.1	42.3	24.4	36.7	20.3	30.5				
	24	23.7	35.7	20.6	31.0	17.2	25.8				

Properties

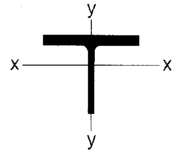
	19	17	15	13	11
A_g (in.^{2})	5.58	5.00	4.42	3.85	3.25
r_x (in.)	2.04	2.04	2.07	2.12	2.14
r_y (in.)	1.55	1.53	1.49	1.08	1.04

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

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

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT6

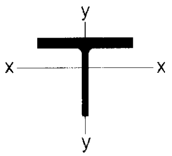
Shape			WT6×											
Wt/ft			29		26.5		25		22.5		20[c]		17.5[c]	
Design			P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
			ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis	X-X Axis	0	255	384	233	350	218	328	196	295	155	233	132	199
		4	237	356	216	325	205	307	183	276	146	219	126	190
		6	215	324	197	297	188	283	169	254	135	203	119	179
		8	189	284	173	261	168	252	150	226	122	183	110	165
		10	159	240	147	221	145	218	129	194	106	159	98.8	149
		12	130	195	120	180	121	182	108	162	89.8	135	86.9	131
		14	101	152	94.2	142	97.6	147	86.8	130	73.8	111	74.7	112
		16	77.7	117	72.3	109	76.2	115	67.6	102	58.8	88.4	62.7	94.3
		18	61.4	92.3	57.1	85.9	60.2	90.5	53.4	80.3	46.5	69.8	51.4	77.3
		20	49.7	74.8	46.3	69.5	48.8	73.3	43.3	65.1	37.6	56.6	41.7	62.6
		22	41.1	61.8	38.2	57.5	40.3	60.6	35.8	53.8	31.1	46.7	34.4	51.7
		24	34.5	51.9	32.1	48.3	33.9	50.9	30.1	45.2	26.1	39.3	28.9	43.5
		26					28.8	43.4	25.6	38.5	22.3	33.5	24.6	37.0
		28											21.3	31.9
	Y-Y Axis	0	255	384	233	350	218	328	196	295	155	233	132	199
		4	242	364	219	329	202	304	170	255	133	200	113	169
		6	235	353	212	318	192	288	167	251	131	197	108	163
		8	224	337	202	304	178	268	159	239	126	190	99.4	149
		10	211	318	191	287	162	244	145	218	117	177	87.4	131
		12	197	296	177	267	144	217	129	194	106	159	74.2	112
		14	181	272	163	245	126	189	112	168	93.5	140	61.0	91.8
		16	164	246	147	221	107	161	95.1	143	80.7	121	48.6	73.0
		18	146	220	132	198	89.1	134	78.9	119	68.3	103	38.6	58.0
		20	129	194	116	174	72.8	109	64.2	96.6	56.5	85.0	31.4	47.2
		22	112	169	101	151	60.2	90.5	53.2	80.0	46.9	70.4	26.0	39.1
		24	96.2	145	85.9	129	50.7	76.2	44.8	67.4	39.5	59.3	21.9	33.0
		26	82.1	123	73.3	110	43.2	65.0	38.3	57.5	33.7	50.6		
		28	70.9	107	63.3	95.1	37.3	56.1	33.0	49.6	29.1	43.7		
		30	61.8	92.9	55.2	82.9	32.5	48.9	28.8	43.3	25.4	38.1		
		32	54.3	81.7	48.5	72.9	28.6	43.0	25.3	38.1	22.3	33.5		

Properties

	29	26.5	25	22.5	20[c]	17.5[c]
A_g (in.^{2})	8.52	7.78	7.30	6.56	5.84	5.17
r_x (in.)	1.50	1.51	1.60	1.59	1.57	1.76
r_y (in.)	2.51	2.48	1.96	1.95	1.94	1.54

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

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



WT6

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT6×											
Wt/ft		15[c]		13[c]		11[c]		9.5[c]		8[c]		7[c]	
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 indicated axis — X-X Axis	0	93.2	140	64.9	97.5	69.0	104	49.9	74.9	38.0	57.1	28.1	42.2
	4	89.7	135	62.9	94.5	66.8	100	48.5	72.9	37.1	55.7	27.5	41.3
	6	85.4	128	60.5	90.9	64.0	96.3	46.8	70.4	36.0	54.1	26.8	40.3
	8	79.8	120	57.2	86.0	60.4	90.8	44.6	67.1	34.4	51.8	25.9	38.9
	10	73.1	110	53.4	80.2	56.1	84.3	41.9	63.0	32.6	49.0	24.7	37.1
	12	65.7	98.7	49.0	73.6	51.2	76.9	38.8	58.4	30.5	45.8	23.3	35.1
	14	57.9	87.0	44.2	66.5	46.0	69.1	35.5	53.3	28.1	42.3	21.8	32.8
	16	50.0	75.2	39.3	59.1	40.6	61.0	32.0	48.1	25.6	38.5	20.2	30.4
	18	42.4	63.7	34.4	51.8	35.2	53.0	28.4	42.7	23.1	34.7	18.5	27.8
	20	35.2	52.9	29.7	44.6	30.1	45.2	24.9	37.4	20.6	30.9	16.8	25.2
	22	29.1	43.7	25.2	37.8	25.2	37.9	21.5	32.4	18.1	27.2	15.1	22.6
	24	24.4	36.7	21.2	31.8	21.2	31.9	18.3	27.5	15.7	23.6	13.4	20.1
	26	20.8	31.3	18.0	27.1	18.1	27.2	15.6	23.5	13.4	20.2	11.8	17.7
	28	17.9	27.0	15.5	23.4	15.6	23.4	13.5	20.2	11.6	17.4	10.2	15.4
	30					13.6	20.4	11.7	17.6	10.1	15.2	8.90	13.4
	32									8.87	13.3	7.82	11.8
Y-Y Axis	0	93.2	140	64.9	97.5	69.0	104	49.9	74.9	38.0	57.1	28.1	42.2
	4	78.1	117	54.0	81.2	52.3	78.6	37.0	55.6	25.6	38.5	18.6	27.9
	6	76.1	114	53.1	79.8	43.7	65.6	31.9	47.9	22.3	33.5	16.5	24.9
	8	71.6	108	50.9	76.5	33.0	49.5	25.0	37.5	17.6	26.5	13.6	20.4
	10	64.6	97.1	47.2	70.9	22.8	34.3	17.9	27.0	12.7	19.1	10.2	15.3
	12	56.4	84.8	42.4	63.8	16.2	24.3	12.8	19.3	9.27	13.9	7.53	11.3
	14	47.8	71.9	37.2	55.9	12.0	18.1						
	16	39.5	59.4	31.8	47.8								
	18	31.8	47.8	26.7	40.1								
	20	25.9	38.9	21.9	32.9								
	22	21.5	32.3	18.2	27.4								
	24	18.1	27.3	15.4	23.1								

Properties

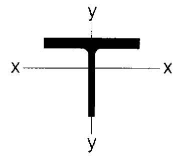
	15	13	11	9.5	8	7
A_g (in.^{2})	4.40	3.82	3.24	2.79	2.36	2.08
r_x (in.)	1.75	1.75	1.90	1.90	1.92	1.92
r_y (in.)	1.52	1.51	0.847	0.821	0.773	0.753

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

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

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT5

Shape			WT5×									
Wt/ft			22.5		19.5		16.5		15		13[c]	
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 indicated axis	X-X Axis	0	199	298	172	258	145	218	132	199	103	155
		4	178	268	154	231	131	196	122	184	95.7	144
		6	155	233	134	202	114	172	110	166	87.2	131
		8	128	193	111	167	95.1	143	96.0	144	76.7	115
		10	100	151	86.7	130	74.9	113	80.1	120	65.0	97.6
		12	74.2	112	64.1	96.3	55.9	84.0	64.3	96.6	53.0	79.7
		14	54.5	81.9	47.1	70.8	41.1	61.7	49.4	74.3	41.7	62.7
		16	41.7	62.7	36.1	54.2	31.4	47.3	37.8	56.9	32.0	48.2
		18	33.0	49.6	28.5	42.8	24.8	37.3	29.9	44.9	25.3	38.1
		20	26.7	40.1	23.1	34.7	20.1	30.2	24.2	36.4	20.5	30.8
		22							20.0	30.1	17.0	25.5
		24							16.8	25.3	14.2	21.4
	Y-Y Axis	0	199	298	172	258	145	218	132	199	103	155
		4	187	281	160	241	133	199	115	173	87.0	131
		6	178	267	152	229	126	189	103	156	81.5	123
		8	166	249	142	213	117	176	89.2	134	71.6	108
		10	151	227	129	194	106	160	73.6	111	59.8	89.9
		12	135	202	115	173	94.5	142	58.0	87.1	47.9	71.9
		14	118	177	100	150	82.1	123	43.7	65.7	36.6	55.0
		16	101	151	85.4	128	69.8	105	33.6	50.5	28.2	42.4
		18	84.5	127	71.3	107	57.9	87.0	26.6	40.0	22.4	33.7
		20	69.2	104	58.3	87.6	47.2	70.9	21.6	32.5	18.2	27.3
		22	57.3	86.1	48.2	72.5	39.1	58.7	17.9	26.9	15.1	22.6
		24	48.2	72.4	40.6	61.0	32.9	49.4				
		26	41.1	61.7	34.6	52.0	28.1	42.2				
		28	35.4	53.2	29.9	44.9	24.2	36.4				
		30	30.9	46.4	26.0	39.1	21.1	31.7				
		32	27.1	40.8	22.9	34.4	18.6	27.9				

Properties

	22.5	19.5	16.5	15	13[c]
A_g (in.^{2})	6.63	5.73	4.85	4.42	3.81
r_x (in.)	1.24	1.24	1.26	1.45	1.44
r_y (in.)	2.01	1.98	1.94	1.37	1.36

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

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

WT5

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT5×									
Wt/ft		11[c]		9.5[c]		8.5[c]		7.5[c]		6	
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 indicated axis: X-X Axis	0	81.2	122	73.4	110	63.0	94.7	53.5	80.4	31.4	47.2
	4	76.0	114	69.0	104	59.4	89.3	50.6	76.1	30.1	45.3
	6	70.0	105	63.8	95.9	55.2	83.0	47.2	71.0	28.6	43.1
	8	62.3	93.6	57.3	86.1	49.9	74.9	42.9	64.5	26.7	40.1
	10	53.6	80.6	49.9	74.9	43.7	65.7	37.9	56.9	24.3	36.6
	12	44.7	67.2	42.1	63.2	37.2	55.9	32.5	48.9	21.8	32.7
	14	36.0	54.1	34.4	51.7	30.8	46.2	27.2	40.9	19.1	28.7
	16	28.1	42.2	27.3	41.0	24.7	37.1	22.1	33.2	16.4	24.6
	18	22.2	33.3	21.5	32.4	19.5	29.3	17.6	26.4	13.8	20.7
	20	18.0	27.0	17.4	26.2	15.8	23.8	14.2	21.4	11.3	17.1
	22	14.8	22.3	14.4	21.7	13.1	19.6	11.8	17.7	9.38	14.1
	24	12.5	18.8	12.1	18.2	11.0	16.5	9.87	14.8	7.88	11.8
	26					9.35	14.1	8.41	12.6	6.71	10.1
Y-Y Axis	0	81.2	122	73.4	110	63.0	94.7	53.5	80.4	31.4	47.2
	4	65.3	98.2	55.7	83.6	45.3	68.1	35.7	53.7	20.8	31.3
	6	62.1	93.4	44.7	67.2	36.6	55.0	28.9	43.5	18.0	27.1
	8	55.6	83.5	32.2	48.4	26.2	39.3	20.5	30.8	14.0	21.1
	10	46.9	70.5	21.5	32.3	17.5	26.3	13.9	20.8	9.99	15.0
	12	37.9	56.9	15.1	22.7	12.4	18.6	9.90	14.9	7.25	10.9
	14	29.2	43.9	11.2	16.8	9.21	13.8				
	16	22.6	34.0								
	18	18.0	27.0								
	20	14.6	22.0								
	22	12.1	18.2								

Properties

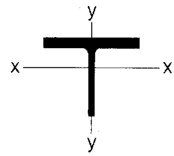
	11	9.5	8.5	7.5	6
A_g (in.^{2})	3.24	2.81	2.50	2.21	1.77
r_x (in.)	1.46	1.54	1.56	1.57	1.57
r_y (in.)	1.33	0.874	0.844	0.810	0.785

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

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

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT4

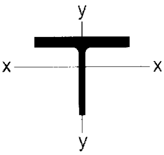
Shape		WT4×									
Wt/ft		33.5		29		24		20		17.5	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	295	443	256	384	211	317	176	264	154	231
	4	253	380	218	328	177	267	148	222	129	193
	6	209	314	179	270	143	215	119	179	103	154
	8	160	241	136	205	106	159	88.1	132	75.0	113
	10	113	170	95.2	143	71.5	107	59.8	89.9	50.3	75.5
	12	78.8	118	66.1	99.4	49.7	74.6	41.5	62.4	34.9	52.5
	14	57.9	87.0	48.6	73.0	36.5	54.8	30.5	45.9	25.6	38.5
	16	44.3	66.6	37.2	55.9	27.9	42.0	23.4	35.1	19.6	29.5
Y-Y Axis	0	295	443	256	384	211	317	176	264	154	231
	4	283	425	245	368	202	303	167	251	146	219
	6	270	405	233	351	192	289	159	238	138	208
	8	253	380	218	328	179	270	148	222	129	194
	10	232	349	200	301	165	247	135	203	118	177
	12	210	315	180	271	148	222	121	182	106	159
	14	186	279	159	240	130	196	107	160	92.7	139
	16	162	243	138	208	113	169	91.7	138	79.7	120
	18	138	207	117	176	95.6	144	77.3	116	67.1	101
	20	115	173	97.7	147	79.3	119	63.8	95.9	55.3	83.1
	22	95.4	143	80.8	121	65.6	98.6	52.8	79.3	45.7	68.7
	24	80.2	121	67.9	102	55.1	82.9	44.4	66.7	38.5	57.8
	26	68.3	103	57.9	87.0	47.0	70.6	37.8	56.8	32.8	49.3
	28	58.9	88.6	49.9	75.0	40.5	60.9	32.6	49.0	28.3	42.5
	30	51.3	77.2	43.5	65.4	35.3	53.1	28.4	42.7	24.6	37.0
	32	45.1	67.8	38.2	57.5	31.0	46.6	25.0	37.5	21.7	32.6

Properties

	33.5	29	24	20	17.5
A_g (in.^{2})	9.84	8.54	7.05	5.87	5.14
r_x (in.)	1.05	1.03	0.986	0.988	0.968
r_y (in.)	2.12	2.10	2.08	2.04	2.03

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

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



WT4

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes

F_y = 50 ksi

Shape		WT4×							
Wt/ft		15.5		14		12		10.5	
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	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	137	205	123	185	106	159	92.3	139
	4	114	171	105	157	89.5	134	80.8	121
	6	91.2	137	85.3	128	72.5	109	68.4	103
	8	66.6	100	63.9	96.1	53.9	81.1	54.2	81.4
	10	44.7	67.1	44.1	66.3	36.9	55.4	40.1	60.3
	12	31.0	46.6	30.6	46.0	25.6	38.5	28.3	42.5
	14	22.8	34.2	22.5	33.8	18.8	28.3	20.8	31.2
	16	17.4	26.2	17.2	25.9	14.4	21.6	15.9	23.9
	18							12.6	18.9
Y-Y Axis	0	137	205	123	185	106	159	92.3	139
	4	128	192	113	170	96.4	145	79.3	119
	6	122	183	105	158	89.1	134	69.9	105
	8	114	171	93.9	141	79.8	120	58.5	87.9
	10	104	156	81.5	122	69.2	104	46.4	69.7
	12	92.7	139	68.5	103	58.0	87.2	34.8	52.3
	14	81.2	122	55.7	83.8	47.1	70.8	25.7	38.6
	16	69.7	105	43.8	65.9	36.9	55.5	19.7	29.7
	18	58.5	87.9	34.7	52.1	29.2	44.0	15.6	23.5
	20	48.1	72.2	28.1	42.3	23.7	35.7	12.7	19.1
	22	39.8	59.8	23.3	35.0	19.6	29.5		
	24	33.4	50.3	19.6	29.4	16.5	24.8		
	26	28.5	42.9	16.7	25.1	14.1	21.1		
	28	24.6	37.0						
	30	21.4	32.2						
	32	18.8	28.3						

Properties

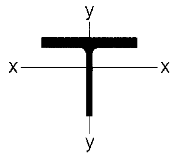
	15.5	14	12	10.5
A_g (in.^{2})	4.56	4.12	3.54	3.08
I (in.^{4})	0.969	1.01	0.999	1.12
r (in.)	2.02	1.62	1.61	1.26

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

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

F_y = 50 ksi

Table 4–7 (continued)
Available Strength in Axial Compression, kips
WT Shapes



WT4

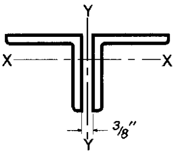
Shape		WT4×							
Wt/ft		9		7.5		6.5		5[c]	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	78.8	118	66.5	99.9	57.4	86.3	32.6	49.0
	4	69.2	104	59.3	89.1	51.4	77.2	29.9	45.0
	6	58.8	88.4	51.4	77.3	44.7	67.1	26.9	40.4
	8	46.8	70.4	42.1	63.3	36.7	55.2	23.2	34.8
	10	34.9	52.5	32.6	49.0	28.6	42.9	19.1	28.7
	12	24.7	37.1	23.8	35.7	20.9	31.5	15.1	22.7
	14	18.1	27.3	17.5	26.2	15.4	23.1	11.4	17.2
	16	13.9	20.9	13.4	20.1	11.8	17.7	8.75	13.2
	18	11.0	16.5	10.6	15.9	9.31	14.0	6.92	10.4
	20			8.55	12.9	7.54	11.3	5.60	8.42
Y-Y Axis	0	78.8	118	66.5	99.9	57.4	86.3	32.6	49.0
	4	65.2	98.0	48.1	72.3	38.5	57.8	23.0	34.6
	6	57.5	86.4	37.6	56.6	30.1	45.2	19.6	29.4
	8	48.0	72.2	26.3	39.6	20.7	31.2	14.7	22.1
	10	37.9	56.9	17.3	26.0	13.6	20.5	10.1	15.3
	12	28.1	42.3	12.1	18.2	9.61	14.4	7.23	10.9
	14	20.8	31.3	8.94	13.4	7.11	10.7	5.38	8.09
	16	16.0	24.1						
	18	12.7	19.1						
	20	10.3	15.5						

Properties

	9	7.5	6.5	5
A_g (in.^{2})	2.63	2.22	1.92	1.48
I (in.^{4})	1.14	1.22	1.23	1.20
r (in.)	1.23	0.876	0.843	0.840

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

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



2L8

Table 4–8
Available Strength in Axial Compression, kips
Double Angles—Equal Legs

$F_y = 36$ ksi

Shape		2L8×8×1-1/8		2L8×8×1		2L8×8×7/8		2L8×8×3/4		2L8×8×5/8		2L8×8×9/16[c]		No. of connectors[a]
Wt/ft		114		103		90.6		78.4		66.0		59.7		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis: X-X Axis	0	720	1080	647	972	569	855	491	739	413	621	359	539	
	2	716	1080	643	967	566	851	489	735	411	618	357	537	
	4	705	1060	634	952	558	838	482	724	405	609	352	529	
	6	687	1030	618	928	544	817	470	706	395	594	344	517	
	8	663	996	596	895	525	789	454	682	382	574	333	500	
	10	632	950	569	855	501	754	434	652	365	549	319	480	
	12	597	897	538	808	474	713	411	617	346	520	303	455	
	14	558	839	503	756	444	667	385	578	325	488	285	428	
	16	516	776	466	700	411	618	357	536	302	453	266	399	
	18	472	710	427	641	377	567	328	493	277	417	245	369	
	20	428	643	387	582	343	515	298	448	253	380	224	337	b
	22	384	577	347	522	308	463	268	403	228	342	203	305	
	24	340	512	309	464	274	412	239	359	203	306	182	274	
	26	299	449	272	408	242	363	211	317	180	270	162	244	
	28	259	390	236	355	210	316	184	277	157	236	143	215	
	30	226	339	205	309	183	275	160	241	137	206	124	187	
	32	199	298	181	271	161	242	141	212	120	181	109	164	
	34	176	264	160	240	143	214	125	188	107	160	96.9	146	
	36	157	236	143	214	127	191	111	167	95.1	143	86.5	130	
	38	141	212	128	192	114	172	99.9	150	85.3	128	77.6	117	
	40	127	191	116	174	103	155	90.2	136	77.0	116	70.0	105	
Y-Y Axis	0	720	1080	647	972	569	855	491	739	413	621	359	539	
	6	684	1030	609	915	527	793	444	668	332	499	278	417	
	9	665	1000	592	890	513	770	432	650	330	495	276	415	
	12	640	961	569	855	492	740	416	625	325	489	273	410	
	15	608	914	541	813	467	702	395	594	317	477	267	401	
	18	572	859	509	765	438	659	371	558	304	456	258	387	
	21	531	799	473	711	406	611	344	518	285	428	244	367	
	24	488	734	434	653	372	559	316	475	262	394	226	340	
	27	444	667	395	593	337	506	286	430	237	357	206	310	
	30	398	599	354	532	301	452	256	384	212	318	185	279	2
	33	354	532	314	472	266	399	226	339	186	280	164	247	
	36	310	466	275	414	231	348	197	296	162	243	143	216	
	39	269	404	238	358	199	299	169	254	139	209	124	186	
	42	232	349	206	309	172	258	146	220	121	181	108	162	
	45	202	304	180	270	150	226	128	192	106	159	94.3	142	
	48	178	268	158	237	132	199	113	169	93.2	140	83.3	125	
	51	158	237	140	211	117	176	100	150	82.8	124	74.1	111	
	54	141	212	125	188	105	157	89.3	134	74.1	111	66.3	99.6	
	57	126	190	112	169	94.0	141	80.3	121	66.6	100	59.6	89.7	
														3

Properties of 2 angles—3/8 in. back to back

	1-1/8	1	7/8	3/4	5/8	9/16
A_g (in.^{2})	33.4	30.0	26.4	22.8	19.2	17.4
r_x (in.)	2.41	2.43	2.45	2.46	2.48	2.49
r_y (in.)	3.54	3.52	3.50	3.47	3.45	3.44

Properties of single angle

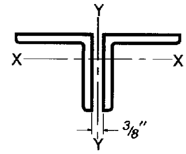
	1-1/8	1	7/8	3/4	5/8	9/16
r_z (in.)	1.56	1.56	1.57	1.57	1.58	1.58

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with $F_y = 36$ ksi.

F_y = 36 ksi

Table 4–8 (continued)
Available Strength in Axial Compression, kips
Double Angles—Equal Legs



2L8–2L6

Shape		2L8×8×		2L6×6×								
		1/2[c]		1		7/8		3/4		5/8		No. of connectors[a]
Wt/ft		53.3		75.0		66.4		57.6		48.5		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis: X-X Axis	0	305	458	475	714	421	632	365	548	307	462	
	2	303	456	471	707	417	626	361	543	305	458	
	4	299	450	458	688	405	609	352	528	297	446	
	6	293	440	436	656	387	581	336	505	284	426	
	8	284	426	409	614	363	545	315	474	266	400	
	10	273	410	375	564	333	501	290	436	246	369	
	12	260	390	338	508	301	453	263	395	223	335	
	14	245	368	299	450	267	401	233	351	198	298	
	16	229	345	260	390	232	349	203	306	173	260	
	18	213	319	221	333	198	298	174	262	149	224	
	20	195	294	185	278	166	250	146	220	125	189	b
	22	178	267	153	230	137	207	121	182	104	156	
	24	161	241	128	193	116	174	102	153	87.4	131	
	26	144	216	109	164	98.4	148	86.8	130	74.5	112	
	28	128	192	94.3	142	84.9	128	74.9	113	64.2	96.5	
	30	112	168			73.9	111	65.2	98.0	55.9	84.1	
	32	98.3	148									
	34	87.1	131									
	36	77.7	117									
	38	69.7	105									
	40	62.9	94.6									
Y-Y Axis	0	305	458	475	714	421	632	365	548	307	462	
	6	224	337	448	674	394	592	338	507	279	419	
	9	223	335	427	642	375	564	322	483	266	399	
	12	221	332	399	600	351	527	300	452	248	373	
	15	217	326	366	550	321	483	275	414	228	342	
	18	211	317	329	494	288	434	247	371	204	307	
	21	202	304	290	436	254	382	217	327	180	270	
	24	190	285	251	377	219	329	187	282	155	233	3
	27	175	263	212	319	185	279	158	238	131	197	
	30	158	238	176	265	153	230	131	196	108	162	
	33	141	212	146	219	127	191	108	163	89.6	135	
	36	125	187	123	184	107	161	91.1	137	75.5	113	
	39	108	163	104	157	91.1	137	77.8	117	64.4	96.9	
	42	94.3	142	90.1	135	78.6	118	67.1	101	55.7	83.6	
	45	82.9	125	78.5	118	68.5	103					
	48	73.3	110									
	51	65.3	98.1									
	54	58.5	87.9									2
	57	52.7	79.2									

Properties of 2 angles—3/8 in. back to back

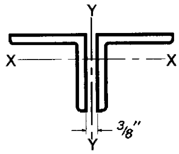
	2L8×8×1/2	2L6×6×1	2L6×6×7/8	2L6×6×3/4	2L6×6×5/8
A_g (in.^{2})	15.5	22.0	19.5	16.9	14.3
r_x (in.)	2.49	1.79	1.81	1.82	1.84
r_y (in.)	3.43	2.72	2.70	2.67	2.65

Properties of single angle

	2L8×8×1/2	2L6×6×1	2L6×6×7/8	2L6×6×3/4	2L6×6×5/8
r_z (in.)	1.59	1.17	1.17	1.17	1.17

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L6

Table 4–8 (continued)
Available Strength in Axial Compression, kips
Double Angles—Equal Legs

$F_y = 36$ ksi

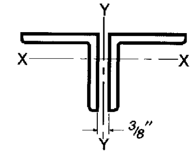
Shape			2L6×6× 9/16		2L6×6× 1/2		2L6×6× 7/16[c]		2L6×6× 3/8[c]		2L6×6× 5/16[c]		No. of connectors[a]
Wt/ft			43.9		39.3		34.6		29.8		25.0		
Design			P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length *KL* (ft) with respect to indicated axis	X-X Axis	0	278	418	249	374	213	320	172	259	131	197	b
		2	276	414	247	371	211	317	171	257	130	195	
		4	269	404	240	361	206	309	167	251	127	191	
		6	257	386	230	345	197	297	160	241	123	184	
		8	241	363	216	325	186	279	152	228	117	175	
		10	223	335	200	300	172	259	141	212	110	165	
		12	202	304	181	272	157	236	130	195	101	152	
		14	180	271	162	243	141	211	117	176	92.4	139	
		16	158	237	142	213	124	186	104	156	83.1	125	
		18	135	204	122	183	107	161	90.9	137	73.7	111	
		20	114	172	103	155	91.1	137	78.2	118	64.4	96.8	
		22	95.0	143	85.7	129	76.1	114	66.2	99.5	55.5	83.4	
		24	79.8	120	72.0	108	64.0	96.1	55.6	83.6	47.1	70.7	
		26	68.0	102	61.4	92.2	54.5	81.9	47.4	71.3	40.1	60.3	
		28	58.7	88.2	52.9	79.5	47.0	70.6	40.9	61.4	34.6	52.0	
		30	51.1	76.8	46.1	69.3	40.9	61.5	35.6	53.5	30.1	45.3	
	Y-Y Axis	0	278	418	249	374	213	320	172	259	131	197	2
		6	247	372	215	323	166	249	126	189	87.8	132	
		9	236	354	205	309	164	246	124	187	87.0	131	
		12	220	331	192	289	159	238	122	183	85.5	128	
		15	201	302	176	265	149	224	116	175	82.8	125	
		18	180	271	158	238	136	204	108	162	78.6	118	
		21	158	237	139	209	119	180	96.5	145	72.4	109	
		24	135	203	119	179	103	154	84.1	126	64.7	97.3	
		27	113	171	100	150	86.1	129	71.6	108	56.3	84.6	
		30	93.1	140	82.2	124	70.8	106	59.5	89.4	47.8	71.8	
		33	77.3	116	68.3	103	59.0	88.7	49.8	74.9	40.4	60.7	
		36	65.1	97.9	57.7	86.7	49.9	75.1	42.3	63.6	34.5	51.8	
		39	55.6	83.6	49.3	74.1	42.8	64.3	36.3	54.5	29.7	44.6	
		42	48.1	72.2	42.6	64.0	37.0	55.6	31.5	47.3	25.8	38.8	
Properties of 2 angles—3/8 in. back to back													
A_g (in.^{2})			12.9		11.5		10.2		8.76		7.34		
r_x (in.)			1.85		1.86		1.86		1.87		1.88		
r_y (in.)			2.64		2.63		2.62		2.60		2.59		
Properties of single angle													
r_z (in.)			1.18		1.18		1.18		1.19		1.19		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with $F_y = 36$ ksi.

F_y = 36 ksi

Table 4–8 (continued)
Available Strength in Axial Compression, kips
Double Angles—Equal Legs



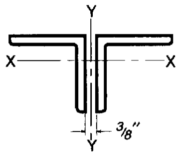
2L5

Shape		2L5×5×														No. of connectors[a]
		7/8		3/4		5/8		1/2		7/16		3/8[c]		5/16[c]		
Wt/ft		54.6		47.5		40.1		32.6		28.7		24.8		20.9		
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	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	344	517	299	450	253	380	205	308	180	271	153	230	119	179	
	2	339	510	295	444	249	375	202	304	178	267	151	227	118	177	
	4	326	490	284	426	240	360	194	292	171	257	146	219	114	171	
	6	304	457	265	398	224	337	182	274	161	241	137	206	107	162	
	8	276	415	241	363	205	308	167	250	147	221	125	189	99.2	149	
	10	244	367	214	321	182	273	148	223	131	197	112	169	89.6	135	
	12	210	316	184	277	157	236	129	193	114	171	97.9	147	79.0	119	
	14	176	264	155	233	133	199	109	164	96.4	145	83.3	125	68.1	102	b
	16	143	215	127	190	109	164	89.7	135	79.6	120	69.1	104	57.4	86.3	
	18	114	171	101	152	87.0	131	72.0	108	64.0	96.2	55.8	83.9	47.3	71.1	
	20	92.2	139	81.8	123	70.4	106	58.3	87.6	51.8	77.9	45.2	68.0	38.4	57.6	
	22	76.2	115	67.6	102	58.2	87.5	48.2	72.4	42.8	64.4	37.4	56.2	31.7	47.6	
	24	64.0	96.2	56.8	85.3	48.9	73.5	40.5	60.8	36.0	54.1	31.4	47.2	26.6	40.0	
	26													22.7	34.1	
Y-Y Axis	0	344	517	299	450	253	380	205	308	180	271	153	230	119	179	
	2	336	505	290	436	242	364	191	287	164	246	122	183	88.5	133	
	4	330	496	285	428	237	357	187	282	161	241	121	183	88.2	133	
	6	320	481	276	415	230	346	182	273	156	234	121	181	87.6	132	
	8	307	461	265	398	221	332	174	262	149	224	119	179	86.6	130	
	10	291	437	251	377	209	314	165	248	141	212	116	174	84.9	128	
	12	272	409	234	352	195	293	154	232	132	198	110	165	82.1	123	
	14	251	378	216	325	180	271	143	214	122	183	103	154	77.9	117	
	16	229	345	197	296	164	247	130	195	111	166	93.6	141	72.3	109	
	18	207	311	178	267	148	222	117	176	99.3	149	84.0	126	65.8	98.9	2
	20	184	277	158	237	131	197	104	156	87.8	132	74.2	112	58.9	88.5	
	22	162	243	139	208	115	173	91.1	137	76.6	115	64.6	97.1	51.9	78.0	
	24	141	212	120	181	99.6	150	78.8	118	65.7	98.7	55.3	83.2	45.0	67.6	
	26	121	181	103	155	85.1	128	67.4	101	56.2	84.5	47.5	71.4	38.8	58.3	
	28	104	156	88.8	133	73.5	110	58.2	87.5	48.7	73.1	41.2	61.9	33.8	50.8	
	30	90.7	136	77.4	116	64.1	96.4	50.8	76.4	42.5	63.9	36.1	54.2	29.6	44.5	
	32	79.8	120	68.1	102	56.4	84.8	44.8	67.3	37.4	56.3	31.8	47.8	26.2	39.4	
	34	70.7	106	60.4	90.7	50.0	75.2	39.7	59.7	33.2	49.9	28.3	42.5	23.3	35.0	
	36	63.1	94.8	53.9	81.0	44.6	67.1	35.5	53.3	29.7	44.6	25.3	38.0	20.9	31.4	
	38	56.6	85.1													3

Properties of 2 angles—3/8 in. back to back							
A_g (in.^{2})	16.0	13.9	11.7	9.50	8.36	7.22	6.06
r_x (in.)	1.49	1.50	1.52	1.53	1.54	1.55	1.56
r_y (in.)	2.30	2.27	2.25	2.22	2.21	2.20	2.19
Properties of single angle							
r_z (in.)	0.971	0.972	0.975	0.980	0.983	0.986	0.990

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



2L4

Table 4–8 (continued)
Available Strength in Axial Compression, kips
Double Angles—Equal Legs

F_y = 36 ksi

Effective length *KL* (ft) with respect to indicated axis		2L4×4× 3/4		5/8		1/2		7/16		3/8		5/16		1/4[c]		No. of connectors[a]
Wt/ft		37.0		31.3		25.5		22.5		19.4		16.3		13.2		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
X-X Axis	0	235	353	199	298	162	243	143	214	123	185	103	155	76.2	115	
	2	230	345	194	292	158	238	140	210	121	182	101	152	74.9	113	
	4	215	323	182	274	149	224	132	198	114	171	95.4	143	71.0	107	
	6	193	290	164	247	134	202	119	179	103	155	86.4	130	64.9	97.6	
	8	166	249	142	213	116	175	103	155	89.5	134	75.2	113	57.3	86.2	
	10	137	205	117	176	96.6	145	85.9	129	74.7	112	63.0	94.7	48.8	73.4	b
	12	108	162	92.9	140	77.0	116	68.7	103	59.9	90.0	50.7	76.2	40.1	60.3	
	14	81.3	122	70.5	106	58.8	88.4	52.6	79.1	46.1	69.2	39.1	58.8	31.8	47.8	
	16	62.2	93.5	54.0	81.1	45.0	67.7	40.3	60.6	35.3	53.0	30.0	45.1	24.5	36.9	
	18	49.2	73.9	42.6	64.1	35.6	53.5	31.8	47.8	27.9	41.9	23.7	35.6	19.4	29.1	
	20			34.5	51.9	28.8	43.3	25.8	38.8	22.6	33.9	19.2	28.8	15.7	23.6	
Y-Y Axis	0	235	353	199	298	162	243	143	214	123	185	103	155	76.2	115	
	2	229	344	192	289	154	232	134	202	113	170	82.8	125	56.1	84.3	
	4	223	335	187	281	150	225	130	196	110	165	82.4	124	55.8	83.9	
	6	213	320	179	268	143	215	125	187	105	158	81.3	122	55.2	83.0	
	8	200	300	167	252	134	201	117	176	98.8	148	78.9	119	54.1	81.4	
	10	184	276	154	231	123	185	107	161	91.0	137	74.3	112	52.1	78.3	
	12	166	250	139	209	111	167	96.9	146	82.2	123	67.8	102	48.7	73.3	
	14	147	222	123	185	98.3	148	85.7	129	72.8	109	60.1	90.3	44.2	66.4	3
	16	128	193	107	161	85.3	128	74.4	112	63.2	94.9	52.0	78.1	39.0	58.6	
	18	110	165	91.2	137	72.6	109	63.3	95.1	53.7	80.8	44.0	66.2	33.6	50.5	
	20	92.2	139	76.3	115	60.5	90.9	52.6	79.1	44.7	67.2	36.4	54.8	28.3	42.5	
	22	76.3	115	63.1	94.9	50.1	75.3	43.6	65.6	37.1	55.8	30.4	45.6	23.7	35.7	
	24	64.2	96.5	53.1	79.8	42.2	63.4	36.8	55.2	31.3	47.0	25.7	38.6	20.2	30.3	
	26	54.7	82.2	45.3	68.1	36.0	54.1	31.4	47.2	26.7	40.2	22.0	33.0	17.3	26.0	
	28	47.2	70.9	39.1	58.7	31.0	46.7	27.1	40.7	23.1	34.7	19.0	28.6	15.0	22.6	
	30	41.1	61.8	34.1	51.2	27.1	40.7	23.6	35.5	20.1	30.3					

Properties of 2 angles—3/8 in. back to back

	3/4	5/8	1/2	7/16	3/8	5/16	1/4
A_g (in.^{2})	10.9	9.21	7.49	6.62	5.72	4.80	3.88
r_x (in.)	1.18	1.20	1.21	1.22	1.23	1.24	1.25
r_y (in.)	1.88	1.85	1.83	1.81	1.80	1.79	1.78

Properties of single angle

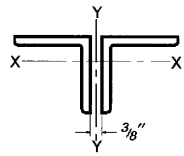
	3/4	5/8	1/2	7/16	3/8	5/16	1/4
r_z (in.)	0.774	0.774	0.776	0.777	0.779	0.781	0.783

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4–8 (continued)
Available Strength in Axial Compression, kips
Double Angles—Equal Legs



2L3½

Shape			2L3½×3½× ½		7/16		3/8		5/16		¼[c]		No. of connectors[a]
Wt/ft			22.2		19.6		17.0		14.3		11.6		
Design			P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis	X-X Axis	0	140	211	124	186	107	161	90.1	135	70.3	106	b
		1	139	209	123	185	106	160	89.5	135	69.9	105	
		2	136	205	120	181	104	156	87.8	132	68.6	103	
		3	132	198	116	175	101	151	85.0	128	66.5	99.9	
		4	126	189	111	167	96.2	145	81.2	122	63.7	95.7	
		5	118	178	105	157	90.6	136	76.5	115	60.2	90.5	
		6	110	165	97.1	146	84.2	127	71.2	107	56.2	84.5	
		7	100	151	89.0	134	77.3	116	65.4	98.3	51.9	77.9	
		8	90.5	136	80.4	121	70.0	105	59.3	89.2	47.2	71.0	
		9	80.6	121	71.8	108	62.5	93.9	53.1	79.8	42.5	63.9	
		10	70.8	106	63.1	94.9	55.1	82.8	46.9	70.5	37.8	56.8	
		11	61.4	92.2	54.8	82.4	47.9	72.1	40.9	61.4	33.2	49.8	
		12	52.3	78.7	46.9	70.5	41.1	61.8	35.2	52.9	28.7	43.2	
		13	44.6	67.0	40.0	60.0	35.0	52.7	30.0	45.0	24.6	36.9	
		14	38.5	57.8	34.4	51.8	30.2	45.4	25.8	38.8	21.2	31.9	
		15	33.5	50.3	30.0	45.1	26.3	39.5	22.5	33.8	18.5	27.7	
		16	29.4	44.2	26.4	39.6	23.1	34.8	19.8	29.7	16.2	24.4	
		17	26.1	39.2	23.4	35.1	20.5	30.8	17.5	26.3	14.4	21.6	
		18							15.6	23.5	12.8	19.3	
	Y-Y Axis	0	140	211	124	186	107	161	90.1	135	70.3	106	3
		2	135	203	118	177	100	150	81.7	123	54.8	82.4	
		4	130	195	114	171	96.6	145	79.0	119	54.4	81.8	
		6	122	184	107	161	91.1	137	74.6	112	53.5	80.3	
		8	113	169	98.5	148	83.8	126	68.8	103	51.3	77.2	
		10	101	152	88.3	133	75.2	113	61.9	93.0	47.4	71.2	
		12	88.6	133	77.3	116	65.9	99.0	54.3	81.6	42.0	63.2	
		14	75.7	114	66.0	99.3	56.2	84.5	46.4	69.7	36.1	54.2	
		16	63.1	94.9	55.0	82.7	46.8	70.3	38.6	58.0	30.1	45.2	
		18	51.2	77.0	44.6	67.0	37.9	56.9	31.3	47.0	24.4	36.6	
		20	41.6	62.5	36.2	54.4	30.8	46.3	25.4	38.2	20.0	30.0	
		22	34.4	51.7	30.0	45.0	25.5	38.3	21.1	31.7	16.6	25.0	
		24	28.9	43.5	25.2	37.9	21.5	32.3	17.8	26.7	14.0	21.1	
		26	24.7	37.1	21.5	32.3	18.3	27.5	15.2	22.8	12.0	18.0	

Properties of 2 angles—3/8 in. back to back

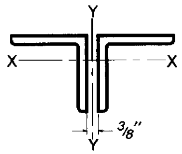
	½	7/16	3/8	5/16	¼
A_g (in.^{2})	6.50	5.74	4.96	4.18	3.38
r_x (in.)	1.05	1.06	1.07	1.08	1.09
r_y (in.)	1.63	1.61	1.60	1.59	1.57

Properties of single angle

	½	7/16	3/8	5/16	¼
r_z (in.)	0.679	0.681	0.683	0.685	0.688

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L3

Table 4–8 (continued)
Available Strength in Axial Compression, kips
Double Angles—Equal Legs

F_y = 36 ksi

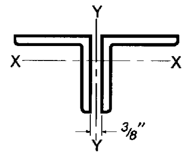
Shape		2L3×3× 1/2		7/16		3/8		5/16		1/4		3/16[c]		No. of connectors[a]
Wt/ft		18.7		16.6		14.3		12.1		9.77		7.41		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis — X-X Axis	0	118	178	105	158	90.9	137	76.6	115	61.9	93.0	42.8	64.3	b
	1	117	176	104	156	90.0	135	75.9	114	61.4	92.2	42.4	63.8	
	2	114	171	101	152	87.6	132	73.8	111	59.8	89.8	41.4	62.3	
	3	109	164	96.4	145	83.7	126	70.6	106	57.2	85.9	39.8	59.8	
	4	102	153	90.3	136	78.5	118	66.3	99.6	53.7	80.8	37.7	56.6	
	5	93.5	141	83.1	125	72.3	109	61.1	91.9	49.6	74.6	35.1	52.7	
	6	84.3	127	75.0	113	65.4	98.2	55.4	83.2	45.0	67.7	32.1	48.3	
	7	74.5	112	66.5	99.9	58.0	87.2	49.3	74.0	40.1	60.3	29.0	43.6	
	8	64.7	97.2	57.8	86.9	50.6	76.0	43.0	64.7	35.1	52.8	25.7	38.7	
	9	55.1	82.8	49.3	74.2	43.3	65.1	36.9	55.5	30.2	45.5	22.5	33.8	
	10	46.0	69.1	41.3	62.1	36.4	54.7	31.1	46.8	25.6	38.4	19.3	29.1	
	11	38.0	57.1	34.2	51.4	30.1	45.3	25.8	38.8	21.2	31.9	16.4	24.6	
	12	31.9	48.0	28.7	43.2	25.3	38.0	21.7	32.6	17.8	26.8	13.7	20.7	
	13	27.2	40.9	24.5	36.8	21.6	32.4	18.5	27.8	15.2	22.8	11.7	17.6	
	14	23.5	35.3	21.1	31.7	18.6	28.0	15.9	24.0	13.1	19.7	10.1	15.2	
	15			18.4	27.6	16.2	24.3	13.9	20.9	11.4	17.2	8.80	13.2	
Y-Y Axis	0	118	178	105	158	90.9	137	76.6	115	61.9	93.0	42.8	64.3	3
	2	114	172	100	151	86.0	129	70.9	107	54.6	82.1	31.0	46.6	
	4	109	164	95.8	144	82.1	123	67.7	102	52.3	78.6	30.7	46.2	
	6	101	152	88.6	133	75.9	114	62.6	94.1	48.6	73.0	30.0	45.2	
	8	90.4	136	79.3	119	67.9	102	56.1	84.3	43.7	65.7	28.6	43.0	
	10	78.4	118	68.7	103	58.8	88.4	48.6	73.1	38.1	57.2	25.9	39.0	
	12	65.9	99.1	57.7	86.7	49.3	74.1	40.8	61.3	32.0	48.1	22.3	33.6	
	14	53.7	80.7	46.9	70.4	40.0	60.1	33.0	49.7	26.0	39.1	18.4	27.7	
	16	42.2	63.5	36.8	55.3	31.3	47.1	25.9	38.9	20.4	30.7	14.7	22.1	
	18	33.4	50.2	29.1	43.8	24.8	37.3	20.5	30.9	16.2	24.4	11.8	17.7	
	20	27.1	40.7	23.6	35.5	20.1	30.3	16.7	25.1	13.2	19.8	9.65	14.5	
	22	22.4	33.7	19.5	29.4	16.7	25.1	13.8	20.8	10.9	16.5	8.04	12.1	
Properties of 2 angles—3/8 in. back to back														
A_g (in.^{2})		5.50		4.86		4.22		3.55		2.87		2.18		
r_x (in.)		0.90		0.90		0.91		0.92		0.93		0.93		
r_y (in.)		1.43		1.42		1.41		1.39		1.38		1.37		
Properties of single angle														
r_z (in.)		0.580		0.580		0.581		0.583		0.585		0.586		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–8 (continued)
Available Strength in Axial Compression, kips
Double Angles—Equal Legs



2L2½

Shape		2L2½×2½× 1/2		3/8		5/16		1/4		3/16[c]		No. of connectors[a]
Wt/ft		15.3		11.8		10.0		8.07		6.13		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	96.9	146	74.7	112	63.1	94.8	51.1	76.8	38.1	57.3	
	1	95.6	144	73.7	111	62.3	93.6	50.5	75.8	37.7	56.6	
	2	91.6	138	70.8	106	59.8	89.9	48.5	72.9	36.3	54.5	
	3	85.4	128	66.2	99.4	56.0	84.2	45.5	68.4	34.1	51.2	
	4	77.5	116	60.2	90.5	51.0	76.7	41.5	62.4	31.2	46.9	
	5	68.3	103	53.3	80.1	45.3	68.1	36.9	55.5	27.9	41.9	
	6	58.5	87.9	45.9	69.0	39.2	58.8	32.0	48.1	24.3	36.5	b
	7	48.8	73.3	38.5	57.9	33.0	49.5	27.0	40.6	20.6	31.0	
	8	39.5	59.4	31.5	47.3	27.0	40.6	22.3	33.4	17.1	25.7	
	9	31.3	47.1	25.1	37.7	21.6	32.4	17.8	26.8	13.8	20.7	
	10	25.4	38.1	20.3	30.5	17.5	26.3	14.4	21.7	11.2	16.8	
	11	21.0	31.5	16.8	25.2	14.4	21.7	11.9	17.9	9.23	13.9	
	12	17.6	26.5	14.1	21.2	12.1	18.2	10.0	15.1	7.75	11.7	
Y-Y Axis	0	96.9	146	74.7	112	63.1	94.8	51.1	76.8	38.1	57.3	
	1	95.2	143	72.5	109	60.4	90.8	47.6	71.5	30.0	45.0	
	2	93.7	141	71.3	107	59.4	89.3	46.8	70.4	29.9	44.9	
	3	91.2	137	69.4	104	57.8	86.9	45.6	68.5	29.7	44.6	
	4	87.8	132	66.8	100	55.6	83.6	43.9	66.0	29.4	44.2	
	5	83.7	126	63.5	95.5	52.9	79.5	41.8	62.8	28.8	43.3	
	6	78.9	119	59.8	89.9	49.8	74.9	39.4	59.2	27.8	41.9	
	7	73.5	111	55.7	83.7	46.3	69.6	36.7	55.1	26.4	39.7	
	8	67.8	102	51.2	77.0	42.6	64.1	33.7	50.7	24.5	36.8	
	9	61.9	93.0	46.6	70.1	38.8	58.3	30.7	46.1	22.4	33.6	
	10	55.8	83.9	42.0	63.1	34.9	52.4	27.6	41.5	20.1	30.3	3
	11	49.8	74.9	37.3	56.1	31.0	46.6	24.5	36.9	17.9	26.9	
	12	44.0	66.1	32.9	49.4	27.2	40.9	21.5	32.4	15.7	23.5	
	13	38.4	57.8	28.5	42.9	23.6	35.5	18.6	28.0	13.5	20.4	
	14	33.2	49.9	24.6	37.0	20.4	30.6	16.1	24.2	11.8	17.7	
	15	28.9	43.5	21.5	32.3	17.8	26.7	14.1	21.2	10.3	15.5	
	16	25.4	38.2	18.9	28.4	15.6	23.5	12.4	18.6	9.09	13.7	
	17	22.5	33.9	16.8	25.2	13.9	20.9	11.0	16.5	8.08	12.2	
	18	20.1	30.2	15.0	22.5	12.4	18.6	9.82	14.8	7.23	10.9	
	19	18.1	27.1	13.4	20.2	11.1	16.7	8.83	13.3	6.51	9.78	
	20	16.3	24.5	12.1	18.2							

Properties of 2 angles—3/8 in. back to back

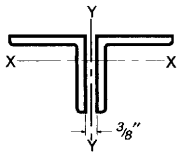
	1/2	3/8	5/16	1/4	3/16
A_g (in.^{2})	4.50	3.47	2.93	2.37	1.80
r_x (in.)	0.74	0.75	0.76	0.76	0.77
r_y (in.)	1.23	1.21	1.19	1.18	1.17

Properties of single angle

	1/2	3/8	5/16	1/4	3/16
r_z (in.)	0.481	0.481	0.481	0.482	0.482

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl*/*r* equal to or greater than 200.



2L2

Table 4–8 (continued)
Available Strength in Axial Compression, kips
Double Angles—Equal Legs

F_y = 36 ksi

Shape		2L2×2×										No. of connectors[a]
		3/8		5/16		1/4		3/16		1/8[c]		
Wt/ft		9.30		7.89		6.43		4.91		3.34		
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 indicated axis — X-X Axis	0	58.6	88.1	49.6	74.5	40.4	60.8	30.8	46.3	19.0	28.6	b
	1	57.4	86.2	48.5	73.0	39.6	59.5	30.2	45.4	18.7	28.1	
	2	53.8	80.8	45.5	68.5	37.2	55.9	28.4	42.7	17.7	26.6	
	3	48.2	72.5	41.0	61.6	33.6	50.4	25.7	38.6	16.2	24.3	
	4	41.4	62.2	35.3	53.1	29.0	43.6	22.3	33.5	14.3	21.4	
	5	34.1	51.2	29.2	43.8	24.1	36.2	18.6	28.0	12.1	18.2	
	6	26.8	40.3	23.1	34.7	19.2	28.8	14.9	22.4	10.0	15.0	
	7	20.2	30.4	17.5	26.3	14.6	22.0	11.4	17.2	7.87	11.8	
	8	15.5	23.3	13.4	20.1	11.2	16.8	8.75	13.1	6.06	9.11	
	9	12.2	18.4	10.6	15.9	8.85	13.3	6.91	10.4	4.79	7.20	
	10					7.17	10.8	5.60	8.42	3.88	5.83	
Y-Y Axis	0	58.6	88.1	49.6	74.5	40.4	60.8	30.8	46.3	19.0	28.6	3
	1	57.3	86.2	48.1	72.3	38.7	58.1	28.4	42.6	14.0	21.0	
	2	56.0	84.1	47.0	70.6	37.7	56.7	27.7	41.6	13.9	21.0	
	3	53.8	80.8	45.1	67.8	36.2	54.4	26.6	40.0	13.8	20.8	
	4	50.8	76.4	42.6	64.0	34.2	51.4	25.2	37.8	13.6	20.5	
	5	47.3	71.0	39.6	59.5	31.8	47.7	23.4	35.2	13.2	19.9	
	6	43.2	65.0	36.2	54.3	29.0	43.6	21.4	32.2	12.6	18.9	
	7	38.9	58.5	32.5	48.8	26.0	39.1	19.2	28.9	11.6	17.4	
	8	34.5	51.8	28.7	43.2	23.0	34.5	17.0	25.5	10.4	15.7	
	9	30.1	45.2	25.0	37.5	19.9	30.0	14.7	22.2	9.15	13.8	
	10	25.8	38.7	21.3	32.1	17.0	25.6	12.6	18.9	7.88	11.8	
	11	21.7	32.6	17.9	26.9	14.2	21.4	10.5	15.8	6.66	10.0	
	12	18.2	27.4	15.1	22.6	12.0	18.0	8.85	13.3	5.66	8.51	
	13	15.5	23.4	12.8	19.3	10.2	15.4	7.56	11.4	4.86	7.31	
	14	13.4	20.2	11.1	16.7	8.82	13.3	6.54	9.82	4.22	6.34	
	15	11.7	17.6	9.66	14.5	7.69	11.6	5.70	8.57	3.69	5.55	
	16	10.3	15.4	8.50	12.8	6.77	10.2	5.02	7.54			
Properties of 2 angles—3/8 in. back to back												
A_g (in.^{2})		2.72		2.30		1.88		1.43		0.968		
r_x (in.)		0.59		0.60		0.61		0.61		0.62		
r_y (in.)		1.01		0.996		0.982		0.967		0.951		
Properties of single angle												
r_z (in.)		0.386		0.386		0.387		0.389		0.391		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4-9
Available Strength in Axial Compression, kips
Double Angles—LLBB

2L8 LLBB

Shape			2L8×6×													
			1		7/8		3/4		5/8		9/16[c]		1/2[c]		7/16[c]		No. of connectors[a]
Wt/ft			88.8		78.5		68.0		57.3		51.8		46.3		40.7		
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	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	
			ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length KL (ft) with respect to indicated axis	X-X Axis	0	560	842	496	745	429	644	359	540	313	470	265	399	217	327	b
		4	550	826	486	731	420	632	353	530	307	462	261	392	214	322	
		6	536	806	475	713	411	617	345	518	300	451	255	384	210	315	
		8	518	779	459	690	397	597	333	501	291	437	248	373	204	307	
		10	496	745	439	660	380	572	320	480	279	420	239	359	197	296	
		12	470	706	417	626	361	542	304	456	266	400	228	342	189	284	
		14	441	663	391	588	339	510	286	429	251	377	216	324	179	270	
		16	410	616	364	547	316	475	266	400	235	353	202	304	169	254	
		18	377	567	335	504	291	438	246	369	217	327	188	283	158	238	
		20	344	516	306	460	266	400	225	338	200	300	174	261	147	221	
		22	310	466	276	415	241	362	204	306	182	273	159	239	135	203	
		24	277	416	247	372	216	324	183	275	164	246	144	217	124	186	
		26	245	368	219	329	191	288	163	244	146	220	130	195	112	168	
		28	214	322	192	289	168	253	143	215	130	195	116	174	101	151	
		30	187	281	167	252	147	220	125	188	114	171	102	154	89.9	135	
		32	164	247	147	221	129	194	110	165	99.9	150	89.8	135	79.4	119	
		34	145	219	130	196	114	172	97.3	146	88.5	133	79.6	120	70.4	106	
		36	130	195	116	175	102	153	86.7	130	79.0	119	71.0	107	62.8	94.3	
		38	116	175	104	157	91.4	137	77.9	117	70.9	107	63.7	95.7	56.3	84.7	
		40	105	158	94.1	142	82.4	124	70.3	106	64.0	96.1	57.5	86.4	50.8	76.4	
		42					74.8	112	63.7	95.8	58.0	87.2	52.1	78.4	46.1	69.3	
	Y-Y Axis	0	560	842	496	745	429	644	359	540	313	470	265	399	217	327	2
		4	523	786	455	684	383	575	300	451	253	380	206	310	161	241	
		6	510	767	444	667	373	561	297	447	251	377	205	307	159	240	
		8	493	741	429	644	361	543	292	439	247	371	202	303	157	237	
		10	471	708	410	616	345	519	283	426	240	361	197	296	155	232	
		12	446	670	388	583	327	492	271	407	231	347	191	287	150	226	
		14	417	627	363	546	307	461	255	383	219	329	182	274	145	217	
		16	387	581	337	506	285	428	237	356	204	307	171	257	137	207	
		18	355	533	309	464	261	393	217	326	188	283	159	239	129	194	
		20	322	484	280	421	237	357	196	295	171	257	145	219	119	179	
		22	289	434	252	378	213	320	175	264	154	231	132	198	109	163	
		24	257	386	223	336	189	285	155	233	137	205	118	177	98.2	148	
		26	226	339	196	295	166	250	135	203	120	180	104	156	87.7	132	
		28	196	294	170	256	144	217	118	177	104	157	91.1	137	77.4	116	
		30	171	257	149	224	126	190	103	155	91.8	138	80.3	121	68.5	103	
		32	151	226	131	197	111	167	91.2	137	81.3	122	71.2	107	61.0	91.6	
		34	134	201	116	175	98.9	149	81.2	122	72.4	109	63.5	95.5	54.5	82.0	
		36	119	179	104	156	88.4	133	72.7	109	64.9	97.5	57.0	85.7	49.1	73.7	
		38	107	161	93.4	140	79.5	119	65.4	98.3	58.5	87.9	51.4	77.3	44.3	66.6	
		40	96.8	145	84.4	127	71.8	108	59.2	89.0	52.9	79.6	46.6	70.1	40.2	60.5	
		42	87.9	132													

Properties of 2 angles—3/8 in. back to back

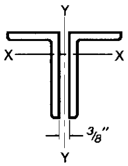
	1	7/8	3/4	5/8	9/16	1/2	7/16
A_g (in.^{2})	26.0	23.0	19.9	16.7	15.1	13.5	11.9
r_x (in.)	2.49	2.50	2.52	2.54	2.55	2.55	2.56
r_y (in.)	2.52	2.50	2.47	2.45	2.44	2.43	2.42

Properties of single angle

r_z (in.)	1.28	1.28	1.29	1.29	1.30	1.30	1.31

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L8 LLBB

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB

F_y = 36 ksi

Shape			2L8×4× 1		7/8		3/4		5/8		9/16[c]		1/2[c]		7/16[c]		No. of connectors[a]
Wt/ft			75.2		66.6		57.8		48.7		44.1		39.5		34.8		
Design			P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length *KL* (ft) with respect to indicated axis	X-X Axis	0	474	713	419	631	364	547	306	459	266	400	226	340	186	279	b
		4	465	699	412	619	357	537	300	451	261	393	222	334	183	275	
		6	454	683	402	604	349	524	293	441	256	384	218	327	179	269	
		8	439	660	389	584	338	507	284	427	248	372	211	318	174	262	
		10	421	632	373	560	324	487	272	409	238	358	204	306	168	253	
		12	399	600	354	532	307	462	259	389	227	341	195	292	161	243	
		14	375	563	332	500	289	435	244	367	214	322	184	277	154	231	
		16	349	524	310	465	270	405	228	342	201	302	173	260	145	218	
		18	321	483	286	429	249	374	211	316	186	280	161	243	136	204	
		20	293	441	261	392	228	342	193	290	171	257	149	224	126	190	
		22	265	399	236	355	207	310	175	263	156	235	137	205	116	175	
		24	237	357	212	318	185	279	157	237	141	212	124	187	107	160	
		26	211	316	188	283	165	248	140	211	126	190	112	168	96.8	145	
		28	185	278	166	249	145	219	124	186	112	169	100	150	87.2	131	
		30	161	242	144	217	127	191	108	163	98.6	148	88.7	133	78.0	117	
		32	142	213	127	191	111	168	95.2	143	86.6	130	78.0	117	69.1	104	
		34	125	188	112	169	98.7	148	84.3	127	76.7	115	69.1	104	61.2	92.0	
		36	112	168	100	151	88.1	132	75.2	113	68.5	103	61.6	92.6	54.6	82.0	
		38	100	151	89.9	135	79.0	119	67.5	101	61.4	92.3	55.3	83.1	49.0	73.6	
		40	90.6	136	81.2	122	71.3	107	60.9	91.5	55.4	83.3	49.9	75.0	44.2	66.5	
		42			73.6	111	64.7	97.2	55.2	83.0	50.3	75.6	45.3	68.0	40.1	60.3	
	Y-Y Axis	0	474	713	419	631	364	547	306	459	266	400	226	340	186	279	2
		4	423	635	366	550	307	462	254	382	215	324	177	266	139	209	
		6	397	597	344	517	289	434	242	363	206	309	170	255	134	201	
		8	364	546	315	473	265	398	222	334	190	286	158	237	126	189	
		10	324	488	281	422	236	355	197	296	170	255	142	214	115	172	
		12	282	424	243	366	205	308	169	254	147	220	124	187	101	152	
		14	238	358	206	309	173	260	141	212	123	185	105	158	86.8	131	
		16	196	295	169	254	142	213	114	171	99.9	150	86.2	130	72.4	109	
		18	166	249	142	213	113	171	91.3	137	80.6	121	69.9	105	59.2	89.0	
		20	135	203	115	173	92.6	139	74.9	113	66.2	99.6	57.7	86.7	49.1	73.8	
		22	112	168	95.7	144	76.9	116	62.4	93.8	55.3	83.2	48.3	72.7	41.3	62.1	
		24	94.1	141	80.6	121	64.9	97.5	52.8	79.3	46.9	70.4	41.0	61.7	35.2	52.9	
		26	80.4	121	68.9	104											3

Properties of 2 angles—3/8 in. back to back

	1	7/8	3/4	5/8	9/16[c]	1/2[c]	7/16[c]
A_g (in.^{2})	22.0	19.5	16.9	14.2	12.9	11.5	10.1
r_x (in.)	2.51	2.53	2.55	2.56	2.57	2.58	2.59
r_y (in.)	1.60	1.57	1.55	1.52	1.51	1.50	1.49

Properties of single angle

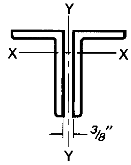
	1	7/8	3/4	5/8	9/16[c]	1/2[c]	7/16[c]
r_z (in.)	0.844	0.846	0.850	0.856	0.859	0.863	0.867

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB

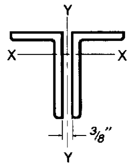


2L7 LLBB

Shape		2L7×4×										No. of connectors[a]
		3/4		5/8		1/2[c]		7/16[c]		3/8[c]		
Wt/ft		114		103		90.6		78.4		66.0		
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 indicated axis — X-X Axis	0	332	498	279	420	218	328	182	273	144	217	b
	4	323	486	273	410	213	321	178	267	141	212	
	6	314	471	264	398	207	312	173	260	138	207	
	8	300	451	253	381	199	299	166	250	133	200	
	10	284	427	240	361	189	284	159	238	127	191	
	12	265	399	224	337	177	267	149	225	121	181	
	14	245	368	207	312	165	247	139	209	113	170	
	16	223	336	189	284	151	227	128	193	105	158	
	18	201	302	171	256	137	206	117	176	96.5	145	
	20	179	269	152	228	122	184	106	159	87.8	132	
	22	157	236	134	201	108	163	94.2	142	79.1	119	
	24	136	205	116	175	95.0	143	83.2	125	70.6	106	
	26	117	175	99.7	150	82.0	123	72.6	109	62.4	93.7	
	28	100	151	86.0	129	70.7	106	62.7	94.3	54.5	81.8	
	30	87.5	132	74.9	113	61.6	92.6	54.6	82.1	47.4	71.3	
	32	76.9	116	65.8	98.9	54.1	81.4	48.0	72.2	41.7	62.7	
	34	68.1	102	58.3	87.6	48.0	72.1	42.5	63.9	36.9	55.5	
	36	60.8	91.3	52.0	78.2	42.8	64.3	37.9	57.0	32.9	49.5	
Y-Y Axis	0	332	498	279	420	218	328	182	273	144	217	2
	4	291	438	236	355	178	267	142	214	107	161	
	6	274	412	223	335	171	257	137	206	104	156	
	8	252	379	205	308	159	239	129	194	98.7	148	
	10	226	340	184	277	143	215	117	176	91.1	137	
	12	197	297	161	242	125	188	103	156	81.5	123	
	14	168	253	137	206	106	159	88.6	133	70.9	107	
	16	139	210	114	171	87.4	131	73.9	111	60.0	90.3	
	18	112	169	91.7	138	70.5	106	60.1	90.4	49.5	74.5	
	20	91.6	138	74.8	112	57.9	87.1	49.6	74.6	41.2	61.9	
	22	76.0	114	62.2	93.5	48.4	72.7	41.6	62.5	34.7	52.1	
	24	64.0	96.2	52.5	78.9	41.0	61.6	35.3	53.0	29.5	44.4	
	26	54.7	82.2	44.9	67.4	35.1	52.8					
Properties of 2 angles—3/8 in. back to back												
A_g (in.^{2})		15.4		13.0		10.5		9.24		7.96		
r_x (in.)		2.21		2.23		2.25		2.26		2.27		
r_y (in.)		1.61		1.58		1.56		1.55		1.54		
Properties of single angle												
r_z (in.)		0.855		0.860		0.866		0.869		0.873		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L6 LLBB

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB

F_y = 36 ksi

Shape		2L6×4×								No. of connectors[a]
		7/8		3/4		5/8		9/16		
Wt/ft		54.3		47.2		39.9		36.1		
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	$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length KL (ft) with respect to indicated axis										
X-X Axis	0	344	517	299	449	253	380	229	344	b
X-X Axis	4	332	500	289	434	244	367	221	333	b
X-X Axis	6	318	478	277	416	234	352	212	319	b
X-X Axis	8	299	450	261	392	221	332	200	301	b
X-X Axis	10	277	416	241	363	204	307	186	279	b
X-X Axis	12	251	378	219	330	186	280	169	254	b
X-X Axis	14	224	337	196	295	167	251	152	228	b
X-X Axis	16	197	296	172	259	147	221	134	201	b
X-X Axis	18	169	255	149	224	127	191	116	175	b
X-X Axis	20	144	216	127	190	108	163	99.0	149	b
X-X Axis	22	119	179	106	159	90.7	136	82.9	125	b
X-X Axis	24	100	151	88.7	133	76.2	115	69.6	105	b
X-X Axis	26	85.5	128	75.5	114	64.9	97.6	59.3	89.2	b
X-X Axis	28	73.7	111	65.1	97.9	56.0	84.1	51.2	76.9	b
X-X Axis	30	64.2	96.5	56.7	85.3	48.8	73.3	44.6	67.0	b
Y-Y Axis	0	344	517	299	449	253	380	229	344	2
Y-Y Axis	4	317	476	271	407	223	335	198	298	2
Y-Y Axis	6	299	450	256	385	211	317	187	282	2
Y-Y Axis	8	277	416	237	356	195	293	173	260	2
Y-Y Axis	10	250	376	213	321	176	264	157	235	2
Y-Y Axis	12	220	331	188	283	155	233	138	208	2
Y-Y Axis	14	190	286	162	243	133	201	119	179	2
Y-Y Axis	16	160	240	136	204	112	168	99.8	150	2
Y-Y Axis	18	138	207	111	167	91.5	137	81.5	123	2
Y-Y Axis	20	112	169	94.8	143	74.5	112	66.5	99.9	2
Y-Y Axis	22	93.0	140	78.6	118	61.8	92.9	55.2	83.0	2
Y-Y Axis	24	78.3	118	66.2	99.5	52.1	78.3	46.6	70.0	2
Y-Y Axis	26	66.8	100	56.5	84.9	44.5	66.9	39.8	59.8	2
Y-Y Axis	28	57.6	86.6	48.8	73.3					3

Properties of 2 angles—3/8 in. back to back

	7/8	3/4	5/8	9/16
A_g (in.^{2})	16.0	13.9	11.7	10.6
r_x (in.)	1.86	1.88	1.89	1.90
r_y (in.)	1.71	1.68	1.66	1.65

Properties of single angle

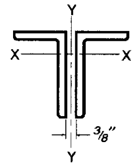
	7/8	3/4	5/8	9/16
r_z (in.)	0.854	0.856	0.859	0.861

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.

F_y = 36 ksi

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB

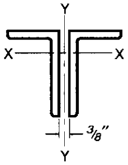


2L6 LLBB

Shape		2L6×4×								No. of connectors[a]
		1/2		7/16[c]		3/8[c]		5/16[c]		
Wt/ft		32.3		28.5		24.6		20.6		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length *KL* (ft) with respect to indicated axis: X-X Axis	0	205	308	175	264	142	213	108	162	b
	4	198	298	170	255	138	207	105	158	
	6	190	286	163	245	133	199	101	153	
	8	179	269	154	232	126	189	96.8	146	
	10	166	250	144	216	118	177	91.2	137	
	12	152	228	132	198	109	163	84.7	127	
	14	136	205	119	178	98.5	148	77.7	117	
	16	120	181	105	158	88.1	132	70.3	106	
	18	105	157	91.7	138	77.7	117	62.8	94.3	
	20	89.3	134	78.8	118	67.4	101	55.3	83.1	
	22	74.8	112	66.5	99.9	57.7	86.7	48.1	72.2	
	24	62.9	94.5	55.9	84.0	48.6	73.1	41.2	61.9	
	26	53.6	80.5	47.6	71.6	41.4	62.3	35.1	52.7	
	28	46.2	69.4	41.1	61.7	35.7	53.7	30.2	45.5	
	30	40.2	60.5	35.8	53.7	31.1	46.8	26.3	39.6	
	32			31.4	47.2	27.4	41.1	23.2	34.8	
Y-Y Axis	0	205	308	175	264	142	213	108	162	2
	4	172	258	143	215	110	166	78.4	118	
	6	163	245	138	208	107	161	76.6	115	
	8	151	227	130	196	102	153	73.6	111	
	10	137	206	119	178	94.0	141	69.0	104	
	12	121	182	105	157	84.0	126	62.9	94.5	
	14	104	157	89.7	135	73.0	110	55.7	83.8	
	16	87.6	132	75.0	113	61.8	92.8	48.1	72.3	
	18	71.6	108	61.1	91.8	50.9	76.5	40.4	60.7	
	20	58.5	87.9	50.1	75.4	42.0	63.1	33.7	50.7	
	22	48.7	73.1	41.8	62.9	35.2	52.9	28.4	42.7	
	24	41.1	61.7	35.4	53.2	29.9	44.9	24.3	36.5	
	26	35.1	52.8	30.3	45.6	25.6	38.5	20.9	31.4	
Properties of 2 angles—3/8 in. back to back										
A_g (in.^{2})		9.50		8.36		7.22		6.05		
r_x (in.)		1.91		1.92		1.93		1.94		
r_y (in.)		1.64		1.62		1.61		1.60		
Properties of single angle										
r_z (in.)		0.864		0.867		0.870		0.874		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



2L6 LLBB

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB

$F_y = 36$ ksi

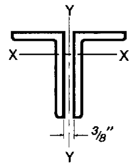
Shape		2L6×3½×						
		½		$^3/_8$[c]		$^5/_{16}$[c]		No. of connectors[a]
Wt/ft		30.7		23.4		19.7		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis — X-X Axis	0	194	292	134	202	102	154	b
	2	192	289	133	201	102	153	
	4	188	282	130	196	99.5	150	
	6	180	271	126	189	96.3	145	
	8	170	256	119	179	91.9	138	
	10	158	237	112	168	86.6	130	
	12	144	217	103	155	80.5	121	
	14	129	195	93.6	141	73.8	111	
	16	114	172	83.8	126	66.8	100	
	18	99.4	149	73.9	111	59.7	89.7	
	20	85.0	128	64.2	96.5	52.6	79.1	
	22	71.3	107	55.0	82.6	45.8	68.8	
	24	59.9	90.1	46.4	69.7	39.3	59.0	
	28	44.0	66.2	34.1	51.2	28.8	43.4	
	30	38.4	57.7	29.7	44.6	25.1	37.8	
	32	33.7	50.7	26.1	39.2	22.1	33.2	
Y-Y Axis	0	194	292	134	202	102	154	2
	2	166	249	107	160	76.0	114	
	4	159	239	104	157	74.6	112	
	6	148	222	99.5	150	71.7	108	
	8	133	200	91.4	137	67.0	101	
	10	116	175	80.6	121	60.3	90.6	
	12	98.0	147	68.5	103	52.3	78.6	
	14	79.9	120	56.1	84.3	43.8	65.8	
	16	62.9	94.5	44.6	67.0	35.5	53.3	
	18	50.2	75.4	35.9	54.0	28.9	43.4	
	20	40.9	61.5	29.5	44.4	23.9	35.9	
	22	34.0	51.1	24.7	37.1	20.0	30.1	
Properties of 2 angles—3/8 in. back to back								
A_g (in.^{2})		9.00		6.84		5.74		
r_x (in.)		1.92		1.93		1.94		
r_y (in.)		1.40		1.38		1.37		
Properties of single angle								
r_z (in.)		0.756		0.763		0.767		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with $F_y = 36$ ksi.

F_y = 36 ksi

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB



2L5 LLBB

Shape		2L5×3½×										
		¾		⅝		½		⅜[c]		5/16[c]		No. of connectors[a]
Wt/ft		39.6		33.5		27.2		20.8		17.4		
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 indicated axis												
X-X Axis	0	250	376	212	319	173	259	129	194	101	151	b
	2	247	372	209	315	171	256	128	192	99.6	150	
	4	238	358	202	303	164	247	123	185	96.4	145	
	6	223	336	190	285	155	232	116	175	91.4	137	
	8	204	307	174	261	142	213	107	161	84.8	127	
	10	182	274	155	234	127	191	96.4	145	76.9	116	
	12	159	238	136	204	111	167	84.7	127	68.3	103	
	14	134	202	115	173	95.0	143	72.7	109	59.4	89.3	
	16	111	167	95.6	144	79.1	119	61.0	91.7	50.6	76.0	
	18	89.4	134	77.2	116	64.2	96.4	49.9	75.0	42.1	63.3	
	20	72.4	109	62.6	94.0	52.0	78.1	40.4	60.8	34.3	51.6	
	22	59.8	89.9	51.7	77.7	43.0	64.6	33.4	50.2	28.4	42.6	
	24	50.3	75.6	43.4	65.3	36.1	54.2	28.1	42.2	23.8	35.8	
Y-Y Axis	0	250	376	212	319	173	259	129	194	101	151	2
	2	239	359	199	299	157	235	108	162	79.1	119	
	4	229	344	190	286	150	226	106	159	77.8	117	
	6	213	320	177	267	140	210	101	152	75.1	113	
	8	193	290	160	241	127	190	92.7	139	70.1	105	
	10	170	255	141	212	111	167	81.7	123	62.8	94.4	
	12	145	218	120	180	94.9	143	69.4	104	54.3	81.6	
	14	120	180	99.3	149	78.4	118	57.0	85.7	45.3	68.1	
	16	101	152	79.6	120	62.7	94.2	45.3	68.1	36.6	55.0	
	18	80.7	121	66.2	99.5	49.8	74.9	36.3	54.5	29.5	44.3	
	20	65.5	98.4	53.8	80.8	40.5	60.9	29.7	44.6	24.2	36.4	
	22	54.2	81.5	44.5	66.9	33.6	50.5	24.7	37.1	20.2	30.4	
	24	45.6	68.5	37.5	56.3	28.3	42.6	20.8	31.3	17.1	25.7	3

Properties of 2 angles—⅜ in. back to back

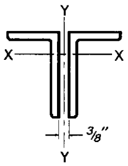
	¾	⅝	½	⅜	5/16
A_g (in.^{2})	11.6	9.84	8.01	6.10	5.12
r_x (in.)	1.55	1.56	1.58	1.59	1.60
r_y (in.)	1.53	1.50	1.48	1.46	1.44

Properties of single angle

	¾	⅝	½	⅜	5/16
r_z (in.)	0.744	0.746	0.750	0.755	0.758

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L5 LLBB

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB

F_y = 36 ksi

Shape		2L5×3×										No. of connectors[a]
		1/2		7/16		3/8[c]		5/16[c]		1/4[c]		
Wt/ft		25.5		22.5		19.5		16.4		13.2		
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 indicated axis: X-X Axis	0	162	243	143	215	121	182	94.3	142	67.3	101	b
	2	160	240	141	212	120	180	93.3	140	66.7	100	
	4	154	232	136	205	116	174	90.4	136	64.9	97.5	
	6	145	218	128	193	109	164	85.7	129	61.9	93.0	
	8	133	200	118	177	101	151	79.5	120	58.0	87.2	
	10	120	180	106	159	90.7	136	72.3	109	53.3	80.2	
	12	105	157	92.9	140	79.9	120	64.3	96.6	48.1	72.4	
	14	89.6	135	79.5	120	68.7	103	55.9	84.1	42.7	64.1	
	16	74.7	112	66.5	99.9	57.7	86.7	47.7	71.7	37.1	55.8	
	18	60.7	91.3	54.2	81.4	47.3	71.1	39.8	59.8	31.7	47.6	
	20	49.2	74.0	43.9	66.0	38.3	57.6	32.5	48.8	26.5	39.9	
	22	40.7	61.1	36.3	54.5	31.7	47.6	26.8	40.3	21.9	33.0	
	24	34.2	51.4	30.5	45.8	26.6	40.0	22.6	33.9	18.4	27.7	
Y-Y Axis	0	162	243	143	215	121	182	94.3	142	67.3	101	2
	2	145	217	124	186	101	153	74.8	112	49.3	74.1	
	4	136	205	117	176	98.1	147	72.6	109	48.1	72.3	
	6	123	185	106	159	90.3	136	67.8	102	45.7	68.7	
	8	107	161	92.1	138	78.6	118	60.1	90.3	41.6	62.5	
	10	89.0	134	76.7	115	64.9	97.5	50.5	75.9	36.0	54.2	
	12	70.8	106	61.0	91.8	51.1	76.8	40.5	60.9	29.8	44.8	
	14	56.4	84.7	46.5	69.8	38.7	58.2	31.2	46.8	23.6	35.5	
	16	43.5	65.3	35.9	54.0	30.1	45.2	24.4	36.7	18.7	28.1	
	18	34.5	51.9	28.5	42.9	24.0	36.1	19.6	29.4	15.1	22.7	
	20	28.1	42.2	23.2	34.9	19.6	29.5	16.0	24.0			3

Properties of 2 angles—3/8 in. back to back

	1/2	7/16	3/8	5/16	1/4
A_g (in.^{2})	7.51	6.62	5.73	4.80	3.88
r_x (in.)	1.58	1.59	1.60	1.61	1.62
r_y (in.)	1.24	1.23	1.22	1.21	1.19

Properties of single angle

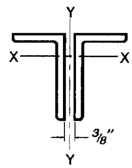
	1/2	7/16	3/8	5/16	1/4
r_z (in.)	0.642	0.644	0.646	0.649	0.652

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB



2L4 LLBB

Shape		2L4×3½×								
		½		3/8		5/16		¼[c]		No. of connectors[a]
Wt/ft		23.8		18.2		15.3		12.4		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	151	227	115	173	96.7	145	71.1	107	b
	2	148	223	113	170	94.9	143	69.9	105	
	4	139	210	106	160	89.6	135	66.4	99.7	
	6	126	190	96.5	145	81.4	122	60.8	91.4	
	8	110	165	84.2	127	71.1	107	53.9	81.0	
	10	91.5	137	70.6	106	59.8	89.9	46.1	69.2	
	12	73.4	110	56.9	85.6	48.4	72.7	38.1	57.2	
	14	56.4	84.8	44.1	66.3	37.6	56.6	30.4	45.6	
	16	43.2	64.9	33.8	50.8	28.8	43.3	23.5	35.3	
	18	34.1	51.3	26.7	40.1	22.8	34.2	18.5	27.9	
	20	27.6	41.5	21.6	32.5	18.4	27.7	15.0	22.6	
Y-Y Axis	0	151	227	115	173	96.7	145	71.1	107	2
	2	143	215	105	157	79.6	120	54.3	81.7	
	4	137	207	101	151	78.7	118	53.8	80.9	
	6	129	193	94.5	142	76.3	115	52.6	79.0	
	8	117	176	86.4	130	71.3	107	50.1	75.4	
	10	104	157	76.8	115	63.8	95.9	46.0	69.2	
	12	89.9	135	66.4	99.8	55.1	82.8	40.6	61.1	
	14	75.6	114	55.8	83.9	46.1	69.2	34.6	52.1	
	16	61.7	92.8	45.6	68.5	37.3	56.1	28.7	43.1	
	18	51.6	77.5	36.4	54.7	29.8	44.9	23.2	34.8	
	20	41.9	63.0	29.6	44.5	24.4	36.6	19.0	28.6	
	22	34.7	52.1	24.5	36.9	20.3	30.4	15.9	23.9	
	24	29.2	43.9	20.7	31.1	17.1	25.7	13.4	20.2	
	26	24.9	37.4							3

Properties of 2 angles—3/8 in. back to back

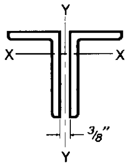
	½	3/8	5/16	¼
A_g (in.²)	7.01	5.34	4.50	3.62
r_x (in.)	1.23	1.25	1.25	1.26
r_y (in.)	1.57	1.55	1.53	1.52

Properties of single angle

	½	3/8	5/16	¼
r_z (in.)	0.716	0.719	0.721	0.723

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl*/*r* equal to or greater than 200.



2L4 LLBB

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB

F_y = 36 ksi

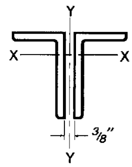
Shape		2L4×3×										No. of connectors[a]
		5/8		1/2		3/8		5/16		1/4[c]		
Wt/ft		27.1		22.1		16.9		14.2		11.5		
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length *KL* (ft) with respect to indicated axis: X-X Axis	0	168	252	140	211	107	161	89.9	135	66.4	99.8	b
	2	164	247	137	207	105	158	88.2	133	65.3	98.1	
	4	155	233	130	195	99.0	149	83.3	125	62.0	93.3	
	6	140	210	117	176	90.0	135	75.8	114	57.0	85.6	
	8	122	183	102	154	78.7	118	66.5	99.9	50.6	76.0	
	10	101	152	85.8	129	66.3	99.6	56.1	84.3	43.4	65.2	
	12	81.3	122	69.1	104	53.7	80.7	45.6	68.5	36.0	54.1	
	14	62.4	93.8	53.5	80.3	41.8	62.9	35.7	53.6	28.8	43.4	
	16	47.8	71.8	40.9	61.5	32.0	48.1	27.3	41.1	22.4	33.6	
	18	37.8	56.8	32.3	48.6	25.3	38.0	21.6	32.5	17.7	26.6	
	20	30.6	46.0	26.2	39.4	20.5	30.8	17.5	26.3	14.3	21.5	
Y-Y Axis	0	168	252	140	211	107	161	89.9	135	66.4	99.8	2
	2	160	241	131	197	96.0	144	75.3	113	52.0	78.2	
	4	152	228	124	187	90.9	137	73.5	110	51.0	76.7	
	6	138	208	113	170	83.0	125	68.8	103	48.5	73.0	
	8	121	182	99.3	149	73.0	110	60.8	91.5	44.0	66.2	
	10	103	154	83.8	126	61.7	92.7	51.2	76.9	37.9	57.0	
	12	83.6	126	68.0	102	50.1	75.2	41.2	61.9	31.1	46.8	
	14	68.9	104	55.6	83.6	38.9	58.5	31.7	47.7	24.5	36.8	
	16	53.2	80.0	42.9	64.4	30.0	45.1	24.6	37.0	19.2	28.8	
	18	42.1	63.3	34.0	51.0	23.8	35.8	19.6	29.4	15.4	23.1	
	20	34.2	51.3	27.6	41.4	19.4	29.1	16.0	24.0	12.6	18.9	
	22	28.3	42.5	22.8	34.3							3
Properties of 2 angles—3/8 in. back to back												
A_g (in.^{2})		7.78		6.50		4.96		4.18		3.38		
r_x (in.)		1.23		1.24		1.26		1.27		1.27		
r_y (in.)		1.35		1.32		1.30		1.29		1.27		
Properties of single angle												
r_z (in.)		0.631		0.633		0.636		0.638		0.639		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB



2L3½ LLBB

Shape			2L3½×3×										No. of connectors[a]
			½		7/16		3/8		5/16		¼[c]		
Wt/ft			20.6		18.2		15.8		13.3		10.8		
Design			P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length *KL* (ft) with respect to indicated axis	X-X Axis	0	129	194	114	172	99.2	149	83.2	125	64.9	97.6	b
		2	126	189	111	167	96.6	145	81.1	122	63.4	95.2	
		4	116	175	103	155	89.5	134	75.2	113	58.9	88.6	
		6	102	153	90.3	136	78.6	118	66.2	99.5	52.2	78.5	
		8	84.6	127	75.2	113	65.7	98.7	55.4	83.3	44.1	66.3	
		10	66.7	100	59.4	89.3	52.1	78.3	44.1	66.3	35.5	53.3	
		12	49.7	74.8	44.6	67.0	39.2	59.0	33.4	50.1	27.2	40.9	
		14	36.5	54.9	32.7	49.2	28.8	43.3	24.6	36.9	20.1	30.3	
		16	28.0	42.1	25.1	37.7	22.1	33.2	18.8	28.3	15.4	23.2	
		18			19.8	29.8	17.4	26.2	14.9	22.3	12.2	18.3	
	Y-Y Axis	0	129	194	114	172	99.2	149	83.2	125	64.9	97.6	2
		2	123	185	108	162	91.8	138	74.7	112	52.3	78.6	
		4	117	176	102	154	87.1	131	71.0	107	51.4	77.3	
		6	107	161	93.5	141	79.8	120	65.2	98.0	49.1	73.9	
		8	94.5	142	82.6	124	70.5	106	57.7	86.8	44.6	67.0	
		10	80.5	121	70.3	106	60.1	90.3	49.3	74.0	38.3	57.6	
		12	66.2	99.4	57.7	86.7	49.3	74.1	40.5	60.8	31.5	47.3	
		14	52.4	78.7	45.6	68.5	38.9	58.5	32.0	48.0	24.8	37.3	
		16	42.5	63.9	36.9	55.5	31.4	47.2	24.7	37.1	19.3	29.0	
		18	33.7	50.6	29.2	44.0	24.9	37.5	19.6	29.5	15.4	23.2	
		20	27.3	41.1	23.7	35.7	20.2	30.4	15.9	24.0	12.6	18.9	
		22	22.6	34.0	19.6	29.5	16.8	25.2	13.2	19.9	10.4	15.7	3

Properties of 2 angles—3/8 in. back to back

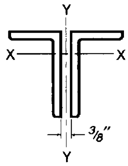
	½	7/16	3/8	5/16	¼
A_g (in.^{2})	6.00	5.30	4.60	3.86	3.12
r_x (in.)	1.07	1.08	1.09	1.09	1.10
r_y (in.)	1.37	1.36	1.35	1.33	1.32

Properties of single angle

	½	7/16	3/8	5/16	¼
r_z (in.)	0.618	0.620	0.622	0.624	0.628

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



2L3½ LLBB

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB

F_y = 36 ksi

Shape		2L3½×2½×								
		½		3/8		5/16		¼[c]		No. of connectors[a]
Wt/ft		18.8		14.5		12.2		9.88		
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	$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length *KL* (ft) with respect to indicated axis										
X-X Axis	0	119	178	91.0	137	76.7	115	59.9	90.1	b
	1	118	177	90.4	136	76.3	115	59.6	89.5	
	2	116	174	88.7	133	74.9	113	58.5	88.0	
	3	112	168	86.0	129	72.6	109	56.8	85.4	
	4	107	161	82.3	124	69.5	104	54.5	82.0	
	5	101	152	77.8	117	65.7	98.8	51.7	77.7	
	6	94.0	141	72.6	109	61.4	92.3	48.5	72.9	
	7	86.4	130	66.9	101	56.7	85.2	44.9	67.5	
	8	78.4	118	60.9	91.5	51.7	77.6	41.1	61.8	
	9	70.2	106	54.7	82.2	46.5	69.9	37.2	55.9	
	10	62.1	93.4	48.6	73.0	41.3	62.1	33.3	50.0	
	11	54.2	81.5	42.6	64.0	36.3	54.6	29.4	44.2	
	12	46.7	70.3	36.8	55.4	31.5	47.3	25.7	38.6	
	13	39.8	59.9	31.5	47.3	26.9	40.5	22.1	33.3	
	14	34.4	51.6	27.1	40.8	23.2	34.9	19.1	28.7	
	15	29.9	45.0	23.6	35.5	20.2	30.4	16.6	25.0	
	16	26.3	39.5	20.8	31.2	17.8	26.7	14.6	22.0	
	17	23.3	35.0	18.4	27.7	15.8	23.7	12.9	19.4	
	18	20.8	31.2	16.4	24.7	14.1	21.1	11.5	17.3	
Y-Y Axis	0	119	178	91.0	137	76.7	115	59.9	90.1	2
	1	114	171	84.3	127	68.7	103	49.2	73.9	
	2	111	167	82.7	124	67.4	101	48.9	73.4	
	3	108	162	80.1	120	65.3	98.2	48.2	72.5	
	4	103	155	76.5	115	62.5	93.9	47.0	70.7	
	5	97.1	146	72.2	108	59.0	88.7	45.1	67.9	
	6	90.3	136	67.1	101	55.0	82.6	42.5	63.9	
	7	82.9	125	61.6	92.6	50.5	75.9	39.2	59.0	
	8	75.1	113	55.8	83.8	45.8	68.8	35.6	53.5	
	9	67.1	101	49.8	74.8	40.9	61.5	31.8	47.8	
	10	59.1	88.9	43.8	65.8	36.0	54.1	27.9	42.0	
	11	51.4	77.3	38.0	57.1	31.2	47.0	24.2	36.4	
	12	46.5	69.9	34.1	51.2	26.7	40.1	20.7	31.0	
	13	39.8	59.8	29.1	43.8	23.9	35.9	17.8	26.7	
	14	34.3	51.6	25.2	37.9	20.7	31.1	15.4	23.2	
	15	30.0	45.0	22.0	33.1	18.1	27.2	13.5	20.3	
	16	26.4	39.6	19.4	29.1	15.9	24.0	12.0	18.0	
	17	23.4	35.1	17.2	25.8	14.2	21.3	10.6	16.0	
	18	20.9	31.4	15.4	23.1	12.7	19.0	9.52	14.3	
										3
Properties of 2 angles—3/8 in. back to back										
A_g (in.²)		5.50		4.22		3.56		2.88		
r_x (in.)		1.08		1.10		1.11		1.12		
r_y (in.)		1.13		1.11		1.09		1.08		
Properties of single angle										
r_z (in.)		0.532		0.535		0.538		0.541		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB

F_y = 36 ksi

2L3 LLBB

Shape			2L3×2½×												No. of connectors[a]
			1/2		7/16		3/8		5/16		1/4		3/16[c]		
Wt/ft			17.1		15.1		13.1		11.1		8.97		6.82		
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 indicated axis	X-X Axis	0	108	162	95.3	143	82.8	124	72.0	108	56.5	84.9	39.1	58.8	b
		1	107	161	94.4	142	82.0	123	71.4	107	56.0	84.2	38.8	58.4	
		2	104	156	91.9	138	79.9	120	69.5	105	54.6	82.0	38.0	57.0	
		3	99.3	149	87.9	132	76.4	115	66.6	100.0	52.3	78.6	36.5	54.9	
		4	93.1	140	82.5	124	71.8	108	62.6	94.1	49.2	74.0	34.6	52.0	
		5	85.7	129	76.1	114	66.3	99.7	57.9	87.0	45.6	68.5	32.3	48.5	
		6	77.5	116	68.9	104	60.2	90.4	52.6	79.0	41.5	62.3	29.7	44.6	
		7	68.8	103	61.3	92.1	53.6	80.6	47.0	70.6	37.1	55.8	26.8	40.3	
		8	60.0	90.1	53.5	80.4	46.9	70.5	41.2	61.9	32.6	49.0	23.9	35.9	
		9	51.3	77.1	45.9	69.0	40.4	60.7	35.5	53.4	28.2	42.4	21.0	31.5	
		10	43.1	64.8	38.7	58.1	34.1	51.2	30.1	45.2	23.9	36.0	18.1	27.2	
		11	35.7	53.6	32.1	48.2	28.3	42.6	25.0	37.6	20.0	30.0	15.4	23.2	
		12	30.0	45.1	26.9	40.5	23.8	35.8	21.0	31.6	16.8	25.2	13.0	19.5	
		13	25.6	38.4	23.0	34.5	20.3	30.5	17.9	26.9	14.3	21.5	11.0	16.6	
		14	22.0	33.1	19.8	29.7	17.5	26.3	15.5	23.2	12.3	18.5	9.52	14.3	
		15	19.2	28.8	17.2	25.9	15.2	22.9	13.5	20.2	10.7	16.1	8.29	12.5	
	Y-Y Axis	0	108	162	95.3	143	82.8	124	72.0	108	56.5	84.9	39.1	58.8	2
		1	105	157	91.9	138	78.8	118	66.9	101	50.2	75.5	30.3	45.5	
		2	103	155	90.3	136	77.4	116	65.7	98.7	49.4	74.2	30.1	45.3	
		3	100	150	87.7	132	75.0	113	63.7	95.7	48.0	72.1	29.9	44.9	
		4	96.0	144	84.2	127	71.8	108	61.0	91.7	46.0	69.2	29.4	44.2	
		5	91.1	137	79.8	120	67.9	102	57.7	86.8	43.6	65.6	28.6	43.0	
		6	85.5	128	74.8	112	63.4	95.3	53.9	81.1	40.9	61.4	27.5	41.3	
		7	79.2	119	69.3	104	58.4	87.8	49.7	74.8	37.8	56.7	25.9	38.9	
		8	72.6	109	63.4	95.3	53.2	79.9	45.3	68.1	34.4	51.8	23.9	35.9	
		9	65.7	98.8	57.3	86.2	47.7	71.8	40.7	61.1	31.0	46.6	21.7	32.6	
		10	58.8	88.4	51.2	77.0	42.3	63.6	36.1	54.2	27.5	41.3	19.4	29.2	
		11	52.0	78.1	45.2	67.9	37.0	55.7	31.5	47.4	24.1	36.2	17.1	25.7	
		12	45.4	68.2	39.4	59.2	33.5	50.4	27.2	40.9	20.7	31.2	14.9	22.3	
		13	39.1	58.8	33.9	50.9	28.8	43.3	24.4	36.7	18.6	27.9	12.8	19.3	
		14	33.8	50.7	29.2	44.0	24.9	37.4	21.1	31.7	16.1	24.2	11.2	16.8	
		15	29.4	44.2	25.5	38.3	21.7	32.6	18.4	27.7	14.1	21.2	9.81	14.7	
		16	25.9	38.9	22.4	33.7	19.1	28.7	16.2	24.4	12.4	18.6	8.68	13.0	
		17	22.9	34.5	19.9	29.9	16.9	25.4	14.4	21.6	11.0	16.6	7.72	11.6	
		18	20.5	30.8	17.8	26.7	15.1	22.7	12.9	19.3	9.85	14.8	6.92	10.4	
		19	18.4	27.6	15.9	24.0	13.6	20.4	11.6	17.4					3

Properties of 2 angles—3/8 in. back to back

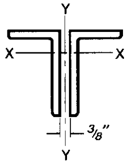
	1/2	7/16	3/8	5/16	1/4	3/16
A_g (in.^{2})	5.00	4.42	3.84	3.34	2.62	1.99
r_x (in.)	0.910	0.917	0.924	0.932	0.940	0.947
r_y (in.)	1.18	1.16	1.15	1.14	1.12	1.11

Properties of single angle

	1/2	7/16	3/8	5/16	1/4	3/16
r_z (in.)	0.516	0.516	0.517	0.518	0.520	0.521

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L3 LLBB

Table 4–9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB

F_y = 36 ksi

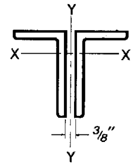
Shape		2L3×2×										No. of connectors[a]
		1/2		3/8		5/16		1/4		3/16[c]		
Wt/ft		15.4		11.9		10.1		8.18		6.24		
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	97.0	146	74.6	112	62.9	94.6	51.3	77.1	35.4	53.3	b
	1	96.1	145	73.9	111	62.4	93.8	50.9	76.5	35.2	52.9	
	2	93.6	141	72.1	108	60.8	91.5	49.6	74.6	34.4	51.7	
	3	89.5	135	69.0	104	58.3	87.7	47.6	71.5	33.1	49.8	
	4	84.1	126	65.0	97.6	55.0	82.6	44.9	67.5	31.5	47.3	
	5	77.6	117	60.1	90.3	50.9	76.5	41.6	62.6	29.4	44.2	
	6	70.4	106	54.7	82.2	46.4	69.7	38.0	57.1	27.1	40.7	
	7	62.7	94.2	48.9	73.4	41.5	62.4	34.1	51.2	24.6	36.9	
	8	54.8	82.4	42.9	64.5	36.6	55.0	30.1	45.2	22.0	33.0	
	9	47.1	70.8	37.1	55.7	31.7	47.6	26.1	39.2	19.3	29.1	
	10	39.8	59.8	31.5	47.3	26.9	40.5	22.3	33.5	16.8	25.2	
	11	33.0	49.6	26.2	39.4	22.5	33.8	18.7	28.0	14.3	21.6	
	12	27.7	41.7	22.0	33.1	18.9	28.4	15.7	23.6	12.1	18.2	
	13	23.6	35.5	18.8	28.2	16.1	24.2	13.4	20.1	10.3	15.5	
	14	20.4	30.6	16.2	24.3	13.9	20.9	11.5	17.3	8.88	13.3	
	15	17.7	26.7	14.1	21.2	12.1	18.2	10.0	15.1	7.74	11.6	
	16									6.80	10.2	
Y-Y Axis	0	97.0	146	74.6	112	62.9	94.6	51.3	77.1	35.4	53.3	2
	1	93.5	141	70.2	106	57.8	86.9	44.9	67.5	28.3	42.5	
	2	90.8	136	68.2	102	56.1	84.4	43.7	65.6	27.9	42.0	
	3	86.4	130	64.8	97.4	53.4	80.3	41.6	62.6	27.3	41.0	
	4	80.6	121	60.4	90.8	49.8	74.9	38.9	58.5	26.2	39.3	
	5	73.7	111	55.2	82.9	45.5	68.4	35.6	53.6	24.4	36.7	
	6	66.1	99.4	49.4	74.2	40.7	61.2	31.9	48.0	22.2	33.3	
	7	58.1	87.3	43.2	65.0	35.6	53.6	28.0	42.1	19.6	29.4	
	8	50.0	75.2	37.1	55.7	30.5	45.9	24.0	36.1	16.9	25.4	
	9	44.6	67.0	32.7	49.1	25.6	38.5	20.2	30.3	14.3	21.5	
	10	37.3	56.1	27.1	40.7	22.2	33.3	17.4	26.1	11.8	17.8	
	11	30.9	46.4	22.5	33.8	18.4	27.6	14.5	21.7	9.9	14.9	
	12	26.0	39.1	18.9	28.4	15.5	23.3	12.2	18.4	8.41	12.6	
	13	22.2	33.3	16.2	24.3	13.2	19.9	10.5	15.7	7.22	10.9	
	14	19.1	28.7	14.0	21.0	11.4	17.2	9.04	13.6	6.27	9.42	
	15	16.7	25.1	12.2	18.3							3
Properties of 2 angles—3/8 in. back to back												
A_g (in.²)		4.50		3.46		2.92		2.38		1.80		
r_x (in.)		0.922		0.937		0.945		0.953		0.961		
r_y (in.)		0.940		0.911		0.897		0.883		0.869		
Properties of single angle												
r_z (in.)		0.425		0.426		0.428		0.431		0.435		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4-9 (continued)
Available Strength in Axial Compression, kips
Double Angles—LLBB



2L2½ LLBB

Shape			2L2½×2×								
			3/8		5/16		1/4		3/16[c]		No. of connectors[a]
Wt/ft			10.6		8.97		7.30		5.57		
Design			P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis	X-X Axis	0	66.8	100	56.5	84.9	45.7	68.7	34.3	51.5	b
		1	66.0	99.2	55.8	83.8	45.1	67.8	33.9	50.9	
		2	63.5	95.4	53.7	80.7	43.5	65.4	32.7	49.1	
		3	59.5	89.4	50.4	75.7	40.9	61.4	30.8	46.3	
		4	54.4	81.7	46.1	69.3	37.5	56.3	28.3	42.6	
		5	48.4	72.7	41.2	61.9	33.5	50.4	25.4	38.2	
		6	42.0	63.1	35.8	53.8	29.3	44.0	22.3	33.5	
		7	35.5	53.3	30.4	45.7	24.9	37.4	19.1	28.7	
		8	29.2	44.0	25.1	37.8	20.7	31.1	16.0	24.0	
		9	23.5	35.2	20.2	30.4	16.7	25.1	13.0	19.6	
		10	19.0	28.5	16.4	24.6	13.5	20.3	10.5	15.9	
		11	15.7	23.6	13.5	20.3	11.2	16.8	8.72	13.1	
		12	13.2	19.8	11.4	17.1	9.40	14.1	7.33	11.0	
		13					8.01	12.0	6.24	9.38	
	Y-Y Axis	0	66.8	100	56.5	84.9	45.7	68.7	34.3	51.5	2
		1	64.3	96.6	53.5	80.4	42.0	63.2	28.1	42.2	
		2	62.6	94.1	52.0	78.2	40.9	61.5	27.8	41.9	
		3	60.0	90.1	49.7	74.6	39.1	58.7	27.3	41.1	
		4	56.4	84.7	46.5	69.9	36.6	55.0	26.3	39.5	
		5	52.1	78.3	42.7	64.2	33.7	50.6	24.6	36.9	
		6	47.3	71.1	38.5	57.9	30.4	45.7	22.3	33.6	
		7	42.1	63.3	34.1	51.2	26.9	40.4	19.8	29.7	
		8	36.9	55.5	29.5	44.4	23.3	35.0	17.1	25.7	
		9	31.7	47.7	25.1	37.7	19.8	29.7	14.5	21.7	
		10	26.8	40.3	22.1	33.2	17.3	26.0	12.6	18.9	3
		11	22.2	33.4	18.3	27.5	14.4	21.6	10.5	15.8	
		12	18.7	28.1	15.4	23.2	12.1	18.2	8.88	13.3	
		13	16.0	24.0	13.2	19.8	10.4	15.6	7.61	11.4	
		14	13.8	20.7	11.4	17.1	8.95	13.5	6.59	9.90	
		15	12.0	18.1	9.91	14.9	7.81	11.7	5.76	8.66	

Properties of 2 angles—3/8 in. back to back

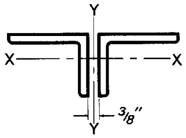
	3/8	5/16	1/4	3/16
A_g (in.^{2})	3.10	2.62	2.12	1.62
r_x (in.)	0.766	0.774	0.782	0.790
r_y (in.)	0.957	0.943	0.930	0.916

Properties of single angle

	3/8	5/16	1/4	3/16
r_z (in.)	0.419	0.420	0.423	0.426

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L8 SLBB

Table 4–10
Available Strength in Axial Compression, kips
Double Angles—SLBB

F_y = 36 ksi

Shape		2L8×6× 1		7/8		3/4		5/8		9/16[c]		1/2[c]		7/16[c]		No. of connectors[a]
Wt/ft		88.8		78.5		68.0		57.3		51.8		46.3		40.7		
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	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length KL (ft) with respect to indicated axis — X-X Axis	0	560	842	496	745	429	644	359	540	313	470	265	399	217	327	
	4	538	809	476	716	412	619	346	520	301	453	256	385	211	316	
	6	511	769	453	681	392	589	330	495	288	433	245	369	202	304	
	8	476	716	422	635	366	550	308	463	270	406	231	347	191	288	
	10	434	653	386	580	335	504	282	424	248	373	214	321	178	268	
	12	388	583	346	519	301	452	254	382	225	338	194	292	163	245	
	14	340	511	303	456	264	398	224	337	199	299	174	261	147	221	
	16	292	439	261	392	228	343	194	291	174	261	152	229	130	196	b
	18	245	369	220	331	193	290	165	247	148	223	132	198	114	171	
	20	202	303	182	273	160	240	137	206	125	187	112	168	97.7	147	
	22	167	251	150	225	132	198	113	170	103	155	93.0	140	82.4	124	
	24	140	211	126	189	111	167	95.0	143	86.7	130	78.1	117	69.3	104	
	26	119	179	107	161	94.5	142	80.9	122	73.9	111	66.6	100	59.0	88.7	
	28	103	155	92.6	139	81.5	122	69.8	105	63.7	95.7	57.4	86.3	50.9	76.5	
	30													44.3	66.6	
Y-Y Axis	0	560	842	496	745	429	644	359	540	313	470	265	399	217	327	
	4	547	822	481	723	411	618	299	449	252	378	205	308	159	239	
	6	541	813	476	715	407	611	299	449	251	378	205	308	159	239	
	8	533	801	468	704	401	602	298	448	251	377	204	307	159	239	
	10	522	785	459	690	393	590	297	447	250	376	204	307	159	238	
	12	509	766	448	673	383	576	296	445	249	375	203	306	158	238	
	16	478	719	421	632	360	541	290	435	246	369	201	302	157	236	
	20	441	663	388	583	332	499	274	412	235	354	195	293	154	231	
	24	400	601	351	528	301	452	250	376	217	327	183	276	148	222	3
	28	356	535	312	469	267	401	222	334	195	293	167	250	137	206	
	32	311	467	272	410	233	350	194	291	171	257	147	222	123	185	
	36	266	401	233	351	200	300	166	249	147	221	128	192	108	162	
	40	224	337	196	295	168	252	139	208	124	186	109	163	93.1	140	
	44	186	280	163	245	139	209	115	173	103	155	90.9	137	78.6	118	
	48	156	235	137	206	117	176	96.8	146	86.8	131	76.8	115	66.5	100	
	52	133	201	117	175	99.7	150	82.7	124	74.2	112	65.6	98.6	57.0	85.6	
	56	115	173	101	151	86.1	129	71.4	107	64.1	96.3	56.7	85.3	49.3	74.1	
	60	100	151	87.8	132	75.0	113	62.3	93.6	55.9	84.1	49.5	74.4	43.1	64.8	

Properties of 2 angles—3/8 in. back to back

	1	7/8	3/4	5/8	9/16	1/2	7/16
A_g (in.^{2})	26.0	23.0	19.9	16.7	15.1	13.5	11.9
r_x (in.)	1.72	1.74	1.75	1.77	1.78	1.79	1.80
r_y (in.)	3.77	3.75	3.72	3.70	3.69	3.68	3.66

Properties of single angle

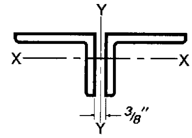
	1	7/8	3/4	5/8	9/16	1/2	7/16
r_z (in.)	1.28	1.28	1.29	1.29	1.30	1.30	1.31

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB



2L8 SLBB

Shape			2L8×4×														
			1		7/8		3/4		5/8		9/16[c]		1/2[c]		7/16[c]		No. of connectors[a]
Wt/ft			75.2		66.6		57.8		48.7		44.1		39.5		34.8		
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	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	
			ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length *KL* (ft) with respect to indicated axis	X-X Axis	0	474	713	419	631	364	547	306	459	266	400	226	340	186	279	
		4	423	635	375	563	326	490	275	413	240	361	205	309	170	255	
		6	366	550	326	489	284	427	240	361	212	318	182	274	152	229	
		8	299	450	267	402	234	352	199	300	177	266	155	232	131	197	
		10	231	347	207	312	183	275	157	236	141	212	125	188	107	161	b
		12	168	252	152	228	135	203	117	175	107	160	96.1	144	84.5	127	
		14	123	185	112	168	99.2	149	85.7	129	78.6	118	71.3	107	63.6	95.6	
		16	94.5	142	85.4	128	75.9	114	65.6	98.6	60.2	90.4	54.6	82.0	48.7	73.2	
		18											43.1	64.8	38.5	57.8	
	Y-Y Axis	0	474	713	419	631	364	547	306	459	266	400	226	340	186	279	
		4	469	705	414	623	358	539	257	386	217	325	177	266	138	208	
		6	465	699	410	617	355	534	257	386	217	325	177	266	138	208	
		8	459	690	405	609	350	526	256	385	216	325	177	266	138	208	
		10	451	678	398	599	344	518	256	385	216	325	177	266	138	208	
		12	442	664	390	586	337	507	256	385	216	325	177	266	138	208	
		16	420	631	370	556	320	481	255	383	215	324	176	265	138	207	
		20	392	590	346	520	299	449	247	372	212	319	175	263	137	206	
		24	362	543	318	479	275	413	229	345	200	301	169	255	135	204	
		28	328	493	289	434	249	374	208	313	183	274	157	236	129	194	6
		32	293	441	258	388	222	334	185	279	163	246	141	213	118	178	
		36	259	389	227	341	195	293	163	244	144	217	125	188	106	160	
		40	224	337	197	295	169	254	140	211	125	188	110	165	93.6	141	
		44	192	288	168	252	144	216	119	179	107	161	94.3	142	81.4	122	
		48	162	243	141	212	121	182	100	151	90.1	135	79.9	120	69.6	105	
		52	138	207	120	181	103	155	85.6	129	76.8	115	68.2	102	59.4	89.3	
		56	119	179	104	156	88.9	134	73.8	111	66.3	99.6	58.8	88.4	51.3	77.1	
		60	104	156	90.4	136	77.4	116	64.3	96.7	57.8	86.8	51.3	77.1	44.7	67.2	
		64	91.0	137	79.5	119	68.1	102	56.6	85.0	50.8	76.3	45.1	67.8	39.4	59.1	
		68	80.6	121													

Properties of 2 angles—3/8 in. back to back

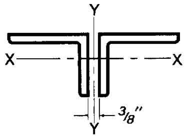
A_g (in.^{2})	22.0	19.5	16.9	14.2	12.9	11.5	10.1
r_x (in.)	1.03	1.04	1.05	1.06	1.07	1.08	1.09
r_y (in.)	4.08	4.06	4.03	4.00	3.99	3.97	3.96

Properties of single angle

r_z (in.)	0.844	0.846	0.850	0.856	0.859	0.863	0.867

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L7 SLBB

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB

F_y = 36 ksi

Shape		2L7×4× 3/4		2L7×4× 5/8		2L7×4× 1/2[c]		2L7×4× 7/16[c]		2L7×4× 3/8[c]		No. of connectors[a]
Wt/ft		52.4		44.2		35.8		31.5		27.2		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis: X-X Axis	0	332	498	279	420	218	328	182	273	144	217	b
	4	299	449	253	380	199	299	166	250	133	200	
	6	263	395	223	334	176	265	149	224	120	181	
	8	219	329	186	280	149	224	127	191	104	157	
	10	173	261	148	223	121	181	104	157	87.2	131	
	12	130	196	112	169	92.9	140	81.8	123	69.8	105	
	14	95.8	144	82.8	124	68.9	103	61.4	92.3	53.6	80.6	
	16	73.3	110	63.4	95.2	52.7	79.2	47.0	70.7	41.1	61.7	
	18	57.9	87.1	50.1	75.2	41.7	62.6	37.2	55.9	32.5	48.8	
Y-Y Axis	0	332	498	279	420	218	328	182	273	144	217	5
	4	325	489	273	410	179	268	142	214	107	160	
	6	321	483	269	404	179	268	142	214	107	160	
	8	316	474	264	397	178	268	142	213	106	160	
	10	308	463	258	388	178	268	142	213	106	160	
	12	300	451	251	377	178	267	142	213	106	160	
	16	279	419	234	351	175	264	140	211	106	159	
	20	254	382	213	320	165	249	136	204	104	157	
	24	227	342	190	285	149	224	125	188	99.3	149	
	28	199	299	166	249	131	197	111	167	90.0	135	
	32	170	256	142	213	112	169	96.0	144	79.2	119	
	36	143	215	119	179	94.4	142	81.5	122	68.1	102	
	40	117	176	97.5	147	77.6	117	67.6	102	57.4	86.3	
	44	97.1	146	80.6	121	64.2	96.5	56.0	84.2	47.7	71.7	
	48	81.6	123	67.8	102	54.0	81.2	47.1	70.8	40.2	60.4	
	52	69.5	105	57.8	86.8	46.1	69.3	40.2	60.4	34.3	51.5	
	56	60.0	90.1	49.8	74.9	39.8	59.8	34.7	52.1	29.6	44.5	

Properties of 2 angles—3/8 in. back to back

	3/4	5/8	1/2	7/16	3/8
A_g (in.^{2})	15.4	13.0	10.5	9.24	7.96
r_x (in.)	1.08	1.10	1.11	1.12	1.12
r_y (in.)	3.48	3.46	3.43	3.42	3.40

Properties of single angle

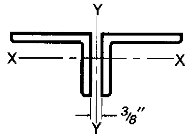
	3/4	5/8	1/2	7/16	3/8
r_z (in.)	0.855	0.860	0.866	0.869	0.873

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB

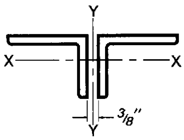


2L6 SLBB

Shape		2L6×4×								
		7/8		3/4		5/8		9/16		No. of connectors[a]
Wt/ft		54.3		47.2		39.9		36.1		
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	$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	344	517	299	449	253	380	229	344	b
	4	311	468	271	408	230	345	208	313	
	6	275	413	240	361	204	307	185	278	
	8	231	347	203	304	173	260	157	236	
	10	184	277	163	244	139	210	127	191	
	12	140	211	124	187	107	161	98.4	148	
	14	103	155	92.0	138	79.6	120	73.1	110	
	16	79.1	119	70.4	106	61.0	91.6	56.0	84.1	
	18	62.5	94.0	55.6	83.6	48.2	72.4	44.2	66.5	
Y-Y Axis	0	344	517	299	449	253	380	229	344	4
	4	337	507	292	439	245	368	221	332	
	6	331	497	287	431	240	361	217	326	
	8	323	485	279	420	234	352	211	317	
	10	312	470	270	406	227	341	204	307	
	12	300	451	260	390	218	327	196	295	
	16	271	408	235	352	197	295	177	266	
	20	238	358	206	309	172	259	155	233	
	24	203	306	175	263	146	220	132	198	
	28	169	253	145	218	121	181	109	163	
	32	136	204	116	175	96.5	145	86.7	130	
	36	107	161	91.8	138	76.3	115	68.6	103	
	40	87.0	131	74.4	112	61.9	93.0	55.6	83.6	
	44	71.9	108	61.5	92.5	51.2	76.9	46.0	69.1	
	48	60.4	90.8	51.7	77.7	43.0	64.7	38.7	58.1	
Properties of 2 angles—3/8 in. back to back										
A_g (in.^{2})		16.0		13.9		11.7		10.6		
r_x (in.)		1.10		1.12		1.13		1.14		
r_y (in.)		2.96		2.94		2.91		2.90		
Properties of single angle										
r_z (in.)		0.854		0.856		0.859		0.861		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



2L6 SLBB

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB

F_y = 36 ksi

Effective length *KL* (ft) with respect to indicated axis		Shape: 2L6×4× $^1/_2$		$^7/_{16}$[c]		$^3/_8$[c]		$^5/_{16}$[c]		No. of connectors[a]
	Wt/ft	32.3		28.5		24.6		20.6		
	Design	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
X-X Axis	0	205	308	175	264	142	213	108	162	b
	4	187	281	161	241	131	196	100	150	
	6	166	250	144	216	118	177	91.3	137	
	8	141	213	123	185	102	153	80.3	121	
	10	115	173	101	151	84.9	128	68.1	102	
	12	89.0	134	78.9	119	67.7	102	55.7	83.7	
	14	66.3	99.6	59.2	88.9	51.8	77.8	43.8	65.9	
	16	50.8	76.3	45.3	68.1	39.6	59.6	33.7	50.6	
	18	40.1	60.3	35.8	53.8	31.3	47.1	26.6	40.0	
Y-Y Axis	0	205	308	175	264	142	213	108	162	4
	4	196	294	143	215	110	165	77.8	117	
	6	192	289	143	215	110	165	77.7	117	
	8	187	282	143	215	110	165	77.6	117	
	10	181	273	142	214	109	164	77.4	116	
	12	174	262	141	212	109	163	77.1	116	
	16	157	236	133	201	105	158	75.9	114	
	20	138	207	119	178	96.3	145	72.3	109	
	24	117	176	101	152	83.5	125	64.9	97.5	
	28	96.3	145	83.5	126	69.9	105	55.6	83.6	
	32	76.8	115	66.8	100	56.7	85.3	46.2	69.4	
	36	60.8	91.4	53.0	79.6	45.1	67.8	37.2	55.9	
	40	49.3	74.2	43.0	64.6	36.7	55.1	30.3	45.6	
	44	40.8	61.3	35.6	53.5	30.4	45.7	25.2	37.8	
	48	34.3	51.6	29.9	45.0					

Properties of 2 angles—$^3/_8$ in. back to back

	$^1/_2$	$^7/_{16}$	$^3/_8$	$^5/_{16}$
A_g (in.^{2})	9.50	8.36	7.22	6.05
r_x (in.)	1.14	1.15	1.16	1.17
r_y (in.)	2.89	2.88	2.86	2.85

Properties of single angle

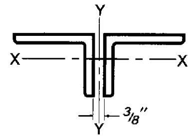
	$^1/_2$	$^7/_{16}$	$^3/_8$	$^5/_{16}$
r_z (in.)	0.864	0.867	0.870	0.874

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

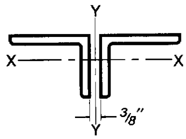
Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB



2L6 SLBB

Shape		2L6×3½×						
		½		⅜[c]		5/16[c]		No. of connectors[a]
Wt/ft		30.7		23.4		19.7		
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	194	292	134	202	102	154	b
	1	192	289	133	201	102	153	
	2	188	282	131	196	99.6	150	
	3	180	271	126	189	96.5	145	
	4	170	256	120	180	92.3	139	
	5	159	238	112	169	87.1	131	
	6	145	218	104	156	81.2	122	
	7	131	196	94.7	142	74.8	112	
	8	116	174	85.1	128	68.0	102	
	9	101	151	75.4	113	61.0	91.7	
	10	86.4	130	65.8	98.9	54.0	81.2	
	11	72.8	109	56.6	85.1	47.3	71.1	
	12	61.2	91.9	48.0	72.1	40.8	61.4	
	13	52.1	78.3	40.9	61.4	34.8	52.4	
	14	44.9	67.5	35.2	53.0	30.0	45.1	
	15	39.1	58.8	30.7	46.1	26.2	39.3	
	16	34.4	51.7	27.0	40.5	23.0	34.6	
Y-Y Axis	0	194	292	134	202	102	154	5
	6	184	277	105	157	74.3	112	
	8	180	271	105	157	74.2	111	
	10	174	262	104	157	74.1	111	
	12	168	252	104	156	73.9	111	
	14	161	241	103	155	73.6	111	
	16	152	229	102	153	73.2	110	
	18	144	216	98.9	149	72.3	109	
	20	134	202	94.1	141	70.6	106	
	22	125	187	88.3	133	67.8	102	
	24	115	173	82.1	123	64.0	96.2	
	26	105	158	75.8	114	59.7	89.8	
	28	95.8	144	69.4	104	55.3	83.1	
	30	86.4	130	63.1	94.9	50.8	76.3	
	32	77.5	116	57.0	85.7	46.3	69.6	
	34	68.8	103	51.1	76.8	42.0	63.1	
	38	55.1	82.9	41.0	61.7	33.9	51.0	
	42	45.2	67.9	33.6	50.6	27.9	41.9	
	46	37.7	56.6	28.1	42.2	23.3	35.0	
	48	34.6	52.0	25.8	38.8	21.4	32.2	
Properties of 2 angles—⅜ in. back to back								
A_g (in.^{2})		9.00		6.84		5.74		
r_x (in.)		0.968		0.984		0.991		
r_y (in.)		2.96		2.94		2.92		
Properties of single angle								
r_z (in.)		0.756		0.763		0.767		

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used. [b] For required number of intermediate connectors, see the discussion of Table 4-8. [c] Shape is slender for compression with F_y = 36 ksi.



2L5 SLBB

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB

F_y = 36 ksi

Shape		2L5×3½×										
		3/4		5/8		1/2		3/8[c]		5/16[c]		No. of connectors[a]
Wt/ft		39.6		33.5		27.2		20.8		17.4		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis — X-X Axis	0	250	376	212	319	173	259	129	194	101	151	b
	1	248	373	210	316	171	257	128	193	100	150	
	2	243	365	206	309	167	252	126	189	98.1	147	
	3	233	350	198	297	161	242	121	182	94.9	143	
	4	220	331	187	282	153	230	115	173	90.6	136	
	5	205	308	175	262	143	215	108	162	85.4	128	
	6	188	282	160	241	132	198	99.7	150	79.4	119	
	7	169	255	145	218	119	179	90.8	136	72.9	110	
	8	150	226	129	194	106	160	81.5	123	66.1	99.3	
	9	131	197	113	170	93.6	141	72.1	108	59.1	88.8	
	10	113	169	97.5	147	81.1	122	62.9	94.5	52.1	78.4	
	11	95.1	143	82.8	124	69.2	104	54.1	81.2	45.4	68.2	
	12	79.9	120	69.5	105	58.2	87.5	45.7	68.7	39.0	58.6	
	13	68.1	102	59.3	89.1	49.6	74.6	39.0	58.6	33.2	49.9	
	14	58.7	88.3	51.1	76.8	42.8	64.3	33.6	50.5	28.6	43.1	
	15	51.2	76.9	44.5	66.9	37.3	56.0	29.3	44.0	25.0	37.5	
	16	45.0	67.6	39.1	58.8	32.8	49.2	25.7	38.7	21.9	33.0	
	17							22.8	34.2	19.4	29.2	
Y-Y Axis	0	250	376	212	319	173	259	129	194	101	151	4
	6	237	357	200	301	161	242	106	159	77.7	117	
	8	229	344	193	290	155	233	105	159	77.5	116	
	10	218	328	184	276	148	223	104	157	76.9	116	
	12	206	310	174	261	140	210	101	152	75.8	114	
	14	193	290	162	244	130	196	96.1	144	73.5	110	
	16	178	268	150	225	120	181	89.3	134	69.6	105	
	18	163	246	137	206	110	165	81.7	123	64.5	97.0	
	20	148	222	124	186	99.4	149	73.9	111	58.9	88.6	
	22	133	199	111	167	88.9	134	66.1	99.3	53.2	79.9	
	24	118	177	98.2	148	78.6	118	58.4	87.7	47.4	71.3	
	26	103	155	86.1	129	68.7	103	51.0	76.7	41.8	62.9	
	28	89.7	135	74.5	112	59.4	89.3	44.1	66.3	36.4	54.8	
	30	78.1	117	64.9	97.6	51.8	77.9	38.5	57.9	31.8	47.9	
	32	68.7	103	57.1	85.8	45.6	68.5	33.9	51.0	28.1	42.2	
	34	60.9	91.5	50.6	76.0	40.4	60.7	30.1	45.2	24.9	37.4	
	38	48.7	73.2	40.5	60.9	32.4	48.6	24.1	36.3	20.0	30.1	

Properties of 2 angles—3/8 in. back to back

	3/4	5/8	1/2	3/8[c]	5/16[c]
A_g (in.^{2})	11.6	9.84	8.01	6.10	5.12
r_x (in.)	0.974	0.987	1.00	1.02	1.02
r_y (in.)	2.47	2.45	2.42	2.39	2.38

Properties of single angle

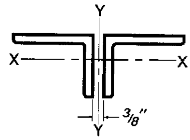
	3/4	5/8	1/2	3/8[c]	5/16[c]
r_z (in.)	0.744	0.746	0.750	0.755	0.758

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB

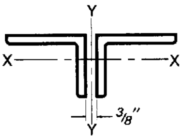


2L5 SLBB

Shape		2L5×3× 1/2		7/16		3/8[c]		5/16[c]		1/4[c]		
Wt/ft		25.5		22.5		19.5		16.4		13.2		No. of connectors[a]
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis — X-X Axis	0	162	243	143	215	121	182	94.3	142	67.3	101	
	1	160	241	141	212	120	180	93.4	140	66.8	100	
	2	155	233	137	205	116	175	90.7	136	65.1	97.8	
	3	146	220	129	194	110	166	86.5	130	62.4	93.8	
	4	135	203	120	180	102	154	80.8	121	58.9	88.5	
	5	122	184	109	163	93.1	140	74.1	111	54.6	82.0	
	6	108	163	96.2	145	82.8	124	66.6	100	49.8	74.8	
	7	93.7	141	83.4	125	72.2	108	58.7	88.3	44.6	67.1	b
	8	79.2	119	70.7	106	61.5	92.5	50.8	76.4	39.3	59.1	
	9	65.5	98.5	58.7	88.2	51.4	77.2	43.1	64.8	34.1	51.3	
	10	53.2	80.0	47.8	71.8	42.0	63.1	35.8	53.8	29.1	43.7	
	11	44.0	66.1	39.5	59.3	34.7	52.2	29.6	44.5	24.3	36.6	
	12	37.0	55.6	33.2	49.9	29.2	43.8	24.9	37.4	20.5	30.7	
	13	31.5	47.3	28.3	42.5	24.9	37.4	21.2	31.9	17.4	26.2	
	14							18.3	27.5	15.0	22.6	
Y-Y Axis	0	162	243	143	215	121	182	94.3	142	67.3	101	
	6	153	230	134	202	100	150	73.5	110	48.1	72.3	
	8	148	222	130	195	99.8	150	73.3	110	48.1	72.2	
	10	141	212	124	186	99.2	149	73.0	110	47.9	72.0	
	12	134	201	117	176	97.2	146	72.4	109	47.7	71.7	
	14	125	188	110	165	92.7	139	70.8	106	47.3	71.1	
	16	116	175	102	153	86.5	130	67.5	101	46.5	69.9	
	18	107	161	93.7	141	79.7	120	62.9	94.5	44.8	67.3	
	20	97.2	146	85.1	128	72.5	109	57.7	86.8	42.1	63.3	4
	22	87.5	132	76.6	115	65.3	98.1	52.4	78.8	38.9	58.5	
	24	78.0	117	68.2	103	58.2	87.4	47.1	70.8	35.5	53.3	
	26	68.9	103	60.2	90.4	51.3	77.1	41.9	63.0	32.0	48.1	
	28	60.0	90.2	52.4	78.7	44.7	67.2	36.9	55.5	28.6	42.9	
	30	52.3	78.6	45.7	68.6	39.0	58.6	32.2	48.4	25.2	37.9	
	32	46.0	69.1	40.2	60.4	34.3	51.5	28.4	42.6	22.3	33.4	
	34	40.8	61.3	35.6	53.5	30.4	45.7	25.2	37.8	19.8	29.7	
	38	32.6	49.1	28.5	42.9	24.4	36.6	20.2	30.3	15.9	23.9	
												5
Properties of 2 angles—3/8 in. back to back												
A_g (in.²)		7.51		6.62		5.73		4.80		3.88		
r_x (in.)		0.824		0.831		0.838		0.846		0.853		
r_y (in.)		2.50		2.48		2.47		2.46		2.44		
Properties of single angle												
r_z (in.)		0.642		0.644		0.646		0.649		0.652		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L4 SLBB

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB

F_y = 36 ksi

Shape		2L4×3½×								No. of connectors[a]
		½		3/8		5/16		¼[c]		
Wt/ft		23.8		18.2		15.3		12.4		
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	$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	151	227	115	173	96.7	145	71.1	107	b
	1	150	225	114	172	96.1	144	70.7	106	
	2	147	221	112	168	94.2	142	69.4	104	
	3	142	213	108	163	91.0	137	67.4	101	
	4	135	203	103	155	86.9	131	64.6	97.0	
	5	127	190	97.0	146	81.7	123	61.1	91.9	
	6	117	176	89.9	135	75.9	114	57.2	85.9	
	7	107	161	82.3	124	69.5	105	52.8	79.4	
	8	96.2	145	74.2	112	62.9	94.5	48.2	72.5	
	9	85.3	128	66.1	99.3	56.1	84.3	43.5	65.4	
	10	74.6	112	58.0	87.2	49.3	74.1	38.8	58.3	
	11	64.3	96.7	50.2	75.5	42.8	64.4	34.1	51.3	
	12	54.6	82.0	42.8	64.4	36.6	55.0	29.7	44.6	
	13	46.5	69.9	36.5	54.8	31.2	46.9	25.5	38.3	
	14	40.1	60.3	31.5	47.3	26.9	40.4	21.9	33.0	
	15	34.9	52.5	27.4	41.2	23.4	35.2	19.1	28.7	
	16	30.7	46.1	24.1	36.2	20.6	31.0	16.8	25.3	
	17	27.2	40.9	21.3	32.1	18.2	27.4	14.9	22.4	
Effective length *KL* (ft) with respect to indicated axis — Y-Y Axis	0	151	227	115	173	96.7	145	71.1	107	3
	6	136	205	101	152	78.2	118	53.4	80.3	
	8	128	192	95.1	143	76.3	115	52.6	79.0	
	10	118	177	87.8	132	72.3	109	50.9	76.5	
	12	107	161	79.6	120	66.2	99.4	47.9	72.0	
	14	95.2	143	70.9	107	59.0	88.6	43.6	65.6	
	16	83.2	125	61.9	93.1	51.4	77.3	38.7	58.1	
	18	71.4	107	53.1	79.8	43.9	66.0	33.6	50.5	
	20	60.2	90.4	44.6	67.1	36.7	55.2	28.6	42.9	
	22	49.9	75.0	37.0	55.6	30.5	45.9	23.9	35.9	
	24	42.0	63.1	31.2	46.9	25.8	38.7	20.2	30.4	
	26	35.8	53.8	26.6	40.0	22.0	33.1	17.3	26.1	
	28	30.9	46.4	23.0	34.5	19.0	28.6	15.0	22.6	
	30	26.9	40.5	20.0	30.1	16.6	25.0	13.1	19.7	

Properties of 2 angles—3/8 in. back to back

	½	3/8	5/16	¼
A_g (in.^{2})	7.01	5.34	4.50	3.62
r_x (in.)	1.04	1.05	1.06	1.07
r_y (in.)	1.89	1.86	1.85	1.83

Properties of single angle

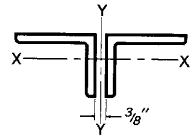
	½	3/8	5/16	¼
r_z (in.)	0.716	0.719	0.721	0.723

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB

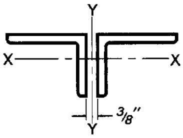


2L4 SLBB

Shape		2L4×3× 5/8		2L4×3× 1/2		2L4×3× 3/8		2L4×3× 5/16		2L4×3× 1/4[c]		No. of connectors[a]
Wt/ft		27.1		22.1		16.9		14.2		11.5		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis — X-X Axis	0	168	252	140	211	107	161	89.9	135	66.4	99.8	b
	1	166	249	139	208	106	159	89.0	134	65.8	99.0	
	2	161	242	134	202	103	154	86.4	130	64.1	96.4	
	3	152	229	128	192	97.8	147	82.3	124	61.4	92.2	
	4	142	213	119	179	91.2	137	76.9	116	57.7	86.7	
	5	129	193	108	163	83.4	125	70.4	106	53.3	80.1	
	6	114	172	96.8	145	74.7	112	63.2	95.0	48.4	72.8	
	7	99.7	150	84.6	127	65.7	98.7	55.7	83.7	43.2	64.9	
	8	85.0	128	72.5	109	56.5	85.0	48.1	72.3	37.9	56.9	
	9	71.0	107	60.9	91.5	47.7	71.8	40.7	61.2	32.6	49.0	
	10	58.0	87.2	50.0	75.1	39.4	59.3	33.8	50.8	27.6	41.5	
	11	47.9	72.0	41.3	62.1	32.6	49.0	27.9	42.0	22.9	34.5	
	12	40.3	60.5	34.7	52.2	27.4	41.2	23.5	35.3	19.3	29.0	
	13	34.3	51.6	29.6	44.5	23.3	35.1	20.0	30.0	16.4	24.7	
	14	29.6	44.5	25.5	38.3	20.1	30.2	17.2	25.9	14.2	21.3	
Y-Y Axis	0	168	252	140	211	107	161	89.9	135	66.4	99.8	3
	6	155	233	128	193	96.3	145	74.1	111	51.1	76.8	
	8	146	220	121	182	90.9	137	72.9	110	50.6	76.0	
	10	136	204	112	169	84.4	127	69.6	105	49.3	74.2	
	12	124	187	103	154	77.1	116	64.1	96.4	46.7	70.2	
	14	112	168	92.3	139	69.2	104	57.7	86.7	42.7	64.2	
	16	99.1	149	81.6	123	61.0	91.7	50.8	76.4	38.1	57.3	
	18	86.4	130	70.9	107	52.9	79.5	44.0	66.1	33.3	50.1	
	20	74.0	111	60.6	91.0	45.1	67.8	37.4	56.1	28.6	43.0	
	22	62.3	93.6	50.8	76.3	37.7	56.7	31.2	46.9	24.1	36.3	
	24	52.4	78.7	42.7	64.2	31.7	47.7	26.3	39.5	20.4	30.6	
	26	44.6	67.1	36.4	54.7	27.1	40.7	22.4	33.7	17.4	26.2	
	28	38.5	57.9	31.4	47.2	23.4	35.1	19.4	29.1	15.1	22.6	
	30	33.5	50.4	27.4	41.1	20.4	30.6	16.9	25.4	13.1	19.8	
	32	29.5	44.3	24.1	36.2	17.9	26.9					4
Properties of 2 angles—3/8 in. back to back												
A_g (in.²)		7.78		6.50		4.96		4.18		3.38		
r_x (in.)		0.845		0.858		0.873		0.880		0.887		
r_y (in.)		1.98		1.95		1.93		1.91		1.90		
Properties of single angle												
r_z (in.)		0.631		0.633		0.636		0.638		0.639		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L3½ SLBB

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB

F_y = 36 ksi

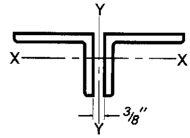
Shape		2L3½×3× ½		7/16		3/8		5/16		¼[c]		No. of connectors[a]
Wt/ft		20.6		18.2		15.8		13.3		10.8		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length *KL* (ft) with respect to indicated axis: X-X Axis	0	129	194	114	172	99.2	149	83.2	125	64.9	97.6	b
	1	128	192	113	170	98.2	148	82.4	124	64.3	96.7	
	2	124	187	110	165	95.5	143	80.2	120	62.6	94.2	
	3	118	178	105	157	91.0	137	76.5	115	59.9	90.1	
	4	110	166	97.8	147	85.1	128	71.6	108	56.3	84.6	
	5	101	152	89.7	135	78.2	117	65.8	99.0	52.0	78.1	
	6	90.7	136	80.6	121	70.4	106	59.4	89.3	47.1	70.9	
	7	79.8	120	71.1	107	62.2	93.5	52.6	79.1	42.0	63.1	
	8	68.9	103	61.5	92.4	53.9	81.0	45.7	68.7	36.8	55.3	
	9	58.2	87.5	52.1	78.3	45.8	68.9	39.0	58.6	31.6	47.5	
	10	48.2	72.4	43.3	65.1	38.2	57.4	32.6	49.0	26.7	40.1	
	11	39.8	59.9	35.8	53.8	31.6	47.5	27.0	40.5	22.2	33.3	
	12	33.5	50.3	30.1	45.2	26.5	39.9	22.7	34.1	18.6	28.0	
	13	28.5	42.9	25.6	38.5	22.6	34.0	19.3	29.0	15.9	23.9	
	14	24.6	37.0	22.1	33.2	19.5	29.3	16.6	25.0	13.7	20.6	
	15							14.5	21.8	11.9	17.9	
Y-Y Axis	0	129	194	114	172	99.2	149	83.2	125	64.9	97.6	3
	6	115	173	101	152	86.7	130	71.4	107	51.1	76.8	
	8	106	160	93.2	140	80.0	120	66.0	99.2	49.5	74.3	
	10	96.0	144	84.1	126	72.2	109	59.6	89.6	45.9	69.0	
	12	84.7	127	74.2	112	63.7	95.7	52.6	79.1	41.0	61.6	
	14	73.1	110	63.9	96.1	54.8	82.4	45.3	68.1	35.4	53.2	
	16	61.6	92.6	53.8	80.9	46.1	69.3	38.1	57.2	29.8	44.9	
	18	50.8	76.3	44.3	66.5	37.8	56.9	31.2	46.9	24.5	36.8	
	20	41.2	61.9	35.9	54.0	30.7	46.2	25.3	38.1	20.0	30.0	
	22	34.1	51.2	29.7	44.7	25.4	38.2	21.0	31.5	16.6	24.9	
	24	28.7	43.1	25.0	37.6	21.4	32.1	17.7	26.6	14.0	21.0	
	26	24.4	36.7	21.3	32.0	18.2	27.4	15.1	22.7	11.9	18.0	
	28	21.1	31.7									
Properties of 2 angles—3/8 in. back to back												
A_g (in.^{2})		6.00		5.30		4.60		3.86		3.12		
r_x (in.)		0.877		0.885		0.892		0.900		0.908		
r_y (in.)		1.69		1.67		1.66		1.65		1.63		
Properties of single angle												
r_z (in.)		0.618		0.620		0.622		0.624		0.628		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB

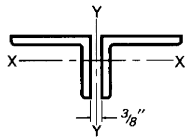


2L3½ SLBB

Shape		2L3½×2½×								No. of connectors[a]
		½		3/8		5/16		¼[c]		
Wt/ft		18.8		14.5		12.2		9.88		
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	$\phi_c P_n$	
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
Effective length *KL* (ft) with respect to indicated axis — X-X Axis	0	119	178	91.0	137	76.7	115	59.9	90.1	b
	1	117	175	89.6	135	75.6	114	59.1	88.8	
	2	111	168	85.7	129	72.4	109	56.7	85.3	
	3	103	155	79.6	120	67.4	101	53.0	79.6	
	4	92.7	139	71.8	108	60.9	91.5	48.1	72.3	
	5	80.7	121	62.8	94.4	53.4	80.3	42.5	63.9	
	6	68.1	102	53.4	80.2	45.5	68.4	36.6	55.0	
	7	55.7	83.8	44.0	66.2	37.7	56.7	30.6	46.0	
	8	44.1	66.3	35.2	53.0	30.3	45.6	24.9	37.5	
	9	34.9	52.4	27.8	41.9	24.0	36.1	19.8	29.8	
	10	28.3	42.5	22.6	33.9	19.4	29.2	16.1	24.1	
	11	23.3	35.1	18.6	28.0	16.1	24.1	13.3	19.9	
	12					13.5	20.3	11.2	16.8	
Y-Y Axis	0	119	178	91.0	137	76.7	115	59.9	90.1	4
	2	116	175	88.4	133	73.7	111	48.4	72.7	
	4	113	170	85.7	129	71.4	107	48.3	72.5	
	6	107	161	81.3	122	67.8	102	47.9	72.1	
	8	99.8	150	75.6	114	63.1	94.8	47.0	70.6	
	10	91.0	137	68.9	104	57.4	86.3	44.3	66.5	
	12	81.3	122	61.4	92.3	51.2	76.9	40.0	60.1	
	14	71.1	107	53.6	80.5	44.6	67.1	35.0	52.7	
	16	60.9	91.6	45.8	68.8	38.1	57.3	30.0	45.1	
	18	51.2	76.9	38.3	57.5	31.8	47.8	25.1	37.8	
	20	42.0	63.1	31.3	47.1	26.0	39.1	20.6	30.9	
	22	34.7	52.2	25.9	39.0	21.5	32.4	17.1	25.7	
	24	29.2	43.9	21.8	32.8	18.1	27.2	14.4	21.6	
	26	24.9	37.4	18.6	27.9	15.4	23.2	12.3	18.4	
	28	21.5	32.3	16.0	24.1	13.3	20.0	10.6	15.9	
Properties of 2 angles—3/8 in. back to back										
A_g (in.²)		5.50		4.22		3.56		2.88		
r_x (in.)		0.701		0.716		0.723		0.731		
r_y (in.)		1.76		1.73		1.72		1.70		
Properties of single angle										
r_z (in.)		0.532		0.535		0.538		0.541		

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



2L3 SLBB

Table 4–10 (continued)
Available Strength in Axial Compression, kips

Double Angles—SLBB

F_y = 36 ksi

Shape		2L3×2½×												No. of connectors[a]
		½		7/16		3/8		5/16		¼		3/16[c]		
Wt/ft		17.1		15.1		13.1		11.1		8.97		6.82		
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 indicated axis — X-X Axis	0	108	162	95.3	143	82.8	124	72.0	108	56.5	84.9	39.1	58.8	b
	1	106	160	93.9	141	81.6	123	71.0	107	55.7	83.7	38.7	58.1	
	2	102	153	89.9	135	78.2	118	68.1	102	53.5	80.4	37.3	56.0	
	3	94.4	142	83.7	126	72.9	110	63.5	95.5	50.0	75.1	35.1	52.7	
	4	85.2	128	75.6	114	66.0	99.2	57.6	86.6	45.4	68.3	32.2	48.4	
	5	74.6	112	66.4	99.8	58.1	87.3	50.9	76.5	40.2	60.4	28.9	43.4	
	6	63.5	95.4	56.6	85.1	49.7	74.7	43.7	65.6	34.6	52.0	25.2	37.9	
	7	52.4	78.8	46.9	70.6	41.3	62.1	36.4	54.8	29.0	43.5	21.5	32.4	
	8	42.0	63.1	37.8	56.8	33.4	50.2	29.6	44.5	23.6	35.5	17.9	27.0	
	9	33.2	49.9	29.9	44.9	26.5	39.8	23.5	35.3	18.8	28.2	14.6	21.9	
	10	26.9	40.4	24.2	36.4	21.4	32.2	19.0	28.6	15.2	22.9	11.8	17.7	
	11	22.2	33.4	20.0	30.1	17.7	26.6	15.7	23.6	12.6	18.9	9.74	14.6	
	12			16.8	25.3	14.9	22.4	13.2	19.9	10.6	15.9	8.18	12.3	
Y-Y Axis	0	108	162	95.3	143	82.8	124	72.0	108	56.5	84.9	39.1	58.8	3
	2	105	158	92.6	139	79.9	120	68.6	103	52.5	78.9	29.9	44.9	
	4	101	151	88.6	133	76.4	115	65.6	98.6	50.2	75.5	29.7	44.6	
	6	93.5	141	82.2	124	70.9	107	60.9	91.5	46.7	70.2	29.3	44.0	
	8	84.4	127	74.1	111	63.9	96.0	54.9	82.4	42.1	63.3	28.1	42.2	
	10	73.9	111	64.9	97.5	55.8	83.9	47.9	72.0	36.9	55.4	25.6	38.4	
	12	62.9	94.5	55.1	82.8	47.3	71.1	40.6	61.0	31.2	46.9	22.1	33.3	
	14	51.9	78.1	45.4	68.2	38.9	58.5	33.3	50.1	25.6	38.5	18.5	27.7	
	16	41.6	62.5	36.2	54.4	31.0	46.5	26.5	39.8	20.3	30.5	14.9	22.4	
	18	32.9	49.4	28.7	43.1	24.5	36.8	21.0	31.5	16.1	24.2	11.9	17.8	
	20	26.7	40.1	23.2	34.9	19.9	29.9	17.0	25.6	13.1	19.7	9.67	14.5	
	22	22.0	33.1	19.2	28.9	16.4	24.7	14.1	21.1	10.8	16.3	8.03	12.1	
	24	18.5	27.8	16.1	24.3	13.8	20.8	11.8	17.8	9.12	13.7			

Properties of 2 angles—3/8 in. back to back

	½	7/16	3/8	5/16	¼	3/16
A_g (in.²)	5.00	4.42	3.84	3.34	2.62	1.99
r_x (in.)	0.718	0.724	0.731	0.739	0.746	0.753
r_y (in.)	1.49	1.48	1.46	1.45	1.44	1.42

Properties of single angle

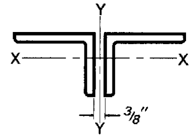
	½	7/16	3/8	5/16	¼	3/16
r_z (in.)	0.516	0.516	0.517	0.518	0.520	0.521

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB



2L3 SLBB

Shape		2L3×2×										No. of connectors[a]
		1/2		3/8		5/16		1/4		3/16[c]		
Wt/ft		15.4		11.9		10.1		8.18		6.24		
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 indicated axis — X-X Axis	0	97.0	146	74.6	112	62.9	94.6	51.3	77.1	35.4	53.3	b
	1	94.5	142	72.8	109	61.5	92.4	50.1	75.3	34.7	52.2	
	2	87.5	132	67.6	102	57.2	86.0	46.7	70.2	32.6	49.0	
	3	77.0	116	59.8	89.8	50.7	76.2	41.6	62.5	29.4	44.2	
	4	64.3	96.6	50.3	75.6	42.9	64.5	35.3	53.0	25.4	38.2	
	5	51.0	76.6	40.3	60.6	34.6	51.9	28.6	43.0	21.1	31.7	
	6	38.4	57.7	30.8	46.3	26.5	39.9	22.1	33.2	16.8	25.2	
	7	28.2	42.5	22.7	34.2	19.7	29.5	16.4	24.7	12.8	19.2	
	8	21.6	32.5	17.4	26.1	15.0	22.6	12.6	18.9	9.79	14.7	
	9	17.1	25.7	13.7	20.7	11.9	17.9	9.9	14.9	7.73	11.6	
Y-Y Axis	0	97.0	146	74.6	112	62.9	94.6	51.3	77.1	35.4	53.3	4
	2	95.3	143	72.9	110	61.2	91.9	49.2	73.9	27.6	41.5	
	4	91.6	138	70.0	105	58.7	88.3	47.3	71.0	27.5	41.4	
	6	85.8	129	65.5	98.4	54.9	82.5	44.2	66.4	27.3	41.1	
	8	78.3	118	59.6	89.6	49.9	75.0	40.2	60.4	26.7	40.1	
	10	69.6	105	52.8	79.4	44.2	66.4	35.5	53.4	24.7	37.1	
	12	60.3	90.6	45.5	68.4	38.0	57.1	30.5	45.9	21.7	32.6	
	14	50.8	76.4	38.2	57.4	31.8	47.8	25.5	38.4	18.4	27.6	
	16	41.7	62.7	31.2	46.9	25.9	39.0	20.8	31.2	15.2	22.8	
	18	33.4	50.2	24.9	37.4	20.6	31.0	16.5	24.8	12.2	18.3	
	20	27.0	40.6	20.1	30.3	16.7	25.1	13.4	20.1	9.89	14.9	
	22	22.4	33.6	16.7	25.0	13.8	20.8	11.1	16.6	8.19	12.3	
	24	18.8	28.2	14.0	21.0	11.6	17.5	9.30	14.0	6.90	10.4	
	26	16.0	24.1									

Properties of 2 angles—3/8 in. back to back

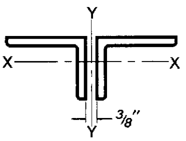
	1/2	3/8	5/16	1/4	3/16
A_g (in.^{2})	4.50	3.46	2.92	2.38	1.80
r_x (in.)	0.543	0.555	0.562	0.569	0.577
r_y (in.)	1.56	1.54	1.52	1.51	1.49

Properties of single angle

	1/2	3/8	5/16	1/4	3/16
r_z (in.)	0.425	0.426	0.428	0.431	0.435

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



2L2½ SLBB

Table 4–10 (continued)
Available Strength in Axial Compression, kips
Double Angles—SLBB

F_y = 36 ksi

Shape		2L2½×2×								No. of connectors[a]
		3/8		5/16		1/4		3/16[c]		
Wt/ft		10.6		8.97		7.30		5.57		
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	
Effective length KL (ft) with respect to indicated axis — X-X Axis	0	66.8	100	56.5	84.9	45.7	68.7	34.3	51.5	
	1	65.3	98.2	55.2	83.0	44.7	67.2	33.6	50.5	
	2	61.0	91.6	51.6	77.6	41.9	62.9	31.5	47.4	
	3	54.3	81.7	46.2	69.4	37.5	56.4	28.4	42.7	
	4	46.3	69.5	39.5	59.3	32.2	48.4	24.5	36.9	
	5	37.6	56.5	32.2	48.5	26.5	39.8	20.3	30.6	
	6	29.2	43.9	25.2	37.9	20.8	31.3	16.2	24.3	b
	7	21.8	32.7	18.9	28.4	15.7	23.6	12.3	18.5	
	8	16.7	25.1	14.4	21.7	12.0	18.0	9.40	14.1	
	9	13.2	19.8	11.4	17.2	9.48	14.2	7.43	11.2	
Y-Y Axis	0	66.8	100	56.5	84.9	45.7	68.7	34.3	51.5	
	2	64.8	97.4	54.3	81.7	43.4	65.2	27.7	41.6	
	4	61.1	91.8	51.1	76.8	40.8	61.3	27.4	41.3	
	6	55.4	83.2	46.2	69.4	36.8	55.4	26.4	39.7	
	8	48.2	72.5	40.0	60.1	31.9	48.0	23.6	35.4	
	10	40.4	60.7	33.2	50.0	26.5	39.8	19.7	29.5	3
	12	32.5	48.9	26.5	39.8	21.1	31.7	15.6	23.5	
	14	25.1	37.7	20.2	30.4	16.0	24.1	11.9	17.9	
	16	19.2	28.9	15.5	23.3	12.3	18.5	9.15	13.8	
	18	15.2	22.9	12.3	18.4	9.74	14.6	7.26	10.9	
	20	12.3	18.5	9.94	14.9	7.90	11.9	5.89	8.86	
										4

Properties of 2 angles—3/8 in. back to back

	3/8	5/16	1/4	3/16
A_g (in.^{2})	3.10	2.62	2.12	1.62
r_x (in.)	0.574	0.581	0.589	0.597
r_y (in.)	1.27	1.26	1.24	1.23

Properties of single angle

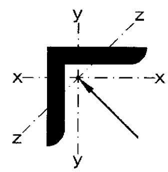
	3/8	5/16	1/4	3/16
r_z (in.)	0.419	0.420	0.423	0.426

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

[a] For Y-Y axis, welded or pretensioned bolted intermediate connectors must be used.
[b] For required number of intermediate connectors, see the discussion of Table 4-8.
[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–11
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles



L8

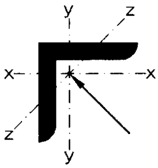
Shape		L8×8×											
		$1^1/_8$		1		$^7/_8$		$^3/_4$		$^5/_8$		$^9/_{16}$[c]	
Wt/ft		57.2		51.3		45.3		39.2		33.0		29.8	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z	0	360	541	323	486	285	428	246	369	207	311	179	270
	1	359	539	322	484	284	426	245	368	206	310	179	269
	2	356	534	319	480	281	422	243	365	204	307	177	267
	3	350	526	314	473	277	416	239	359	201	302	175	263
	4	342	515	308	462	271	407	234	352	197	296	171	258
	5	333	500	299	450	263	396	228	342	192	288	167	251
	6	322	484	289	435	255	383	220	331	185	278	162	243
	7	309	464	278	417	245	368	211	318	178	268	156	234
	8	295	443	265	398	234	351	202	304	170	256	149	224
	9	280	420	251	378	222	333	192	288	162	243	142	213
	10	264	396	237	356	209	314	181	272	153	229	134	202
	11	247	371	222	334	196	294	170	255	143	215	126	190
	12	230	345	207	311	182	274	158	238	134	201	118	178
	13	212	319	191	288	169	254	146	220	124	186	110	165
	14	195	294	176	264	155	234	135	203	114	171	102	153
	15	178	268	161	242	142	214	123	185	104	157	93.4	140
	16	162	243	146	219	129	194	112	169	95.1	143	85.4	128
	17	146	220	132	198	117	175	101	152	86.0	129	77.6	117
	18	131	196	118	177	104	157	90.8	137	77.2	116	70.1	105
	19	117	176	106	159	93.7	141	81.5	123	69.3	104	62.9	94.5
	20	106	159	95.5	144	84.6	127	73.6	111	62.5	94.0	56.8	85.3
	21	96.1	144	86.7	130	76.7	115	66.7	100	56.7	85.3	51.5	77.4
	22	87.5	132	79.0	119	69.9	105	60.8	91.4	51.7	77.7	46.9	70.5
	23	80.1	120	72.2	109	64.0	96.1	55.6	83.6	47.3	71.1	42.9	64.5
	24	73.5	111	66.4	99.7	58.7	88.3	51.1	76.8	43.4	65.3	39.4	59.2
	25	67.8	102	61.2	91.9	54.1	81.4	47.1	70.8	40.0	60.2	36.3	54.6
	26	62.7	94.2	56.5	85.0	50.0	75.2	43.5	65.4	37.0	55.6	33.6	50.5

Properties

	$1^1/_8$	1	$^7/_8$	$^3/_4$	$^5/_8$	$^9/_{16}$
A_g (in.^{2})	16.7	15.0	13.2	11.4	9.61	8.68
r_z (in.)	1.56	1.56	1.57	1.57	1.58	1.58

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

[c] Shape is slender for compression with F_y = 36 ksi.



L8

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

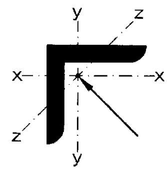
Shape	L8×8×		L8×6×									
	1/2[c]		1		7/8		3/4		5/8		9/16[c]	
Wt/ft	26.7		44.4		39.3		34.0		28.6		25.9	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to least radius of gyration r_z												
0	152	229	280	421	248	373	214	322	180	270	156	235
1	152	228	279	419	247	371	213	321	179	269	156	234
2	151	226	275	413	243	366	210	316	176	265	154	231
3	149	223	269	404	238	357	206	309	173	259	150	226
4	146	219	260	391	230	346	199	299	167	251	146	219
5	142	214	249	375	221	332	191	287	161	241	140	211
6	138	207	237	356	210	316	182	273	153	230	134	201
7	133	200	223	335	198	297	171	257	144	216	126	190
8	128	192	208	313	184	277	160	240	135	202	119	178
9	122	183	192	289	171	256	148	222	125	187	110	166
10	116	174	176	265	156	235	136	204	114	172	101	152
11	109	164	160	240	142	213	123	185	104	156	92.6	139
12	103	154	143	216	127	192	111	167	93.7	141	83.9	126
13	95.8	144	128	192	114	171	98.8	148	83.7	126	75.3	113
14	88.9	134	113	169	100	151	87.3	131	74.1	111	67.0	101
15	82.1	123	98.3	148	87.5	132	76.3	115	64.8	97.5	59.0	88.6
16	75.4	113	86.4	130	76.9	116	67.1	101	57.0	85.6	51.8	77.9
17	68.9	104	76.6	115	68.2	102	59.4	89.3	50.5	75.9	45.9	69.0
18	62.6	94.1	68.3	103	60.8	91.4	53.0	79.6	45.0	67.7	41.0	61.6
19	56.4	84.8	61.3	92.1	54.6	82.0	47.6	71.5	40.4	60.7	36.8	55.2
20	50.9	76.5	55.3	83.1	49.2	74.0	42.9	64.5	36.5	54.8	33.2	49.9
21	46.2	69.4	50.2	75.4	44.7	67.1	38.9	58.5	33.1	49.7	30.1	45.2
22	42.1	63.3										
23	38.5	57.9										
24	35.4	53.2										
25	32.6	49.0										
26	30.1	45.3										
Properties												
A_g (in.^{2})	7.75		13.0		11.5		9.94		8.36		7.56	
r_z (in.)	1.59		1.28		1.28		1.29		1.29		1.30	

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles



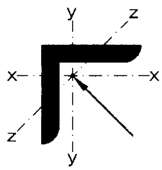
L8

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

Shape	L8×6×				L8×4×							
	1/2[c]		7/16[c]		1		7/8		3/4		5/8	
Wt/ft	23.2		20.4		37.6		33.3		28.9		24.4	
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	133	199	109	163	237	356	210	315	182	273	153	230
1	132	199	108	163	235	353	208	312	180	271	151	227
2	130	196	107	161	227	342	201	302	174	262	147	220
3	128	192	105	158	215	324	191	287	166	249	139	209
4	124	187	102	154	200	301	177	266	154	231	130	195
5	120	180	98.9	149	182	273	161	242	140	210	118	177
6	115	172	94.9	143	162	243	143	215	125	187	105	158
7	109	163	90.3	136	141	212	125	188	109	164	92.1	139
8	102	154	85.3	128	120	180	106	160	93.0	140	78.9	119
9	95.3	143	80.0	120	100	150	88.9	134	77.8	117	66.2	99.5
10	88.2	133	74.5	112	81.8	123	72.7	109	63.6	95.7	54.3	81.7
11	80.9	122	68.8	103	67.6	102	60.1	90.3	52.6	79.1	44.9	67.5
12	73.7	111	63.0	94.7	56.8	85.3	50.5	75.9	44.2	66.4	37.7	56.7
13	66.5	100	57.3	86.2	48.4	72.7	43.0	64.6	37.7	56.6	32.1	48.3
14	59.6	89.5	51.8	77.8	41.7	62.7	37.1	55.7	32.5	48.8	27.7	41.7
15	52.9	79.5	46.4	69.7								
16	46.6	70.0	41.2	61.9								
17	41.3	62.0	36.5	54.8								
18	36.8	55.3	32.5	48.9								
19	33.0	49.6	29.2	43.9								
20	29.8	44.8	26.4	39.6								
21	27.0	40.6	23.9	35.9								
Properties												
A_g (in.^{2})	6.75		5.93		11.0		9.73		8.44		7.11	
r_z (in.)	1.30		1.31		0.844		0.846		0.850		0.856	

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



L8–L7

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

Shape	L8×4×						L7×4×					
	9/16[c]		1/2[c]		7/16[c]		3/4		5/8		1/2[c]	
Wt/ft	22.1		19.7		17.4		26.2		22.1		17.9	
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_z												
0	133	200	113	170	92.8	139	166	249	140	210	109	164
1	132	198	112	168	92.0	138	164	247	138	208	108	163
2	128	192	109	164	89.6	135	159	239	134	202	105	158
3	122	183	104	156	85.9	129	151	227	127	191	100	150
4	114	171	97.4	146	80.9	122	140	211	119	178	93.4	140
5	104	156	89.6	135	74.9	113	128	192	108	162	85.6	129
6	93.2	140	80.9	122	68.1	102	114	172	96.6	145	76.9	116
7	82.0	123	71.7	108	60.9	91.6	99.8	150	84.5	127	67.7	102
8	70.8	106	62.4	93.8	53.6	80.5	85.4	128	72.5	109	58.5	87.9
9	59.9	90.0	53.3	80.1	46.3	69.6	71.6	108	60.9	91.5	49.5	74.5
10	49.5	74.4	44.7	67.1	39.4	59.2	58.7	88.3	50.0	75.2	41.1	61.8
11	40.9	61.5	36.9	55.5	32.8	49.3	48.5	73.0	41.3	62.1	34.0	51.0
12	34.4	51.7	31.0	46.6	27.6	41.5	40.8	61.3	34.7	52.2	28.5	42.9
13	29.3	44.1	26.4	39.7	23.5	35.3	34.8	52.2	29.6	44.5	24.3	36.5
14	25.3	38.0	22.8	34.3	20.3	30.5	30.0	45.0	25.5	38.4	21.0	31.5

Properties

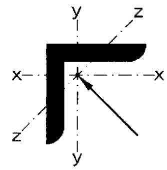
	L8×4×9/16	L8×4×1/2	L8×4×7/16	L7×4×3/4	L7×4×5/8	L7×4×1/2
A_g (in.^{2})	6.43	5.75	5.06	7.69	6.48	5.25
r_z (in.)	0.859	0.863	0.867	0.855	0.860	0.866

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles



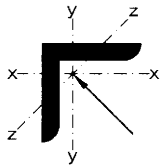
L7–L6

Shape	L7×4×				L6×6×							
	7/16[c]		3/8[c]		1		7/8		3/4		5/8	
Wt/ft	15.8		13.6		37.5		33.2		28.8		24.3	
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_z												
0	90.8	136	72.1	108	238	357	210	316	182	274	154	231
1	90.0	135	71.5	107	236	355	209	314	181	273	153	230
2	87.5	132	69.7	105	232	349	206	309	178	268	150	226
3	83.6	126	66.9	100	226	340	200	301	173	261	146	220
4	78.4	118	63.1	94.8	217	327	192	289	167	251	141	212
5	72.2	109	58.5	87.9	207	311	183	275	159	239	134	201
6	65.3	98.2	53.4	80.2	194	292	172	259	149	224	126	190
7	58.0	87.2	47.9	71.9	181	272	160	241	139	209	117	176
8	50.6	76.0	42.2	63.5	166	250	147	221	128	192	108	162
9	43.3	65.1	36.6	55.1	151	227	134	201	116	175	98.5	148
10	36.4	54.7	31.2	47.0	136	204	121	181	105	157	88.7	133
11	30.1	45.3	26.2	39.3	121	182	107	161	93.3	140	79.0	119
12	25.3	38.0	22.0	33.0	106	160	94.3	142	82.1	123	69.7	105
13	21.6	32.4	18.7	28.2	92.4	139	82.0	123	71.5	107	60.7	91.2
14	18.6	27.9	16.2	24.3	79.7	120	70.7	106	61.7	92.7	52.4	78.7
15					69.4	104	61.6	92.6	53.7	80.7	45.6	68.6
16					61.0	91.7	54.2	81.4	47.2	71.0	40.1	60.3
17					54.0	81.2	48.0	72.1	41.8	62.8	35.5	53.4
18					48.2	72.5	42.8	64.3	37.3	56.1	31.7	47.6
19					43.3	65.0	38.4	57.7	33.5	50.3	28.4	42.7
Properties												
A_g (in.²)	4.62		3.98		11.0		9.75		8.46		7.13	
r_z (in.)	0.869		0.873		1.17		1.17		1.17		1.17	

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

[c] Shape is slender for compression with F_y = 36 ksi.

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



L6

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

Shape	L6×6×										L6×4×	
	9/16		1/2		7/16[c]		3/8[c]		5/16[c]		7/8	
Wt/ft	22.0		19.6		17.3		14.9		12.5		27.2	
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_z												
0	139	209	124	187	106	160	86.1	129	65.4	98.3	172	259
1	138	208	124	186	106	159	85.6	129	65.1	97.8	170	256
2	136	205	122	183	104	157	84.4	127	64.2	96.5	165	248
3	132	199	118	178	102	153	82.3	124	62.8	94.4	157	236
4	127	192	114	171	97.9	147	79.6	120	60.9	91.6	146	219
5	121	182	109	163	93.4	140	76.1	114	58.5	88.0	133	199
6	114	172	102	154	88.1	132	72.1	108	55.8	83.8	118	178
7	106	160	95.3	143	82.3	124	67.7	102	52.6	79.1	103	155
8	98.0	147	87.8	132	76.0	114	62.9	94.5	49.3	74.1	88.5	133
9	89.3	134	80.0	120	69.5	104	57.8	86.9	45.7	68.7	74.1	111
10	80.5	121	72.2	108	62.9	94.5	52.7	79.2	42.0	63.2	60.8	91.3
11	71.8	108	64.4	96.8	56.3	84.6	47.5	71.4	38.3	57.6	50.2	75.5
12	63.3	95.1	56.8	85.4	49.9	75.0	42.5	63.8	34.6	52.0	42.2	63.4
13	55.2	82.9	49.6	74.5	43.7	65.7	37.6	56.4	31.0	46.6	35.9	54.0
14	47.6	71.6	42.8	64.3	37.9	56.9	32.8	49.4	27.5	41.3	31.0	46.6
15	41.5	62.4	37.3	56.0	33.0	49.6	28.6	43.0	24.1	36.3		
16	36.5	54.8	32.8	49.2	29.0	43.6	25.1	37.8	21.2	31.9		
17	32.3	48.5	29.0	43.6	25.7	38.6	22.3	33.5	18.8	28.2		
18	28.8	43.3	25.9	38.9	22.9	34.4	19.9	29.9	16.8	25.2		
19	25.9	38.9	23.2	34.9	20.6	30.9	17.8	26.8	15.0	22.6		

Properties

	9/16	1/2	7/16	3/8	5/16	L6×4×7/8
A_g (in.^{2})	6.45	5.77	5.08	4.38	3.67	7.98
r_z (in.)	1.18	1.18	1.18	1.19	1.19	0.854

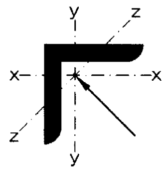
ASD	LRFD
$\Omega_c = 1.67$	$\phi_c = 0.90$

[c] Shape is slender for compression with F_y = 36 ksi.

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

F_y = 36 ksi

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles



L6

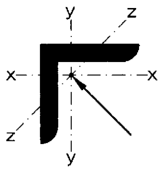
Shape	L6×4×									
	3/4		5/8		9/16		1/2		7/16[c]	
Wt/ft	23.6		19.9		18.1		16.2		14.2	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to least radius of gyration r_z										
0	150	225	126	190	114	172	102	154	87.7	132
1	148	222	125	188	113	170	101	152	86.8	131
2	143	216	121	182	110	165	98.3	148	84.3	127
3	136	205	115	173	104	157	93.4	140	80.3	121
4	127	190	107	161	97.2	146	87.0	131	75.0	113
5	115	173	97.7	147	88.6	133	79.4	119	68.6	103
6	103	155	87.3	131	79.2	119	71.0	107	61.6	92.6
7	90.0	135	76.3	115	69.4	104	62.2	93.6	54.2	81.5
8	77.1	116	65.4	98.4	59.5	89.4	53.5	80.3	46.8	70.4
9	64.6	97.2	55.0	82.6	50.0	75.2	45.0	67.6	39.6	59.6
10	53.0	79.7	45.1	67.8	41.1	61.8	37.0	55.6	32.8	49.3
11	43.8	65.8	37.3	56.1	34.0	51.1	30.6	46.0	27.1	40.8
12	36.8	55.3	31.3	47.1	28.6	42.9	25.7	38.6	22.8	34.3
13	31.4	47.1	26.7	40.1	24.3	36.6	21.9	32.9	19.4	29.2
14	27.0	40.7	23.0	34.6	21.0	31.5	18.9	28.4	16.7	25.2

Properties

	3/4	5/8	9/16	1/2	7/16
A_g (in.^{2})	6.94	5.86	5.31	4.75	4.18
r_z (in.)	0.856	0.859	0.861	0.864	0.867

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



L6

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

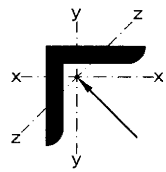
Shape	L6×4×				L6×3½×					
	3/8[c]		5/16[c]		1/2		3/8[c]		5/16[c]	
Wt/ft	12.3		10.3		15.4		11.7		9.8	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to least radius of gyration r_z										
0	70.9	107	53.9	81.0	97.0	146	67.2	101	51.1	76.8
1	70.3	106	53.4	80.3	95.7	144	66.4	99.8	50.6	76.0
2	68.4	103	52.1	78.4	92.0	138	64.1	96.3	49.0	73.6
3	65.3	98.2	50.0	75.2	86.1	129	60.4	90.8	46.4	69.8
4	61.3	92.1	47.2	71.0	78.5	118	55.6	83.5	43.1	64.8
5	56.4	84.8	43.9	66.0	69.6	105	50.0	75.1	39.2	58.9
6	51.1	76.7	40.1	60.3	60.2	90.5	43.8	65.9	34.8	52.4
7	45.3	68.2	36.0	54.2	50.7	76.1	37.6	56.5	30.3	45.6
8	39.5	59.4	31.9	47.9	41.5	62.4	31.4	47.3	25.9	38.9
9	33.9	50.9	27.7	41.7	33.2	49.8	25.7	38.6	21.6	32.4
10	28.5	42.8	23.7	35.7	26.9	40.4	20.8	31.2	17.6	26.5
11	23.6	35.4	19.9	29.9	22.2	33.4	17.2	25.8	14.6	21.9
12	19.8	29.8	16.7	25.2	18.7	28.0	14.4	21.7	12.2	18.4
13	16.9	25.4	14.3	21.4						
14	14.6	21.9	12.3	18.5						
Properties										
A_g (in.^{2})	3.61		3.03		4.50		3.42		2.87	
r_z (in.)	0.870		0.874		0.756		0.763		0.767	

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles



L5

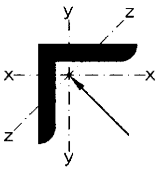
Shape		L5×5×											
		7/8		3/4		5/8		1/2		7/16		3/8[c]	
Wt/ft		27.3		23.7		20.1		16.3		14.4		12.4	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to least radius of gyration r_z	0	172	259	150	225	126	190	102	154	90.1	135	76.5	115
	1	171	256	148	223	125	188	102	153	89.4	134	75.9	114
	2	167	250	145	218	122	184	99.2	149	87.3	131	74.2	112
	3	160	240	139	209	118	177	95.4	143	84.0	126	71.4	107
	4	151	227	132	198	111	167	90.2	136	79.5	119	67.7	102
	5	141	211	122	184	104	156	84.1	126	74.1	111	63.2	94.9
	6	129	194	112	168	94.8	143	77.1	116	67.9	102	58.1	87.3
	7	116	174	101	152	85.5	128	69.6	105	61.4	92.2	52.6	79.0
	8	103	155	89.5	135	75.8	114	61.8	92.9	54.5	82.0	46.9	70.4
	9	89.7	135	78.1	117	66.2	99.6	54.0	81.2	47.7	71.7	41.1	61.8
	10	77.0	116	67.1	101	56.9	85.6	46.5	69.9	41.1	61.8	35.6	53.5
	11	64.9	97.5	56.6	85.0	48.1	72.3	39.4	59.2	34.9	52.4	30.3	45.5
	12	54.5	81.9	47.5	71.5	40.4	60.7	33.1	49.7	29.3	44.0	25.5	38.3
	13	46.4	69.8	40.5	60.9	34.4	51.7	28.2	42.4	25.0	37.5	21.7	32.6
	14	40.0	60.2	34.9	52.5	29.7	44.6	24.3	36.5	21.5	32.3	18.7	28.1
	15	34.9	52.4	30.4	45.7	25.9	38.9	21.2	31.8	18.7	28.2	16.3	24.5
	16	30.7	46.1	26.7	40.2	22.7	34.2	18.6	28.0	16.5	24.8	14.3	21.5

Properties

	7/8	3/4	5/8	1/2	7/16	3/8
A_g (in.^{2})	7.98	6.94	5.86	4.75	4.18	3.61
r_z (in.)	0.971	0.972	0.975	0.980	0.983	0.986

ASD	LRFD
Ω_c = 1.67	ϕ_c = 0.90

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



L5

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

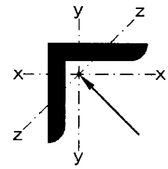
Shape	L5×5×		L5×3½×									
	5/16[c]		3/4		5/8		1/2		3/8[c]		5/16[c]	
Wt/ft	10.4		19.8		16.8		13.6		10.4		8.7	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z: 0	59.5	89.5	125	188	106	159	86.3	130	64.6	97.1	50.3	75.7
1	59.1	88.9	124	186	105	157	85.1	128	63.8	95.9	49.7	74.8
2	57.9	87.0	119	178	100	151	81.8	123	61.3	92.2	48.0	72.1
3	55.9	84.0	111	166	93.8	141	76.4	115	57.5	86.4	45.2	67.9
4	53.2	79.9	101	151	85.3	128	69.5	105	52.4	78.8	41.5	62.4
5	49.9	75.0	89.0	134	75.5	113	61.6	92.6	46.6	70.0	37.3	56.0
6	46.2	69.4	76.5	115	65.0	97.6	53.1	79.8	40.4	60.7	32.6	49.1
7	42.2	63.4	64.1	96.3	54.4	81.8	44.6	67.0	34.0	51.2	27.9	42.0
8	37.9	57.0	52.2	78.4	44.4	66.7	36.4	54.7	28.0	42.1	23.3	35.0
9	33.6	50.6	41.5	62.4	35.3	53.0	29.0	43.6	22.4	33.7	19.0	28.5
10	29.4	44.2	33.6	50.5	28.6	43.0	23.5	35.3	18.1	27.3	15.4	23.1
11	25.4	38.1	27.8	41.7	23.6	35.5	19.4	29.2	15.0	22.5	12.7	19.1
12	21.5	32.4	23.3	35.1	19.9	29.8	16.3	24.5	12.6	18.9	10.7	16.0
13	18.3	27.6										
14	15.8	23.8										
15	13.8	20.7										
16	12.1	18.2										
Properties												
A_g (in.²)	3.03		5.81		4.92		4.00		3.05		2.56	
r_z (in.)	0.990		0.744		0.746		0.750		0.755		0.758	

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

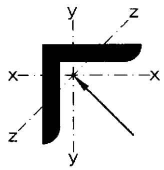


L5

Shape	L5×3½×		L5×3×									
	¼[c]		½		7/16		3/8[c]		5/16[c]		¼[c]	
Wt/ft	7.0		12.8		11.3		9.7		8.2		6.6	
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_z												
0	35.7	53.7	80.9	122	71.4	107	60.7	91.2	47.2	70.9	33.7	50.6
1	35.3	53.1	79.4	119	70.1	105	59.6	89.6	46.4	69.7	33.2	49.9
2	34.2	51.5	75.2	113	66.4	99.7	56.5	84.9	44.2	66.4	31.8	47.8
3	32.5	48.8	68.6	103	60.6	91.0	51.7	77.7	40.7	61.2	29.6	44.5
4	30.2	45.4	60.3	90.6	53.3	80.1	45.6	68.5	36.3	54.5	26.8	40.2
5	27.4	41.3	51.1	76.8	45.2	67.9	38.8	58.4	31.3	47.0	23.5	35.3
6	24.4	36.7	41.7	62.7	37.0	55.6	31.9	48.0	26.1	39.3	20.1	30.2
7	21.3	32.0	32.8	49.4	29.2	43.8	25.3	38.1	21.1	31.7	16.7	25.0
8	18.2	27.3	25.2	37.9	22.4	33.7	19.5	29.3	16.5	24.8	13.4	20.2
9	15.2	22.9	19.9	29.9	17.7	26.6	15.4	23.2	13.0	19.6	10.6	16.0
10	12.4	18.7	16.1	24.3	14.3	21.5	12.5	18.8	10.6	15.9	8.61	12.9
11	10.3	15.4										
12	8.64	13.0										
Properties												
A_g (in.^{2})	2.06		3.75		3.31		2.86		2.40		1.94	
r_z (in.)	0.761		0.642		0.644		0.646		0.649		0.652	

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



L4

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

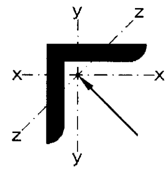
Shape	L4×4×											
	3/4		5/8		1/2		7/16		3/8		5/16	
Wt/ft	18.5		15.7		12.7		11.2		9.7		8.2	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to least radius of gyration r_z												
0	117	176	99.3	149	80.8	121	71.4	107	61.7	92.7	51.6	77.5
1	116	174	98.0	147	79.7	120	70.5	106	60.9	91.5	51.0	76.6
2	111	168	94.4	142	76.8	115	67.9	102	58.6	88.1	49.1	73.8
3	105	157	88.6	133	72.1	108	63.7	95.8	55.1	82.8	46.1	69.4
4	95.8	144	81.1	122	66.0	99.2	58.4	87.7	50.5	75.9	42.3	63.6
5	85.4	128	72.3	109	58.9	88.6	52.1	78.4	45.1	67.8	37.8	56.9
6	74.3	112	62.9	94.6	51.3	77.1	45.4	68.3	39.3	59.1	33.0	49.6
7	63.1	94.8	53.4	80.2	43.6	65.5	38.6	58.0	33.4	50.2	28.1	42.2
8	52.1	78.4	44.1	66.4	36.0	54.2	32.0	48.0	27.7	41.7	23.3	35.1
9	42.0	63.1	35.5	53.4	29.0	43.6	25.8	38.7	22.4	33.6	18.9	28.3
10	34.0	51.1	28.8	43.3	23.5	35.4	20.9	31.4	18.1	27.2	15.3	23.0
11	28.1	42.2	23.8	35.7	19.4	29.2	17.2	25.9	15.0	22.5	12.6	19.0
12	23.6	35.5	20.0	30.0	16.3	24.6	14.5	21.8	12.6	18.9	10.6	15.9
13											9.04	13.6
Properties												
A_g (in.^{2})	5.44		4.61		3.75		3.31		2.86		2.40	
r_z (in.)	0.774		0.774		0.776		0.777		0.779		0.781	

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

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

F_y = 36 ksi

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles



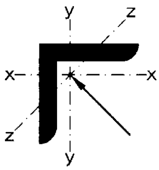
L4

Shape	L4×4×		L4×3½×								L4×3×	
	1/4[c]		1/2		3/8		5/16		1/4[c]		5/8	
Wt/ft	6.6		11.9		9.1		7.7		6.2		13.6	
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_z												
0	38.1	57.3	75.5	114	57.6	86.5	48.4	72.7	35.6	53.5	83.9	126
1	37.7	56.7	74.4	112	56.7	85.2	47.7	71.7	35.1	52.8	82.3	124
2	36.4	54.8	71.2	107	54.3	81.6	45.6	68.6	33.7	50.7	77.7	117
3	34.4	51.8	66.1	99.4	50.4	75.8	42.4	63.8	31.6	47.5	70.7	106
4	31.8	47.8	59.6	89.6	45.5	68.4	38.3	57.6	28.8	43.3	61.9	93.0
5	28.8	43.2	52.2	78.4	39.9	60.0	33.6	50.6	25.6	38.4	52.1	78.4
6	25.4	38.2	44.3	66.6	34.0	51.0	28.7	43.1	22.1	33.2	42.3	63.6
7	21.9	33.0	36.6	55.0	28.1	42.2	23.7	35.7	18.6	28.0	33.0	49.6
8	18.5	27.8	29.3	44.0	22.5	33.9	19.1	28.7	15.3	23.0	25.3	38.0
9	15.3	23.0	23.1	34.8	17.8	26.8	15.1	22.7	12.2	18.3	20.0	30.0
10	12.4	18.6	18.7	28.2	14.4	21.7	12.2	18.4	9.89	14.9	16.2	24.3
11	10.2	15.4	15.5	23.3	11.9	17.9	10.1	15.2	8.17	12.3		
12	8.61	12.9					8.49	12.8	6.87	10.3		
13	7.34	11.0										
Properties												
A_g (in.²)	1.94		3.50		2.67		2.25		1.81		3.89	
r_z (in.)	0.783		0.716		0.719		0.721		0.723		0.631	

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

[c] Shape is slender for compression with F_y = 36 ksi.

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



L4–L3½

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

Shape	L4×3×								L3½×3½×			
	½		3/8		5/16		¼[c]		½		7/16	
Wt/ft	11.1		8.5		7.1		5.8		11.1		9.8	
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	$\phi_c P_n$
Effective length *KL* (ft) with respect to least radius of gyration r_z	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
0	70.1	105	53.5	80.4	44.9	67.5	33.2	49.9	70.1	105	61.9	93.0
1	68.7	103	52.5	78.9	44.1	66.3	32.7	49.1	68.9	104	60.9	91.5
2	64.9	97.6	49.6	74.5	41.7	62.7	31.0	46.7	65.6	98.6	57.9	87.1
3	59.1	88.8	45.2	67.9	38.0	57.1	28.5	42.9	60.4	90.8	53.4	80.3
4	51.7	77.8	39.6	59.5	33.4	50.1	25.3	38.1	53.9	81.0	47.6	71.6
5	43.6	65.6	33.4	50.3	28.2	42.4	21.8	32.7	46.5	69.8	41.1	61.8
6	35.4	53.2	27.2	40.9	23.0	34.6	18.1	27.2	38.8	58.3	34.3	51.6
7	27.7	41.6	21.3	32.0	18.1	27.1	14.5	21.8	31.3	47.1	27.8	41.7
8	21.2	31.9	16.3	24.6	13.9	20.8	11.3	16.9	24.5	36.8	21.7	32.6
9	16.8	25.2	12.9	19.4	10.9	16.5	8.91	13.4	19.3	29.0	17.1	25.8
10	13.6	20.4	10.5	15.7	8.87	13.3	7.21	10.8	15.7	23.5	13.9	20.9
11									12.9	19.4	11.5	17.2

Properties

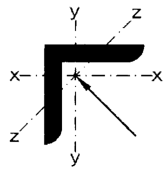
	L4×3×½	L4×3×3/8	L4×3×5/16	L4×3×¼	L3½×3½×½	L3½×3½×7/16
A_g (in.²)	3.25	2.48	2.09	1.69	3.25	2.87
r_z (in.)	0.633	0.636	0.638	0.639	0.679	0.681

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

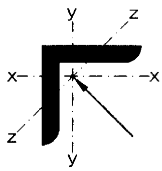


L3 1/2

Shape	L3 1/2×3 1/2×						L3 1/2×3×					
	3/8		5/16		1/4[c]		1/2		7/16		3/8	
Wt/ft	8.5		7.2		5.8		10.3		9.1		7.9	
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_z: 0	53.5	80.4	45.1	67.7	35.2	52.8	64.7	97.2	57.1	85.9	49.6	74.5
1	52.6	79.1	44.3	66.6	34.6	52.0	63.4	95.3	56.0	84.2	48.6	73.1
2	50.1	75.3	42.2	63.5	33.1	49.7	59.7	89.8	52.8	79.3	45.8	68.9
3	46.2	69.4	39.0	58.6	30.6	46.0	54.1	81.3	47.8	71.9	41.6	62.5
4	41.2	61.9	34.8	52.3	27.5	41.3	47.1	70.8	41.6	62.6	36.2	54.4
5	35.6	53.5	30.1	45.2	23.9	35.9	39.4	59.2	34.9	52.4	30.4	45.6
6	29.8	44.8	25.2	37.9	20.2	30.3	31.7	47.6	28.1	42.2	24.5	36.8
7	24.1	36.2	20.4	30.7	16.5	24.8	24.4	36.7	21.7	32.6	18.9	28.5
8	18.9	28.3	16.0	24.1	13.1	19.6	18.7	28.1	16.6	24.9	14.5	21.8
9	14.9	22.4	12.7	19.0	10.3	15.5	14.8	22.2	13.1	19.7	11.5	17.2
10	12.1	18.1	10.2	15.4	8.36	12.6	12.0	18.0	10.6	16.0	9.28	13.9
11	10.0	15.0	8.47	12.7	6.91	10.4						
Properties												
A_g (in.^{2})	2.48		2.09		1.69		3.00		2.65		2.30	
r_z (in.)	0.683		0.685		0.688		0.618		0.620		0.622	

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



L3½

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

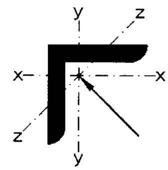
Shape	L3½×3×				L3½×2½×							
	5/16		1/4[c]		1/2		3/8		5/16		1/4[c]	
Wt/ft	6.7		5.4		9.4		7.2		6.1		4.9	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z: 0	41.6	62.5	32.5	48.8	59.3	89.1	45.5	68.4	38.4	57.7	30.0	45.0
1	40.8	61.3	31.9	47.9	57.7	86.7	44.3	66.6	37.4	56.2	29.2	43.9
2	38.5	57.9	30.1	45.3	53.3	80.0	40.9	61.5	34.6	51.9	27.1	40.7
3	34.9	52.5	27.5	41.3	46.6	70.0	35.8	53.9	30.3	45.6	23.9	36.0
4	30.5	45.8	24.1	36.2	38.6	58.0	29.8	44.8	25.2	37.9	20.1	30.2
5	25.6	38.5	20.4	30.7	30.3	45.6	23.5	35.3	19.9	29.9	16.0	24.1
6	20.7	31.0	16.6	25.0	22.5	33.9	17.5	26.3	14.9	22.4	12.2	18.3
7	16.0	24.1	13.1	19.6	16.6	24.9	12.9	19.3	11.0	16.5	8.98	13.5
8	12.3	18.4	10.0	15.1	12.7	19.1	9.85	14.8	8.40	12.6	6.88	10.3
9	9.69	14.6	7.92	11.9							5.43	8.17
10	7.85	11.8	6.41	9.64								
Properties												
A_g (in.^{2})	1.93		1.56		2.75		2.11		1.78		1.44	
r_z (in.)	0.624		0.628		0.532		0.535		0.538		0.541	

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles



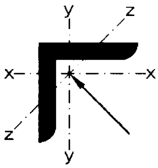
L3

Shape		L3×3×											
		1/2		7/16		3/8		5/16		1/4		3/16[c]	
Wt/ft		9.35		8.28		7.17		6.04		4.89		3.70	
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_z	0	59.2	89.0	52.4	78.8	45.4	68.3	38.3	57.5	31.0	46.5	21.4	32.1
	1	57.9	87.1	51.3	77.0	44.4	66.8	37.4	56.3	30.3	45.5	21.0	31.5
	2	54.1	81.4	47.9	72.0	41.5	62.4	35.0	52.6	28.3	42.6	19.7	29.7
	3	48.4	72.7	42.8	64.3	37.1	55.8	31.3	47.1	25.4	38.1	17.8	26.8
	4	41.3	62.1	36.6	55.0	31.7	47.7	26.8	40.3	21.7	32.6	15.5	23.3
	5	33.7	50.7	29.9	44.9	25.9	39.0	21.9	32.9	17.8	26.7	12.9	19.4
	6	26.3	39.5	23.3	35.0	20.3	30.5	17.1	25.8	13.9	20.9	10.4	15.6
	7	19.7	29.6	17.4	26.2	15.2	22.8	12.9	19.3	10.5	15.7	7.97	12.0
	8	15.1	22.7	13.4	20.1	11.6	17.5	9.84	14.8	8.01	12.0	6.10	9.17
	9	11.9	17.9	10.6	15.9	9.18	13.8	7.77	11.7	6.33	9.51	4.82	7.24

Properties						
A_g (in.^{2})	2.75	2.43	2.11	1.78	1.44	1.09
r_z (in.)	0.580	0.580	0.581	0.583	0.585	0.586

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



L3

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

Shape		L3×2½×											
		½		7/16		3/8		5/16		¼		3/16[c]	
Wt/ft		8.53		7.56		6.56		5.54		4.49		3.41	
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_z	0	53.9	81.0	47.6	71.6	41.4	62.2	36.0	54.1	28.2	42.4	19.6	29.4
	1	52.4	78.7	46.3	69.6	40.2	60.5	35.0	52.6	27.5	41.3	19.1	28.7
	2	48.1	72.3	42.5	63.9	36.9	55.5	32.2	48.3	25.2	37.9	17.7	26.6
	3	41.7	62.7	36.9	55.4	32.1	48.2	27.9	42.0	21.9	33.0	15.6	23.4
	4	34.2	51.3	30.2	45.4	26.3	39.5	22.9	34.4	18.0	27.1	13.0	19.6
	5	26.4	39.7	23.4	35.1	20.3	30.6	17.8	26.7	14.0	21.0	10.4	15.6
	6	19.3	29.0	17.0	25.6	14.9	22.3	13.0	19.5	10.3	15.4	7.84	11.8
	7	14.2	21.3	12.5	18.8	10.9	16.4	9.54	14.3	7.54	11.3	5.77	8.67
	8	10.8	16.3	9.59	14.4	8.36	12.6	7.31	11.0	5.77	8.67	4.42	6.64

Properties

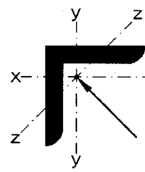
	1/2	7/16	3/8	5/16	1/4	3/16
A_g (in.^{2})	2.50	2.21	1.92	1.67	1.31	1.00
r_z (in.)	0.516	0.516	0.517	0.518	0.520	0.521

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles



L3–L2½

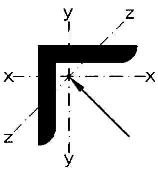
Shape	L3×2×										L2½×2½×	
	½		⅜		5/16		¼		3/16[c]		½	
Wt/ft	7.70		5.95		5.03		4.09		3.12		7.65	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**
Effective length *KL* (ft) with respect to least radius of gyration r_z 0	48.5	72.9	37.3	56.1	31.5	47.3	25.7	38.6	17.7	26.6	48.5	72.8
1	46.5	69.9	35.8	53.8	30.2	45.4	24.6	37.0	17.1	25.7	46.9	70.5
2	41.0	61.6	31.6	47.4	26.7	40.1	21.8	32.8	15.3	23.0	42.5	63.9
3	33.3	50.0	25.6	38.5	21.7	32.6	17.8	26.7	12.8	19.2	36.1	54.3
4	24.8	37.3	19.1	28.8	16.3	24.4	13.4	20.1	9.87	14.8	28.7	43.2
5	17.0	25.5	13.1	19.7	11.2	16.8	9.24	13.9	7.10	10.7	21.4	32.2
6	11.8	17.7	9.12	13.7	7.77	11.7	6.42	9.64	4.94	7.43	15.1	22.7
7	8.66	13.0	6.70	10.1	5.71	8.58	4.71	7.08	3.63	5.46	11.1	16.7
8											8.50	12.8

Properties

	L3×2×½	L3×2×⅜	L3×2×5/16	L3×2×¼	L3×2×3/16	L2½×2½×½
A_g (in.²)	2.25	1.73	1.46	1.19	0.902	2.25
r_z (in.)	0.425	0.426	0.428	0.431	0.435	0.481

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



L2$^{1}/_{2}$

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

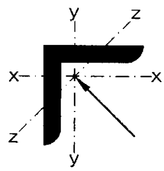
Shape		L2$^{1}/_{2}$×2$^{1}/_{2}$×								L2$^{1}/_{2}$×2×	
		$^{3}/_{8}$		$^{5}/_{16}$		$^{1}/_{4}$		$^{3}/_{16}$[c]		$^{3}/_{8}$	
Wt/ft		5.90		4.98		4.04		3.06		5.30	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z	0	37.4	56.1	31.5	47.4	25.6	38.4	19.1	28.7	33.4	50.2
	1	36.1	54.3	30.5	45.9	24.7	37.2	18.5	27.8	32.0	48.1
	2	32.8	49.2	27.7	41.6	22.4	33.7	16.8	25.2	28.1	42.2
	3	27.8	41.8	23.5	35.3	19.1	28.6	14.3	21.5	22.6	34.0
	4	22.1	33.2	18.7	28.1	15.2	22.8	11.4	17.2	16.7	25.2
	5	16.4	24.7	13.9	20.9	11.3	17.0	8.56	12.9	11.4	17.1
	6	11.6	17.4	9.82	14.8	7.98	12.0	6.87	9.13	7.88	11.8
	7	8.53	12.8	7.21	10.8	5.87	8.82	4.46	6.70		
	8	6.53	9.81	5.52	8.30	4.49	6.75	3.42	5.13		
Properties											
A_g (in.^{2})		1.73		1.46		1.19		0.900		1.55	
r_z (in.)		0.481		0.481		0.482		0.482		0.419	

ASD	LRFD
Ω_c = 1.67	ϕ_c = 0.90

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles



L2½

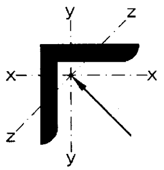
Shape	L2½×2×						L2½×1½×			
	5/16		1/4		3/16[c]		1/4		3/16[c]	
Wt/ft	4.49		3.65		2.78		3.22		2.47	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z: 0	28.2	42.4	22.9	34.3	17.1	25.8	20.2	30.4	15.2	22.8
1	27.1	40.7	21.9	32.9	16.5	24.7	18.8	28.2	14.1	21.2
2	23.8	35.7	19.3	29.0	14.5	21.9	15.1	22.6	11.4	17.1
3	19.2	28.8	15.6	23.4	11.8	17.8	10.4	15.7	8.00	12.0
4	14.2	21.4	11.6	17.4	8.89	13.4	6.30	9.47	4.89	7.36
5	9.66	14.5	7.90	11.9	6.13	9.21	4.03	6.06	3.13	4.71
6	6.71	10.1	5.49	8.25	4.26	6.40				
7	4.93	7.41	4.03	6.06	3.13	4.70				

Properties

	L2½×2×5/16	L2½×2×1/4	L2½×2×3/16	L2½×1½×1/4	L2½×1½×3/16
A_g (in.²)	1.31	1.06	0.809	0.938	0.715
r_z (in.)	0.420	0.423	0.426	0.321	0.324

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



L2

Table 4–11 (continued)
Available Strength in Axial Compression, kips
Concentrically Loaded Single Angles

F_y = 36 ksi

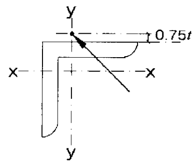
Shape		L2×2×									
		3/8		5/16		1/4		3/16		1/8[c]	
Wt/ft		4.65		3.94		3.21		2.46		1.67	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z	0	29.3	44.1	24.8	37.3	20.2	30.4	15.4	23.2	9.52	14.3
	1	27.9	41.9	23.6	35.4	19.2	28.9	14.7	22.0	9.09	13.7
	2	23.9	35.9	20.2	30.4	16.5	24.8	12.6	19.0	7.94	11.9
	3	18.5	27.9	15.7	23.6	12.8	19.3	9.82	14.8	6.33	9.52
	4	13.0	19.5	11.0	16.5	8.99	13.5	6.91	10.4	4.62	6.94
	5	8.45	12.7	7.15	10.7	5.86	8.81	4.51	6.78	3.09	4.64
	6	5.87	8.82	4.96	7.46	4.07	6.12	3.13	4.71	2.15	3.23

Properties					
A_g (in.^{2})	1.36	1.15	0.938	0.715	0.484
r_z (in.)	0.386	0.386	0.387	0.389	0.391

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	[c] Shape is slender for compression with F_y = 36 ksi. Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–12
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

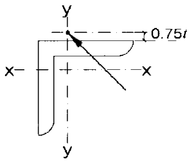


L8

Shape		L8×8×											
		1 1/8		1		7/8		3/4		5/8 [c]		9/16 [c]	
Wt/ft		57.2		51.3		45.3		39.2		33.0		29.8	
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_z	0	125	187	116	175	107	161	96.6	145	85.1	128	77.5	117
	1	124	187	116	174	107	160	96.5	145	84.9	128	77.4	116
	2	124	186	115	173	106	159	95.9	144	84.4	127	76.9	116
	3	122	184	114	172	105	158	95.0	143	83.6	126	76.2	115
	4	121	182	113	169	104	156	93.7	141	82.4	124	75.2	113
	5	119	178	111	166	102	153	92.0	138	81.0	122	73.9	111
	6	116	175	108	163	99.7	150	90.1	135	79.0	119	71.6	108
	7	113	171	106	159	97.2	146	87.8	132	76.3	115	69.2	104
	8	110	166	103	154	94.5	142	84.6	127	73.5	111	66.7	100
	9	107	161	99.5	150	91.0	137	81.4	122	70.6	106	64.0	96.2
	10	103	155	95.8	144	87.3	131	78.0	117	67.6	102	61.3	92.1
	11	99.1	149	91.6	138	83.5	125	74.5	112	64.5	97.0	58.5	88.0
	12	94.6	142	87.4	131	79.5	120	70.9	107	61.4	92.3	55.7	83.8
	13	90.0	135	83.1	125	75.6	114	67.3	101	58.2	87.5	52.9	79.5
	14	85.4	128	78.8	118	71.6	108	63.7	95.8	55.1	82.8	50.1	75.3
	15	80.8	121	74.5	112	67.6	102	60.1	90.4	51.9	78.1	47.2	71.0
	16	76.2	114	70.1	105	63.6	95.6	56.6	85.0	48.8	73.4	44.4	66.8
	17	71.6	108	65.8	98.9	59.7	89.7	53.0	79.7	45.7	68.7	41.7	62.6
	18	66.9	101	61.5	92.5	55.7	83.7	49.4	74.3	42.6	64.0	38.9	58.5
	19	62.6	94.1	57.5	86.4	52.0	78.2	46.1	69.3	39.7	59.6	36.2	54.5
	20	58.7	88.2	53.8	80.9	48.6	73.1	43.1	64.7	37.0	55.7	33.8	50.8
	21	55.0	82.7	50.4	75.8	45.6	68.5	40.3	60.6	34.6	52.0	31.6	47.5
	22	51.7	77.7	47.4	71.2	42.7	64.2	37.8	56.8	32.4	48.7	29.5	44.4
	23	48.7	73.1	44.5	66.9	40.2	60.4	35.5	53.3	30.4	45.7	27.7	41.6
	24	45.9	68.9	41.9	63.0	37.8	56.8	33.3	50.1	28.6	42.9	26.0	39.1
	25	43.3	65.1	39.6	59.4	35.6	53.5	31.4	47.2	26.9	40.4	24.5	36.8
	26					33.6	50.5	29.6	44.5	25.3	38.1	23.0	34.6
Properties													
A_g (in.^{2})		16.8		15.1		13.3		11.5		9.69		8.77	
r_z (in.)		1.56		1.56		1.57		1.57		1.58		1.58	

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



L8

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

F_y = 36 ksi

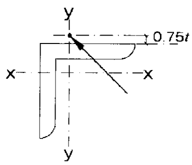
Shape	L8×8×		L8×6×									
	1/2[c,f]		1		7/8		3/4		5/8[c]		9/16[c]	
Wt/ft	26.7		44.4		39.3		34.0		28.6		25.9	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to least radius of gyration r_z												
0	68.4	103	93.8	141	87.6	132	80.0	120	70.7	106	64.4	96.8
1	68.2	103	93.5	141	87.3	131	79.6	120	70.4	106	64.1	96.3
2	67.9	102	92.6	139	86.2	130	78.5	118	69.3	104	63.2	95.0
3	67.2	101	90.9	137	84.4	127	76.8	115	67.8	102	61.8	92.9
4	66.4	99.8	88.5	133	82.1	123	74.6	112	65.8	99.0	60.0	90.2
5	65.3	98.1	85.7	129	79.3	119	72.1	108	63.5	95.5	57.9	87.0
6	63.5	95.5	82.4	124	76.3	115	69.2	104	60.9	91.6	55.6	83.5
7	61.4	92.2	78.9	119	72.9	110	66.1	99.3	58.1	87.3	53.0	79.7
8	59.1	88.8	75.2	113	69.4	104	62.8	94.3	55.1	82.9	50.3	75.6
9	56.8	85.3	71.3	107	65.7	98.7	59.4	89.2	52.1	78.2	47.5	71.4
10	54.4	81.8	67.2	101	61.9	93.0	55.9	84.0	48.9	73.5	44.7	67.2
11	52.0	78.1	63.2	95.0	58.1	87.3	52.3	78.7	45.8	68.8	41.8	62.9
12	49.5	74.4	59.1	88.9	54.3	81.5	48.8	73.4	42.7	64.1	39.0	58.6
13	47.0	70.7	55.1	82.8	50.5	75.9	45.4	68.2	39.6	59.5	36.2	54.4
14	44.6	67.0	51.1	76.8	46.8	70.3	42.0	63.1	36.6	55.0	33.5	50.3
15	42.1	63.3	47.2	70.9	43.1	64.8	38.6	58.0	33.6	50.5	30.8	46.3
16	39.7	59.6	43.6	65.5	39.8	59.8	35.6	53.5	30.9	46.4	28.3	42.5
17	37.3	56.0	40.4	60.7	36.8	55.3	32.9	49.4	28.5	42.8	26.1	39.2
18	34.9	52.5	37.5	56.4	34.1	51.3	30.4	45.7	26.3	39.6	24.1	36.2
19	32.5	48.9	34.9	52.4	31.7	47.6	28.2	42.4	24.4	36.6	22.3	33.5
20	30.3	45.6	32.5	48.9	29.5	44.4	26.2	39.4	22.6	34.0	20.7	31.1
21	28.3	42.6	30.4	45.7	27.5	41.4	24.5	36.8	21.1	31.7	19.2	28.9
22	26.5	39.8										
23	24.8	37.3										
24	23.3	35.0										
25	21.9	32.9										
26	20.6	31.0										
Properties												
A_g (in.^{2})	7.84		13.1		11.5		9.99		8.41		7.61	
r_z (in.)	1.59		1.28		1.28		1.29		1.29		1.30	

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

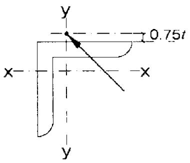


L8

Shape		L8×6×				L8×4×							
		1/2[c,f]		7/16[c,f]		1		7/8		3/4		5/8[c]	
Wt/ft		23.2		20.4		37.6		33.3		28.9		24.4	
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_z	0	57.4	86.3	49.6	74.6	58.5	87.9	55.3	83.1	51.5	77.5	46.9	70.4
	1	57.1	85.9	49.4	74.2	58.0	87.2	54.9	82.5	51.1	76.9	46.5	69.8
	2	56.4	84.7	48.7	73.2	56.8	85.4	53.7	80.6	49.9	75.1	45.3	68.2
	3	55.1	82.9	47.7	71.7	54.9	82.5	51.8	77.8	48.1	72.3	43.6	65.5
	4	53.6	80.5	46.4	69.7	52.4	78.8	49.3	74.1	45.7	68.7	41.3	62.1
	5	51.7	77.7	44.8	67.3	49.5	74.5	46.5	69.9	43.0	64.6	38.7	58.2
	6	49.6	74.6	43.0	64.6	46.3	69.6	43.3	65.1	40.0	60.1	35.9	54.0
	7	47.4	71.2	41.1	61.7	42.9	64.5	40.0	60.2	36.8	55.3	32.9	49.5
	8	45.0	67.6	39.0	58.7	39.4	59.2	36.6	55.1	33.6	50.5	30.0	45.0
	9	42.5	63.9	36.9	55.5	35.9	53.9	33.3	50.0	30.4	45.6	27.0	40.6
	10	40.0	60.1	34.8	52.3	32.3	48.6	29.9	44.9	27.2	40.9	24.1	36.3
	11	37.5	56.3	32.6	49.1	29.1	43.8	26.9	40.4	24.4	36.6	21.6	32.4
	12	35.0	52.6	30.5	45.9	26.4	39.6	24.2	36.4	21.9	33.0	19.3	29.1
	13	32.5	48.9	28.4	42.7	23.9	36.0	22.0	33.0	19.8	29.8	17.4	26.2
	14	30.1	45.3	26.4	39.7	21.8	32.8	20.0	30.0	18.0	27.0	15.8	23.7
	15	27.8	41.8	24.4	36.7								
	16	25.5	38.4	22.5	33.9								
	17	23.5	35.3	20.7	31.2								
	18	21.7	32.6	19.1	28.8								
	19	20.1	30.2	17.7	26.6								
	20	18.6	28.0	16.4	24.7								
	21	17.3	26.0	15.3	23.0								
Properties													
A_g (in.^{2})		6.80		5.99		11.1		9.79		8.49		7.16	
r_z (in.)		1.30		1.31		0.844		0.846		0.850		0.856	

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



L8–L7

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

F_y = 36 ksi

Shape	L8×4×						L7×4×					
	9/16[c]		1/2[c,f]		7/16[c,f]		3/4		5/8		1/2[c]	
Wt/ft	22.1		19.7		17.4		26.2		22.1		17.9	
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_z												
0	43.5	65.4	39.5	59.4	34.7	52.2	48.7	73.2	44.3	66.6	38.2	57.4
1	43.1	64.8	39.2	58.9	34.4	51.8	48.3	72.6	43.9	66.0	37.8	56.9
2	42.1	63.3	38.2	57.5	33.6	50.5	47.1	70.8	42.8	64.3	36.9	55.4
3	40.4	60.8	36.7	55.2	32.3	48.6	45.4	68.2	41.1	61.8	35.4	53.2
4	38.3	57.6	34.8	52.3	30.7	46.1	43.1	64.8	39.0	58.6	33.5	50.3
5	35.9	54.0	32.6	49.0	28.8	43.3	40.5	60.9	36.5	54.9	31.3	47.0
6	33.3	50.0	30.2	45.5	26.8	40.2	37.6	56.6	33.8	50.8	28.9	43.5
7	30.5	45.9	27.8	41.8	24.7	37.1	34.6	52.1	31.0	46.6	26.5	39.8
8	27.8	41.7	25.3	38.1	22.6	33.9	31.6	47.5	28.2	42.4	24.0	36.1
9	25.1	37.7	22.9	34.4	20.5	30.8	28.5	42.9	25.4	38.2	21.6	32.5
10	22.4	33.7	20.5	30.9	18.4	27.7	25.6	38.4	22.7	34.1	19.3	29.0
11	20.0	30.1	18.3	27.5	16.5	24.7	22.9	34.4	20.2	30.4	17.1	25.7
12	17.9	26.9	16.4	24.6	14.7	22.1	20.6	30.9	18.1	27.2	15.3	23.0
13	16.1	24.3	14.7	22.2	13.2	19.9	18.5	27.9	16.3	24.5	13.7	20.7
14	14.6	21.9	13.3	20.0	12.0	18.0	16.8	25.3	14.7	22.1	12.4	18.6

Properties

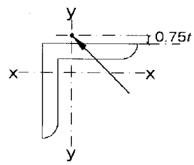
	L8×4×9/16	L8×4×1/2	L8×4×7/16	L7×4×3/4	L7×4×5/8	L7×4×1/2
A_g (in.^{2})	6.49	5.80	5.11	7.70	6.50	5.26
r_z (in.)	0.859	0.863	0.867	0.855	0.860	0.866

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles



L7–L6

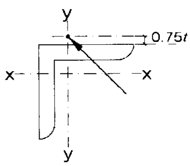
Shape		L7×4×				L6×6×							
		7/16[c,f]		3/8[c,f]		1		7/8		3/4		5/8	
Wt/ft		15.8		13.6		37.5		33.2		28.8		24.3	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**
Effective length *KL* (ft) with respect to least radius of gyration r_z	**0**	**34.0**	51.1	**28.9**	43.4	**76.7**	115	**71.3**	107	**65.1**	97.9	**58.1**	87.3
	1	**33.7**	50.6	**28.6**	43.1	**76.5**	115	**71.1**	107	**64.9**	97.6	**57.9**	87.0
	2	**32.8**	49.3	**27.9**	42.0	**75.7**	114	**70.4**	106	**64.2**	96.6	**57.3**	86.1
	3	**31.5**	47.3	**26.8**	40.3	**74.5**	112	**69.2**	104	**63.2**	94.9	**56.3**	84.6
	4	**29.8**	44.8	**25.4**	38.2	**72.8**	109	**67.6**	102	**61.7**	92.7	**54.9**	82.6
	5	**27.8**	41.8	**23.8**	35.8	**70.7**	106	**65.5**	98.5	**59.8**	89.9	**53.2**	80.0
	6	**25.7**	38.7	**22.1**	33.2	**68.2**	102	**63.2**	94.9	**57.6**	86.5	**51.2**	76.9
	7	**23.6**	35.5	**20.3**	30.5	**65.3**	98.2	**60.5**	90.9	**55.1**	82.8	**48.6**	73.0
	8	**21.4**	32.2	**18.5**	27.8	**62.2**	93.5	**57.6**	86.5	**52.1**	78.3	**45.8**	68.9
	9	**19.3**	29.1	**16.8**	25.2	**58.9**	88.5	**54.3**	81.6	**49.0**	73.6	**43.0**	64.6
	10	**17.3**	26.0	**15.1**	22.7	**55.4**	83.3	**50.8**	76.4	**45.7**	68.8	**40.1**	60.3
	11	**15.4**	23.1	**13.5**	20.2	**51.6**	77.6	**47.3**	71.1	**42.5**	63.9	**37.2**	55.9
	12	**13.7**	20.6	**12.0**	18.1	**47.8**	71.9	**43.7**	65.7	**39.3**	59.0	**34.3**	51.6
	13	**12.3**	18.5	**10.8**	16.2	**44.1**	66.2	**40.2**	60.4	**36.1**	54.2	**31.5**	47.3
	14	**11.1**	16.7	**9.71**	14.6	**40.4**	60.7	**36.8**	55.3	**32.9**	49.5	**28.7**	43.1
	15					**37.1**	55.7	**33.7**	50.7	**30.1**	45.3	**26.2**	39.4
	16					**34.1**	51.3	**31.0**	46.6	**27.6**	41.5	**24.0**	36.1
	17					**31.5**	47.3	**28.6**	42.9	**25.4**	38.2	**22.0**	33.1
	18					**29.1**	43.8	**26.4**	39.7	**23.5**	35.3	**20.3**	30.5
	19					**27.0**	40.6	**24.4**	36.7	**21.7**	32.6	**18.8**	28.2

Properties

	L7×4×7/16	L7×4×3/8	L6×6×1	L6×6×7/8	L6×6×3/4	L6×6×5/8
A_g (in.^{2})	4.63	4.00	11.0	9.75	8.46	7.13
r_z (in.)	0.869	0.873	1.17	1.17	1.17	1.17

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



L6

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

F_y = 36 ksi

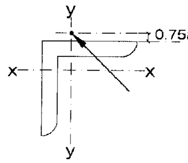
Shape		L6×6×										L6×4×	
		9/16		1/2		7/16[c]		3/8[c,f]		5/16[c,f]		7/8	
Wt/ft		22.0		19.6		17.3		14.9		12.5		27.2	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z	0	54.2	81.4	49.9	75.0	44.8	67.4	38.3	57.5	29.4	44.1	49.3	74.2
	1	54.0	81.1	49.8	74.8	44.7	67.2	38.1	57.3	29.3	44.0	49.0	73.7
	2	53.4	80.3	49.2	74.0	44.2	66.5	37.8	56.7	29.0	43.6	47.9	72.0
	3	52.5	78.9	48.4	72.7	43.5	65.3	37.1	55.8	28.6	43.0	46.2	69.4
	4	51.2	77.0	47.2	70.9	42.4	63.7	36.3	54.5	28.0	42.1	43.9	66.0
	5	49.6	74.6	45.5	68.4	40.6	61.0	34.7	52.2	27.3	41.0	41.3	62.1
	6	47.4	71.2	43.3	65.1	38.6	58.0	33.1	49.7	26.4	39.7	38.4	57.8
	7	44.9	67.5	41.0	61.7	36.6	54.9	31.3	47.1	25.3	38.1	35.4	53.2
	8	42.4	63.7	38.7	58.1	34.4	51.7	29.5	44.4	23.9	35.9	32.4	48.6
	9	39.7	59.7	36.2	54.4	32.2	48.5	27.7	41.6	22.5	33.8	29.3	44.0
	10	37.0	55.6	33.7	50.7	30.0	45.2	25.8	38.8	21.0	31.6	26.2	39.4
	11	34.3	51.6	31.2	47.0	27.8	41.8	24.0	36.1	19.6	29.4	23.5	35.4
	12	31.6	47.5	28.8	43.3	25.7	38.6	22.2	33.3	18.2	27.3	21.2	31.8
	13	29.0	43.6	26.3	39.6	23.5	35.3	20.4	30.6	16.8	25.2	19.1	28.7
	14	26.4	39.6	24.0	36.0	21.4	32.1	18.6	27.9	15.4	23.1	17.3	26.1
	15	24.1	36.2	21.8	32.8	19.5	29.3	16.9	25.4	14.0	21.1		
	16	22.0	33.1	20.0	30.0	17.8	26.7	15.4	23.2	12.8	19.3		
	17	20.2	30.4	18.3	27.5	16.3	24.5	14.1	21.2	11.7	17.6		
	18	18.6	28.0	16.9	25.3	15.0	22.5	13.0	19.5	10.8	16.2		
	19	17.2	25.9	15.6	23.4	13.8	20.8	12.0	18.0	9.91	14.9		
Properties													
A_g (in.^{2})		6.45		5.77		5.08		4.38		3.67		7.98	
r_z (in.)		1.18		1.18		1.18		1.19		1.19		0.854	

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles



L6

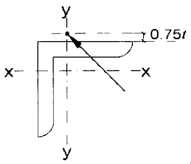
Shape	L6×4×									
	3/4		5/8		9/16		1/2		7/16[c]	
Wt/ft	23.6		19.9		18.1		16.2		14.2	
Design	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length KL (ft) with respect to least radius of gyration r_z										
0	46.1	69.3	41.9	63.0	39.4	59.3	36.6	55.1	33.1	49.8
1	45.7	68.7	41.5	62.4	39.0	58.7	36.3	54.5	32.8	49.3
2	44.5	66.9	40.4	60.7	38.0	57.1	35.3	53.0	31.9	47.9
3	42.8	64.3	38.8	58.3	36.4	54.7	33.8	50.8	30.5	45.8
4	40.6	61.0	36.7	55.2	34.4	51.7	31.9	47.9	28.8	43.3
5	38.1	57.2	34.3	51.6	32.2	48.3	29.8	44.7	26.8	40.3
6	35.3	53.1	31.8	47.7	29.7	44.6	27.4	41.2	24.7	37.2
7	32.5	48.8	29.1	43.7	27.2	40.8	25.0	37.6	22.6	33.9
8	29.6	44.4	26.4	39.7	24.6	37.0	22.7	34.0	20.4	30.7
9	26.7	40.1	23.7	35.7	22.1	33.2	20.3	30.5	18.3	27.5
10	23.8	35.8	21.1	31.8	19.6	29.5	18.0	27.1	16.2	24.4
11	21.3	32.0	18.8	28.3	17.4	26.2	16.0	24.0	14.3	21.6
12	19.1	28.7	16.8	25.3	15.6	23.4	14.2	21.4	12.8	19.2
13	17.2	25.9	15.1	22.7	14.0	21.0	12.7	19.1	11.4	17.2
14	15.6	23.4	13.6	20.5	12.6	18.9	11.5	17.2	10.3	15.4

Properties

	3/4	5/8	9/16	1/2	7/16
A_g (in.^{2})	6.94	5.86	5.31	4.75	4.18
r_z (in.)	0.856	0.859	0.861	0.864	0.867

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



L6

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

F_y = 36 ksi

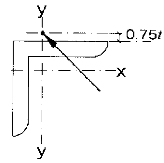
Shape		L6×4×				L6×3½×					
		3/8 [c,f]		5/16 [c,f]		1/2		3/8 [c,f]		5/16 [c,f]	
Wt/ft		12.3		10.3		15.4		11.7		9.83	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z	0	28.7	43.1	23.4	35.2	32.1	48.2	25.5	38.4	21.0	31.5
	1	28.4	42.7	23.2	34.9	31.7	47.6	25.2	37.9	20.7	31.2
	2	27.6	41.5	22.6	33.9	30.7	46.1	24.4	36.7	20.1	30.2
	3	26.5	39.8	21.6	32.5	29.1	43.7	23.1	34.8	19.0	28.6
	4	25.0	37.5	20.4	30.7	27.1	40.8	21.6	32.4	17.8	26.8
	5	23.3	35.0	19.1	28.7	24.9	37.5	19.8	29.8	16.4	24.7
	6	21.5	32.3	17.6	26.5	22.6	34.0	17.9	27.0	15.0	22.5
	7	19.6	29.5	16.2	24.3	20.2	30.4	16.1	24.2	13.5	20.3
	8	17.8	26.7	14.7	22.1	17.9	26.9	14.3	21.5	12.1	18.1
	9	15.9	24.0	13.3	20.0	15.7	23.6	12.6	18.9	10.7	16.1
	10	14.2	21.4	11.9	17.9	13.8	20.7	11.0	16.5	9.37	14.1
	11	12.6	18.9	10.6	16.0	12.2	18.3	9.68	14.5	8.25	12.4
	12	11.2	16.8	9.43	14.2	10.8	16.2	8.57	12.9	7.31	11.0
	13	10.0	15.0	8.43	12.7						
	14	8.98	13.5	7.58	11.4						
Properties											
A_g (in.²)		3.61		3.03		4.52		3.44		2.89	
r_z (in.)		0.870		0.874		0.756		0.763		0.767	

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles



L5

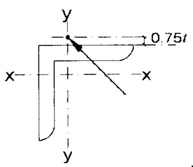
Shape		L5×5×											
		7/8		3/4		5/8		1/2		7/16		3/8[c]	
Wt/ft		27.3		23.7		20.1		16.3		14.4		12.4	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z	0	54.8	82.4	50.5	75.9	45.4	68.3	39.5	59.3	36.1	54.3	32.2	48.4
	1	54.6	82.0	50.2	75.5	45.2	67.9	39.3	59.0	35.9	54.0	32.0	48.1
	2	53.8	80.8	49.5	74.4	44.5	66.9	38.7	58.2	35.4	53.2	31.5	47.4
	3	52.5	79.0	48.3	72.6	43.5	65.3	37.7	56.7	34.5	51.9	30.8	46.2
	4	50.8	76.4	46.7	70.2	42.0	63.1	36.4	54.8	33.3	50.1	29.4	44.2
	5	48.7	73.3	44.7	67.2	40.2	60.4	34.7	52.2	31.5	47.3	27.7	41.7
	6	46.3	69.6	42.5	63.8	38.1	57.2	32.6	48.9	29.5	44.3	26.0	39.0
	7	43.6	65.6	39.9	60.0	35.5	53.3	30.3	45.5	27.4	41.1	24.1	36.2
	8	40.7	61.2	37.1	55.7	32.8	49.3	28.0	42.0	25.2	37.9	22.2	33.4
	9	37.6	56.6	34.1	51.2	30.1	45.2	25.6	38.5	23.1	34.7	20.3	30.5
	10	34.4	51.7	31.1	46.7	27.4	41.2	23.2	34.9	20.9	31.5	18.4	27.7
	11	31.1	46.8	28.1	42.2	24.7	37.1	20.9	31.4	18.8	28.3	16.6	24.9
	12	28.1	42.2	25.2	37.9	22.1	33.3	18.7	28.1	16.8	25.3	14.8	22.2
	13	25.4	38.2	22.8	34.3	19.9	30.0	16.8	25.3	15.1	22.7	13.2	19.9
	14	23.1	34.7	20.6	31.0	18.0	27.1	15.2	22.8	13.6	20.4	11.9	17.9
	15	21.0	31.6	18.8	28.2	16.4	24.6	13.7	20.6	12.3	18.5	10.8	16.2
	16	19.2	28.9	17.1	25.8	14.9	22.4	12.5	18.8	11.2	16.8	9.77	14.7

Properties

	7/8	3/4	5/8	1/2	7/16	3/8
A_g (in.^{2})	8.02	6.98	5.90	4.79	4.22	3.65
r_z (in.)	0.971	0.972	0.975	0.980	0.983	0.986

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.



L5

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

F_y = 36 ksi

Shape		L5×5×		L5×3½×									
		5/16[c,f]		3/4		5/8		1/2		3/8[c]		5/16[c,f]	
Wt/ft		10.4		19.8		16.8		13.6		10.4		8.72	
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_z	0	26.8	40.3	36.7	55.2	33.8	50.8	30.0	45.1	24.7	37.1	20.9	31.3
	1	26.7	40.1	36.4	54.7	33.4	50.3	29.6	44.5	24.4	36.6	20.6	30.9
	2	26.3	39.5	35.4	53.2	32.3	48.6	28.5	42.9	23.5	35.3	19.8	29.8
	3	25.7	38.6	33.7	50.6	30.7	46.1	27.0	40.6	22.2	33.3	18.7	28.2
	4	24.6	36.9	31.5	47.4	28.7	43.1	25.1	37.8	20.6	30.9	17.4	26.1
	5	23.2	34.8	29.1	43.8	26.4	39.6	23.0	34.6	18.8	28.2	15.9	23.9
	6	21.7	32.6	26.6	39.9	24.0	36.0	20.8	31.3	16.9	25.4	14.3	21.6
	7	20.2	30.3	23.9	36.0	21.5	32.3	18.6	28.0	15.1	22.6	12.8	19.2
	8	18.6	28.0	21.3	32.0	19.0	28.6	16.4	24.7	13.2	19.9	11.3	16.9
	9	17.1	25.7	18.7	28.2	16.7	25.1	14.3	21.5	11.5	17.3	9.83	14.8
	10	15.5	23.4	16.5	24.9	14.7	22.0	12.5	18.8	10.0	15.0	8.54	12.8
	11	14.0	21.1	14.7	22.1	13.0	19.5	11.0	16.6	8.77	13.2	7.48	11.2
	12	12.6	18.9	13.1	19.7	11.5	17.3	9.77	14.7	7.74	11.6	6.59	9.91
	13	11.2	16.9										
	14	10.1	15.2										
	15	9.11	13.7										
	16	8.26	12.4										

Properties

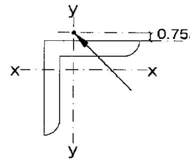
	L5×5×5/16	L5×3½×3/4	L5×3½×5/8	L5×3½×1/2	L5×3½×3/8	L5×3½×5/16
A_g (in.²)	3.07	5.82	4.93	4.00	3.05	2.56
r_z (in.)	0.990	0.744	0.746	0.750	0.755	0.758

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

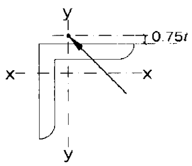


L5

Shape		L5×3½×		L5×3×									
		¼[c,f]		½		7/16		3/8[c]		5/16[c,f]		¼[c,f]	
Wt/ft		7.03		12.8		11.3		9.74		8.19		6.60	
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_z	0	16.1	24.3	25.2	37.9	23.4	35.2	21.1	31.8	18.0	27.1	14.0	21.1
	1	15.9	24.0	24.8	37.3	23.0	34.6	20.8	31.3	17.7	26.7	13.8	20.8
	2	15.4	23.1	23.8	35.7	22.0	33.1	19.9	29.8	16.9	25.5	13.2	19.8
	3	14.6	21.9	22.2	33.4	20.5	30.8	18.5	27.8	15.8	23.7	12.3	18.5
	4	13.5	20.3	20.3	30.5	18.7	28.1	16.8	25.3	14.3	21.5	11.3	16.9
	5	12.4	18.6	18.2	27.4	16.8	25.2	15.0	22.6	12.8	19.3	10.1	15.2
	6	11.2	16.9	16.1	24.2	14.7	22.1	13.2	19.8	11.3	16.9	9.01	13.5
	7	10.1	15.2	14.0	21.0	12.8	19.2	11.4	17.1	9.78	14.7	7.89	11.9
	8	8.98	13.5	12.0	18.0	10.9	16.4	9.71	14.6	8.36	12.6	6.83	10.3
	9	7.91	11.9	10.3	15.5	9.39	14.1	8.33	12.5	7.17	10.8	5.85	8.79
	10	6.90	10.4	9.00	13.5	8.15	12.2	7.22	10.9	6.20	9.32	5.06	7.60
	11	6.04	9.08										
	12	5.33	8.01										
Properties													
A_g (in.^{2})		2.07		3.75		3.31		2.86		2.41		1.94	
r_z (in.)		0.761		0.642		0.644		0.646		0.649		0.652	

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



L4

Table 4–12 (continued)
Available Strength in Axial Compression, kips

Eccentrically Loaded Single Angles

F_y = 36 ksi

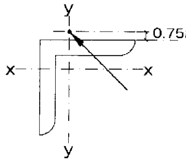
Shape	L4×4×											
	3/4		5/8		1/2		7/16		3/8		5/16[c]	
Wt/ft	18.5		15.7		12.7		11.2		9.72		8.16	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**
Effective length *KL* (ft) with respect to least radius of gyration r_z												
0	36.1	54.2	32.8	49.2	28.8	43.3	26.5	39.8	23.9	35.9	21.0	31.6
1	35.8	53.8	32.5	48.9	28.6	42.9	26.3	39.5	23.7	35.6	20.8	31.3
2	35.0	52.7	31.8	47.8	27.9	41.9	25.6	38.5	23.2	34.8	20.3	30.6
3	33.8	50.8	30.6	46.0	26.8	40.3	24.7	37.1	22.2	33.4	19.5	29.3
4	32.1	48.3	29.0	43.6	25.4	38.2	23.3	35.1	20.9	31.4	18.1	27.3
5	30.1	45.2	27.2	40.8	23.7	35.6	21.6	32.4	19.2	28.9	16.6	25.0
6	27.8	41.8	25.0	37.6	21.6	32.4	19.6	29.5	17.5	26.3	15.1	22.7
7	25.4	38.1	22.6	34.0	19.4	29.2	17.6	26.5	15.7	23.6	13.5	20.3
8	22.8	34.2	20.2	30.4	17.3	26.0	15.6	23.5	13.9	20.9	11.9	18.0
9	20.1	30.2	17.8	26.7	15.1	22.7	13.7	20.6	12.1	18.2	10.4	15.6
10	17.7	26.6	15.6	23.4	13.2	19.9	11.9	17.9	10.5	15.8	9.03	13.6
11	15.7	23.6	13.8	20.7	11.6	17.5	10.5	15.8	9.24	13.9	7.90	11.9
12	14.0	21.0	12.2	18.4	10.3	15.5	9.26	13.9	8.15	12.3	6.96	10.5
13											6.17	9.27
Properties												
A_g (in.^{2})	5.43		4.61		3.75		3.30		2.86		2.40	
r_z (in.)	0.774		0.774		0.776		0.777		0.779		0.781	

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

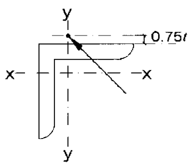


L4

Shape		L4×4×		L4×3½×								L4×3×	
		1/4[c,f]		1/2		3/8		5/16[c]		1/4[c,f]		5/8	
Wt/ft		6.58		11.9		9.10		7.65		6.18		13.6	
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_z	0	16.9	25.3	26.8	40.3	22.6	33.9	20.0	30.1	16.3	24.5	25.8	38.8
	1	16.7	25.2	26.5	39.9	22.3	33.6	19.8	29.8	16.0	24.0	25.5	38.3
	2	16.4	24.6	25.7	38.7	21.5	32.4	18.9	28.4	15.2	22.9	24.5	36.9
	3	15.7	23.5	24.4	36.7	20.2	30.3	17.6	26.5	14.2	21.4	22.9	34.5
	4	14.6	21.9	22.6	34.0	18.6	28.0	16.2	24.4	13.1	19.7	21.0	31.6
	5	13.4	20.1	20.6	30.9	16.9	25.4	14.7	22.1	11.9	17.9	18.9	28.4
	6	12.2	18.3	18.5	27.8	15.1	22.7	13.1	19.7	10.6	16.0	16.7	25.0
	7	10.9	16.4	16.4	24.6	13.3	20.0	11.5	17.3	9.37	14.1	14.5	21.7
	8	9.69	14.6	14.3	21.4	11.5	17.3	9.96	15.0	8.15	12.3	12.4	18.7
	9	8.50	12.8	12.3	18.5	9.91	14.9	8.53	12.8	6.99	10.5	10.7	16.1
	10	7.36	11.1	10.7	16.1	8.59	12.9	7.37	11.1	6.02	9.05	9.34	14.0
	11	6.43	9.66	9.41	14.1	7.50	11.3	6.42	9.66	5.23	7.86		
	12	5.65	8.49					5.64	8.47	4.58	6.88		
	13	5.00	7.51										
Properties													
A_g (in.²)		1.93		3.50		2.68		2.25		1.82		3.99	
r_z (in.)		0.783		0.716		0.719		0.721		0.723		0.631	

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



L4–L3½

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

F_y = 36 ksi

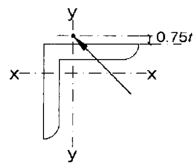
Shape	L4×3×								L3½×3½×			
	½		⅜		$^5/_{16}$[c]		¼[c,f]		½		$^7/_{16}$	
Wt/ft	11.1		8.47		7.12		5.75		11.1		9.82	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z												
0	23.2	34.9	19.8	29.7	17.5	26.2	14.2	21.3	24.0	36.1	22.2	33.4
1	22.9	34.4	19.4	29.1	17.1	25.7	13.9	20.9	23.8	35.7	22.0	33.0
2	21.9	32.9	18.4	27.7	16.2	24.4	13.2	19.8	23.1	34.7	21.3	32.0
3	20.3	30.6	17.1	25.6	15.0	22.5	12.2	18.3	21.9	33.0	20.3	30.5
4	18.5	27.9	15.4	23.2	13.5	20.4	11.0	16.6	20.5	30.8	18.9	28.4
5	16.6	24.9	13.7	20.6	12.0	18.0	9.78	14.7	18.7	28.2	17.1	25.8
6	14.5	21.9	12.0	18.0	10.4	15.7	8.53	12.8	16.7	25.1	15.3	22.9
7	12.5	18.9	10.3	15.4	8.91	13.4	7.31	11.0	14.7	22.0	13.4	20.1
8	10.7	16.1	8.68	13.1	7.51	11.3	6.17	9.28	12.6	19.0	11.5	17.3
9	9.19	13.8	7.42	11.2	6.40	9.62	5.24	7.88	10.9	16.4	9.87	14.8
10	7.97	12.0	6.40	9.62	5.50	8.27	4.50	6.76	9.45	14.2	8.55	12.8
11									8.26	12.4	7.46	11.2
Properties												
A_g (in.²)	3.25		2.49		2.09		1.69		3.27		2.89	
r_z (in.)	0.633		0.636		0.638		0.639		0.679		0.681	

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles



L3½

Shape	L3½×3½×						L3½×3×					
	3/8		5/16		1/4[c]		1/2		7/16		3/8	
Wt/ft	8.51		7.16		5.79		10.3		9.09		7.88	
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_z												
0	20.2	30.3	17.9	26.9	15.1	22.6	21.8	32.8	20.4	30.6	18.7	28.1
1	20.0	30.0	17.7	26.6	14.9	22.4	21.6	32.4	20.1	30.2	18.4	27.7
2	19.4	29.1	17.2	25.8	14.5	21.7	20.7	31.1	19.3	29.0	17.6	26.4
3	18.4	27.7	16.3	24.4	13.5	20.3	19.3	29.1	17.9	26.9	16.2	24.4
4	17.0	25.6	14.9	22.4	12.4	18.6	17.6	26.4	16.2	24.3	14.7	22.0
5	15.4	23.1	13.4	20.2	11.1	16.7	15.6	23.5	14.4	21.6	13.0	19.5
6	13.7	20.5	11.9	17.9	9.85	14.8	13.6	20.5	12.5	18.8	11.3	16.9
7	11.9	17.9	10.4	15.6	8.59	12.9	11.7	17.5	10.7	16.0	9.58	14.4
8	10.2	15.4	8.87	13.3	7.36	11.1	9.91	14.9	9.03	13.6	8.08	12.1
9	8.77	13.2	7.58	11.4	6.27	9.42	8.49	12.8	7.72	11.6	6.88	10.3
10	7.58	11.4	6.53	9.82	5.39	8.10	7.34	11.0	6.66	10.0	5.92	8.90
11	6.60	9.92	5.68	8.54	4.67	7.02						

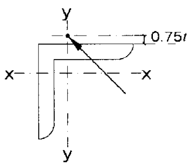
Properties

	L3½×3½×3/8	L3½×3½×5/16	L3½×3½×1/4	L3½×3×1/2	L3½×3×7/16	L3½×3×3/8
A_g (in.^{2})	2.50	2.10	1.70	3.02	2.67	2.32
r_z (in.)	0.683	0.685	0.688	0.618	0.620	0.622

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

[c] Shape is slender for compression with F_y = 36 ksi.

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



L3½

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

F_y = 36 ksi

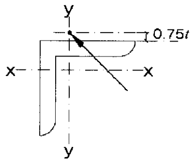
Shape		L3½×3×				L3½×2½×							
		5/16		1/4[c]		1/2		3/8		5/16		1/4[c]	
Wt/ft		6.65		5.38		9.41		7.23		6.10		4.94	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length KL (ft) with respect to least radius of gyration r_z	0	16.7	25.2	14.2	21.4	18.1	27.2	15.7	23.7	14.1	21.2	12.0	18.0
	1	16.5	24.8	13.9	20.8	17.8	26.7	15.4	23.1	13.8	20.7	11.7	17.5
	2	15.6	23.4	13.1	19.6	16.8	25.2	14.4	21.6	12.8	19.3	10.9	16.3
	3	14.3	21.6	12.0	18.0	15.3	22.9	13.0	19.5	11.6	17.4	9.79	14.7
	4	12.9	19.4	10.8	16.2	13.5	20.3	11.4	17.2	10.2	15.3	8.56	12.9
	5	11.4	17.1	9.51	14.3	11.7	17.6	9.81	14.7	8.67	13.0	7.30	11.0
	6	9.86	14.8	8.23	12.4	9.86	14.8	8.20	12.3	7.22	10.9	6.08	9.13
	7	8.37	12.6	6.99	10.5	8.23	12.4	6.78	10.2	5.94	8.93	4.98	7.48
	8	7.03	10.6	5.85	8.79	6.94	10.4	5.68	8.54	4.96	7.45	4.13	6.21
	9	5.97	8.97	4.95	7.44							3.48	5.23
	10	5.12	7.70	4.23	6.36								
Properties													
A_g (in.²)		1.95		1.58		2.76		2.12		1.79		1.45	
r_z (in.)		0.624		0.628		0.532		0.535		0.538		0.541	

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

[c] Shape is slender for compression with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles



L3

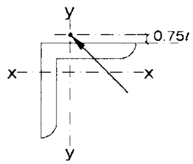
Shape	L3×3×											
	1/2		7/16		3/8		5/16		1/4		3/16[c,f]	
Wt/ft	9.35		8.28		7.17		6.04		4.89		3.70	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to least radius of gyration r_z: 0	19.1	28.7	17.7	26.6	16.2	24.3	14.4	21.7	12.4	18.6	9.47	14.2
1	18.8	28.3	17.5	26.3	16.0	24.0	14.2	21.4	12.2	18.3	9.34	14.0
2	18.1	27.2	16.8	25.2	15.3	23.0	13.6	20.5	11.7	17.6	8.97	13.5
3	16.9	25.4	15.7	23.6	14.3	21.5	12.7	19.1	10.7	16.1	8.17	12.3
4	15.4	23.2	14.3	21.5	12.9	19.4	11.3	17.0	9.55	14.4	7.28	10.9
5	13.7	20.7	12.6	18.9	11.3	17.0	9.91	14.9	8.32	12.5	6.36	9.56
6	11.9	17.8	10.8	16.3	9.71	14.6	8.47	12.7	7.08	10.6	5.44	8.17
7	9.99	15.0	9.09	13.7	8.12	12.2	7.06	10.6	5.88	8.84	4.54	6.83
8	8.44	12.7	7.66	11.5	6.82	10.3	5.91	8.88	4.90	7.37	3.77	5.67
9	7.21	10.8	6.52	9.80	5.79	8.70	5.00	7.51	4.14	6.22	3.17	4.76

Properties

	1/2	7/16	3/8	5/16	1/4	3/16
A_g (in.^{2})	2.75	2.43	2.11	1.78	1.44	1.09
r_z (in.)	0.580	0.580	0.581	0.583	0.585	0.586

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



L3

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

F_y = 36 ksi

Shape	L3×2½×											
	½		7/16		3/8		5/16		¼		3/16[c,f]	
Wt/ft	8.53		7.56		6.56		5.54		4.49		3.41	
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_z												
0	16.7	25.1	15.7	23.6	14.5	21.7	13.1	19.6	11.4	17.1	8.81	13.2
1	16.4	24.7	15.4	23.1	14.2	21.3	12.8	19.2	11.0	16.6	8.53	12.8
2	15.5	23.3	14.5	21.8	13.3	20.0	11.9	17.9	10.2	15.3	7.87	11.8
3	14.1	21.3	13.1	19.7	12.0	18.0	10.7	16.0	9.10	13.7	7.03	10.6
4	12.5	18.7	11.5	17.3	10.5	15.7	9.27	13.9	7.88	11.8	6.09	9.15
5	10.7	16.0	9.83	14.8	8.89	13.4	7.84	11.8	6.63	9.97	5.14	7.72
6	8.90	13.4	8.15	12.3	7.34	11.0	6.44	9.68	5.42	8.15	4.23	6.36
7	7.39	11.1	6.74	10.1	6.04	9.08	5.27	7.93	4.42	6.64	3.42	5.14
8	6.20	9.32	5.64	8.48	5.04	7.57	4.38	6.58	3.65	5.49	2.81	4.23

Properties

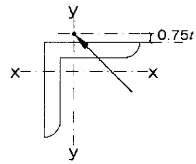
	½	7/16	3/8	5/16	¼	3/16
A_g (in.^{2})	2.51	2.22	1.93	1.63	1.32	1.00
r_z (in.)	0.516	0.516	0.517	0.518	0.520	0.521

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.

F_y = 36 ksi

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

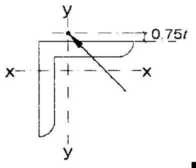


L3–L2½

Shape		L3×2×										L2½×2½×	
		1/2		3/8		5/16		1/4		3/16[c,f]		1/2	
Wt/ft		7.70		5.95		5.03		4.09		3.12		7.65	
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	$\phi_c P_n$	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_z	0	13.0	19.6	11.6	17.4	10.5	15.8	9.25	13.9	7.29	11.0	14.5	21.8
	1	12.7	19.1	11.2	16.8	10.2	15.3	8.91	13.4	7.02	10.6	14.2	21.4
	2	11.7	17.6	10.2	15.3	9.23	13.9	8.05	12.1	6.35	9.54	13.5	20.2
	3	10.3	15.5	8.86	13.3	7.98	12.0	6.92	10.4	5.45	8.20	12.3	18.5
	4	8.70	13.1	7.41	11.1	6.63	9.97	5.71	8.59	4.51	6.77	10.8	16.3
	5	7.10	10.7	5.97	8.97	5.31	7.97	4.54	6.82	3.61	5.42	9.20	13.8
	6	5.76	8.65	4.78	7.19	4.22	6.35	3.59	5.39	2.83	4.26	7.54	11.3
	7	4.74	7.12	3.90	5.86	3.42	5.15	2.89	4.34	2.28	3.42	6.22	9.34
	8											5.19	7.80
Properties													
A_g (in.²)		2.26		1.75		1.48		1.20		0.917		2.25	
r_z (in.)		0.425		0.426		0.428		0.431		0.435		0.481	

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates *Kl/r* equal to or greater than 200.



L2½

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

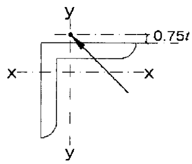
F_y = 36 ksi

Shape		L2½×2½×								L2½×2×	
		3/8		5/16		1/4		3/16[c]		3/8	
Wt/ft		5.90		4.98		4.04		3.06		5.30	
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_z	0	12.5	18.7	11.2	16.8	9.70	14.6	7.88	11.8	10.7	16.1
	1	12.2	18.3	11.0	16.5	9.50	14.3	7.71	11.6	10.4	15.6
	2	11.5	17.3	10.3	15.5	8.93	13.4	7.19	10.8	9.49	14.3
	3	10.4	15.7	9.34	14.0	7.96	12.0	6.32	9.50	8.21	12.3
	4	9.10	13.7	8.03	12.1	6.81	10.2	5.38	8.09	6.81	10.2
	5	7.60	11.4	6.68	10.0	5.64	8.47	4.43	6.66	5.42	8.15
	6	6.16	9.26	5.38	8.09	4.52	6.79	3.53	5.31	4.32	6.49
	7	5.04	7.57	4.38	6.58	3.66	5.49	2.85	4.28		
	8	4.18	6.28	3.62	5.44	3.01	4.52	2.33	3.50		
Properties											
A_g (in.^{2})		1.73		1.46		1.19		0.901		1.56	
r_z (in.)		0.481		0.481		0.482		0.482		0.419	

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	[c] Shape is slender for compression with F_y = 36 ksi. Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 36 ksi

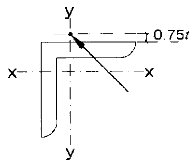
Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles



L2½

Shape	L2½×2×						L2½×1½×			
	5/16		1/4		3/16[c]		1/4		3/16[c]	
Wt/ft	4.49		3.65		2.78		3.22		2.47	
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_z										
0	9.78	14.7	8.66	13.0	7.13	10.7	6.42	9.65	5.53	8.31
1	9.49	14.3	8.33	12.5	6.81	10.2	6.07	9.12	5.18	7.79
2	8.58	12.9	7.49	11.3	6.09	9.15	5.16	7.76	4.36	6.55
3	7.38	11.1	6.40	9.62	5.18	7.78	4.08	6.14	3.40	5.12
4	6.08	9.14	5.24	7.88	4.22	6.35	3.04	4.56	2.50	3.76
5	4.81	7.23	4.12	6.19	3.30	4.97	2.28	3.43	1.85	2.78
6	3.81	5.72	3.24	4.87	2.58	3.87				
7			2.60	3.90	2.05	3.09				
Properties										
A_g (in.²)	1.32		1.07		0.818		0.947		0.724	
r_z (in.)	0.420		0.423		0.426		0.321		0.324	

ASD	LRFD	
$\Omega_c = 1.67$	$\phi_c = 0.90$	[c] Shape is slender for compression with F_y = 36 ksi. Note: Heavy line indicates Kl/r equal to or greater than 200.



L2

Table 4–12 (continued)
Available Strength in Axial Compression, kips
Eccentrically Loaded Single Angles

F_y = 36 ksi

Shape		L2×2×									
		3/8		5/16		1/4		3/16		1/8[c,f]	
Wt/ft		4.65		3.94		3.21		2.46		1.67	
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_z	0	9.04	13.6	8.22	12.4	7.24	10.9	6.04	9.08	4.29	6.45
	1	8.78	13.2	7.98	12.0	7.02	10.5	5.85	8.79	4.16	6.26
	2	8.04	12.1	7.29	11.0	6.39	9.61	5.28	7.93	3.70	5.56
	3	6.96	10.5	6.28	9.43	5.43	8.16	4.41	6.63	3.09	4.64
	4	5.70	8.57	5.06	7.61	4.34	6.52	3.50	5.26	2.46	3.70
	5	4.43	6.66	3.90	5.87	3.32	4.99	2.66	4.00	1.87	2.81
	6	3.49	5.25	3.06	4.60	2.59	3.89	2.06	3.09	1.43	2.16

Properties

	3/8	5/16	1/4	3/16	1/8
A_g (in.^{2})	1.37	1.16	0.944	0.722	0.491
r_z (in.)	0.386	0.386	0.387	0.389	0.391

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

[c] Shape is slender for compression with F_y = 36 ksi.
[f] Shape exceeds compact limit for flexure with F_y = 36 ksi.
Note: Heavy line indicates Kl/r equal to or greater than 200.

F_y = 46 ksi
f'_c = 4 ksi

Table 4–13
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

4

COMPOSITE
HSS20–HSS16

Shape		HSS20×12×						HSS16×12×					
		5/8		1/2		3/8		5/8		1/2		3/8	
t_{design}, in.		0.581		0.465		0.349		0.581		0.465		0.349	
Steel Wt/ft		127		103		78.4		110		89.6		68.3	
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 $(KL)_y$, with respect to weak axis (ft)	0	1150	1730	1010	1520	866	1300	970	1460	850	1270	725	1090
	6	1130	1700	994	1490	851	1280	954	1430	835	1250	712	1070
	7	1130	1690	988	1480	846	1270	948	1420	830	1240	708	1060
	8	1120	1680	981	1470	840	1260	941	1410	824	1240	703	1050
	9	1110	1660	973	1460	833	1250	934	1400	817	1230	697	1050
	10	1100	1650	965	1450	826	1240	925	1390	810	1220	690	1040
	11	1090	1630	955	1430	817	1230	916	1370	802	1200	683	1030
	12	1080	1620	945	1420	808	1210	906	1360	793	1190	676	1010
	13	1070	1600	934	1400	799	1200	896	1340	784	1180	668	1000
	14	1050	1580	923	1380	789	1180	885	1330	774	1160	659	988
	15	1040	1560	910	1370	778	1170	873	1310	764	1150	650	975
	16	1020	1540	898	1350	766	1150	860	1290	752	1130	640	960
	17	1010	1510	884	1330	754	1130	847	1270	741	1110	630	945
	18	993	1490	870	1300	742	1110	833	1250	729	1090	619	929
	19	976	1460	855	1280	729	1090	818	1230	716	1070	608	912
	20	959	1440	840	1260	715	1070	803	1210	703	1050	597	895
	21	941	1410	824	1240	702	1050	788	1180	689	1030	585	877
	22	923	1380	808	1210	687	1030	772	1160	675	1010	573	859
	23	904	1360	791	1190	673	1010	756	1130	661	992	560	840
	24	885	1330	774	1160	658	987	739	1110	646	970	548	821
	25	865	1300	757	1130	643	964	723	1080	632	947	535	802
	26	845	1270	739	1110	627	941	705	1060	616	925	522	782
	27	825	1240	721	1080	611	917	688	1030	601	902	508	762
	28	805	1210	703	1050	596	893	670	1010	586	879	495	742
	29	784	1180	685	1030	580	869	653	979	570	855	481	722
	30	763	1140	666	999	563	845	635	952	554	832	468	702
	32	721	1080	629	944	531	797	599	898	523	784	440	660
	34	679	1020	592	888	499	748	563	844	491	736	413	619
	36	637	955	555	832	466	700	527	790	459	689	386	579
	38	595	893	518	777	435	652	491	737	428	642	359	538
	40	554	832	482	723	403	605	456	684	398	597	333	499

Properties

M_{nx}/Ω_b	$\phi_b M_{nx}$ kip-ft	528	794	432	649	331	497	379	569	310	466	239	359
M_{ny}/Ω_b	$\phi_b M_{ny}$ kip-ft	372	559	303	455	234	352	310	466	255	383	196	295
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	72000		62600		52400		40200		35100		29200	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	30400		26400		21900		24800		21600		18000	
r_{mx}/r_{my}		1.54		1.54		1.55		1.27		1.28		1.27	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

4

COMPOSITE
HSS16–HSS14

Table 4–13 (continued)
Available Strength in Axial Compression, kips

F_y = 46 ksi
f'_c = 4 ksi

Concrete Filled Rectangular HSS

Shape	HSS16×12×		HSS16×8×								HSS14×10×	
	5/16		5/8		1/2		3/8		5/16		5/8	
t_{design}, in.	0.291		0.581		0.465		0.349		0.291		0.581	
Steel Wt/ft	57.4		93.1		75.9		58.1		48.9		93.1	
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 $(KL)_y$, with respect to weak axis (ft)												
0	661	992	762	1140	661	992	557	835	503	754	783	1170
6	649	974	735	1100	638	957	537	805	484	727	764	1150
7	645	968	725	1090	630	945	530	795	478	717	757	1140
8	640	961	714	1070	620	930	522	783	471	706	749	1120
9	635	953	702	1050	610	915	513	769	463	694	741	1110
10	629	944	689	1030	598	897	503	754	454	680	731	1100
11	622	934	674	1010	586	879	492	739	444	666	721	1080
12	615	923	658	988	572	858	481	722	434	650	710	1060
13	608	912	642	963	558	837	469	703	422	634	698	1050
14	600	899	624	937	543	815	456	684	411	616	685	1030
15	591	887	606	909	528	791	443	665	399	598	672	1010
16	582	873	587	881	511	767	429	644	386	579	658	986
17	573	859	568	852	495	742	415	623	373	560	643	965
18	563	844	548	822	478	716	401	601	360	540	628	942
19	552	829	528	792	460	690	386	579	347	520	612	918
20	542	813	507	761	442	664	371	557	333	500	596	894
21	531	796	487	730	425	637	356	534	319	479	580	870
22	520	779	466	699	407	610	341	511	306	458	563	845
23	508	762	445	667	389	583	326	488	292	438	546	819
24	496	744	424	636	371	556	310	466	278	417	529	793
25	484	726	404	605	353	529	295	443	264	396	512	767
26	472	708	383	575	335	503	280	421	251	376	494	741
27	460	690	363	544	318	477	266	399	237	356	477	715
28	447	671	343	515	301	451	251	377	224	337	459	689
29	435	652	324	486	284	426	237	356	212	317	442	663
30	422	633	305	457	268	401	223	335	199	299	424	636
32	397	596	268	403	236	354	197	295	175	263	390	585
34	372	558	238	357	209	313	174	261	155	233	356	535
36	347	520	212	318	186	280	155	233	138	208	324	486
38	322	483	190	286	167	251	140	209	124	186	292	439
40	298	447	172	258	151	226	126	189	112	168	264	396
Properties												
M_{nx}/Ω_b | $\phi_b M_{nx}$ kip-ft	201	303	296	445	243	366	188	283	159	240	275	414
M_{ny}/Ω_b | $\phi_b M_{ny}$ kip-ft	166	249	182	273	150	226	117	175	98.8	148	218	328
$P_{ex}(K_xL_x)^2/10^4$ kip-in.^{2}	26200		28900		25500		21500		19200		24300	
$P_{ey}(K_yL_y)^2/10^4$ kip-in.^{2}	16000		9030		7930		6620		5890		13900	
r_{mx}/r_{my}	1.28		1.79		1.79		1.80		1.80		1.32	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

F_y = 46 ksi
f'_c = 4 ksi

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

4

COMPOSITE
HSS14–HSS12

Shape		HSS14×10×								HSS12×10×			
		1/2		3/8		5/16		1/4		1/2		3/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.465		0.349	
Steel Wt/ft		75.9		58.1		48.9		39.5		69.1		52.9	
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 $(KL)_y$ with respect to weak axis (ft)	0	682	1020	577	866	523	785	468	702	608	912	513	770
	6	666	998	563	845	510	765	456	685	593	890	501	751
	7	660	990	558	837	506	758	452	678	588	882	496	744
	8	653	980	552	828	500	750	447	671	582	873	491	736
	9	646	969	546	819	494	742	442	663	575	863	485	728
	10	638	956	539	808	488	732	436	654	568	851	479	718
	11	629	943	531	797	481	721	429	644	559	839	472	708
	12	619	928	523	784	473	710	422	633	551	826	464	696
	13	609	913	514	771	465	697	415	622	541	812	456	684
	14	598	897	505	757	456	684	407	610	531	797	448	672
	15	586	879	495	742	447	671	398	598	521	781	439	658
	16	574	861	484	726	437	656	390	584	510	765	429	644
	17	562	842	473	710	428	641	380	571	498	747	420	629
	18	548	823	462	693	417	626	371	557	486	729	410	614
	19	535	802	451	676	407	610	361	542	474	711	399	599
	20	521	782	439	658	396	593	351	527	461	692	388	583
	21	507	760	427	640	384	577	341	512	449	673	377	566
	22	493	739	414	621	373	560	331	496	435	653	366	549
	23	478	717	402	603	362	542	320	480	422	633	355	532
	24	463	695	389	584	350	525	310	464	409	613	344	515
	25	448	672	376	564	338	507	299	448	395	592	332	498
	26	433	649	363	545	326	489	288	432	381	572	320	481
	27	418	627	350	526	314	472	277	416	368	551	309	463
	28	403	604	337	506	303	454	267	400	354	531	297	446
	29	387	581	324	487	291	436	256	384	340	510	286	428
	30	372	559	312	467	279	418	245	368	327	490	274	411
	32	343	514	286	429	256	384	224	337	300	450	251	377
	34	314	470	262	392	233	350	204	306	274	411	229	344
	36	285	428	238	356	212	317	185	277	248	373	208	312
	38	258	387	214	321	190	286	166	248	224	336	187	281
	40	233	349	193	290	172	258	149	224	202	303	169	253
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	227	341	175	263	148	223	120	181	181	272	140	211
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	180	271	139	209	118	177	95.8	144	160	240	124	186
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	21600		18000		16000		14000		14400		12100	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	12200		10200		9030		7850		10600		8870	
r_{mx}/r_{my}		1.33		1.33		1.33		1.33		1.16		1.17	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

4

COMPOSITE
HSS12

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 4 ksi

Shape	HSS12×10×				HSS12×8×							
	5/16		1/4		5/8		1/2		3/8		1/4	
t_{design}, in.	0.291		0.233		0.581		0.465		0.349		0.233	
Steel Wt/ft	44.6		36.0		76.1		62.3		47.8		32.6	
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 $(KL)_y$ with respect to weak axis (ft)												
0	464	697	414	622	609	913	528	792	443	664	354	531
6	453	679	404	606	586	879	508	762	426	640	340	510
7	449	673	400	600	578	867	501	752	421	631	335	503
8	444	666	396	593	569	853	494	740	414	621	330	495
9	438	658	391	586	558	838	485	727	407	610	324	486
10	433	649	385	578	547	821	475	713	399	598	317	476
11	426	639	380	569	535	803	465	698	390	585	310	465
12	419	629	373	560	522	783	454	681	381	571	303	454
13	412	618	367	550	508	762	442	663	371	556	295	442
14	404	606	359	539	494	741	430	645	361	541	286	429
15	396	594	352	528	479	718	417	626	350	525	277	416
16	387	581	344	516	463	695	404	606	339	508	268	402
17	378	568	336	504	447	671	390	585	327	491	259	388
18	369	554	328	491	431	646	376	564	315	473	249	374
19	360	540	319	478	414	621	362	543	303	455	239	359
20	350	525	310	465	397	596	347	521	291	437	229	344
21	340	510	301	451	380	570	333	499	279	418	219	329
22	330	495	292	437	363	544	318	477	267	400	209	314
23	319	479	282	423	346	519	303	455	254	382	199	299
24	309	463	273	409	329	493	289	433	242	363	189	284
25	298	448	263	395	312	468	274	412	230	345	180	270
26	288	432	254	380	296	443	260	390	218	327	170	255
27	277	416	244	366	279	419	246	369	206	309	161	241
28	267	400	235	352	263	395	232	348	195	292	151	227
29	256	384	225	338	248	372	219	328	183	275	142	213
30	246	368	216	323	232	348	206	308	172	259	133	200
32	225	337	197	295	204	306	181	271	152	227	117	176
34	205	307	179	268	181	271	160	240	134	201	104	155
36	186	278	162	243	161	242	143	214	120	180	92.4	139
38	167	250	145	218	145	217	128	192	107	161	83.0	124
40	151	226	131	196	131	196	116	173	97.0	145	74.9	112
Properties												
M_{nx}/Ω_b | $\phi_b M_{nx}$ kip-ft	119	179	96.6	145	188	283	156	235	122	183	84.0	126
M_{ny}/Ω_b | $\phi_b M_{ny}$ kip-ft	105	158	85.4	128	142	214	118	178	92.1	138	63.8	95.8
$P_{ex}(K_xL_x)^2/10^4$ kip-in.^{2}	10800		9370		13500		11900		10100		7860	
$P_{ey}(K_yL_y)^2/10^4$ kip-in.^{2}	7910		6880		6870		6080		5100		3930	
r_{mx}/r_{my}	1.17		1.17		1.40		1.40		1.41		1.41	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

F_y = 46 ksi
f'_c = 4 ksi

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

4

COMPOSITE HSS12–HSS10

Shape	HSS12×6×								HSS10×8×			
	5/8		1/2		3/8		1/4		5/8		1/2	
t_{design}, in.	0.581		0.465		0.349		0.233		0.581		0.465	
Steel Wt/ft	67.6		55.5		42.7		29.2		67.6		55.5	
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)$_y$ with respect to weak axis (ft) 0	519	778	447	671	372	558	293	440	532	798	461	692
6	485	728	419	629	349	524	275	412	511	767	443	665
7	473	710	409	614	341	512	268	402	504	756	437	656
8	460	691	398	597	332	498	261	391	496	744	430	645
9	446	669	386	579	322	483	253	379	487	730	422	633
10	431	646	373	560	311	467	244	367	476	715	414	620
11	414	621	359	539	300	450	235	353	465	698	404	606
12	397	595	344	517	288	432	226	338	454	681	394	591
13	379	568	329	494	275	413	216	323	441	662	384	576
14	360	540	313	470	262	394	205	308	428	642	373	559
15	341	512	297	446	249	374	195	292	415	622	361	542
16	322	483	281	421	236	354	184	276	401	601	349	524
17	303	454	265	397	222	333	173	260	386	579	337	505
18	284	426	248	372	209	313	163	244	372	557	324	487
19	265	397	232	348	195	293	152	228	357	535	312	467
20	246	370	216	324	182	273	142	212	342	512	299	448
21	228	343	201	301	169	254	131	197	326	490	286	429
22	211	316	186	278	157	235	122	182	311	467	273	409
23	193	290	171	256	145	217	112	168	296	444	260	389
24	178	267	157	235	133	199	103	154	281	421	247	370
25	164	246	145	217	122	184	94.7	142	266	399	234	351
26	151	227	134	200	113	170	87.5	131	251	377	221	332
27	140	211	124	186	105	158	81.2	122	237	356	209	314
28	131	196	115	173	97.6	146	75.5	113	223	335	197	295
29	122	183	107	161	91.0	137	70.4	106	209	314	185	278
30	114	171	100	151	85.1	128	65.7	98.6	196	294	173	260
32	99.9	150	88.2	132	74.8	112	57.8	86.7	172	258	152	228
34	88.5	133	78.1	117	66.2	99.3	51.2	76.8	152	229	135	202
36	79.0	118	69.7	105	59.1	88.6	45.7	68.5	136	204	120	180
38	70.9	106	62.5	93.8	53.0	79.5	41.0	61.5	122	183	108	162
40			56.5	84.7	47.8	71.8	37.0	55.5	110	165	97.5	146

Properties

M_{nx}/Ω_b $\phi_b M_{nx}$ kip-ft	158	237	132	198	103	155	71.4	107	143	215	119	179
M_{ny}/Ω_b $\phi_b M_{ny}$ kip-ft	96.6	145	80.9	122	63.5	95.4	44.3	66.5	122	184	102	153
$P_{ex}(K_xL_x)^2/10^4$ kip-in.^{2}	10700		9460		8090		6310		8400		7440	
$P_{ey}(K_yL_y)^2/10^4$ kip-in.^{2}	3360		2970		2520		1940		5790		5130	
r_{mx}/r_{my}	1.78		1.79		1.79		1.80		1.20		1.21	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

4

COMPOSITE HSS10

Table 4-13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 4 ksi

Shape		HSS10×8×								HSS10×6×			
		3/8		5/16		1/4		3/16		5/8		1/2	
t_{design}, in.		0.349		0.291		0.233		0.174		0.581		0.465	
Steel Wt/ft		42.7		36.1		29.2		22.2		59.1		48.7	
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 $(KL)_y$ with respect to weak axis (ft)	0	386	579	347	520	307	460	265	398	449	673	387	581
	6	371	557	334	500	295	442	254	381	419	628	362	543
	7	366	549	329	493	291	436	251	376	408	612	353	530
	8	360	540	324	485	286	429	246	369	397	595	344	515
	9	354	531	318	477	281	421	242	362	384	576	333	499
	10	347	520	311	467	275	412	236	355	370	555	321	482
	11	339	508	304	456	268	403	231	346	355	533	309	463
	12	331	496	297	445	262	393	225	337	340	510	296	444
	13	322	483	289	433	255	382	218	328	324	486	282	423
	14	313	469	281	421	247	371	212	318	307	461	268	402
	15	303	455	272	408	239	359	205	307	291	436	254	381
	16	293	440	263	395	231	347	198	297	274	410	240	360
	17	283	425	254	381	223	335	190	286	257	385	225	338
	18	273	409	244	367	215	322	183	274	240	360	211	316
	19	262	393	235	352	206	309	175	263	223	335	197	295
	20	252	377	225	338	197	296	168	252	207	311	183	274
	21	241	361	215	323	189	283	160	240	191	287	169	254
	22	230	345	206	309	180	270	152	228	176	264	156	234
	23	219	329	196	294	171	257	145	217	161	242	143	215
	24	208	313	186	279	163	244	137	206	148	222	132	197
	25	198	297	177	265	154	231	130	194	136	205	121	182
	26	187	281	167	251	146	218	122	183	126	189	112	168
	27	177	265	158	237	137	206	115	173	117	175	104	156
	28	167	250	149	223	129	194	108	162	109	163	96.7	145
	29	157	235	140	210	121	182	101	152	101	152	90.2	135
	30	147	221	131	197	114	170	94.5	142	94.7	142	84.2	126
	32	129	194	115	173	99.8	150	83.0	125	83.3	125	74.0	111
	34	115	172	102	153	88.4	133	73.5	110	73.8	111	65.6	98.4
	36	102	153	91.0	136	78.8	118	65.6	98.4	65.8	98.7	58.5	87.8
	38	91.7	138	81.7	123	70.8	106	58.9	88.3	59.0	88.6	52.5	78.8
	40	82.8	124	73.7	111	63.9	95.8	53.1	79.7				
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	93.0	140	79.0	119	64.5	97.0	49.1	73.8	118	177	98.7	148
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	79.8	120	67.9	102	55.4	83.3	42.2	63.5	82.1	123	69.1	104
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	6320		5640		4900		4090		6550		5820	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	4350		3870		3360		2790		2790		2490	
r_{mx}/r_{my}		1.21		1.21		1.21		1.21		1.53		1.53	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 4 ksi

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

4

COMPOSITE HSS10

Shape		HSS10×6×								HSS10×5×			
		3/8		5/16		1/4		3/16		3/8		5/16	
t_{design}, in.		0.349		0.291		0.233		0.174		0.349		0.291	
Steel Wt/ft		37.6		31.8		25.8		19.7		35.1		29.7	
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 $(KL)_y$, with respect to weak axis (ft)	0	322	483	288	432	253	379	216	324	290	435	259	388
	6	302	452	270	405	237	355	202	303	264	397	236	354
	7	294	442	263	395	231	346	197	295	256	383	228	342
	8	286	430	256	384	225	337	191	287	246	369	219	329
	9	278	416	248	373	218	327	185	278	235	353	210	315
	10	268	402	240	360	210	315	179	268	224	336	200	300
	11	258	387	231	346	202	303	172	257	212	318	189	284
	12	247	371	221	332	194	291	164	246	200	300	179	268
	13	236	354	212	317	185	277	157	235	187	281	167	251
	14	225	337	201	302	176	264	149	223	174	262	156	234
	15	213	320	191	287	167	250	141	211	162	243	145	218
	16	201	302	181	271	157	236	133	199	149	224	134	201
	17	190	284	170	255	148	222	124	187	137	206	123	185
	18	178	267	159	239	139	208	116	175	125	188	112	169
	19	166	249	149	224	130	194	108	163	114	171	102	153
	20	155	232	139	208	121	181	101	151	103	154	92.3	138
	21	143	215	129	193	112	168	93.1	140	93.1	140	83.7	126
	22	133	199	119	179	103	155	85.7	129	84.8	127	76.3	114
	23	122	183	110	164	94.8	142	78.5	118	77.6	116	69.8	105
	24	112	168	101	151	87.1	131	72.1	108	71.3	107	64.1	96.2
	25	103	155	92.7	139	80.3	120	66.4	99.6	65.7	98.5	59.1	88.6
	26	95.4	143	85.7	129	74.2	111	61.4	92.1	60.7	91.1	54.6	81.9
	27	88.4	133	79.5	119	68.8	103	56.9	85.4	56.3	84.4	50.7	76.0
	28	82.2	123	73.9	111	64.0	96.0	53.0	79.4	52.3	78.5	47.1	70.7
	29	76.7	115	68.9	103	59.6	89.5	49.4	74.0	48.8	73.2	43.9	65.9
	30	71.6	107	64.4	96.6	55.7	83.6	46.1	69.2	45.6	68.4	41.0	61.5
	32	63.0	94.4	56.6	84.9	49.0	73.5	40.5	60.8	40.1	60.1	36.1	54.1
	34	55.8	83.7	50.1	75.2	43.4	65.1	35.9	53.9	35.5	53.3	31.9	47.9
	36	49.7	74.6	44.7	67.1	38.7	58.1	32.0	48.0				
	38	44.7	67.0	40.1	60.2	34.7	52.1	28.7	43.1				
	40	40.3	60.4	36.2	54.3	31.4	47.0	25.9	38.9				
Properties													
M_{nx}/Ω_b $\phi_b M_{nx}$	kip-ft	77.5	116	66.1	99.3	54.1	81.3	41.3	62.0	69.8	105	59.6	89.5
M_{ny}/Ω_b $\phi_b M_{ny}$	kip-ft	54.4	81.8	46.5	69.8	38.1	57.2	29.1	43.8	42.9	64.5	36.7	55.2
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	5000		4520		3920		3270		4310		3900	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	2120		1900		1640		1360		1350		1210	
r_{mx}/r_{my}		1.54		1.54		1.54		1.55		1.79		1.79	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

4

COMPOSITE
HSS10–HSS9

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 4 ksi

Shape		HSS10×5×				HSS9×7×							
		1/4		3/16		5/8		1/2		3/8		5/16	
t_{design}, in.		0.233		0.174		0.581		0.465		0.349		0.291	
Steel Wt/ft		24.1		18.4		59.1		48.7		37.6		31.8	
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 $(KL)_y$ with respect to weak axis (ft)	0	226	339	192	288	454	681	392	589	327	491	293	440
	6	206	309	174	261	430	646	373	559	311	467	279	418
	7	199	299	168	253	422	633	366	549	306	458	274	411
	8	192	287	162	243	413	620	358	537	299	449	268	402
	9	183	275	155	232	403	604	350	524	292	438	262	393
	10	175	262	147	221	392	588	340	510	285	427	255	382
	11	165	248	139	209	380	570	330	495	276	415	248	371
	12	156	234	131	196	367	551	319	479	268	401	240	360
	13	146	219	123	184	354	531	308	462	258	388	232	347
	14	136	204	114	171	340	510	297	445	249	373	223	334
	15	126	190	106	158	326	489	284	427	239	359	214	321
	16	117	175	97.3	146	312	467	272	408	229	343	205	308
	17	107	161	89.1	134	297	445	260	389	219	328	196	294
	18	98.0	147	81.2	122	282	423	247	370	208	312	187	280
	19	89.1	134	73.6	110	267	401	234	351	198	297	177	266
	20	80.4	121	66.4	99.6	252	378	221	332	187	281	168	252
	21	72.9	109	60.2	90.3	237	356	209	313	177	265	158	238
	22	66.4	99.7	54.9	82.3	223	334	196	295	166	250	149	224
	23	60.8	91.2	50.2	75.3	209	313	184	276	156	235	140	210
	24	55.8	83.7	46.1	69.2	195	292	172	258	146	220	131	197
	25	51.4	77.2	42.5	63.7	181	272	161	241	137	205	123	184
	26	47.6	71.4	39.3	58.9	168	252	149	223	127	191	114	171
	27	44.1	66.2	36.4	54.6	156	233	138	207	118	177	106	159
	28	41.0	61.5	33.9	50.8	145	217	128	193	110	165	98.4	148
	29	38.2	57.4	31.6	47.4	135	202	120	180	102	153	91.7	138
	30	35.7	53.6	29.5	44.3	126	189	112	168	95.6	143	85.7	129
	32	31.4	47.1	25.9	38.9	111	166	98.4	148	84.0	126	75.3	113
	34	27.8	41.7	23.0	34.5	98.1	147	87.1	131	74.4	112	66.7	100
	36					87.5	131	77.7	117	66.4	99.6	59.5	89.3
	38					78.5	118	69.8	105	59.6	89.4	53.4	80.1
	40					70.9	106	63.0	94.4	53.8	80.7	48.2	72.3
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	48.8	73.4	37.3	56.1	111	167	92.9	140	72.9	110	62.2	93.4
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	30.2	45.4	23.2	34.8	93.0	140	78.1	117	61.4	92.3	52.4	78.7
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	3410		2850		5640		5050		4320		3870	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	1060		873		3730		3310		2820		2530	
r_{mx}/r_{my}		1.80		1.81		1.23		1.24		1.24		1.24	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 4 ksi

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

4

COMPOSITE HSS9

Shape	HSS9×5×											
	5/8		1/2		3/8		5/16		1/4		3/16	
t_{design}, in.	0.581		0.465		0.349		0.291		0.233		0.174	
Steel Wt/ft	50.6		41.9		32.5		27.6		22.4		17.1	
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 $(KL)_y$ with respect to weak axis (ft)												
0	374	561	322	483	267	400	238	357	208	311	176	264
6	338	506	292	438	243	364	216	325	189	283	160	240
7	325	488	282	423	234	352	209	314	183	274	154	231
8	312	468	271	406	225	338	201	302	176	263	148	222
9	297	446	258	388	216	323	192	289	168	252	142	212
10	282	422	245	368	205	307	183	275	160	240	135	202
11	265	398	232	348	194	291	173	260	151	227	127	191
12	249	373	218	327	182	274	163	245	143	214	120	179
13	232	347	203	305	171	256	153	229	134	200	112	168
14	215	322	189	283	159	239	143	214	124	187	104	156
15	198	296	175	262	147	221	132	198	115	173	96.3	145
16	181	272	160	241	136	204	122	183	106	160	88.7	133
17	165	247	147	220	124	187	112	168	97.6	146	81.2	122
18	149	224	133	200	113	170	102	153	89.1	134	73.9	111
19	134	201	120	180	103	154	92.6	139	80.9	121	66.9	100
20	121	182	109	163	92.8	139	83.6	125	73.0	110	60.3	90.5
21	110	165	98.5	148	84.2	126	75.8	114	66.2	99.3	54.7	82.1
22	100	150	89.7	135	76.7	115	69.1	104	60.3	90.5	49.9	74.8
23	91.6	137	82.1	123	70.2	105	63.2	94.8	55.2	82.8	45.6	68.4
24	84.1	126	75.4	113	64.4	96.7	58.0	87.1	50.7	76.0	41.9	62.9
25	77.5	116	69.5	104	59.4	89.1	53.5	80.2	46.7	70.1	38.6	57.9
26	71.7	107	64.2	96.4	54.9	82.4	49.5	74.2	43.2	64.8	35.7	53.6
27	66.4	99.7	59.6	89.4	50.9	76.4	45.9	68.8	40.1	60.1	33.1	49.7
28	61.8	92.7	55.4	83.1	47.3	71.0	42.6	64.0	37.2	55.9	30.8	46.2
29	57.6	86.4	51.6	77.5	44.1	66.2	39.8	59.6	34.7	52.1	28.7	43.1
30	53.8	80.7	48.3	72.4	41.2	61.9	37.1	55.7	32.4	48.7	26.8	40.2
32	47.3	71.0	42.4	63.6	36.2	54.4	32.6	49.0	28.5	42.8	23.6	35.4
34							28.9	43.4	25.3	37.9	20.9	31.3
Properties												
M_{nx}/Ω_b / $\phi_b M_{nx}$ kip-ft	88.3	133	74.7	112	59.1	88.8	50.5	75.9	41.5	62.4	31.8	47.8
M_{ny}/Ω_b / $\phi_b M_{ny}$ kip-ft	58.1	87.3	49.3	74.1	39.2	58.9	33.6	50.5	27.7	41.6	21.2	31.9
$P_{ex}(K_xL_x)^2/10^4$ kip-in.^{2}	4230		3800		3250		2950		2590		2160	
$P_{ey}(K_yL_y)^2/10^4$ kip-in.^{2}	1580		1430		1220		1100		959		792	
r_{mx}/r_{my}	1.63		1.63		1.63		1.64		1.64		1.65	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

4

COMPOSITE HSS8

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 4 ksi

Shape		HSS8×6×											
		5/8		1/2		3/8		5/16		1/4		3/16	
t_{design}, in.		0.581		0.465		0.349		0.291		0.233		0.174	
Steel Wt/ft		50.6		41.9		32.5		27.6		22.4		17.1	
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 $(KL)_y$ with respect to weak axis (ft)	0	379	568	327	491	272	408	243	364	213	319	181	271
	6	352	528	305	458	254	381	227	340	199	298	169	253
	7	343	515	297	446	248	372	221	332	194	291	164	247
	8	333	499	289	433	241	361	215	323	188	282	160	240
	9	321	482	279	419	233	350	208	313	182	274	155	232
	10	309	464	269	404	225	337	201	302	176	264	149	223
	11	296	445	258	387	216	324	193	290	169	254	143	214
	12	283	424	247	370	207	310	185	278	162	243	137	205
	13	269	403	235	353	197	296	177	265	154	231	130	195
	14	255	382	223	334	187	281	168	252	147	220	124	185
	15	240	360	211	316	177	266	159	238	139	208	117	175
	16	225	338	198	297	167	251	150	225	131	196	110	165
	17	211	316	186	279	157	235	141	211	123	184	103	155
	18	196	295	174	260	147	220	132	198	115	173	96.3	144
	19	182	273	161	242	137	205	123	184	107	161	89.6	134
	20	168	252	150	224	127	190	114	171	99.6	149	83.0	125
	21	155	232	138	207	117	176	106	159	92.1	138	76.6	115
	22	142	212	127	190	108	162	97.4	146	84.9	127	70.4	106
	23	130	194	116	174	99.1	149	89.3	134	77.8	117	64.5	96.7
	24	119	179	106	160	91.0	136	82.0	123	71.4	107	59.2	88.8
	25	110	165	98.1	147	83.8	126	75.6	113	65.8	98.8	54.6	81.8
	26	101	152	90.7	136	77.5	116	69.9	105	60.9	91.3	50.4	75.7
	27	94.0	141	84.1	126	71.9	108	64.8	97.2	56.4	84.7	46.8	70.2
	28	87.4	131	78.2	117	66.8	100	60.3	90.4	52.5	78.7	43.5	65.2
	29	81.5	122	72.9	109	62.3	93.5	56.2	84.3	48.9	73.4	40.5	60.8
	30	76.2	114	68.1	102	58.2	87.3	52.5	78.8	45.7	68.6	37.9	56.8
	32	66.9	100	59.9	89.8	51.2	76.8	46.1	69.2	40.2	60.3	33.3	49.9
	34	59.3	88.9	53.1	79.6	45.3	68.0	40.9	61.3	35.6	53.4	29.5	44.2
	36	52.9	79.3	47.3	71.0	40.4	60.7	36.5	54.7	31.8	47.6	26.3	39.5
	38			42.5	63.7	36.3	54.4	32.7	49.1	28.5	42.7	23.6	35.4
	40							29.5	44.3	25.7	38.6	21.3	32.0
Properties													
M_{nx}/Ω_b | $\phi_b M_{nx}$	kip-ft	82.8	124	69.9	105	55.3	83.1	47.3	71.1	38.8	58.4	29.7	44.7
M_{ny}/Ω_b | $\phi_b M_{ny}$	kip-ft	67.7	102	57.3	86.1	45.4	68.2	38.8	58.4	31.9	48.0	24.5	36.8
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	3630		3240		2780		2520		2190		1830	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	2250		2020		1730		1560		1350		1120	
r_{mx}/r_{my}		1.27		1.27		1.27		1.27		1.27		1.28	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 4 ksi

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

4
COMPOSITE HSS8

Shape		HSS8×4×											
		5/8		1/2		3/8		5/16		1/4		3/16	
t_{design}, in.		0.581		0.465		0.349		0.291		0.233		0.174	
Steel Wt/ft		42.1		35.1		27.4		23.3		19.0		14.5	
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 $(KL)_y$, with respect to weak axis (ft)	0	302	453	261	391	215	323	191	286	166	248	139	208
	6	256	385	223	334	185	278	165	247	143	215	120	180
	7	242	362	211	316	176	263	156	234	136	204	114	171
	8	226	338	197	296	165	247	147	221	128	192	107	161
	9	209	313	183	275	154	231	137	206	120	179	100	150
	10	191	287	169	253	142	213	127	191	111	166	92.7	139
	11	174	261	154	231	130	195	117	175	102	153	85.1	128
	12	157	235	140	209	118	178	106	159	92.9	139	77.5	116
	13	140	210	125	188	107	160	95.9	144	84.0	126	70.1	105
	14	123	185	111	167	95.5	143	85.9	129	75.4	113	62.8	94.2
	15	108	162	98.1	147	84.7	127	76.4	115	67.1	101	55.8	83.8
	16	94.9	142	86.2	129	74.4	112	67.2	101	59.1	88.7	49.2	73.8
	17	84.1	126	76.4	115	65.9	98.9	59.6	89.3	52.4	78.5	43.6	65.4
	18	75.0	112	68.1	102	58.8	88.2	53.1	79.7	46.7	70.1	38.9	58.3
	19	67.3	101	61.1	91.7	52.8	79.2	47.7	71.5	41.9	62.9	34.9	52.3
	20	60.7	91.1	55.2	82.7	47.6	71.4	43.0	64.5	37.8	56.7	31.5	47.2
	21	55.1	82.6	50.0	75.1	43.2	64.8	39.0	58.5	34.3	51.5	28.6	42.8
	22	50.2	75.3	45.6	68.4	39.4	59.0	35.6	53.3	31.3	46.9	26.0	39.0
	23	45.9	68.9	41.7	62.6	36.0	54.0	32.5	48.8	28.6	42.9	23.8	35.7
	24	42.2	63.3	38.3	57.5	33.1	49.6	29.9	44.8	26.3	39.4	21.9	32.8
	25	38.9	58.3	35.3	53.0	30.5	45.7	27.5	41.3	24.2	36.3	20.1	30.2
	26			32.6	49.0	28.2	42.3	25.5	38.2	22.4	33.6	18.6	27.9
	27							23.6	35.4	20.8	31.1	17.3	25.9
	28											16.1	24.1

Properties

M_{nx}/Ω_b	$\phi_b M_{nx}$	kip-ft	63.0	94.7	53.8	80.9	43.0	64.7	37.0	55.6	30.5	45.9	23.5	35.3
M_{ny}/Ω_b	$\phi_b M_{ny}$	kip-ft	38.1	57.2	32.8	49.3	26.4	39.6	22.7	34.2	18.8	28.3	14.5	21.8

$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	2530	2300	1990	1810	1600	1340
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	798	724	625	566	497	413
r_{mx}/r_{my}		1.78	1.78	1.78	1.79	1.79	1.80

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

4

COMPOSITE HSS7

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 4 ksi

Shape		HSS7×5×											
		1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		35.1		27.4		23.3		19.0		14.5		9.85	
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 $(KL)_y$ with respect to weak axis (ft)	0	266	398	220	330	196	294	171	256	144	216	117	175
	6	240	359	199	299	178	266	155	232	131	196	105	158
	7	231	346	192	288	171	257	150	224	126	189	101	152
	8	221	332	184	277	165	247	144	216	121	181	97.2	146
	9	211	316	176	264	157	236	137	206	115	173	92.5	139
	10	199	299	167	251	149	224	130	196	110	164	87.6	131
	11	188	282	158	236	141	211	123	185	103	155	82.5	124
	12	176	264	148	222	132	199	116	174	97.1	146	77.2	116
	13	164	245	138	207	124	186	108	162	90.6	136	71.8	108
	14	151	227	128	192	115	172	101	151	84.2	126	66.5	99.7
	15	139	209	118	177	106	159	93.2	140	77.8	117	61.1	91.7
	16	127	191	109	163	97.7	146	85.7	129	71.4	107	55.9	83.9
	17	116	174	99.1	149	89.3	134	78.4	118	65.2	97.9	50.9	76.3
	18	105	157	90.0	135	81.2	122	71.4	107	59.3	88.9	46.0	69.0
	19	94.2	141	81.1	122	73.3	110	64.5	96.8	53.5	80.2	41.3	61.9
	20	85.0	127	73.2	110	66.1	99.2	58.2	87.3	48.2	72.4	37.2	55.9
	21	77.1	116	66.4	99.6	60.0	89.9	52.8	79.2	43.8	65.6	33.8	50.7
	22	70.2	105	60.5	90.7	54.6	82.0	48.1	72.2	39.9	59.8	30.8	46.2
	23	64.3	96.4	55.3	83.0	50.0	75.0	44.0	66.0	36.5	54.7	28.2	42.2
	24	59.0	88.5	50.8	76.2	45.9	68.9	40.4	60.6	33.5	50.2	25.9	38.8
	25	54.4	81.6	46.8	70.3	42.3	63.5	37.3	55.9	30.9	46.3	23.8	35.8
	26	50.3	75.4	43.3	65.0	39.1	58.7	34.4	51.7	28.5	42.8	22.0	33.1
	27	46.6	70.0	40.2	60.2	36.3	54.4	31.9	47.9	26.5	39.7	20.4	30.7
	28	43.4	65.1	37.3	56.0	33.7	50.6	29.7	44.6	24.6	36.9	19.0	28.5
	29	40.4	60.6	34.8	52.2	31.4	47.2	27.7	41.5	22.9	34.4	17.7	26.6
	30	37.8	56.7	32.5	48.8	29.4	44.1	25.9	38.8	21.4	32.2	16.6	24.8
	32			28.6	42.9	25.8	38.7	22.7	34.1	18.8	28.3	14.6	21.8
	34									16.7	25.0	12.9	19.3
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	50.2	75.4	40.1	60.2	34.4	51.8	28.4	42.7	21.8	32.8	15.0	22.5
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	39.6	59.6	31.7	47.7	27.3	41.1	22.6	33.9	17.4	26.1	11.9	17.9
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	1940		1680		1530		1350		1120		871	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	1120		962		868		765		634		490	
r_{mx}/r_{my}		1.32		1.32		1.33		1.33		1.33		1.33	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 4 ksi

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

4
COMPOSITE
HSS7

Shape		HSS7×4×											
		1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		31.7		24.9		21.2		17.3		13.3		9.00	
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 $(KL)_y$, with respect to weak axis (ft)	0	234	351	193	290	172	257	149	223	125	187	100	150
	6	199	299	166	249	148	222	128	193	108	161	85.7	129
	7	188	282	157	236	140	210	122	183	102	153	81.1	122
	8	176	264	147	221	132	197	115	172	95.8	144	76.0	114
	9	163	245	137	206	123	184	107	160	89.4	134	70.7	106
	10	150	225	127	190	113	170	98.8	148	82.6	124	65.1	97.7
	11	137	205	116	174	104	156	90.7	136	75.8	114	59.5	89.3
	12	123	185	105	157	94.3	141	82.5	124	68.9	103	54.0	80.9
	13	110	165	94.4	142	85.0	127	74.5	112	62.2	93.3	48.5	72.7
	14	97.8	147	84.2	126	76.0	114	66.7	100	55.7	83.5	43.2	64.8
	15	85.7	129	74.4	112	67.3	101	59.2	88.9	49.4	74.1	38.1	57.1
	16	75.4	113	65.4	98.1	59.2	88.8	52.1	78.2	43.4	65.2	33.5	50.2
	17	66.8	100	57.9	86.9	52.4	78.6	46.2	69.3	38.5	57.7	29.6	44.5
	18	59.5	89.3	51.7	77.5	46.8	70.1	41.2	61.8	34.3	51.5	26.4	39.7
	19	53.4	80.2	46.4	69.5	42.0	63.0	37.0	55.4	30.8	46.2	23.7	35.6
	20	48.2	72.3	41.8	62.8	37.9	56.8	33.4	50.0	27.8	41.7	21.4	32.1
	21	43.7	65.6	37.9	56.9	34.4	51.5	30.3	45.4	25.2	37.8	19.4	29.1
	22	39.9	59.8	34.6	51.9	31.3	47.0	27.6	41.4	23.0	34.5	17.7	26.5
	23	36.5	54.7	31.6	47.5	28.6	43.0	25.2	37.8	21.0	31.5	16.2	24.3
	24	33.5	50.2	29.1	43.6	26.3	39.5	23.2	34.7	19.3	29.0	14.9	22.3
	25	30.9	46.3	26.8	40.2	24.2	36.4	21.3	32.0	17.8	26.7	13.7	20.6
	26			24.8	37.1	22.4	33.6	19.7	29.6	16.4	24.7	12.7	19.0
	27							18.3	27.5	15.3	22.9	11.8	17.6
	28											10.9	16.4

Properties

M_{nx}/Ω_b	$\phi_b M_{nx}$ kip-ft	43.2	64.9	34.7	52.2	30.0	45.0	24.8	37.3	19.1	28.7	13.2	19.8
M_{ny}/Ω_b	$\phi_b M_{ny}$ kip-ft	29.0	43.6	23.4	35.2	20.3	30.5	16.8	25.3	13.0	19.6	8.97	13.5
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	1610		1400		1270		1120		943		733	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	634		550		498		438		366		281	
r_{mx}/r_{my}		1.60		1.59		1.59		1.60		1.61		1.62	
ASD	LRFD	Note: Heavy line indicates Kl/r equal to or greater than 200.											
Ω_c = 2.00	ϕ_c = 0.75												

4

COMPOSITE HSS6

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 4 ksi

Shape		HSS6×5×											
		1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		31.7		24.9		21.2		17.3		13.3		9.00	
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 $(KL)_y$ with respect to weak axis (ft)	0	237	356	197	295	175	263	152	228	128	192	103	155
	1	237	355	196	294	175	262	152	228	128	192	103	155
	2	235	352	195	292	173	260	151	226	127	190	102	153
	3	231	347	192	288	171	256	149	223	125	187	101	151
	4	226	339	188	282	167	251	146	219	123	184	98.7	148
	5	220	331	183	275	163	245	142	213	119	179	96.1	144
	6	213	320	178	266	158	237	138	207	116	174	93.1	140
	7	205	308	171	257	153	229	133	199	112	168	89.6	134
	8	196	294	164	246	146	219	128	191	107	161	85.8	129
	9	187	280	156	234	140	209	122	183	102	153	81.7	123
	10	176	264	148	222	132	198	116	173	97.0	145	77.3	116
	11	166	248	139	209	125	187	109	164	91.4	137	72.7	109
	12	155	232	131	196	117	175	102	153	85.8	129	68.0	102
	13	144	215	122	182	109	164	95.5	143	80.0	120	63.2	94.8
	14	132	199	113	169	101	152	88.6	133	74.2	111	58.4	87.6
	15	122	182	104	155	93.2	140	81.8	123	68.4	103	53.7	80.5
	16	111	166	94.9	142	85.5	128	75.1	113	62.8	94.2	49.1	73.6
	17	100	151	86.4	130	77.9	117	68.6	103	57.3	85.9	44.6	66.9
	18	90.4	136	78.2	117	70.7	106	62.2	93.4	51.9	77.9	40.2	60.3
	19	81.1	122	70.2	105	63.6	95.4	56.1	84.1	46.7	70.1	36.1	54.2
	20	73.2	110	63.4	95.1	57.4	86.1	50.6	75.9	42.2	63.3	32.6	48.9
	21	66.4	99.6	57.5	86.2	52.0	78.1	45.9	68.9	38.3	57.4	29.6	44.3
	22	60.5	90.8	52.4	78.6	47.4	71.1	41.8	62.7	34.9	52.3	26.9	40.4
	23	55.4	83.0	47.9	71.9	43.4	65.1	38.3	57.4	31.9	47.8	24.6	37.0
	24	50.8	76.3	44.0	66.0	39.8	59.8	35.1	52.7	29.3	43.9	22.6	33.9
	25	46.9	70.3	40.6	60.8	36.7	55.1	32.4	48.6	27.0	40.5	20.9	31.3
	26	43.3	65.0	37.5	56.2	33.9	50.9	29.9	44.9	25.0	37.4	19.3	28.9
	27	40.2	60.3	34.8	52.2	31.5	47.2	27.8	41.7	23.1	34.7	17.9	26.8
	28	37.4	56.0	32.3	48.5	29.3	43.9	25.8	38.7	21.5	32.3	16.6	24.9
	29	34.8	52.2	30.1	45.2	27.3	40.9	24.1	36.1	20.1	30.1	15.5	23.2
	30	32.5	48.8	28.2	42.2	25.5	38.3	22.5	33.7	18.7	28.1	14.5	21.7
Properties													
M_{nx}/Ω_b | $\phi_b M_{nx}$	kip-ft	39.5	59.4	31.8	47.8	27.4	41.2	22.7	34.1	17.5	26.3	12.0	18.1
M_{ny}/Ω_b | $\phi_b M_{ny}$	kip-ft	34.8	52.3	28.0	42.1	24.2	36.3	20.0	30.1	15.4	23.2	10.6	16.0
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	1300		1130		1020		903		753		585	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	962		832		753		665		554		428	
r_{mx}/r_{my}		1.16		1.16		1.16		1.16		1.17		1.17	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

F_y = 46 ksi
f'_c = 4 ksi

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

4

COMPOSITE
HSS6

Shape		HSS6×4×											
		1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		28.3		22.3		19.1		15.6		12.0		8.15	
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 $(KL)_y$, with respect to weak axis (ft)	0	207	311	172	258	152	229	132	198	111	166	88.3	132
	1	206	310	171	256	152	228	132	197	110	165	87.9	132
	2	204	305	169	253	150	225	130	195	109	163	86.7	130
	3	199	298	165	248	147	220	127	191	106	160	84.9	127
	4	193	289	160	240	142	213	124	185	103	155	82.3	123
	5	185	277	154	231	137	205	119	178	99.5	149	79.2	119
	6	176	263	147	220	131	196	114	170	95.1	143	75.5	113
	7	165	248	139	208	124	185	108	161	90.0	135	71.4	107
	8	154	232	130	195	116	174	101	152	84.6	127	66.9	100
	9	143	214	121	181	108	162	94.0	141	78.8	118	62.1	93.2
	10	131	196	111	166	99.4	149	86.8	130	72.8	109	57.2	85.8
	11	119	178	101	152	90.9	136	79.5	119	66.6	100	52.2	78.3
	12	107	160	91.5	137	82.4	124	72.2	108	60.5	90.8	47.3	70.9
	13	95.2	143	82.0	123	74.0	111	65.0	97.5	54.5	81.8	42.4	63.6
	14	84.0	126	72.9	109	65.9	98.9	58.0	87.0	48.7	73.1	37.7	56.6
	15	73.4	110	64.1	96.1	58.2	87.3	51.3	77.0	43.2	64.7	33.2	49.8
	16	64.5	96.8	56.3	84.5	51.1	76.7	45.1	67.7	37.9	56.9	29.2	43.8
	17	57.1	85.7	49.9	74.8	45.3	67.9	40.0	60.0	33.6	50.4	25.8	38.8
	18	51.0	76.5	44.5	66.8	40.4	60.6	35.7	53.5	30.0	44.9	23.0	34.6
	19	45.8	68.6	39.9	59.9	36.3	54.4	32.0	48.0	26.9	40.3	20.7	31.0
	20	41.3	61.9	36.0	54.1	32.7	49.1	28.9	43.3	24.3	36.4	18.7	28.0
	21	37.5	56.2	32.7	49.0	29.7	44.5	26.2	39.3	22.0	33.0	16.9	25.4
	22	34.1	51.2	29.8	44.7	27.0	40.6	23.9	35.8	20.1	30.1	15.4	23.1
	23	31.2	46.8	27.3	40.9	24.7	37.1	21.8	32.8	18.3	27.5	14.1	21.2
	24	28.7	43.0	25.0	37.5	22.7	34.1	20.1	30.1	16.8	25.3	13.0	19.4
	25	26.4	39.6	23.1	34.6	20.9	31.4	18.5	27.7	15.5	23.3	11.9	17.9
	26					19.4	29.0	17.1	25.6	14.4	21.5	11.0	16.6
	27									13.3	20.0	10.2	15.4
Properties													
M_{nx}/Ω_b | $\phi_b M_{nx}$	kip-ft	33.6	50.5	27.3	41.0	23.6	35.4	19.6	29.4	15.2	22.8	10.5	15.7
M_{ny}/Ω_b | $\phi_b M_{ny}$	kip-ft	25.2	37.9	20.5	30.8	17.8	26.7	14.8	22.2	11.5	17.3	7.94	11.9
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	1060		927		844		747		631		490	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	543		474		429		379		318		245	
r_{mx}/r_{my}		1.40		1.40		1.40		1.40		1.41		1.41	

ASD	LRFD	
$\Omega_c = 2.00$	$\phi_c = 0.75$	Note: Heavy line indicates Kl/r equal to or greater than 200.

4

COMPOSITE HSS6

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 4 ksi

Shape	HSS6×3×											
	1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.	0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft	24.9		19.7		16.9		13.9		10.7		7.30	
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 $(KL)_y$, with respect to weak axis (ft)												
0	177	266	147	220	130	195	112	168	92.9	139	73.1	110
1	176	264	146	218	129	193	111	167	92.2	138	72.6	109
2	172	257	142	213	126	189	109	163	90.3	135	71.0	107
3	165	247	137	205	121	182	105	157	87.1	131	68.5	103
4	155	233	130	194	115	173	99.7	150	82.9	124	65.1	97.6
5	144	216	121	181	108	162	93.4	140	77.7	117	60.9	91.4
6	132	198	111	167	99.2	149	86.2	129	71.8	108	56.3	84.4
7	118	177	101	151	90.0	135	78.4	118	65.5	98.2	51.2	76.8
8	104	157	89.5	134	80.5	121	70.3	105	58.8	88.2	45.9	68.8
9	90.8	136	78.5	118	70.9	106	62.1	93.2	52.1	78.2	40.5	60.8
10	77.6	116	67.8	102	61.5	92.3	54.1	81.2	45.5	68.2	35.3	53.0
11	65.1	97.6	57.7	86.6	52.6	78.9	46.4	69.7	39.2	58.7	30.3	45.5
12	54.7	82.0	48.5	72.8	44.3	66.4	39.2	58.9	33.2	49.8	25.6	38.4
13	46.6	69.9	41.3	62.0	37.7	56.6	33.4	50.2	28.3	42.4	21.8	32.7
14	40.2	60.3	35.6	53.4	32.5	48.8	28.8	43.3	24.4	36.6	18.8	28.2
15	35.0	52.5	31.0	46.6	28.4	42.5	25.1	37.7	21.2	31.8	16.4	24.6
16	30.8	46.1	27.3	40.9	24.9	37.4	22.1	33.1	18.7	28.0	14.4	21.6
17	27.2	40.9	24.2	36.2	22.1	33.1	19.6	29.3	16.5	24.8	12.8	19.1
18	24.3	36.4	21.6	32.3	19.7	29.5	17.4	26.2	14.7	22.1	11.4	17.1
19			19.3	29.0	17.7	26.5	15.7	23.5	13.2	19.8	10.2	15.3
20							14.1	21.2	11.9	17.9	9.22	13.8
21											8.36	12.5
Properties												
M_{nx}/Ω_b, $\phi_b M_{nx}$ kip-ft	27.7	41.7	22.7	34.2	19.8	29.7	16.5	24.8	12.8	19.3	8.89	13.4
M_{ny}/Ω_b, $\phi_b M_{ny}$ kip-ft	16.7	25.1	13.8	20.8	12.1	18.2	10.1	15.2	7.91	11.9	5.51	8.28
$P_{ex}(K_xL_x)^2/10^4$ kip-in.^{2}	824		730		667		593		505		395	
$P_{ey}(K_yL_y)^2/10^4$ kip-in.^{2}	259		229		209		186		157		121	
r_{mx}/r_{my}	1.78		1.79		1.79		1.79		1.79		1.81	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 4 ksi

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

COMPOSITE HSS5

Shape		HSS5×4×											
		1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		24.9		19.7		16.9		13.9		10.7		7.30	
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length $(KL)_y$, with respect to weak axis (ft)	0	181	271	150	225	133	200	115	173	96.3	144	76.5	115
	1	180	270	149	224	133	199	115	172	95.9	144	76.2	114
	2	177	266	147	221	131	196	113	170	94.7	142	75.2	113
	3	173	260	144	216	128	192	111	166	92.7	139	73.5	110
	4	167	251	139	209	124	186	108	162	89.9	135	71.3	107
	5	160	240	134	201	119	179	104	155	86.5	130	68.5	103
	6	152	228	127	191	114	170	98.7	148	82.5	124	65.3	97.9
	7	143	214	120	180	107	161	93.3	140	78.1	117	61.6	92.5
	8	133	199	112	168	100	150	87.4	131	73.2	110	57.7	86.5
	9	122	183	104	156	93.0	140	81.2	122	68.1	102	53.5	80.3
	10	112	167	95.2	143	85.5	128	74.8	112	62.8	94.2	49.2	73.8
	11	101	151	86.5	130	77.9	117	68.3	102	57.4	86.1	44.9	67.3
	12	90.2	135	77.9	117	70.3	106	61.8	92.7	52.0	78.0	40.5	60.8
	13	79.9	120	69.5	104	63.0	94.4	55.4	83.1	46.7	70.1	36.3	54.5
	14	70.1	105	61.5	92.2	55.9	83.8	49.3	74.0	41.6	62.4	32.2	48.4
	15	61.1	91.6	53.8	80.7	49.0	73.5	43.4	65.1	36.7	55.1	28.3	42.5
	16	53.7	80.5	47.3	70.9	43.1	64.6	38.1	57.2	32.3	48.4	24.9	37.3
	17	47.5	71.3	41.9	62.8	38.2	57.2	33.8	50.7	28.6	42.9	22.0	33.1
	18	42.4	63.6	37.3	56.0	34.0	51.0	30.1	45.2	25.5	38.2	19.7	29.5
	19	38.1	57.1	33.5	50.3	30.5	45.8	27.0	40.6	22.9	34.3	17.6	26.5
	20	34.4	51.5	30.3	45.4	27.6	41.3	24.4	36.6	20.7	31.0	15.9	23.9
	21	31.2	46.7	27.4	41.2	25.0	37.5	22.1	33.2	18.7	28.1	14.4	21.7
	22	28.4	42.6	25.0	37.5	22.8	34.2	20.2	30.3	17.1	25.6	13.2	19.7
	23	26.0	39.0	22.9	34.3	20.8	31.3	18.5	27.7	15.6	23.4	12.0	18.1
	24	23.9	35.8	21.0	31.5	19.1	28.7	16.9	25.4	14.3	21.5	11.1	16.6
	25			19.4	29.0	17.6	26.5	15.6	23.4	13.2	19.8	10.2	15.3
	26							14.4	21.7	12.2	18.3	9.42	14.1
	27											8.74	13.1
Properties													
M_{nx}/Ω_b | $\phi_b M_{nx}$	kip-ft	25.1	37.8	20.6	30.9	17.9	26.9	14.9	22.4	11.6	17.4	8.03	12.1
M_{ny}/Ω_b | $\phi_b M_{ny}$	kip-ft	21.5	32.2	17.6	26.5	15.3	23.0	12.8	19.2	10.0	15.0	6.90	10.4
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	652		575		524		465		395		305	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	451		397		361		321		271		209	
r_{mx}/r_{my}		1.20		1.20		1.20		1.20		1.21		1.21	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

4

COMPOSITE HSS5

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 4 ksi

Shape		HSS5×3× 1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		21.5		17.2		14.8		12.2		9.43		6.45	
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length $(KL)_y$ with respect to weak axis (ft)	0	152	229	127	190	112	168	97.0	145	80.4	121	63.1	94.6
	1	151	227	126	188	111	167	96.3	144	79.8	120	62.6	93.9
	2	147	221	123	184	109	163	94.1	141	78.1	117	61.2	91.8
	3	141	212	118	177	105	157	90.6	136	75.2	113	59.0	88.5
	4	133	199	111	167	99.2	149	86.0	129	71.5	107	56.0	84.0
	5	123	184	104	156	92.6	139	80.4	121	66.9	100	52.4	78.6
	6	112	168	95.0	142	85.0	128	74.0	111	61.7	92.6	48.3	72.5
	7	99.9	150	85.6	128	76.9	115	67.1	101	56.1	84.2	43.9	65.8
	8	87.8	132	75.9	114	68.5	103	60.0	90	50.3	75.4	39.3	58.9
	9	75.8	114	66.3	99.4	60.0	90.1	52.8	79.2	44.4	66.6	34.6	51.9
	10	64.3	96.5	56.9	85.4	51.8	77.8	45.8	68.7	38.6	57.9	30.1	45.1
	11	53.6	80.4	48.0	72.1	44.1	66.1	39.1	58.7	33.1	49.6	25.7	38.6
	12	45.0	67.6	40.4	60.6	37.0	55.6	32.9	49.4	27.9	41.9	21.7	32.6
	13	38.4	57.6	34.4	51.6	31.6	47.3	28.1	42.1	23.8	35.7	18.5	27.7
	14	33.1	49.6	29.7	44.5	27.2	40.8	24.2	36.3	20.5	30.8	16.0	23.9
	15	28.8	43.2	25.8	38.8	23.7	35.6	21.1	31.6	17.9	26.8	13.9	20.8
	16	25.3	38.0	22.7	34.1	20.8	31.2	18.5	27.8	15.7	23.6	12.2	18.3
	17	22.4	33.7	20.1	30.2	18.5	27.7	16.4	24.6	13.9	20.9	10.8	16.2
	18	20.0	30.0	17.9	26.9	16.5	24.7	14.6	22.0	12.4	18.6	9.63	14.5
	19			16.1	24.2	14.8	22.2	13.1	19.7	11.1	16.7	8.66	13.0
	20									10.1	15.1	7.82	11.7

Properties

		1/2		3/8		5/16		1/4		3/16		1/8	
M_{nx}/Ω_b	$\phi_b M_{nx}$ kip-ft	20.3	30.5	16.8	25.3	14.7	22.1	12.4	18.6	9.66	14.5	6.73	10.1
M_{ny}/Ω_b	$\phi_b M_{ny}$ kip-ft	14.0	21.1	11.7	17.6	10.3	15.4	8.65	13.0	6.79	10.2	4.74	7.13
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	497		446		409		364		311		243	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	213		192		176		156		132		103	
r_{mx}/r_{my}		1.53		1.53		1.53		1.53		1.53		1.54	

ASD	LRFD
Ω_c = 2.00	ϕ_c = 0.75

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

F_y = 46 ksi
f'_c = 4 ksi

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

4

COMPOSITE
HSS5–HSS4

Shape		HSS5×2½×						HSS4×3×					
		1/4		3/16		1/8		3/8		5/16		1/4	
t_{design}, in.		0.233		0.174		0.116		0.349		0.291		0.233	
Steel Wt/ft		11.3		8.79		6.02		14.6		12.7		10.5	
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 $(KL)_y$ with respect to weak axis (ft)	0	87.8	132	72.4	109	56.3	84.5	107	160	94.8	142	82.0	123
	1	86.8	130	71.7	108	55.8	83.7	106	159	94.1	141	81.3	122
	2	84.1	126	69.5	104	54.1	81.1	103	155	91.8	138	79.4	119
	3	79.7	120	66.0	98.9	51.3	77.0	98.9	148	88.1	132	76.4	115
	4	74.0	111	61.3	92.0	47.8	71.7	93.2	140	83.3	125	72.3	108
	5	67.2	101	55.9	83.8	43.5	65.3	86.4	130	77.4	116	67.4	101
	6	59.7	89.6	49.8	74.8	38.9	58.3	78.8	118	70.8	106	61.8	92.7
	7	52.0	78.0	43.5	65.3	34.0	51.0	70.6	106	63.7	95.6	55.8	83.7
	8	44.3	66.4	37.3	55.9	29.1	43.7	62.2	93.3	56.4	84.6	49.6	74.4
	9	36.9	55.4	31.2	46.9	24.4	36.6	53.9	80.8	49.1	73.7	43.4	65.1
	10	30.1	45.2	25.6	38.4	20.0	30.1	45.9	68.8	42.1	63.2	37.4	56.1
	11	24.9	37.3	21.2	31.7	16.6	24.8	38.4	57.5	35.4	53.2	31.7	47.6
	12	20.9	31.4	17.8	26.7	13.9	20.9	32.2	48.4	29.8	44.7	26.6	40.0
	13	17.8	26.7	15.2	22.7	11.9	17.8	27.5	41.2	25.4	38.1	22.7	34.1
	14	15.4	23.1	13.1	19.6	10.2	15.3	23.7	35.5	21.9	32.8	19.6	29.4
	15	13.4	20.1	11.4	17.1	8.91	13.4	20.6	30.9	19.1	28.6	17.1	25.6
	16	11.8	17.6	10.0	15.0	7.83	11.7	18.1	27.2	16.7	25.1	15.0	22.5
	17			8.86	13.3	6.93	10.4	16.1	24.1	14.8	22.3	13.3	19.9
	18							14.3	21.5	13.2	19.9	11.8	17.8
	19											10.6	15.9
Properties													
M_{nx}/Ω_b | $\phi_b M_{nx}$	kip-ft	11.1	16.7	8.70	13.1	6.08	9.14	11.7	17.7	10.4	15.6	8.76	13.2
M_{ny}/Ω_b | $\phi_b M_{ny}$	kip-ft	6.78	10.2	5.35	8.04	3.76	5.65	9.58	14.4	8.47	12.7	7.17	10.8
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	315		269		213		245		226		203	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	98.9		84.1		65.8		153		141		126	
r_{mx}/r_{my}		1.79		1.79		1.80		1.27		1.27		1.27	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

COMPOSITE
HSS4

Table 4–13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 4 ksi

Shape		HSS4×3×				HSS4×2½×							
		3/16		1/8		3/8		5/16		1/4		3/16	
t_{design}, in.		0.174		0.116		0.349		0.291		0.233		0.174	
Steel Wt/ft		8.15		5.60		13.4		11.6		9.63		7.51	
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 $(KL)_y$ with respect to weak axis (ft)	0	67.9	102	53.0	79.5	95.9	144	85.2	128	73.6	110	60.8	91.1
	1	67.4	101	52.6	78.9	94.7	142	84.2	126	72.8	109	60.1	90.2
	2	65.8	98.7	51.4	77.2	91.3	137	81.3	122	70.4	106	58.2	87.3
	3	63.4	95.1	49.5	74.3	85.9	129	76.8	115	66.6	99.8	55.1	82.7
	4	60.1	90.1	47.0	70.4	78.9	118	70.8	106	61.6	92.3	51.1	76.7
	5	56.1	84.1	43.9	65.8	70.7	106	63.7	95.6	55.7	83.5	46.4	69.6
	6	51.6	77.4	40.4	60.5	61.9	92.8	56.1	84.1	49.3	73.9	41.2	61.9
	7	46.7	70.1	36.6	54.8	52.8	79.2	48.2	72.3	42.6	63.9	35.9	53.8
	8	41.7	62.5	32.6	48.9	44.0	66.0	40.5	60.7	36.0	54.1	30.5	45.8
	9	36.6	54.9	28.7	43.0	35.7	53.6	33.2	49.9	29.8	44.7	25.4	38.1
	10	31.7	47.5	24.8	37.2	28.9	43.4	26.9	40.4	24.2	36.3	20.7	31.1
	11	27.0	40.5	21.2	31.8	23.9	35.9	22.2	33.4	20.0	30.0	17.1	25.7
	12	22.7	34.1	17.8	26.7	20.1	30.1	18.7	28.0	16.8	25.2	14.4	21.6
	13	19.3	29.0	15.2	22.8	17.1	25.7	15.9	23.9	14.3	21.5	12.3	18.4
	14	16.7	25.0	13.1	19.6	14.8	22.1	13.7	20.6	12.4	18.5	10.6	15.9
	15	14.5	21.8	11.4	17.1	12.9	19.3	12.0	17.9	10.8	16.1	9.21	13.8
	16	12.8	19.2	10.0	15.0					9.46	14.2	8.09	12.1
	17	11.3	17.0	8.87	13.3								
	18	10.1	15.1	7.92	11.9								
	19	9.06	13.6	7.10	10.7								
	20			6.41	9.62								
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	6.90	10.4	4.84	7.27	10.3	15.5	9.12	13.7	7.75	11.6	6.13	9.22
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	5.66	8.50	3.97	5.97	7.34	11.0	6.53	9.82	5.57	8.37	4.42	6.65
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	173		137		207		193		174		148	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	107		84.2		95.0		88.4		79.5		68.0	
r_{mx}/r_{my}		1.27		1.27		1.48		1.48		1.48		1.48	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 4 ksi

Table 4-13 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

4
COMPOSITE HSS4

Shape		HSS4×2½×		HSS4×2×									
		1/8		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.116		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		5.17		12.1		10.5		8.78		6.87		4.75	
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length $(KL)_y$, with respect to weak axis (ft)	0	47.2	70.7	85.0	128	75.6	113	65.2	97.9	53.7	80.5	41.3	61.9
	1	46.7	70.0	83.4	125	74.3	111	64.1	96.2	52.8	79.2	40.6	60.9
	2	45.2	67.8	78.7	118	70.3	105	60.9	91.3	50.2	75.3	38.7	58.1
	3	42.9	64.3	71.5	107	64.2	96.2	55.8	83.7	46.2	69.3	35.7	53.6
	4	39.8	59.7	62.4	93.6	56.4	84.7	49.4	74.1	41.2	61.7	31.9	47.9
	5	36.2	54.3	52.5	78.7	47.9	71.8	42.3	63.4	35.5	53.2	27.6	41.4
	6	32.2	48.3	42.4	63.6	39.2	58.8	34.9	52.4	29.6	44.3	23.2	34.7
	7	28.1	42.1	33.0	49.5	30.9	46.3	27.9	41.8	23.8	35.7	18.8	28.2
	8	24.0	35.9	25.2	37.9	23.7	35.6	21.6	32.4	18.6	27.9	14.7	22.1
	9	20.0	30.0	19.9	29.9	18.8	28.1	17.0	25.6	14.7	22.0	11.6	17.5
	10	16.4	24.5	16.2	24.2	15.2	22.8	13.8	20.7	11.9	17.8	9.43	14.2
	11	13.5	20.3	13.4	20.0	12.6	18.8	11.4	17.1	9.83	14.7	7.80	11.7
	12	11.4	17.0	11.2	16.8	10.5	15.8	9.59	14.4	8.26	12.4	6.55	9.83
	13	9.68	14.5							7.03	10.6	5.58	8.37
	14	8.35	12.5										
	15	7.27	10.9										
	16	6.39	9.59										
	17	5.66	8.49										
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	4.32	6.49	8.82	13.3	7.88	11.8	6.74	10.1	5.37	8.07	3.80	5.71
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	3.13	4.70	5.30	7.96	4.76	7.16	4.10	6.17	3.29	4.94	2.34	3.52
$P_{ex}(K_xL_x)^2/10^4$	kip-in.²	119		168		158		144		124		100	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.²	53.7		53.0		49.8		45.4		39.0		31.0	
r_{mx}/r_{my}		1.49		1.78		1.78		1.78		1.79		1.79	
ASD	LRFD	Note: Heavy line indicates Kl/r equal to or greater than 200.											
Ω_c = 2.00	ϕ_c = 0.75												

5

COMPOSITE
HSS20–HSS16

Table 4–14
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 5 ksi

Shape		HSS20×12×						HSS16×12×					
		5/8		1/2		3/8		5/8		1/2		3/8	
t_{design}, in.		0.581		0.465		0.349		0.581		0.465		0.349	
Steel Wt/ft		127		103		78.4		110		89.6		68.3	
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 $(KL)_y$, with respect to weak axis (ft)	0	1240	1860	1100	1650	959	1440	1040	1560	920	1380	798	1200
	6	1220	1820	1080	1620	941	1410	1020	1530	904	1360	784	1180
	7	1210	1810	1070	1610	935	1400	1010	1520	898	1350	778	1170
	8	1200	1800	1070	1600	928	1390	1010	1510	891	1340	772	1160
	9	1190	1790	1060	1590	920	1380	998	1500	884	1330	765	1150
	10	1180	1770	1050	1570	911	1370	988	1480	875	1310	758	1140
	11	1170	1750	1040	1550	901	1350	978	1470	866	1300	750	1120
	12	1150	1730	1030	1540	891	1340	967	1450	856	1280	741	1110
	13	1140	1710	1010	1520	879	1320	955	1430	846	1270	731	1100
	14	1130	1690	999	1500	867	1300	943	1410	834	1250	721	1080
	15	1110	1670	985	1480	854	1280	929	1390	822	1230	710	1070
	16	1090	1640	970	1460	841	1260	915	1370	810	1210	699	1050
	17	1080	1620	955	1430	827	1240	900	1350	796	1190	687	1030
	18	1060	1590	938	1410	812	1220	885	1330	783	1170	675	1010
	19	1040	1560	922	1380	797	1200	869	1300	768	1150	662	993
	20	1020	1530	904	1360	781	1170	852	1280	753	1130	649	973
	21	1000	1500	886	1330	765	1150	835	1250	738	1110	635	952
	22	981	1470	868	1300	748	1120	818	1230	722	1080	621	931
	23	960	1440	849	1270	731	1100	800	1200	706	1060	607	910
	24	939	1410	829	1240	714	1070	782	1170	690	1030	592	888
	25	917	1380	810	1210	696	1040	763	1140	673	1010	577	866
	26	895	1340	790	1180	678	1020	744	1120	656	984	562	843
	27	872	1310	769	1150	660	990	725	1090	639	959	547	820
	28	850	1270	749	1120	642	963	705	1060	622	933	531	797
	29	827	1240	728	1090	623	935	686	1030	604	906	516	774
	30	804	1210	708	1060	605	907	666	999	587	880	500	751
	32	757	1140	666	999	568	852	627	940	551	827	469	704
	34	711	1070	624	936	531	796	587	881	516	774	438	657
	36	665	997	583	874	494	741	548	822	481	722	407	611
	38	619	929	542	813	458	687	509	764	447	670	377	566
	40	575	862	502	753	423	634	472	707	413	620	348	522
Properties													
M_{nx}/Ω_b	$\phi_b M_{nx}$ kip-ft	528	794	432	649	331	497	379	569	310	466	239	359
M_{ny}/Ω_b	$\phi_b M_{ny}$ kip-ft	372	559	303	455	234	352	310	466	255	383	196	295
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	74200		64800		54600		41200		36100		30400	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	31100		27100		22600		25300		22200		18600	
r_{mx}/r_{my}		1.54		1.55		1.55		1.27		1.28		1.28	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

F_y = 46 ksi
f'_c = 5 ksi

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

5

COMPOSITE
HSS16–HSS14

Shape		HSS16×12×		HSS16×8×								HSS14×10×	
		5/16		5/8		1/2		3/8		5/16		5/8	
t_{design}, in.		0.291		0.581		0.465		0.349		0.291		0.581	
Steel Wt/ft		57.4		93.1		75.9		58.1		48.9		93.1	
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length $(KL)_y$ with respect to weak axis (ft)	0	736	1100	805	1210	707	1060	604	906	551	827	831	1250
	6	722	1080	775	1160	680	1020	581	872	530	795	810	1210
	7	717	1080	765	1150	671	1010	573	860	522	784	803	1200
	8	711	1070	753	1130	661	991	564	846	514	771	794	1190
	9	705	1060	739	1110	649	973	554	831	504	757	785	1180
	10	698	1050	724	1090	636	954	543	814	494	741	774	1160
	11	690	1030	709	1060	622	933	531	796	483	724	763	1140
	12	681	1020	691	1040	607	911	518	776	471	706	750	1130
	13	672	1010	673	1010	591	887	504	756	458	687	737	1110
	14	663	994	654	982	575	862	490	734	445	667	723	1080
	15	653	979	635	952	558	836	475	712	431	646	708	1060
	16	642	963	614	921	540	810	459	689	416	625	693	1040
	17	631	946	593	890	521	782	443	665	402	602	677	1020
	18	619	928	571	857	502	754	427	640	386	580	660	991
	19	607	910	550	824	483	725	410	615	371	557	643	965
	20	594	891	527	791	464	696	393	590	356	533	626	939
	21	581	872	505	757	444	666	376	565	340	510	608	912
	22	568	852	482	724	424	637	359	539	324	486	590	884
	23	555	832	460	690	405	607	342	514	309	463	571	857
	24	541	811	438	656	385	578	326	488	293	440	552	829
	25	527	790	415	623	366	549	309	463	278	417	534	800
	26	513	769	394	590	347	520	293	439	263	394	515	772
	27	498	748	372	558	328	492	276	415	248	372	496	743
	28	484	726	351	527	310	464	261	391	233	350	477	715
	29	469	704	331	496	291	437	245	368	219	329	458	687
	30	455	682	310	465	274	411	230	344	205	308	439	659
	32	426	638	273	409	241	361	202	303	180	270	402	603
	34	397	595	241	362	213	320	179	268	160	239	366	549
	36	368	552	215	323	190	285	159	239	142	214	332	497
	38	340	510	193	290	171	256	143	215	128	192	298	447
	40	313	469	174	262	154	231	129	194	115	173	269	403
Properties													
M_{nx}/Ω_b	$\phi_b M_{nx}$ kip-ft	201	303	296	445	243	366	188	283	159	240	275	414
M_{ny}/Ω_b	$\phi_b M_{ny}$ kip-ft	166	249	182	273	150	226	117	175	98.8	148	218	328
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	27200		29500		26200		22300		19900		24900	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	16600		9170		8090		6780		6060		14100	
r_{mx}/r_{my}		1.28		1.79		1.80		1.81		1.81		1.33	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

5

COMPOSITE
HSS14–HSS12

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 5 ksi

Shape		HSS14×10×								HSS12×10×			
		1/2		3/8		5/16		1/4		1/2		3/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.465		0.349	
Steel Wt/ft		75.9		58.1		48.9		39.5		69.1		52.9	
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 $(KL)_y$, with respect to weak axis (ft)	0	732	1100	630	944	577	865	523	785	651	976	558	837
	6	714	1070	613	920	562	842	509	763	634	951	543	815
	7	707	1060	608	911	556	834	504	755	628	942	538	807
	8	700	1050	601	902	550	825	498	747	621	932	532	798
	9	692	1040	594	890	543	815	491	737	614	921	526	788
	10	682	1020	586	878	535	803	484	726	605	908	518	777
	11	672	1010	577	865	527	791	476	715	596	895	510	766
	12	662	992	567	851	518	777	468	702	587	880	502	753
	13	650	975	557	835	509	763	459	689	576	864	493	739
	14	638	957	546	819	498	748	450	674	565	847	483	724
	15	625	937	535	802	488	732	440	659	553	830	473	709
	16	611	917	523	784	477	715	429	644	541	811	462	693
	17	597	896	510	766	465	698	418	628	528	792	451	676
	18	583	874	498	747	453	680	407	611	515	773	439	659
	19	568	852	485	727	441	661	396	594	501	752	428	641
	20	552	828	471	706	428	642	384	576	488	731	416	623
	21	537	805	457	686	415	623	372	558	473	710	403	605
	22	521	781	443	665	402	603	360	540	459	688	391	586
	23	504	756	429	643	389	583	347	521	444	666	378	567
	24	488	732	415	622	375	563	335	503	429	644	365	548
	25	471	707	400	600	362	543	323	484	414	622	352	528
	26	455	682	386	578	348	523	310	465	399	599	339	509
	27	438	657	371	556	335	502	298	447	384	577	326	489
	28	421	632	356	535	322	482	285	428	369	554	313	470
	29	405	607	342	513	308	462	273	409	355	532	300	450
	30	388	582	328	492	295	442	261	391	340	510	288	431
	32	356	534	299	449	269	403	237	355	311	466	262	394
	34	324	486	272	408	244	365	214	321	282	424	238	357
	36	294	441	246	369	219	329	192	287	255	383	215	322
	38	264	396	221	331	197	295	172	258	229	344	193	289
	40	238	358	199	299	177	266	155	233	207	310	174	261
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	227	341	175	263	148	223	120	181	181	272	140	211
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	180	271	139	209	118	177	95.8	144	160	240	124	186
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	22200		18600		16600		14500		14800		12500	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	12500		10500		9330		8150		10900		9130	
r_{mx}/r_{my}		1.33		1.33		1.33		1.34		1.17		1.17	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

F_y = 46 ksi
f'_c = 5 ksi

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

5

COMPOSITE HSS12

Shape		HSS12×10×				HSS12×8×							
		5/16		1/4		5/8		1/2		3/8		1/4	
t_{design}, in.		0.291		0.233		0.581		0.465		0.349		0.233	
Steel Wt/ft		44.6		36.0		76.1		62.3		47.8		32.6	
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 $(KL)_y$ with respect to weak axis (ft)	0	510	765	461	692	640	961	561	842	478	717	391	586
	6	496	745	448	673	615	923	539	809	459	689	375	562
	7	492	737	444	666	606	910	532	798	453	679	369	554
	8	486	729	439	658	597	895	523	785	445	668	363	544
	9	480	720	433	649	585	878	514	770	437	655	356	534
	10	473	710	427	640	573	860	503	754	428	642	348	522
	11	466	698	420	630	560	840	492	737	418	627	340	509
	12	458	686	412	618	546	819	479	719	408	611	331	496
	13	449	674	404	606	531	796	466	700	397	595	321	482
	14	440	660	396	594	515	773	453	679	385	577	311	467
	15	431	646	387	581	499	749	439	658	373	559	301	452
	16	421	631	378	567	482	723	424	636	360	540	290	436
	17	410	615	368	552	465	697	409	614	347	521	280	419
	18	400	599	358	537	447	671	394	591	334	501	268	403
	19	389	583	348	522	429	644	378	567	321	481	257	386
	20	377	566	338	507	411	617	362	544	307	461	246	369
	21	366	549	327	491	393	589	347	520	294	441	234	352
	22	354	531	316	474	375	562	331	496	280	420	223	335
	23	342	514	305	458	356	534	315	472	267	400	212	318
	24	331	496	294	442	338	507	299	449	253	380	200	301
	25	319	478	283	425	320	481	284	425	240	360	189	284
	26	307	460	272	409	303	454	268	402	227	340	179	268
	27	295	442	261	392	285	428	253	380	214	321	168	252
	28	283	424	250	376	269	403	238	357	201	302	158	236
	29	271	406	240	359	252	378	224	336	189	284	147	221
	30	259	389	229	343	236	354	210	314	177	265	138	206
	32	236	354	208	312	207	311	184	276	155	233	121	181
	34	214	320	187	281	184	275	163	245	138	206	107	161
	36	192	288	168	252	164	246	146	218	123	184	95.5	143
	38	172	258	150	226	147	220	131	196	110	165	85.7	129
	40	155	233	136	204	133	199	118	177	99.4	149	77.4	116
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	119	179	96.6	145	188	283	156	235	122	183	84.0	126
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	105	158	85.4	128	142	214	118	178	92.1	138	63.8	95.8
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	11100		9760		13800		12200		10400		8160	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	8160		7140		6970		6190		5230		4060	
r_{mx}/r_{my}		1.17		1.17		1.40		1.41		1.41		1.42	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

5

COMPOSITE
HSS12–HSS10

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 5 ksi

Shape		HSS12×6×								HSS10×8×			
		5/8		1/2		3/8		1/4		5/8		1/2	
t_{design}, in.		0.581		0.465		0.349		0.233		0.581		0.465	
Steel Wt/ft		67.6		55.5		42.7		29.2		67.6		55.5	
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 $(KL)_y$ with respect to weak axis (ft)	0	541	811	471	707	398	596	320	480	558	837	488	732
	6	505	757	440	660	372	558	299	448	535	803	469	703
	7	492	738	430	644	363	544	291	437	527	791	462	693
	8	478	717	418	626	353	529	283	424	518	778	454	681
	9	463	694	404	607	342	513	274	411	508	763	446	668
	10	446	670	390	585	330	495	264	396	497	746	436	654
	11	429	643	375	562	317	476	253	380	486	728	426	639
	12	410	615	359	539	304	456	242	364	473	709	415	622
	13	391	586	342	514	290	435	231	347	460	689	403	605
	14	371	557	325	488	276	413	219	329	446	668	391	587
	15	351	527	308	462	261	392	207	311	431	646	379	568
	16	331	496	291	436	246	370	195	293	416	624	366	549
	17	311	466	273	410	232	348	183	275	401	601	352	529
	18	290	436	256	383	217	325	171	257	385	577	339	508
	19	270	406	238	358	202	304	159	239	369	553	325	487
	20	251	376	221	332	188	282	148	222	353	529	311	466
	21	232	348	205	307	174	262	137	205	336	505	297	445
	22	214	320	189	283	161	241	126	188	320	480	283	424
	23	195	293	173	260	148	221	115	172	304	456	269	403
	24	180	269	159	239	136	203	106	158	288	432	255	382
	25	165	248	147	220	125	187	97.3	146	272	409	241	362
	26	153	229	136	203	116	173	90.0	135	257	386	228	342
	27	142	213	126	188	107	161	83.4	125	242	363	214	322
	28	132	198	117	175	100	149	77.6	116	227	341	202	302
	29	123	184	109	163	92.8	139	72.3	108	212	319	189	283
	30	115	172	102	153	86.8	130	67.6	101	198	298	176	265
	32	101	151	89.5	134	76.2	114	59.4	89.1	174	262	155	233
	34	89.5	134	79.2	119	67.5	101	52.6	78.9	155	232	137	206
	36	79.8	120	70.7	106	60.2	90.4	46.9	70.4	138	207	123	184
	38	71.6	107	63.4	95.2	54.1	81.1	42.1	63.2	124	186	110	165
	40			57.3	85.9	48.8	73.2	38.0	57.0	112	167	99.3	149

Properties

M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	158	237	132	198	103	155	71.4	107	143	215	119	179
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	96.6	145	80.9	122	63.5	95.4	44.3	66.5	122	184	102	153
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	10800		9660		8310		6550		8520		7590	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	3400		3010		2560		2000		5860		5210	
r_{mx}/r_{my}		1.79		1.79		1.80		1.81		1.21		1.21	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 5 ksi

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

5
COMPOSITE HSS10

Shape		HSS10×8×								HSS10×6×			
		3/8		5/16		1/4		3/16		5/8		1/2	
t_{design}, in.		0.349		0.291		0.233		0.174		0.581		0.465	
Steel Wt/ft		42.7		36.1		29.2		22.2		59.1		48.7	
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length $(KL)_y$, with respect to weak axis (ft)	0	415	622	376	565	337	506	296	445	467	700	407	610
	6	398	597	361	542	323	485	284	425	435	652	379	569
	7	392	589	356	534	318	478	279	419	423	635	370	555
	8	386	579	350	525	313	469	274	411	411	616	359	539
	9	379	568	343	515	307	460	268	402	397	596	348	521
	10	371	556	336	504	300	450	262	393	383	574	335	503
	11	362	543	328	492	293	439	255	383	367	550	322	482
	12	353	529	319	479	285	427	248	372	351	526	308	461
	13	343	515	310	466	277	415	241	361	334	500	293	439
	14	333	499	301	452	268	402	233	349	316	474	278	417
	15	322	483	291	437	259	389	225	337	298	448	263	394
	16	311	467	281	422	250	375	216	324	280	421	247	371
	17	300	450	271	406	240	360	208	311	263	394	232	348
	18	288	432	260	390	231	346	199	298	245	368	217	325
	19	277	415	249	374	221	331	190	285	228	341	202	303
	20	265	397	239	358	211	316	181	272	211	316	187	281
	21	253	379	228	342	201	302	172	258	194	291	173	259
	22	241	361	217	325	191	287	163	245	178	267	159	238
	23	229	344	206	309	181	272	155	232	163	244	145	218
	24	217	326	195	293	172	257	146	219	150	224	133	200
	25	206	309	185	277	162	243	137	206	138	207	123	184
	26	194	291	174	261	153	229	129	193	127	191	114	171
	27	183	275	164	246	143	215	121	181	118	177	105	158
	28	172	258	154	231	134	202	113	169	110	165	98.1	147
	29	161	242	144	216	125	188	105	158	102	154	91.4	137
	30	151	226	135	202	117	176	98.2	147	95.7	144	85.4	128
	32	133	199	118	178	103	155	86.3	129	84.1	126	75.1	113
	34	117	176	105	157	91.3	137	76.4	115	74.5	112	66.5	100
	36	105	157	93.6	140	81.4	122	68.2	102	66.5	100	59.3	89.0
	38	94.0	141	84.0	126	73.1	110	61.2	91.8	59.6	89.5	53.2	79.9
	40	84.8	127	75.8	114	65.9	98.9	55.2	82.8				
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	93.0	140	79.0	119	64.5	97.0	49.1	73.8	118	177	98.7	148
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	79.8	120	67.9	102	55.4	83.3	42.2	63.5	82.1	123	69.1	104
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	6490		5820		5070		4260		6640		5930	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	4450		3990		3470		2890		2820		2520	
r_{mx}/r_{my}		1.21		1.21		1.21		1.21		1.53		1.53	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

5

COMPOSITE
HSS10

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 5 ksi

Shape		HSS10×6×								HSS10×5×			
		3/8		5/16		1/4		3/16		3/8		5/16	
t_{design}, in.		0.349		0.291		0.233		0.174		0.349		0.291	
Steel Wt/ft		37.6		31.8		25.8		19.7		35.1		29.7	
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 $(KL)_y$, with respect to weak axis (ft)	0	343	515	310	464	275	413	239	359	307	461	276	414
	6	320	480	289	434	257	385	222	334	279	418	251	376
	7	312	468	282	423	250	375	217	325	269	404	242	363
	8	303	455	274	411	243	364	210	315	258	388	233	349
	9	294	441	265	398	235	352	203	304	247	370	222	333
	10	283	425	256	383	226	339	195	293	234	352	211	317
	11	272	408	246	368	217	326	187	280	221	332	199	299
	12	260	390	235	352	208	311	178	267	208	312	187	281
	13	248	372	224	336	198	296	169	254	195	292	175	263
	14	236	353	213	319	187	281	160	240	181	271	163	244
	15	223	334	201	302	177	266	151	226	167	251	151	226
	16	210	315	190	284	167	250	142	213	154	231	139	208
	17	197	296	178	267	156	234	132	199	141	211	127	190
	18	184	277	166	250	146	219	123	185	128	192	115	173
	19	172	258	155	233	136	203	114	171	116	173	104	157
	20	159	239	144	216	126	188	106	158	104	156	94.2	141
	21	147	221	133	199	116	174	97.0	146	94.6	142	85.4	128
	22	136	204	122	184	106	160	88.7	133	86.2	129	77.8	117
	23	124	186	112	168	97.4	146	81.1	122	78.8	118	71.2	107
	24	114	171	103	154	89.5	134	74.5	112	72.4	109	65.4	98.1
	25	105	158	94.9	142	82.5	124	68.7	103	66.7	100	60.3	90.4
	26	97.2	146	87.7	132	76.2	114	63.5	95.2	61.7	92.5	55.7	83.6
	27	90.2	135	81.3	122	70.7	106	58.9	88.3	57.2	85.8	51.7	77.5
	28	83.8	126	75.6	113	65.7	98.6	54.7	82.1	53.2	79.8	48.0	72.1
	29	78.2	117	70.5	106	61.3	91.9	51.0	76.5	49.6	74.4	44.8	67.2
	30	73.0	110	65.9	98.8	57.3	85.9	47.7	71.5	46.3	69.5	41.9	62.8
	32	64.2	96.3	57.9	86.9	50.3	75.5	41.9	62.9	40.7	61.1	36.8	55.2
	34	56.9	85.3	51.3	76.9	44.6	66.9	37.1	55.7	36.1	54.1	32.6	48.9
	36	50.7	76.1	45.8	68.6	39.8	59.7	33.1	49.7				
	38	45.5	68.3	41.1	61.6	35.7	53.5	29.7	44.6				
	40	41.1	61.6	37.1	55.6	32.2	48.3	26.8	40.2				

Properties

M_{nx}/Ω_b	$\phi_b M_{nx}$	kip-ft	77.5	116	66.1	99.3	54.1	81.3	41.3	62.0	69.8	105	59.6	89.5
M_{ny}/Ω_b	$\phi_b M_{ny}$	kip-ft	54.4	81.8	46.5	69.8	38.1	57.2	29.1	43.8	42.9	64.5	36.7	55.2
$P_{ex}(K_xL_x)^2/10^4$		kip-in.^{2}	5130		4650		4050		3400		4410		4020	
$P_{ey}(K_yL_y)^2/10^4$		kip-in.^{2}	2160		1940		1700		1410		1370		1240	
r_{mx}/r_{my}			1.54		1.55		1.54		1.55		1.79		1.80	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 5 ksi

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

5

COMPOSITE HSS10–HSS9

Shape		HSS10×5×				HSS9×7×							
		1/4		3/16		5/8		1/2		3/8		5/16	
t_{design}, in.		0.233		0.174		0.581		0.465		0.349		0.291	
Steel Wt/ft		24.1		18.4		59.1		48.7		37.6		31.8	
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 $(KL)_y$, with respect to weak axis (ft)	0	244	366	211	316	473	710	413	620	349	524	316	474
	6	222	332	190	286	448	672	392	588	332	497	300	450
	7	214	321	184	275	439	659	384	576	325	488	294	441
	8	205	308	176	264	429	644	376	564	318	477	288	432
	9	196	294	168	251	419	628	366	550	310	466	281	421
	10	186	279	159	238	407	610	356	534	302	453	273	409
	11	176	264	150	225	394	591	345	518	293	439	265	397
	12	165	248	140	210	380	571	334	501	283	425	256	384
	13	154	231	131	196	366	550	322	482	273	410	247	370
	14	143	215	121	182	352	528	309	464	263	394	237	356
	15	132	199	112	167	337	505	296	444	252	377	227	341
	16	122	183	102	153	321	482	283	424	241	361	217	326
	17	111	167	93.1	140	305	458	269	404	229	344	207	310
	18	101	152	84.3	126	290	435	256	383	218	327	197	295
	19	91.2	137	75.8	114	274	411	242	363	206	310	186	279
	20	82.3	124	68.4	103	258	387	228	343	195	292	176	264
	21	74.7	112	62.0	93.0	243	364	215	322	184	275	166	248
	22	68.1	102	56.5	84.8	227	341	202	302	172	259	155	233
	23	62.3	93.4	51.7	77.6	212	319	189	283	161	242	146	218
	24	57.2	85.8	47.5	71.2	198	297	176	264	151	226	136	204
	25	52.7	79.1	43.8	65.7	184	275	164	245	140	211	126	190
	26	48.7	73.1	40.5	60.7	170	255	151	227	130	195	117	176
	27	45.2	67.8	37.5	56.3	157	236	140	211	121	181	109	163
	28	42.0	63.0	34.9	52.3	146	219	131	196	112	168	101	151
	29	39.2	58.8	32.5	48.8	136	205	122	183	105	157	94.1	141
	30	36.6	54.9	30.4	45.6	127	191	114	171	97.7	147	87.9	132
	32	32.2	48.3	26.7	40.1	112	168	100	150	85.9	129	77.3	116
	34	28.5	42.7	23.7	35.5	99.2	149	88.5	133	76.0	114	68.5	103
	36					88.5	133	79.0	118	67.8	102	61.1	91.6
	38					79.4	119	70.9	106	60.9	91.3	54.8	82.2
	40					71.7	108	64.0	95.9	54.9	82.4	49.5	74.2
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	48.8	73.4	37.3	56.1	111	167	92.9	140	72.9	110	62.2	93.4
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	30.2	45.4	23.2	34.8	93.0	140	78.1	117	61.4	92.3	52.4	78.7
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	3530		2970		5730		5140		4420		3970	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	1080		899		3770		3360		2880		2590	
r_{mx}/r_{my}		1.81		1.82		1.23		1.24		1.24		1.24	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

5

COMPOSITE
HSS9

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 5 ksi

Shape	HSS9×5×											
	5/8		1/2		3/8		5/16		1/4		3/16	
t_{design}, in.	0.581		0.465		0.349		0.291		0.233		0.174	
Steel Wt/ft	50.6		41.9		32.5		27.6		22.4		17.1	
Design	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length $(KL)_y$, with respect to weak axis (ft) 0	**386**	580	**336**	504	**282**	423	**253**	380	**224**	336	**193**	289
6	**348**	522	**304**	456	**255**	383	**230**	345	**203**	304	**174**	261
7	**335**	503	**293**	439	**247**	370	**222**	333	**196**	294	**168**	252
8	**321**	481	**281**	421	**237**	355	**213**	319	**188**	282	**161**	241
9	**305**	458	**268**	402	**226**	339	**203**	305	**179**	269	**153**	230
10	**289**	433	**254**	381	**214**	321	**193**	289	**170**	255	**145**	218
11	**272**	408	**239**	359	**202**	303	**182**	273	**161**	241	**137**	205
12	**254**	381	**224**	336	**190**	285	**171**	257	**151**	226	**128**	192
13	**236**	355	**209**	314	**177**	266	**160**	240	**141**	211	**119**	179
14	**219**	328	**194**	291	**165**	247	**148**	223	**131**	196	**110**	166
15	**201**	301	**179**	268	**152**	228	**137**	206	**121**	181	**102**	152
16	**184**	275	**164**	246	**140**	209	**126**	189	**111**	166	**93.0**	140
17	**167**	250	**149**	224	**128**	191	**115**	173	**101**	152	**84.7**	127
18	**151**	226	**135**	203	**116**	174	**105**	157	**91.9**	138	**76.7**	115
19	**135**	203	**122**	182	**104**	157	**94.4**	142	**82.9**	124	**68.9**	103
20	**122**	183	**110**	165	**94.3**	141	**85.2**	128	**74.8**	112	**62.1**	93.2
21	**111**	166	**99.5**	149	**85.5**	128	**77.3**	116	**67.8**	102	**56.4**	84.6
22	**101**	151	**90.7**	136	**77.9**	117	**70.4**	106	**61.8**	92.7	**51.4**	77.0
23	**92.3**	138	**83.0**	124	**71.3**	107	**64.4**	96.7	**56.5**	84.8	**47.0**	70.5
24	**84.7**	127	**76.2**	114	**65.5**	98.2	**59.2**	88.8	**51.9**	77.9	**43.2**	64.7
25	**78.1**	117	**70.2**	105	**60.3**	90.5	**54.5**	81.8	**47.9**	71.8	**39.8**	59.7
26	**72.2**	108	**64.9**	97.4	**55.8**	83.7	**50.4**	75.6	**44.2**	66.4	**36.8**	55.2
27	**67.0**	100	**60.2**	90.3	**51.7**	77.6	**46.8**	70.1	**41.0**	61.5	**34.1**	51.1
28	**62.3**	93.4	**56.0**	84.0	**48.1**	72.1	**43.5**	65.2	**38.1**	57.2	**31.7**	47.6
29	**58.0**	87.1	**52.2**	78.3	**44.8**	67.3	**40.5**	60.8	**35.6**	53.3	**29.6**	44.3
30	**54.2**	81.4	**48.8**	73.2	**41.9**	62.9	**37.9**	56.8	**33.2**	49.8	**27.6**	41.4
32	**47.7**	71.5	**42.9**	64.3	**36.8**	55.2	**33.3**	49.9	**29.2**	43.8	**24.3**	36.4
34							**29.5**	44.2	**25.9**	38.8	**21.5**	32.3
Properties												
M_{nx}/Ω_b / $\phi_b M_{nx}$ kip-ft	**88.3**	133	**74.7**	112	**59.1**	88.8	**50.5**	75.9	**41.5**	62.4	**31.8**	47.8
M_{ny}/Ω_b / $\phi_b M_{ny}$ kip-ft	**58.1**	87.3	**49.3**	74.1	**39.2**	58.9	**33.6**	50.5	**27.7**	41.6	**21.2**	31.9
$P_{ex}(K_xL_x)^2/10^4$ kip-in.^{2}	4280		3860		3330		3020		2680		2230	
$P_{ey}(K_yL_y)^2/10^4$ kip-in.^{2}	1600		1440		1240		1120		982		816	
r_{mx}/r_{my}	1.64		1.64		1.64		1.64		1.65		1.65	

ASD	LRFD	Note: Heavy line indicates *Kl/r* equal to or greater than 200.
$\Omega_c = 2.00$	$\phi_c = 0.75$	

F_y = 46 ksi
f'_c = 5 ksi

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

5

COMPOSITE HSS8

Shape		HSS8×6×											
		5/8		1/2		3/8		5/16		1/4		3/16	
t_{design}, in.		0.581		0.465		0.349		0.291		0.233		0.174	
Steel Wt/ft		50.6		41.9		32.5		27.6		22.4		17.1	
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 $(KL)_y$, with respect to weak axis (ft)	0	393	589	343	514	288	433	260	390	230	346	199	299
	6	364	547	318	478	269	403	242	363	214	322	185	277
	7	355	532	310	465	262	393	236	354	209	313	180	270
	8	344	516	301	451	254	381	229	344	203	304	175	262
	9	332	498	291	436	246	368	221	332	196	294	168	253
	10	319	478	280	420	237	355	213	320	189	283	162	243
	11	305	458	268	402	227	340	205	307	181	271	155	233
	12	291	436	256	384	217	325	196	293	173	259	148	222
	13	276	414	243	365	206	309	186	279	164	246	140	210
	14	261	392	230	346	196	293	176	265	156	233	133	199
	15	246	369	217	326	185	277	167	250	147	220	125	187
	16	230	346	204	306	174	260	157	235	138	207	117	176
	17	215	323	191	286	163	244	147	220	129	194	109	164
	18	200	300	178	267	152	228	137	206	120	181	102	153
	19	185	278	165	247	141	211	127	191	112	168	94.2	141
	20	171	256	152	229	130	196	118	177	103	155	86.8	130
	21	157	235	140	210	120	180	109	163	95.3	143	79.7	120
	22	143	214	128	193	110	165	99.8	150	87.3	131	72.8	109
	23	131	196	117	176	101	151	91.3	137	79.9	120	66.6	99.9
	24	120	180	108	162	92.7	139	83.9	126	73.4	110	61.1	91.7
	25	111	166	99.4	149	85.4	128	77.3	116	67.6	101	56.4	84.5
	26	102	154	91.9	138	79.0	118	71.5	107	62.5	93.8	52.1	78.1
	27	94.9	142	85.2	128	73.2	110	66.3	99.4	58.0	87.0	48.3	72.5
	28	88.3	132	79.3	119	68.1	102	61.6	92.5	53.9	80.9	44.9	67.4
	29	82.3	123	73.9	111	63.5	95.2	57.5	86.2	50.3	75.4	41.9	62.8
	30	76.9	115	69.0	104	59.3	89.0	53.7	80.5	47.0	70.4	39.1	58.7
	32	67.6	101	60.7	91.0	52.1	78.2	47.2	70.8	41.3	61.9	34.4	51.6
	34	59.9	89.8	53.7	80.6	46.2	69.3	41.8	62.7	36.6	54.8	30.5	45.7
	36	53.4	80.1	47.9	71.9	41.2	61.8	37.3	55.9	32.6	48.9	27.2	40.8
	38			43.0	64.5	37.0	55.5	33.5	50.2	29.3	43.9	24.4	36.6
	40							30.2	45.3	26.4	39.6	22.0	33.0
Properties													
M_{nx}/Ω_b	$\phi_b M_{nx}$ kip-ft	82.8	124	69.9	105	55.3	83.1	47.3	71.1	38.8	58.4	29.7	44.7
M_{ny}/Ω_b	$\phi_b M_{ny}$ kip-ft	67.7	102	57.3	86.1	45.4	68.2	38.8	58.4	31.9	48.0	24.5	36.8
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	3660		3300		2840		2580		2260		1890	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	2280		2040		1760		1580		1390		1160	
r_{mx}/r_{my}		1.27		1.27		1.27		1.28		1.28		1.28	
ASD	LRFD	Note: Heavy line indicates Kl/r equal to or greater than 200.											
Ω_c = 2.00	ϕ_c = 0.75												

5

COMPOSITE HSS8

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 5 ksi

Shape		HSS8×4×											
		5/8		1/2		3/8		5/16		1/4		3/16	
t_{design}, in.		0.581		0.465		0.349		0.291		0.233		0.174	
Steel Wt/ft		42.1		35.1		27.4		23.3		19.0		14.5	
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 $(KL)_y$ with respect to weak axis (ft)	0	310	465	270	405	225	338	202	302	177	265	151	226
	6	262	393	230	345	193	290	173	260	152	228	129	194
	7	247	370	217	325	183	274	164	246	144	216	122	183
	8	230	345	203	304	171	257	154	231	135	203	115	172
	9	213	319	188	282	159	239	143	215	126	189	107	160
	10	195	292	173	259	147	220	132	198	116	174	98.2	147
	11	176	265	157	236	134	201	121	181	106	159	89.8	135
	12	159	238	142	213	121	182	110	164	96.5	145	81.3	122
	13	141	212	127	191	109	164	98.6	148	86.9	130	73.1	110
	14	124	187	113	169	97.2	146	87.9	132	77.6	116	65.1	97.6
	15	109	163	98.8	148	85.7	129	77.7	117	68.6	103	57.4	86.1
	16	95.4	143	86.9	130	75.3	113	68.3	102	60.3	90.4	50.4	75.7
	17	84.5	127	77.0	115	66.7	100	60.5	90.7	53.4	80.1	44.7	67.0
	18	75.4	113	68.6	103	59.5	89.3	53.9	80.9	47.6	71.5	39.9	59.8
	19	67.6	101	61.6	92.4	53.4	80.1	48.4	72.6	42.8	64.1	35.8	53.7
	20	61.0	91.6	55.6	83.4	48.2	72.3	43.7	65.5	38.6	57.9	32.3	48.4
	21	55.4	83.1	50.4	75.6	43.7	65.6	39.6	59.5	35.0	52.5	29.3	43.9
	22	50.4	75.7	45.9	68.9	39.8	59.8	36.1	54.2	31.9	47.8	26.7	40.0
	23	46.2	69.2	42.0	63.1	36.5	54.7	33.0	49.6	29.2	43.8	24.4	36.6
	24	42.4	63.6	38.6	57.9	33.5	50.2	30.3	45.5	26.8	40.2	22.4	33.6
	25	39.1	58.6	35.6	53.4	30.9	46.3	28.0	41.9	24.7	37.0	20.7	31.0
	26			32.9	49.3	28.5	42.8	25.9	38.8	22.8	34.3	19.1	28.7
	27							24.0	36.0	21.2	31.8	17.7	26.6
	28											16.5	24.7

Properties												
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	63.0	94.7	53.8	80.9	43.0	64.7	37.0	55.6	30.5	45.9	23.5	35.3
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	38.1	57.2	32.8	49.3	26.4	39.6	22.7	34.2	18.8	28.3	14.5	21.8
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	2560		2330		2030		1840		1640		1390	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	802		730		634		575		507		423	
r_{mx}/r_{my}		1.79		1.79		1.79		1.79		1.80		1.81	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 5 ksi

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

COMPOSITE
HSS7

Shape		HSS7×5×											
		1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		35.1		27.4		23.3		19.0		14.5		9.85	
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 $(KL)_y$, with respect to weak axis (ft)	0	276	414	232	347	208	312	183	275	157	236	131	196
	6	248	372	209	313	188	282	166	248	142	212	117	175
	7	239	358	201	302	181	271	160	239	136	204	112	168
	8	229	343	193	289	173	260	153	229	131	196	107	161
	9	217	326	184	276	165	248	146	219	124	186	102	152
	10	206	308	174	261	157	235	138	207	118	176	95.8	144
	11	193	290	164	246	148	221	130	195	111	166	89.7	135
	12	181	271	153	230	138	207	122	183	103	155	83.6	125
	13	168	252	143	214	129	193	114	171	96.2	144	77.3	116
	14	155	232	132	198	119	179	105	158	88.9	133	71.1	107
	15	142	213	122	183	110	165	97.1	146	81.8	123	65.0	97.5
	16	130	195	111	167	101	151	89.0	133	74.7	112	59.1	88.6
	17	118	177	101	152	91.7	138	81.1	122	67.9	102	53.3	80.0
	18	106	159	91.7	137	83.0	125	73.5	110	61.3	92.0	47.7	71.6
	19	95.1	143	82.3	123	74.6	112	66.0	99.1	55.0	82.5	42.8	64.3
	20	85.9	129	74.3	111	67.4	101	59.6	89.4	49.7	74.5	38.7	58.0
	21	77.9	117	67.4	101	61.1	91.6	54.1	81.1	45.0	67.6	35.1	52.6
	22	71.0	106	61.4	92.1	55.7	83.5	49.3	73.9	41.0	61.6	32.0	47.9
	23	64.9	97.4	56.2	84.3	50.9	76.4	45.1	67.6	37.5	56.3	29.2	43.9
	24	59.6	89.4	51.6	77.4	46.8	70.2	41.4	62.1	34.5	51.7	26.9	40.3
	25	55.0	82.4	47.5	71.3	43.1	64.7	38.1	57.2	31.8	47.7	24.7	37.1
	26	50.8	76.2	44.0	65.9	39.9	59.8	35.3	52.9	29.4	44.1	22.9	34.3
	27	47.1	70.7	40.8	61.1	37.0	55.4	32.7	49.1	27.2	40.9	21.2	31.8
	28	43.8	65.7	37.9	56.9	34.4	51.5	30.4	45.6	25.3	38.0	19.7	29.6
	29	40.8	61.3	35.3	53.0	32.0	48.1	28.3	42.5	23.6	35.4	18.4	27.6
	30	38.2	57.2	33.0	49.5	29.9	44.9	26.5	39.7	22.1	33.1	17.2	25.8
	32			29.0	43.5	26.3	39.5	23.3	34.9	19.4	29.1	15.1	22.7
	34									17.2	25.8	13.4	20.1

Properties

M_{nx}/Ω_b	$\phi_b M_{nx}$	kip-ft	50.2	75.4	40.1	60.2	34.4	51.8	28.4	42.7	21.8	32.8	15.0	22.5
M_{ny}/Ω_b	$\phi_b M_{ny}$	kip-ft	39.6	59.6	31.7	47.7	27.3	41.1	22.6	33.9	17.4	26.1	11.9	17.9
$P_{ex}(K_xL_x)^2/10^4$		kip-in.^{2}	1970		1710		1560		1380		1160		909	
$P_{ey}(K_yL_y)^2/10^4$		kip-in.^{2}	1130		976		884		783		652		508	
r_{mx}/r_{my}			1.32		1.32		1.33		1.33		1.33		1.34	

ASD	LRFD	
$\Omega_c = 2.00$	$\phi_c = 0.75$	Note: Heavy line indicates Kl/r equal to or greater than 200.

5

COMPOSITE
HSS7

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 5 ksi

Shape		HSS7×4×											
		1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		31.7		24.9		21.2		17.3		13.3		9.00	
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 $(KL)_y$, with respect to weak axis (ft)	0	242	363	202	303	181	271	159	238	135	203	111	166
	6	205	308	173	259	155	232	136	204	115	173	93.9	141
	7	193	290	163	245	146	220	129	193	109	164	88.5	133
	8	181	271	153	229	137	206	121	181	102	153	82.6	124
	9	167	251	142	213	128	191	112	168	95.0	142	76.4	115
	10	153	230	130	196	117	176	103	155	87.4	131	70.0	105
	11	139	209	119	178	107	161	94.5	142	79.8	120	63.6	95.3
	12	125	188	108	161	97.1	146	85.7	128	72.2	108	57.2	85.8
	13	112	168	96.4	145	87.2	131	77.0	115	64.8	97.2	51.0	76.5
	14	98.8	148	85.6	128	77.6	116	68.6	103	57.6	86.4	45.0	67.6
	15	86.4	130	75.3	113	68.4	103	60.5	90.7	50.7	76.0	39.4	59.0
	16	75.9	114	66.1	99.2	60.1	90.1	53.1	79.7	44.5	66.8	34.6	51.9
	17	67.3	101	58.6	87.9	53.2	79.8	47.1	70.6	39.5	59.2	30.6	46.0
	18	60.0	90.0	52.3	78.4	47.5	71.2	42.0	63.0	35.2	52.8	27.3	41.0
	19	53.8	80.8	46.9	70.4	42.6	63.9	37.7	56.5	31.6	47.4	24.5	36.8
	20	48.6	72.9	42.3	63.5	38.4	57.7	34.0	51.0	28.5	42.8	22.1	33.2
	21	44.1	66.1	38.4	57.6	34.9	52.3	30.8	46.3	25.9	38.8	20.1	30.1
	22	40.2	60.2	35.0	52.5	31.8	47.7	28.1	42.2	23.6	35.3	18.3	27.4
	23	36.7	55.1	32.0	48.0	29.1	43.6	25.7	38.6	21.6	32.3	16.7	25.1
	24	33.7	50.6	29.4	44.1	26.7	40.1	23.6	35.4	19.8	29.7	15.4	23.1
	25	31.1	46.7	27.1	40.6	24.6	36.9	21.8	32.7	18.2	27.4	14.2	21.3
	26			25.1	37.6	22.8	34.1	20.1	30.2	16.9	25.3	13.1	19.6
	27							18.7	28.0	15.6	23.5	12.1	18.2
	28											11.3	16.9

Properties

			1/2		3/8		5/16		1/4		3/16		1/8	
M_{nx}/Ω_b	$\phi_b M_{nx}$	kip-ft	43.2	64.9	34.7	52.2	30.0	45.0	24.8	37.3	19.1	28.7	13.2	19.8
M_{ny}/Ω_b	$\phi_b M_{ny}$	kip-ft	29.0	43.6	23.4	35.2	20.3	30.5	16.8	25.3	13.0	19.6	8.97	13.5
$P_{ex}(K_xL_x)^2/10^4$		kip-in.^{2}	1630		1420		1290		1150		975		763	
$P_{ey}(K_yL_y)^2/10^4$		kip-in.^{2}	638		556		505		446		374		291	
r_{mx}/r_{my}			1.60		1.60		1.60		1.61		1.61		1.62	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 5 ksi

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

5

COMPOSITE HSS6

Shape		HSS6×5×											
		1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		31.7		24.9		21.2		17.3		13.3		9.00	
Design		P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length $(KL)_y$ with respect to weak axis (ft)	0	246	369	206	310	185	278	163	244	139	209	115	173
	1	245	368	206	309	185	277	162	244	139	208	115	172
	2	243	365	204	306	183	275	161	242	138	206	114	170
	3	239	359	201	302	180	271	159	238	136	203	112	168
	4	234	351	197	295	177	265	156	233	133	199	109	164
	5	228	342	192	288	172	258	152	227	129	194	106	160
	6	220	331	186	278	167	250	147	220	125	188	103	154
	7	212	318	179	268	161	241	141	212	121	181	98.7	148
	8	202	304	171	256	154	231	135	203	115	173	94.2	141
	9	192	288	163	244	146	219	129	193	110	165	89.4	134
	10	181	272	154	231	138	208	122	183	104	156	84.2	126
	11	170	255	145	217	130	195	115	172	97.5	146	78.9	118
	12	158	238	135	203	122	183	107	161	91.1	137	73.4	110
	13	147	220	125	188	113	170	100	150	84.7	127	67.9	102
	14	135	203	116	174	105	157	92.5	139	78.2	117	62.4	93.6
	15	124	186	106	160	96.2	144	85.1	128	71.8	108	57.0	85.5
	16	113	169	97.1	146	87.9	132	77.8	117	65.5	98.3	51.7	77.6
	17	102	153	88.1	132	79.9	120	70.7	106	59.5	89.2	46.7	70.0
	18	91.3	137	79.4	119	72.1	108	63.9	95.9	53.6	80.4	41.7	62.6
	19	81.9	123	71.2	107	64.7	97.1	57.4	86.1	48.1	72.1	37.5	56.2
	20	73.9	111	64.3	96.4	58.4	87.6	51.8	77.7	43.4	65.1	33.8	50.7
	21	67.1	101	58.3	87.5	53.0	79.5	47.0	70.4	39.4	59.1	30.7	46.0
	22	61.1	91.7	53.1	79.7	48.3	72.4	42.8	64.2	35.9	53.8	27.9	41.9
	23	55.9	83.9	48.6	72.9	44.2	66.3	39.2	58.7	32.8	49.2	25.6	38.4
	24	51.3	77.0	44.7	67.0	40.6	60.9	36.0	53.9	30.1	45.2	23.5	35.2
	25	47.3	71.0	41.2	61.7	37.4	56.1	33.1	49.7	27.8	41.7	21.6	32.5
	26	43.7	65.6	38.0	57.1	34.6	51.9	30.6	46.0	25.7	38.5	20.0	30.0
	27	40.6	60.9	35.3	52.9	32.1	48.1	28.4	42.6	23.8	35.7	18.6	27.8
	28	37.7	56.6	32.8	49.2	29.8	44.7	26.4	39.6	22.1	33.2	17.3	25.9
	29	35.2	52.7	30.6	45.9	27.8	41.7	24.6	36.9	20.6	31.0	16.1	24.1
	30	32.9	49.3	28.6	42.9	26.0	38.9	23.0	34.5	19.3	28.9	15.0	22.5
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	39.5	59.4	31.8	47.8	27.4	41.2	22.7	34.1	17.5	26.3	12.0	18.1
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	34.8	52.3	28.0	42.1	24.2	36.3	20.0	30.1	15.4	23.2	10.6	16.0
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	1310		1140		1040		924		778		608	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	971		845		768		680		570		444	
r_{mx}/r_{my}		1.16		1.16		1.16		1.17		1.17		1.17	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

5

COMPOSITE HSS6

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 5 ksi

Shape	HSS6×4×											
	1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.	0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft	28.3		22.3		19.1		15.6		12.0		8.15	
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 $(KL)_y$ with respect to weak axis (ft)												
0	214	321	179	269	160	240	140	211	119	179	97.5	146
1	213	319	178	267	160	239	140	210	119	178	97.0	146
2	210	315	176	264	157	236	138	207	117	176	95.7	144
3	205	307	172	258	154	231	135	203	115	172	93.5	140
4	198	297	167	250	149	224	131	196	111	167	90.5	136
5	190	285	160	240	143	215	126	189	107	160	86.8	130
6	180	271	152	228	137	205	120	180	102	153	82.5	124
7	170	255	144	215	129	193	113	170	96.1	144	77.7	117
8	158	237	134	201	121	181	106	159	90.0	135	72.5	109
9	146	219	124	186	112	168	98.5	148	83.5	125	67.0	100
10	133	200	114	171	103	154	90.6	136	76.8	115	61.3	92.0
11	121	181	104	156	93.8	141	82.7	124	70.0	105	55.6	83.4
12	108	163	93.6	140	84.7	127	74.8	112	63.3	94.9	50.0	75.0
13	96.3	145	83.6	125	75.8	114	67.0	101	56.7	85.1	44.5	66.8
14	84.8	127	74.0	111	67.3	101	59.5	89.3	50.3	75.5	39.3	58.9
15	73.9	111	64.8	97.2	59.0	88.5	52.3	78.5	44.2	66.3	34.3	51.4
16	65.0	97.5	57.0	85.5	51.9	77.8	46.0	69.0	38.9	58.3	30.1	45.2
17	57.6	86.3	50.5	75.7	46.0	68.9	40.7	61.1	34.4	51.6	26.7	40.1
18	51.3	77.0	45.0	67.5	41.0	61.5	36.3	54.5	30.7	46.1	23.8	35.7
19	46.1	69.1	40.4	60.6	36.8	55.2	32.6	48.9	27.6	41.3	21.4	32.1
20	41.6	62.4	36.5	54.7	33.2	49.8	29.4	44.1	24.9	37.3	19.3	28.9
21	37.7	56.6	33.1	49.6	30.1	45.2	26.7	40.0	22.6	33.8	17.5	26.2
22	34.4	51.6	30.1	45.2	27.4	41.2	24.3	36.5	20.6	30.8	15.9	23.9
23	31.4	47.2	27.6	41.4	25.1	37.7	22.3	33.4	18.8	28.2	14.6	21.9
24	28.9	43.3	25.3	38.0	23.1	34.6	20.4	30.7	17.3	25.9	13.4	20.1
25	26.6	39.9	23.3	35.0	21.2	31.9	18.8	28.3	15.9	23.9	12.3	18.5
26					19.6	29.5	17.4	26.1	14.7	22.1	11.4	17.1
27									13.6	20.5	10.6	15.9

Properties

		1/2		3/8		5/16		1/4		3/16		1/8	
M_{nx}/Ω_b $\phi_b M_{nx}$	kip-ft	33.6	50.5	27.3	41.0	23.6	35.4	19.6	29.4	15.2	22.8	10.5	15.7
M_{ny}/Ω_b $\phi_b M_{ny}$	kip-ft	25.2	37.9	20.5	30.8	17.8	26.7	14.8	22.2	11.5	17.3	7.94	11.9
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	1070		942		860		765		651		508	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	546		480		436		386		327		253	
r_{mx}/r_{my}		1.40		1.40		1.40		1.41		1.41		1.42	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 5 ksi

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

COMPOSITE
HSS6

Shape	HSS6×3×1/2		HSS6×3×3/8		HSS6×3×5/16		HSS6×3×1/4		HSS6×3×3/16		HSS6×3×1/8	
t_{design}, in.	0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft	24.9		19.7		16.9		13.9		10.7		7.30	
Design	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD	P_n/Ω_c ASD	$\phi_c P_n$ LRFD
Effective length $(KL)_y$ (ft), with respect to weak axis												
0	182	273	152	228	135	203	118	177	99.3	149	79.9	120
1	180	270	151	226	134	201	117	176	98.5	148	79.3	119
2	176	264	147	221	131	197	114	172	96.3	144	77.5	116
3	168	253	141	212	126	189	110	165	92.8	139	74.5	112
4	159	238	134	201	120	179	105	157	88.1	132	70.6	106
5	147	221	125	187	112	167	97.6	146	82.3	123	65.8	98.8
6	134	201	114	171	103	154	89.9	135	75.8	114	60.5	90.7
7	120	180	103	154	92.8	139	81.5	122	68.8	103	54.7	82.0
8	106	159	91.5	137	82.6	124	72.7	109	61.5	92.3	48.7	73.0
9	91.8	138	79.9	120	72.5	109	64.0	96.0	54.2	81.2	42.7	64.0
10	78.2	117	68.8	103	62.6	93.9	55.4	83.1	47.0	70.5	36.9	55.3
11	65.4	98.0	58.2	87.3	53.3	79.9	47.3	70.9	40.2	60.2	31.3	47.0
12	54.9	82.4	48.9	73.3	44.8	67.1	39.8	59.7	33.8	50.8	26.3	39.5
13	46.8	70.2	41.7	62.5	38.1	57.2	33.9	50.9	28.8	43.2	22.4	33.6
14	40.3	60.5	35.9	53.9	32.9	49.3	29.2	43.9	24.9	37.3	19.3	29.0
15	35.1	52.7	31.3	46.9	28.6	43.0	25.5	38.2	21.7	32.5	16.8	25.3
16	30.9	46.3	27.5	41.2	25.2	37.8	22.4	33.6	19.0	28.5	14.8	22.2
17	27.4	41.0	24.4	36.5	22.3	33.5	19.8	29.8	16.9	25.3	13.1	19.7
18	24.4	36.6	21.7	32.6	19.9	29.8	17.7	26.5	15.0	22.6	11.7	17.5
19			19.5	29.2	17.9	26.8	15.9	23.8	13.5	20.2	10.5	15.8
20							14.3	21.5	12.2	18.3	9.48	14.2
21											8.60	12.9

Properties

	1/2 ASD	1/2 LRFD	3/8 ASD	3/8 LRFD	5/16 ASD	5/16 LRFD	1/4 ASD	1/4 LRFD	3/16 ASD	3/16 LRFD	1/8 ASD	1/8 LRFD
M_{nx}/Ω_b / $\phi_b M_{nx}$ kip-ft	27.7	41.7	22.7	34.2	19.8	29.7	16.5	24.8	12.8	19.3	8.89	13.4
M_{ny}/Ω_b / $\phi_b M_{ny}$ kip-ft	16.7	25.1	13.8	20.8	12.1	18.2	10.1	15.2	7.91	11.9	5.51	8.28
$P_{ex}(K_xL_x)^2/10^4$ kip-in.^{2}	831		739		678		605		518		409	
$P_{ey}(K_yL_y)^2/10^4$ kip-in.^{2}	259		232		212		189		160		124	
r_{mx}/r_{my}	1.79		1.79		1.79		1.79		1.80		1.81	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

5

COMPOSITE HSS5

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 5 ksi

Shape		HSS5×4×											
		1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		24.9		19.7		16.9		13.9		10.7		7.30	
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 $(KL)_y$ with respect to weak axis (ft)	0	186	279	156	234	140	209	122	183	104	155	84.1	126
	1	185	278	155	233	139	208	122	182	103	155	83.7	126
	2	182	273	153	230	137	206	120	180	102	152	82.6	124
	3	178	267	150	224	134	201	117	176	99.4	149	80.7	121
	4	172	258	145	217	130	195	114	171	96.3	144	78.0	117
	5	164	247	139	208	124	187	109	164	92.5	139	74.8	112
	6	156	234	132	198	118	178	104	156	88.1	132	71.1	107
	7	146	219	124	186	112	167	98.0	147	83.1	125	66.8	100
	8	136	203	116	173	104	156	91.6	137	77.7	116	62.3	93.4
	9	125	187	107	160	96.3	144	84.8	127	72.0	108	57.5	86.3
	10	114	170	97.7	147	88.3	132	77.8	117	66.1	99.1	52.6	78.9
	11	102	154	88.5	133	80.2	120	70.8	106	60.1	90.2	47.7	71.5
	12	91.4	137	79.5	119	72.2	108	63.8	95.7	54.2	81.4	42.8	64.2
	13	80.8	121	70.7	106	64.3	96.5	57.0	85.5	48.5	72.7	38.0	57.1
	14	70.6	106	62.3	93.5	56.9	85.3	50.5	75.7	43.0	64.4	33.5	50.3
	15	61.5	92.2	54.4	81.6	49.7	74.5	44.2	66.3	37.6	56.4	29.2	43.8
	16	54.0	81.1	47.8	71.7	43.7	65.5	38.8	58.3	33.1	49.6	25.7	38.5
	17	47.9	71.8	42.3	63.5	38.7	58.0	34.4	51.6	29.3	43.9	22.8	34.1
	18	42.7	64.0	37.8	56.6	34.5	51.8	30.7	46.0	26.1	39.2	20.3	30.4
	19	38.3	57.5	33.9	50.8	31.0	46.5	27.5	41.3	23.5	35.2	18.2	27.3
	20	34.6	51.9	30.6	45.9	28.0	41.9	24.9	37.3	21.2	31.8	16.4	24.7
	21	31.4	47.1	27.7	41.6	25.4	38.0	22.5	33.8	19.2	28.8	14.9	22.4
	22	28.6	42.9	25.3	37.9	23.1	34.7	20.5	30.8	17.5	26.2	13.6	20.4
	23	26.2	39.2	23.1	34.7	21.1	31.7	18.8	28.2	16.0	24.0	12.4	18.6
	24	24.0	36.0	21.2	31.9	19.4	29.1	17.3	25.9	14.7	22.0	11.4	17.1
	25			19.6	29.4	17.9	26.8	15.9	23.9	13.5	20.3	10.5	15.8
	26							14.7	22.1	12.5	18.8	9.73	14.6
	27											9.02	13.5
Properties													
M_{nx}/Ω_b / $\phi_b M_{nx}$	kip-ft	25.1	37.8	20.6	30.9	17.9	26.9	14.9	22.4	11.6	17.4	8.03	12.1
M_{ny}/Ω_b / $\phi_b M_{ny}$	kip-ft	21.5	32.2	17.6	26.5	15.3	23.0	12.8	19.2	10.0	15.0	6.90	10.4
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	658		582		533		475		406		317	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	454		402		367		327		278		216	
r_{mx}/r_{my}		1.20		1.20		1.20		1.21		1.21		1.21	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 5 ksi

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

5
COMPOSITE HSS5

Shape	HSS5×3×											
	1/2		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.	0.465		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft	21.5		17.2		14.8		12.2		9.43		6.45	
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 $(KL)_y$ with respect to weak axis (ft) 0	156	234	131	196	117	175	102	153	85.6	128	68.7	103
1	155	232	130	195	116	174	101	152	85.0	127	68.1	102
2	151	226	127	190	113	170	98.7	148	83.0	125	66.5	99.8
3	144	216	122	182	109	163	95.0	142	79.9	120	64.0	96.0
4	135	203	115	172	103	154	89.9	135	75.7	114	60.6	90.9
5	125	188	107	160	95.7	144	83.9	126	70.7	106	56.4	84.7
6	114	170	97.4	146	87.7	132	77.0	115	65.0	97.5	51.8	77.7
7	101	152	87.5	131	79.1	119	69.6	104	58.8	88.2	46.8	70.1
8	88.9	133	77.4	116	70.2	105	61.9	92.9	52.4	78.6	41.6	62.3
9	76.5	115	67.3	101	61.3	92.0	54.3	81.4	46.0	69.0	36.4	54.6
10	64.8	97.1	57.6	86.4	52.7	79.1	46.8	70.2	39.8	59.7	31.3	47.0
11	53.8	80.7	48.4	72.6	44.5	66.8	39.8	59.6	33.9	50.8	26.6	39.8
12	45.2	67.8	40.7	61.0	37.4	56.1	33.4	50.1	28.5	42.7	22.3	33.5
13	38.5	57.8	34.7	52.0	31.9	47.8	28.5	42.7	24.3	36.4	19.0	28.5
14	33.2	49.8	29.9	44.8	27.5	41.2	24.5	36.8	20.9	31.4	16.4	24.6
15	28.9	43.4	26.0	39.0	23.9	35.9	21.4	32.1	18.2	27.3	14.3	21.4
16	25.4	38.2	22.9	34.3	21.0	31.6	18.8	28.2	16.0	24.0	12.5	18.8
17	22.5	33.8	20.3	30.4	18.6	28.0	16.6	25.0	14.2	21.3	11.1	16.7
18	20.1	30.2	18.1	27.1	16.6	24.9	14.8	22.3	12.7	19.0	9.92	14.9
19			16.2	24.3	14.9	22.4	13.3	20.0	11.4	17.0	8.90	13.3
20									10.3	15.4	8.03	12.0
Properties												
M_{nx}/Ω_b / $\phi_b M_{nx}$ kip-ft	20.3	30.5	16.8	25.3	14.7	22.1	12.4	18.6	9.66	14.5	6.73	10.1
M_{ny}/Ω_b / $\phi_b M_{ny}$ kip-ft	14.0	21.1	11.7	17.6	10.3	15.4	8.65	13.0	6.79	10.2	4.74	7.13
$P_{ex}(K_xL_x)^2/10^4$ kip-in.^{2}	501		451		415		372		320		252	
$P_{ey}(K_yL_y)^2/10^4$ kip-in.^{2}	215		193		177		158		135		106	
r_{mx}/r_{my}	1.53		1.53		1.53		1.53		1.54		1.55	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

5

COMPOSITE
HSS5–HSS4

Table 4–14 (continued)
Available Strength in Axial Compression, kips

F_y = 46 ksi
f'_c = 5 ksi

Concrete Filled Rectangular HSS

Shape	HSS5×2½×						HSS4×3×					
	¼		3/16		⅛		⅜		5/16		¼	
t_{design}, in.	0.233		0.174		0.116		0.349		0.291		0.233	
Steel Wt/ft	11.3		8.79		6.02		14.6		12.7		10.5	
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 $(KL)_y$, with respect to weak axis (ft)												
0	91.7	138	76.7	115	60.9	91.4	110	165	98.3	147	85.7	129
1	90.7	136	75.8	114	60.3	90.4	109	163	97.5	146	85.1	128
2	87.7	132	73.4	110	58.3	87.5	106	159	95.1	143	83.0	125
3	83.0	124	69.6	104	55.2	82.9	102	153	91.2	137	79.7	120
4	76.8	115	64.5	96.7	51.2	76.8	95.7	144	86.0	129	75.3	113
5	69.5	104	58.5	87.8	46.4	69.6	88.6	133	79.8	120	70.0	105
6	61.6	92.4	51.9	77.9	41.2	61.8	80.5	121	72.8	109	64.1	96.1
7	53.3	80.0	45.1	67.7	35.7	53.6	72.0	108	65.3	98.0	57.7	86.5
8	45.2	67.8	38.4	57.6	30.3	45.5	63.3	94.9	57.7	86.5	51.1	76.6
9	37.5	56.2	31.9	47.9	25.2	37.8	54.6	81.9	50.0	75.1	44.5	66.8
10	30.5	45.7	26.0	39.0	20.5	30.8	46.4	69.5	42.7	64.1	38.2	57.2
11	25.2	37.8	21.5	32.3	17.0	25.5	38.6	57.9	35.8	53.7	32.1	48.2
12	21.1	31.7	18.1	27.1	14.3	21.4	32.5	48.7	30.1	45.1	27.0	40.5
13	18.0	27.0	15.4	23.1	12.1	18.2	27.7	41.5	25.6	38.4	23.0	34.5
14	15.5	23.3	13.3	19.9	10.5	15.7	23.8	35.8	22.1	33.1	19.8	29.8
15	13.5	20.3	11.6	17.4	9.12	13.7	20.8	31.2	19.2	28.9	17.3	25.9
16	11.9	17.8	10.2	15.2	8.02	12.0	18.3	27.4	16.9	25.4	15.2	22.8
17			9.01	13.5	7.10	10.7	16.2	24.3	15.0	22.5	13.5	20.2
18							14.4	21.6	13.4	20.0	12.0	18.0
19											10.8	16.2
Properties												
M_{nx}/Ω_b / $\phi_b M_{nx}$ kip-ft	11.1	16.7	8.70	13.1	6.08	9.14	11.7	17.7	10.4	15.6	8.76	13.2
M_{ny}/Ω_b / $\phi_b M_{ny}$ kip-ft	6.78	10.2	5.35	8.04	3.76	5.65	9.58	14.4	8.47	12.7	7.17	10.8
$P_{ex}(K_xL_x)^2/10^4$ kip-in.^{2}	321		275		220		248		229		206	
$P_{ey}(K_yL_y)^2/10^4$ kip-in.^{2}	100		85.5		67.4		154		142		128	
r_{mx}/r_{my}	1.79		1.79		1.81		1.27		1.27		1.27	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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

F_y = 46 ksi
f'_c = 5 ksi

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

5

COMPOSITE HSS4

Shape	HSS4×3×				HSS4×2½×							
	3/16		1/8		3/8		5/16		1/4		3/16	
t_{design}, in.	0.174		0.116		0.349		0.291		0.233		0.174	
Steel Wt/ft	8.15		5.60		13.4		11.6		9.63		7.51	
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)$_y$, with respect to weak axis (ft)												
0	72.0	108	57.5	86.2	98.4	148	88	132	76.6	115	64.1	96.1
1	71.4	107	57.0	85.5	97.1	146	86.9	130	75.8	114	63.4	95.1
2	69.7	105	55.6	83.5	93.6	140	83.9	126	73.2	110	61.3	91.9
3	67.0	101	53.5	80.2	87.9	132	79.0	119	69.1	104	58.0	86.9
4	63.4	95.1	50.5	75.8	80.6	121	72.7	109	63.8	95.6	53.6	80.4
5	59.0	88.5	47.0	70.5	72.1	108	65.3	98.0	57.5	86.2	48.5	72.7
6	54.1	81.1	43.1	64.6	62.9	94.4	57.3	85.9	50.7	76.0	42.9	64.3
7	48.8	73.2	38.8	58.2	53.5	80.3	49.1	73.6	43.6	65.5	37.1	55.6
8	43.3	65.0	34.4	51.6	44.4	66.7	41.0	61.6	36.7	55.1	31.3	47.0
9	37.9	56.8	30.0	45.1	35.9	53.9	33.5	50.2	30.2	45.3	25.9	38.9
10	32.6	48.8	25.8	38.7	29.1	43.6	27.1	40.7	24.5	36.7	21.0	31.6
11	27.5	41.3	21.8	32.7	24.0	36.1	22.4	33.6	20.2	30.3	17.4	26.1
12	23.1	34.7	18.3	27.4	20.2	30.3	18.8	28.2	17.0	25.5	14.6	21.9
13	19.7	29.6	15.6	23.4	17.2	25.8	16.0	24.1	14.5	21.7	12.4	18.7
14	17.0	25.5	13.4	20.2	14.8	22.3	13.8	20.7	12.5	18.7	10.7	16.1
15	14.8	22.2	11.7	17.6	12.9	19.4	12.0	18.1	10.9	16.3	9.35	14.0
16	13.0	19.5	10.3	15.4					9.56	14.3	8.22	12.3
17	11.5	17.3	9.12	13.7								
18	10.3	15.4	8.13	12.2								
19	9.23	13.8	7.30	10.9								
20			6.59	9.88								

Properties

M_{nx}/Ω_b	$\phi_b M_{nx}$ kip-ft	6.90	10.4	4.84	7.27	10.3	15.5	9.12	13.7	7.75	11.6	6.13	9.22
M_{ny}/Ω_b	$\phi_b M_{ny}$ kip-ft	5.66	8.50	3.97	5.97	7.34	11.0	6.53	9.82	5.57	8.37	4.42	6.65
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	177		141		209		194		176		153	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	109		86.5		95.5		89.0		80.4		69.1	
r_{mx}/r_{my}		1.27		1.28		1.48		1.48		1.48		1.49	

ASD	LRFD
Ω_c = 2.00	ϕ_c = 0.75

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

5

COMPOSITE HSS4

Table 4–14 (continued)
Available Strength in Axial Compression, kips
Concrete Filled Rectangular HSS

F_y = 46 ksi
f'_c = 5 ksi

Shape		HSS4×3×		HSS4×2×									
		1/8		3/8		5/16		1/4		3/16		1/8	
t_{design}, in.		0.116		0.349		0.291		0.233		0.174		0.116	
Steel Wt/ft		5.17		12.1		10.5		8.78		6.87		4.75	
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 $(KL)_y$ (ft), with respect to weak axis	0	50.8	76.2	86.8	130	77.7	116	67.5	101	56.2	84.3	44.1	66.2
	1	50.2	75.3	85.1	128	76.2	114	66.3	99.5	55.3	82.9	43.4	65.1
	2	48.6	72.9	80.2	120	72.1	108	62.9	94.3	52.5	78.7	41.2	61.9
	3	45.9	68.9	72.7	109	65.6	98.5	57.5	86.3	48.2	72.3	37.9	56.9
	4	42.5	63.7	63.4	95.1	57.6	86.4	50.8	76.2	42.7	64.1	33.7	50.5
	5	38.4	57.7	53.1	79.7	48.7	73.0	43.2	64.9	36.6	54.9	29.0	43.4
	6	34.0	51.0	42.8	64.2	39.7	59.5	35.6	53.3	30.3	45.5	24.1	36.1
	7	29.4	44.2	33.1	49.6	31.1	46.7	28.2	42.3	24.3	36.4	19.3	29.0
	8	24.9	37.4	25.3	38.0	23.9	35.8	21.7	32.6	18.8	28.2	15.0	22.6
	9	20.6	30.9	20.0	30.0	18.9	28.3	17.2	25.8	14.9	22.3	11.9	17.8
	10	16.8	25.1	16.2	24.3	15.3	22.9	13.9	20.9	12.0	18.1	9.62	14.4
	11	13.8	20.8	13.4	20.1	12.6	18.9	11.5	17.2	10.0	14.9	7.95	11.9
	12	11.6	17.5	11.3	16.9	10.6	15.9	9.66	14.5	8.36	12.5	6.68	10.0
	13	9.91	14.9							7.12	10.7	5.69	8.54
	14	8.55	12.8										
	15	7.45	11.2										
	16	6.54	9.82										
	17	5.80	8.70										
Properties													
M_{nx}/Ω_b | $\phi_b M_{nx}$	kip-ft	4.32	6.49	8.82	13.3	7.88	11.8	6.74	10.1	5.37	8.07	3.80	5.71
M_{ny}/Ω_b | $\phi_b M_{ny}$	kip-ft	3.13	4.70	5.30	7.96	4.76	7.16	4.10	6.17	3.29	4.94	2.34	3.52
$P_{ex}(K_xL_x)^2/10^4$	kip-in.^{2}	122		170		160		145		127		103	
$P_{ey}(K_yL_y)^2/10^4$	kip-in.^{2}	55.0		53.3		50.1		45.6		39.5		31.5	
r_{mx}/r_{my}		1.49		1.79		1.79		1.78		1.79		1.80	

ASD	LRFD
$\Omega_c = 2.00$	$\phi_c = 0.75$

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