DESIGN TABLES FOR TURKISH STRUCTURAL STEEL CODE
VOLUME I

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ABSTRACT

DESIGN TABLES FOR TURKISH STRUCTURAL STEEL CODE

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Steel structures comprise a good share of the industrial construction in Turkey. Accordingly, developing systematic means for structural steel design would directly translate into reduced engineering time in a project. American Institute of Steel Construction (AISC) provides practicing engineers with a design manual to facilitate the design process. The design tables in this manual, however, cannot be used in Turkey. Turkish Structural Steel Code has recently been adopted from AISC Specification for Structural Steel Buildings but European not American steel sections are used in the Turkish steel construction industry. Hence, design tables developed for European steel sections would significantly aid the structural engineers in Turkey. The objective of this thesis is to develop a design manual similar to AISC Steel Construction Manual for commonly used European wide-flange steel sections used in the Turkish steel industry. The design manual will also serve as a reference that can be consulted to verify the engineering calculations in Turkey.

Keywords: Building Codes, Steel Structures, Structural Design, Structural Steel, Wide-Flange Sections

ÖZ

TÜRKİYE YAPISAL ÇELİK YÖNETMELİĞİ İÇİN TASARIM TABLOLARI

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Yüksek Lisans, İnşaat Mühendisliği
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Türkiye'deki endüstriyel yapı stoğunun önemli bir bölümünü çelik yapısal sistemler oluşturmaktadır. Çelik yapı tasarımını sistematik bir şekilde yürüterek mühendislik hesapları için harcanan süre kısaltılabilir. Amerika Birleşik Devletleri'nde bulunan Çelik Yapılar Enstitüsü (AISC) mühendislik hesaplarını kolaylaştırmak amacıyla bir tasarım kılavuzu geliştirmiştir. Çevre ve Şehircilik Bakanlığı tarafından yayınlanan Çelik Yapıların Tasarım, Hesap ve Yapımına Dair Esaslar yönetmeliği AISC tarafından geliştirilen yönetmelik ile büyük ölçüde örtüşmektedir. Türkiye'de çelik yapı tasarımı için Avrupa profilleri kullanıldığından AISC tarafından geliştirilen kılavuzun ülkemizde kullanılması mümkün değildir. Bu tezin amacı ülkemizde çalışan çelik yapı tasarım mühendislerine yardımcı olacak bir tasarım kılavuzunun geliştirilmesidir. Bu sayede ülkemizde kullanılan profiller için tasarım esnasında faydalı olabilecek bilgiler tablolar halinde sunulabilecektir. Bu kılavuz aynı zamanda tasarım hesaplarının doğrulanması amacı ile de kullanılabilir.

Anahtar Kelimeler: Bina Yönetmelikleri, Çelik Yapılar, Geniş Başlıklı Profiller, Yapı Tasarımı, Yapısal Çelik

I dedicate this work to my family, my supervisor, my co-supervisor and Turkey.

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CHAPTER 1

INTRODUCTION

1.1 Background Information

Recently updated Turkish Structural Steel Code [Ministry of Environment and Urban Planning, 2018] has been adopted from American Institute of Steel Construction (AISC) Specification for Structural Steel Buildings [AISC, 2016]. On the contrary, European steel sections are used in the Turkish steel construction industry. Accordingly, to facilitate the design of steel structures in Turkey, design tables providing the capacities of members that use European steel sections can be developed. Such tables would aid structural engineers in selecting the appropriate sections and verifying their designs.

1.2 Objectives and Scope

The purpose of this thesis is to develop design tables similar to those in AISC Steel Construction Manual [AISC, 2017] but customized for the Turkish steel construction industry, i.e., in line with Turkish Structural Steel Code, for steel sections and grades commonly used in Turkey. In the design of steel structures, various steels sections such as angles, channels, tees are used. This study is limited to the design of wide-flange steel sections. Eight European wide-flange steel sections of three different steel grades used in Turkey are considered within the scope of this study: HD, HEA, HEB, HEM, IPE, IPEA, IPEO and IPN sections of S235, S275 and S355 steel grades. Table 1.1 presents the specified minimum yield stress, F_y, and tensile strength, F_u, for these steel grades [Ministry of Environment and Urban Planning, 2018]. Design tables are developed for members subject to tension, compression, flexure and

Table 1.1 Material properties for the steel grades considered in this study.

Steel Grade	F_y **(MPa)**	F_u **(MPa)**
S235	235	360
S275	275	430
S355	355	510

combined forces, composite members, connecting elements as well as bolts and welds.

1.3 Thesis Outline

Each chapter that follows is divided into three main sections. The first main section presents the design equations per AISC Specification for Structural Steel Buildings that are related to the limit states being addressed in the chapter provided that they conform with Turkish Structural Steel Code; otherwise, those in the Turkish code are presented. The second main section presents the design tables developed to facilitate the design process and explains how the design equations presented are employed in developing these tables. Sample tables are provided in this section; all tables developed are presented in the corresponding appendix for the chapter (Table A.1 in Appendix A presents the dimensions and properties of the steel sections). The third main section presents the sample calculations in developing these design tables.

Below are the chapters that follow:

- Design of members for tension
- Design of members for compression
- Design of members for flexure
- Design of members for combined forces
- Design of composite members
- Design of bolts
- Design of welds
- Design of connecting elements

Table 1.2 Steel sections, bolts and welds considered in the study.

Chapter	Shapes	Grades
2 Tension	HD, HEA, HEB, HEM, IPE, IPEA, IPEO, IPN	S235, S275, S355
3 Compression	HD, HEA, HEB, HEM, IPE, IPEA, IPEO, IPN	S235, S275, S355
4 Flexure	HD, HEA, HEB, HEM, IPE, IPEA, IPEO, IPN	S235, S275, S355
5 Combined Forces	HD, HEA, HEB, HEM, IPE, IPEA, IPEO, IPN	S235, S275, S355
6 Composite Members	HD, HEA, HEB, HEM, IPE, IPEA, IPEO	S235, S275, S355
7 Bolts	M16, M20, M22, M24, M27, M30, M36	4.6, 4.8, 5.6, 5.8, 6.8, 8.8, 10.9
8 Welds	6 different weld groups	E43, E49, E55, E57
9 Connecting Elements	HD, HEA, HEB, HEM, IPE, IPEA, IPEO, IPN	S235, S275, S355

Table 1.2 provides a summary of the steel sections and grades, bolt diameters and grades, and weld grades considered in each chapter.

1.3.1 Design of members for tension

Chapter 2 presents the design of members for tension. Available strength in axial tension design tables are developed. These tables are presented in Appendix B.

1.3.2 Design of members for compression

Chapter 3 presents the design of members for compression. Design tables are developed for available strength in axial compression, stiffness reduction factor and available critical stress. These tables are presented in Appendix C.

1.3.3 Design of members for flexure

Chapter 4 presents the design of members for flexure. Design tables are developed for selection of steel sections by strong- and weak-axis plastic section moduli and moments of inertia, maximum total uniform load, available moment versus unbraced length and available shear stress. These tables are presented in Appendix D.

1.3.4 Design of members for combined forces

Chapter 5 presents the design of members for combined forces. Available strength tables developed in the previous chapters are merged. These tables are presented in Appendix E.

1.3.5 Design of composite members

Chapter 6 presents the design of composite members. Design tables are developed for available strength in flexure and lower-bound elastic moment of inertia. These tables are presented in Appendix F.

1.3.6 Design of bolts

Chapter 7 presents the design of bolts. Design tables are developed for available shear and tensile strength of bolts, available slip resistance for slip-critical connections, available bearing and tearout strength at bolt holes based on bolt spacing and edge distance, and for eccentrically loaded bolt groups. These tables are presented in Appendix G.

1.3.7 Design of welds

Chapter 8 presents the design of welds. Design tables are developed for electrode strength coefficients and for concentrically and eccentrically loaded weld groups. These tables are presented in Appendix H.

1.3.8 Design of connecting elements

Chapter 9 presents the design of connecting elements. Design tables are developed for reduction in area for holes, elastic section modulus for coped I-shapes, block shear rupture and beam bearing constants. These tables are presented in Appendix I.

Finally, Chapter 10 presents a summary of the study, conclusions drawn and future research ideas.

1.4 Disclaimer

The layout as well as the limit states considered in developing the design manual in this study are adopted from AISC Steel Construction Manual. In the calculations, design equations specified in AISC Specification for Structural Steel Buildings are used.

CHAPTER 2

DESIGN OF MEMBERS FOR TENSION

2.1 Introduction

This chapter develops the design tables for tension members that use European I-shaped sections of S235, S275 and S355 steels and presents the equations and sample calculations in developing the tables.

2.2 Design Equations

The nominal tensile strength of members subject to axial tension, P_n, is calculated based on the limit states of tensile yielding in the gross section:

$$P_n = F_y A_g \tag{2.1}$$

and tensile rupture in the net section:

$$P_n = F_u A_e \tag{2.2}$$

where A_g is the gross cross-sectional area and A_e is the effective net area of tension members. For these limit states, the resistance factors, ϕ_t, are 0.90 and 0.75 for LRFD, whereas the safety factors, Ω_t, are 1.67 and 2.00 for ASD, respectively. The effective net area is determined by multiplying the net area by the shear lag factor, U:

$$A_e = U \cdot A_n \tag{2.3}$$

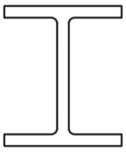
2.3 Design Tables

The available strength in axial tension design tables (see Table B.1 in Appendix B; see Table 2.1 for a sample) were developed for European I-shaped sections of S235, S275 and S355 steels. The tabulated values of the available tensile rupture strength were calculated by setting [AISC, 2017]

$$A_e = 0.75A_g \tag{2.4}$$

Hence, these values can be used conservatively when $A_e > 0.75A_g$ but must be calculated otherwise.

Table 2.1 Available strength in axial tension for HD shapes of S355 steel.



Available Strength in Axial Tension
HD Shapes

F_y = 355 MPa
F_u = 510 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HD 400 × 1086	1386	1040	44300	29500	39800	26500
× 990	1262	947	40300	26800	36200	24100
× 900	1149	862	36700	24400	33000	22000
× 818	1043	782	33300	22200	29900	19900
× 744	948.1	711	30300	20200	27200	18100
× 677	863.4	648	27600	18400	24800	16500
× 634	808.0	606	25800	17200	23200	15500
× 592	754.9	566	24100	16000	21700	14400
× 551	701.4	526	22400	14900	20100	13400
× 509	649.0	487	20700	13800	18600	12400
× 463	589.5	442	18800	12500	16900	11300
× 421	537.1	403	17200	11400	15400	10300
× 382	487.1	365	15600	10400	14000	9320
× 347	442.0	332	14100	9400	12700	8450
× 314	399.2	299	12800	8490	11500	7630
× 287	366.3	275	11700	7790	10500	7010
× 262	334.6	251	10700	7110	9600	6400
× 237	300.9	226	9610	6400	8630	5750
× 216	275.5	207	8800	5860	7900	5270
× 187	237.6	178	7590	5050	6820	4540
HD 360 × 196	250.3	188	8000	5320	7180	4790
× 179	228.3	171	7290	4850	6550	4370
× 162	206.3	155	6590	4390	5920	3950
× 147	187.9	141	6000	3990	5390	3590
× 134	170.6	128	5450	3630	4890	3260
HD 320 × 300	382.1	287	12200	8120	11000	7310
× 245	312.0	234	9970	6630	8950	5970
× 198	252.3	189	8060	5360	7240	4830
× 158	201.2	151	6430	4280	5770	3850
× 127	161.3	121	5150	3430	4630	3080
× 97.6	124.4	93.3	3970	2640	3570	2380
× 74.2	94.58	70.9	3020	2010	2710	1810
HD 260 × 172	219.6	165	7020	4670	6300	4200
× 142	180.3	135	5760	3830	5170	3450
× 114	145.7	109	4660	3100	4180	2790
× 93.0	118.4	88.8	3780	2520	3400	2260
× 68.2	86.82	65.1	2770	1850	2490	1660
× 54.1	68.97	51.7	2200	1470	1980	1320
Limit State	**LRFD**	**ASD**	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.835A_g$.			
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$				
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$				

2.4 Sample Calculations

HD 260×54.1; S355 steel:

Tensile yielding strength

$P_n = (355)(6897) \times 10^{-3} = 2450$ kN

$\phi_t P_n = (0.90)(2450) = 2200$ kN (LRFD)

$P_n/\Omega_t = 2450/1.67 = 1470$ kN (ASD)

Tensile rupture strength

$P_n = (510)(0.75)(6897) \times 10^{-3} = 2640$ kN

$\phi_t P_n = (0.75)(2640) = 1980$ kN (LRFD)

$P_n/\Omega_t = 2640/2.00 = 1320$ kN (ASD)

CHAPTER 3

DESIGN OF MEMBER FOR COMPRESSION

3.1 Introduction

This chapter develops the design tables for compression members that use European I-shaped sections of S235, S275 and S355 steels and presents the equations and sample calculations in developing the tables.

3.2 Design Equations

3.2.1 Compressive strength

The nominal compressive strength of members subject to axial compression, P_n, is calculated based on the limit state of flexural buckling:

$$P_n = F_{cr} A_g \tag{3.1}$$

for members without slender elements, and

$$P_n = F_{cr} A_e \tag{3.2}$$

for members with slender elements, where F_{cr} is the critical stress and A_e is the summation of the effective areas of the cross section. The critical stress is

$$F_{cr} = 0.658^{F_y/F_e} F_y \text{ when } L_c/r \leq 4.71\sqrt{E/F_y} \tag{3.3}$$

$$F_{cr} = 0.877 F_e \text{ when } L_c/r > 4.71\sqrt{E/F_y} \tag{3.4}$$

where F_e is the elastic buckling stress, L_c is the effective length of member, r is the radius of gyration and E is the modulus of elasticity of steel. The elastic buckling stress is

$$F_e = \pi^2 \mathrm{E}/(L_c/r)^2 \tag{3.5}$$

where

$$\mathrm{L_c} = K \cdot L \tag{3.6}$$

in which K is the effective length factor and L is the laterally unbraced length of the member. The effective slenderness ratio, $\mathrm{L_c/r}$, is recommended not to exceed 200. For compression, the resistance factor, ϕ_c, is 0.90 for LRFD, whereas the safety factor, Ω_c, is 1.67 for ASD.

Cross-sections are classified as slender or non-slender according to the width-to-thickness ratios, λ, of their elements. If they exceed the limiting ratios, λ_r, they are slender. For doubly symmetric I-shaped sections, the flange is slender if

$$\left(\lambda = b_f/2t_f\right) > \left(\lambda_r = 0.56\sqrt{E/F_y}\right) \tag{3.7}$$

where b_f and t_f are the width and thickness of the flange, respectively, and the web is slender if

$$(\lambda = h/t_w) > \left(\lambda_r = 1.49\sqrt{E/F_y}\right) \tag{3.8}$$

where h is the clear distance between flanges less the fillet at each flange and t_w is the thickness of the web. For such sections, A_e is calculated based on reduced effective widths for slender elements

$$b_e = b \text{ when } \lambda \leq \lambda_r\sqrt{F_y/F_{cr}} \tag{3.9}$$

$$b_e = b\left(1 - c_1\sqrt{F_{el}/F_{cr}}\right)\sqrt{F_{el}/F_{cr}} \text{ when } \lambda > \lambda_r\sqrt{F_y/F_{cr}} \tag{3.10}$$

where b is the width of the element, c_1 is the imperfection adjustment factor, F_{el} is the elastic local buckling stress:

$$F_{el} = (c_2\,\lambda_r/\lambda)^2 F_y \tag{3.11}$$

where

$$c_2 = \left(1 - \sqrt{1 - 4c_1}\right)/2c_1 \tag{3.12}$$

3.2.2 Flanges and webs with concentrated forces

The nominal strength of I-shaped members without stiffeners to resist concentrated interior forces applied normal to the flange face, R_n, is calculated based on the limit states of flange local bending:

$$R_n = 6.25F_y t_f^2 \tag{3.13}$$

web local yielding:

$$R_n = F_y t_w(5k + l_b) \tag{3.14}$$

and web compression buckling:

$$R_n = 24t_w^3\sqrt{E \cdot F_y}/h \cdot Q_f \tag{3.15}$$

where k is the distance from the outer face of the flange to the web toe of the fillet, l_b is the length of bearing, and Q_f is 1.0 for wide-flange sections. For the limit states of flange local bending and web compression buckling, the resistance factor, ϕ, is 0.90 for LRFD, whereas the safety factor, Ω, is 1.67 for ASD. For the limit state of web local yielding, ϕ is 1.00 for LRFD and Ω is 1.50 for ASD.

3.2.3 Stiffness reduction factor

The flexural stiffnesses of all members that contribute to the stability of the structure must further be reduced by a stiffness reduction factor

$$\tau_b = 1.0 \text{ when } \alpha P_r/P_{ns} \leq 0.5 \tag{3.16}$$

$$\tau_b = 4(\alpha P_r/P_{ns})(1 - \alpha P_r/P_{ns}) \text{ when } \alpha P_r/P_{ns} > 0.5 \tag{3.17}$$

where α is 1.0 for LRFD and 1.6 for ASD, P_r is the required compressive strength, and P_{ns} is the compressive strength for the cross-section:

$$P_{ns} = F_y A_g \tag{3.18}$$

for non-slender cross-sections and

$$P_{ns} = F_y A_e \tag{3.19}$$

for slender cross-sections.

3.3 Design Tables

The following design tables were developed to facilitate the design of compression members that use European I-shaped sections of S235, S275 and S355 steels:

(1) Available strength in axial compression
(2) Stiffness reduction factor
(3) Available critical stress for compression members

3.3.1 Available strength in axial compression

The available strength in axial compression tables (see Table C.1 in Appendix C; see Table 3.1 for a sample) were developed for the effective length with respect to the weak axis, L_{cy}, ranging from 0 to 15 m. The available strength for the effective length with respect to the strong axis, L_{cx}, can be determined by entering the table at an effective length $L_{cx}/(r_x/r_y)$ where r_x/r_y is the ratio of strong-axis to weak-axis radius of gyration, which is also provided in the table. The available strength in axial compression is the smaller of the two tabulated values; i.e., the tabulated value for the larger of L_{cy} and $L_{cx}/(r_x/r_y)$. Note that the tabulated values were shown in gray for members with an effective slenderness ratio, L_c/r_y, exceeding the recommended value of 200.

The table also provides the variables:

$$P_{wo} = \phi(5F_y t_w k) \text{ for LRFD and } 5F_y t_w k/\Omega \text{ for ASD} \tag{3.20}$$

$$P_{wi} = \phi(F_y t_w) \text{ for LRFD and } F_y t_w/\Omega \text{ for ASD} \tag{3.21}$$

$$\begin{gathered} P_{wb} = \phi \cdot 24t_w^3 \sqrt{E \cdot F_y}/h \cdot Q_f \text{ for LRFD} \\ \text{and } 24t_w^3 \sqrt{E \cdot F_y}/h \cdot Q_f/\Omega \text{ for ASD} \end{gathered} \tag{3.22}$$

$$P_{fb} = \phi(6.25F_y t_f^2) \text{ for LRFD and } 6.25F_y t_f^2/\Omega \text{ for ASD} \tag{3.23}$$

which are used to calculate the strength of I-shaped members without stiffeners to resist concentrated interior forces (cf. Eqs. 3.13–15); L_p, L_r, A_g, I_x, I_y (see Chapter 4); $P_{ex}L_{cx}^2$ and $P_{ey}L_{cy}^2$:

$$P_{ex}L_{cx}^2 = \pi^2 E \cdot I_x \tag{3.24}$$

$$P_{ey}L_{cy}^2 = \pi^2 E \cdot I_y \tag{3.25}$$

where P_{ex} and P_{ey} are elastic critical buckling loads with respect to the strong and weak axes, respectively.

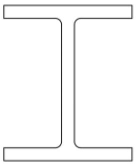
3.3.2 Stiffness reduction factor

Stiffness reduction factors were presented in Table C.2 in Appendix C (and Table 3.2) as a function of P_r/A where P_r is denoted as P_u for LRFD and P_a for ASD, and A is A_g for non-slender and A_e for slender cross-sections.

3.3.3 Available critical stress

The available critical stress tables (see Table C.3 in Appendix C; see Table 3.3 for a sample) were developed for effective slenderness ratios ranging from 1 to 200.

Table 3.1 Available strength in axial compression for HD shapes of S235 steel.



Available Strength in Axial Compression, kN
HD Shapes

F_y = 235 MPa

Shape		**HD 260 × 54.1**		**HD 260 × 68.2**		**HD 260 × 93.0**		**HD 260 × 114**		**HD 260 × 142**		**HD 260 × 172**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1460	971	1840	1220	2500	1670	3080	2050	3810	2540	4640	3090
	1.00	1440	959	1810	1210	2480	1650	3050	2030	3770	2510	4600	3060
	1.50	1420	944	1790	1190	2440	1620	3000	2000	3720	2480	4540	3020
	2.00	1390	924	1750	1170	2390	1590	2950	1960	3650	2430	4450	2960
	2.50	1350	899	1710	1130	2330	1550	2870	1910	3560	2370	4350	2890
	3.00	1310	869	1650	1100	2260	1500	2790	1850	3460	2300	4230	2810
	3.50	1250	835	1590	1060	2170	1450	2690	1790	3340	2220	4090	2720
	4.00	1200	797	1520	1010	2080	1390	2570	1710	3200	2130	3930	2610
	4.50	1140	756	1450	962	1980	1320	2450	1630	3060	2030	3760	2500
	5.00	1070	713	1370	910	1880	1250	2330	1550	2900	1930	3580	2380
	5.50	1000	669	1290	855	1770	1180	2190	1460	2740	1820	3380	2250
	6.00	936	623	1200	799	1650	1100	2060	1370	2580	1710	3190	2120
	6.50	867	577	1120	742	1540	1020	1920	1280	2410	1600	2980	1990
	7.00	798	531	1030	685	1420	948	1780	1180	2230	1490	2780	1850
	7.50	730	485	946	629	1310	872	1640	1090	2070	1370	2580	1720
	8.00	663	441	863	574	1200	798	1500	999	1900	1260	2380	1580
	8.50	599	399	783	521	1090	725	1370	911	1730	1150	2180	1450
	9.00	537	357	706	469	986	656	1240	825	1580	1050	1990	1320
	9.50	482	320	633	421	885	589	1120	742	1420	946	1800	1200
	10.0	435	289	572	380	799	531	1010	670	1280	854	1630	1080
	10.5	394	262	518	345	724	482	913	608	1160	775	1480	983
	11.0	359	239	472	314	660	439	832	554	1060	706	1350	896
	11.5	329	219	432	288	604	402	761	507	971	646	1230	819
	12.0	302	201	397	264	555	369	699	465	891	593	1130	753
	12.5	278	185	366	243	511	340	644	429	822	547	1040	694
	13.0	257	171	338	225	473	314	596	396	760	505	964	641
	13.5	238	159	314	209	438	292	552	368	704	469	894	595
	14.0	222	148	292	194	407	271	514	342	655	436	831	553
	14.5	207	138	272	181	380	253	479	319	611	406	775	515
	15.0	193	129	254	169	355	236	448	298	571	380	724	482
Properties													
P_{wo} , kN		256	171	322	214	488	325	668	446	920	613	1190	797
P_{wi} , kN/m		1530	1020	1760	1180	2350	1570	2940	1960	3640	2430	4230	2820
P_{wb} , kN		230	153	353	235	837	557	1630	1090	3120	2070	4880	3250
P_{fb} , kN		119	79.4	207	137	405	269	611	407	928	618	1400	929
L_p , m		3.27		3.34		3.38		3.42		3.47		3.54	
L_r , m		11.7		13.3		16.9		20.4		25.0		30.2	
$A_g \times 10^2$, mm^2		68.97		86.82		118.4		145.7		180.3		219.6	
$I_x \times 10^4$, mm^4		7981		10450		14920		18910		24330		31310	
$I_y \times 10^4$, mm^4		2788		3668		5135		6456		8236		10450	
$r_y \times 10$, mm		6.36		6.50		6.58		6.66		6.76		6.90	
r_x / r_y		1.69		1.69		1.71		1.71		1.72		1.73	
$P_{ex} L_{cx}^2$, kN · m^2		158000		206000		294000		373000		481000		618000	
$P_{ey} L_{cy}^2$, kN · m^2		55100		72400		101000		128000		163000		206000	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table 3.2 Stiffness reduction factor.

Stiffness Reduction Factor, τ_b

LRFD $\frac{P_u}{A}$ ASD $\frac{P_a}{A}$	F_y, MPa					
	235		275		355	
MPa	LRFD	ASD	LRFD	ASD	LRFD	ASD
360	–	–	–	–	–	–
350	–	–	–	–	0.0555	–
340	–	–	–	–	0.162	–
330	–	–	–	–	0.262	–
320	–	–	–	–	0.355	–
310	–	–	–	–	0.443	–
300	–	–	–	–	0.524	–
290	–	–	–	–	0.598	–
280	–	–	–	–	0.667	–
270	–	–	0.0714	–	0.728	–
260	–	–	0.206	–	0.784	–
250	–	–	0.331	–	0.833	–
240	–	–	0.444	–	0.876	–
230	0.0833	–	0.547	–	0.913	–
220	0.239	–	0.640	–	0.943	0.0335
210	0.380	–	0.722	–	0.966	0.203
200	0.507	–	0.793	–	0.984	0.355
190	0.619	–	0.854	–	0.995	0.492
180	0.717	–	0.904	–	1.00	0.612
170	0.800	–	0.944	0.0432	↓	0.717
160	0.869	–	0.973	0.257	↓	0.804
150	0.923	–	0.992	0.444	↓	0.876
140	0.963	0.178	1.00	0.604	↓	0.931
130	0.989	0.407	↓	0.737	↓	0.970
120	1.00	0.598	↓	0.843	↓	0.993
110	↓	0.752	↓	0.922	↓	1.00
100	↓	0.869	↓	0.973	↓	↓
90.0	↓	0.949	↓	0.998	↓	↓
80.0	↓	0.992	↓	1.00	↓	↓
70.0	↓	1.00	↓	1.00	↓	↓

– Indicates the stiffness reduction parameter is not applicable because the required strength exceeds the available strength for $L_c/r = 0$

$A = A_g$ for nonslender cross–sections, mm^2

$= A_e$ for selnder cross–sections, mm^2

Table 3.3 Available critical stress for compression members.

Available Critical Stress for Compression Members

$\frac{L_c}{r}$	F_y = 235 MPa		F_y = 275 MPa		F_y = 355 MPa	
	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c
	MPa	MPa	MPa	MPa	MPa	MPa
	LRFD	ASD	LRFD	ASD	LRFD	ASD
1	211	141	247	165	319	213
2	211	141	247	165	319	213
3	211	141	247	165	319	212
4	211	141	247	165	319	212
5	211	141	247	164	319	212
6	211	140	247	164	319	212
7	211	140	247	164	318	212
8	211	140	247	164	318	212
9	211	140	246	164	318	211
10	210	140	246	164	317	211
11	210	140	246	164	317	211
12	210	140	245	163	316	210
13	210	140	245	163	315	210
14	209	139	245	163	315	209
15	209	139	244	163	314	209
16	209	139	244	162	313	209
17	208	139	243	162	313	208
18	208	138	243	162	312	207
19	208	138	242	161	311	207
20	207	138	242	161	310	206
21	207	138	241	160	309	206
22	206	137	241	160	308	205
23	206	137	240	160	307	204
24	206	137	239	159	306	204
25	205	136	239	159	305	203
26	204	136	238	158	304	202
27	204	136	237	158	302	201
28	203	135	236	157	301	200
29	203	135	236	157	300	200
30	202	135	235	156	299	199
31	202	134	234	156	297	198
32	201	134	233	155	296	197
33	200	133	232	155	294	196
34	200	133	231	154	293	195
35	199	132	230	153	291	194
36	198	132	229	153	290	193
37	198	131	229	152	288	192
38	197	131	228	151	287	191
39	196	130	226	151	285	190
40	195	130	225	150	283	188
LRFD	ASD					
$\phi_c = 0.90$	$\Omega_c = 1.67$					

3.4 Sample Calculations

3.4.1 Available strength in axial compression

Members with non-slender elements

HD 260×142; S235 steel; $L_c = 5.00$ m:

Flange

$\{\lambda = 265/[(2)(26.5)] = 5.00\} \leq \left(\lambda_r = 0.56\sqrt{200000/235} = 16.3\right)$

∴ non-slender flange

Web

$(\lambda = 177/15.5 = 11.4) \leq \left(\lambda_r = 1.49\sqrt{200000/235} = 43.5\right)$

∴ non-slender web

$\left(L_c/r_y = 5000/67.6 = 74.0\right) \leq \left(4.71\sqrt{E/F_y} = 4.71\sqrt{200000/235} = 137\right)$

$F_e = \pi^2(200000)/74.0^2 = 361$ MPa

$F_{cr} = (0.658)^{235/361}(235) = 179$ MPa

$P_n = (179)(18030) \times 10^{-3} = 3230$ kN

$\phi_c P_n = (0.90)(3230) = 2900$ kN (LRFD)

$P_n/\Omega_c = 3230/1.67 = 1930$ kN (ASD)

Members with slender flanges

HD 260×54.1; S355 steel; $L_c = 7.00$ m:

Flange

$\{\lambda = 260/[(2)(9.5)] = 13.7\} > \left(\lambda_r = 0.56\sqrt{200000/355} = 13.3\right)$

∴ slender flange

Web

$(\lambda = 177/6.5 = 27.2) \leq \left(\lambda_r = 1.49\sqrt{200000/355} = 35.4\right)$

∴ non-slender web

$\left(L_c/r_y = 7000/63.6 = 110\right) \leq \left(4.71\sqrt{E/F_y} = 4.71\sqrt{200000/355} = 112\right)$

$F_e = \pi^2(200000)/110^2 = 163$ MPa

$F_{cr} = (0.658)^{355/163}(355) = 143$ MPa

$(\lambda = 13.7) \leq \left(\lambda_r\sqrt{F_y/F_{cr}} = 13.3\sqrt{355/143} = 21.0\right)$

$A_e = 6900$ mm^2

$P_n = (143)(6900) \times 10^{-3} = 984$ kN

$\phi_c P_n = (0.90)(984) = 885$ kN (LRFD)

$P_n/\Omega_c = 984/1.67 = 589$ kN (ASD)

Members with slender webs

IPEA 300; S355 steel; $L_c = 7.00$ m:

Flange

$\{\lambda = 150/[(2)(9.2)] = 8.15\} \leq \left(\lambda_r = 0.56\sqrt{200000/355} = 13.3\right)$

∴ slender flange

Web

$(\lambda = 249/6.1 = 40.8) > \left(\lambda_r = 1.49\sqrt{200000/355} = 35.4\right)$

∴ non-slender web

$\left(L_c/r_y = 7000/33.4 = 210\right) > \left(4.71\sqrt{E/F_y} = 112\right)$

$\therefore L_c/r_y$ exceeds the recommended value of 200!

$F_e = \pi^2(200000)/210^2 = 44.8$ MPa

$F_{cr} = (0.877)(44.8) = 39.3$ MPa

$(\lambda = 40.8) \leq \left(\lambda_r\sqrt{F_y/F_{cr}} = 35.4\sqrt{355/39.3} = 106\right)$

$A_e = 4650$ mm^2

$P_n = (39.3)(4650) \times 10^{-3} = 183$ kN

$\phi_c P_n = (0.90)(183) = 165$ kN (LRFD)

$P_n/\Omega_c = 183/1.67 = 110$ kN (ASD)

Web local yielding

IPEA 300; S275 steel:

$P_{wo} = (1.00)(5)(275)(6.1)(24.2) \times 10^{-3} = 203$ kN (LRFD)

$P_{wo} = (5)(275)(6.1)(24.2)/1.50 \times 10^{-3} = 135$ kN (ASD)

$P_{wi} = (1.00)(275)(6.1) \times 10^{-3} = 1680$ kN/m (LRFD)

$P_{wi} = (275)(6.1)/1.50 \times 10^{-3} = 1120$ kN/m (ASD)

Web compression buckling

IPEA 300; S275 steel:

$P_{wb} = (0.90)\,(24)(6.1)^3\sqrt{(200000)(275)}/249 \cdot (1.0) \times 10^{-3} = 146$ kN (LRFD)

$P_{wb} = (24)(6.1)^3\sqrt{(200000)(275)}/249 \cdot (1.0)/1.67 \times 10^{-3} = 97.3$ kN (ASD)

Flange local bending

IPEA 300; S275 steel:

$P_{fb} = (0.90)(6.25)(275)(9.2)^2 \times 10^{-3} = 131$ kN (LRFD)

$P_{fb} = (6.25)(275)(9.2)^2/1.67 \times 10^{-3} = 87.4$ kN (ASD)

Elastic critical buckling load

IPEA 300; S275 steel:

$P_{ex}L_{cx}^2 = \pi^2(200000)(7173 \times 10^4) \times 10^{-9} = 142000$ kN·m^2

$P_{ey}L_{cy}^2 = \pi^2(200000)(519.0 \times 10^4) \times 10^{-9} = 10200$ kN·m^2

3.4.2 Stiffness reduction factor

$P_r/A = 350$ MPa; S355 steel:

$\alpha P_r/P_{ns} = (1.0)(350)/355 = 0.986 > 0.5$ (LRFD)

$\tau_b = (4)(0.986)(1 - 0.986) = 0.0555$ (LRFD)

$\alpha P_r/P_{ns} = (1.6)(350)/355 = 1.58 > 1$ (ASD)

$\therefore$ τ_b not calculated (ASD)

$P_r/A = 170$ MPa; S355 steel:

$\alpha P_r/P_{ns} = (1.0)(170)/355 = 0.479 \leq 0.5$ (LRFD)

$\tau_b = 1.0$ (LRFD)

$\alpha P_r/P_{ns} = (1.6)(170)/355 = 0.766 > 0.5$ (ASD)

$\therefore \tau_b = (4)(0.766)(1 - 0.766) = 0.717$ (ASD)

3.4.3 Available critical stress

$L_c/r = 30$; S355 steel:

$$(L_c/r = 30) \leq \left(4.71\sqrt{E/F_y} = 112\right)$$

$F_e = \pi^2(200000)/30^2 = 2190$ MPa

$F_{cr} = (0.658)^{355/2190}(355) = 332$ MPa

$\phi_c F_{cr} = (0.90)(332) = 299$ MPa (LRFD)

$F_{cr}/\Omega_c = 332/1.67 = 199$ MPa (ASD)

$L_c/r = 150$; S355 steel:

$$(L_c/r = 150) > \left(4.71\sqrt{E/F_y} = 112\right)$$

$F_e = \pi^2(200000)/150^2 = 87.7$ MPa

$F_{cr} = (0.877)(87.7) = 76.9$ MPa

$\phi_c F_{cr} = (0.90)(76.9) = 69.2$ MPa (LRFD)

$F_{cr}/\Omega_c = 76.9/1.67 = 46.1$ MPa (ASD)

CHAPTER 4

DESIGN OF MEMBERS FOR FLEXURE

4.1 Introduction

This chapter develops the design tables for flexural members that use European I-shaped sections of S235, S275 and S355 steels and presents the equations and sample calculations in developing the tables.

4.2 Design Equations: Flexural Strength of Members Bent about Strong Axis

The flexural strength of doubly symmetric members bent about their strong axis is calculated based on the limit states of yielding (plastic moment), local buckling, and lateral-torsional buckling (LTB). For flexure, the resistance factor, ϕ_b, is 0.90 for LRFD, whereas the safety factor, Ω_b, is 1.67 for ASD.

4.2.1 Yielding

The nominal flexural strength, M_n, for members with compact sections (i.e., no local buckling) and with laterally unbraced lengths not exceeding the limiting value for the limit state of yielding (i.e., no LTB) is equal to the plastic moment strength, M_p:

$$M_n = M_p = F_y Z_x \tag{4.1}$$

where Z_x is the strong-axis plastic section modulus.

4.2.2 Local buckling

All European I-shaped sections considered in this study have compact webs, i.e., their λ_w values do not exceed the limiting ratio for compact webs in flexure, λ_{pw}:

$$\lambda_w \le \left(\lambda_{pw} = 3.76\sqrt{E/F_y}\right) \tag{4.2}$$

Hence, the design equations are only presented for the flanges in the following.

4.2.2.1 I-shaped sections with compact flanges

The limit state of local buckling does not apply if sections have compact flanges, i.e., their λ_f values do not exceed the limiting ratio for compact flanges in flexure, λ_{pf}:

$$\lambda_f \le \left(\lambda_{pf} = 0.38\sqrt{E/F_y}\right) \tag{4.3}$$

Most European I-shaped sections considered in this study have compact flanges.

4.2.2.2 I-shaped sections with noncompact flanges

Sections have noncompact flanges when

$$\lambda_{pf} < \lambda_f \le \left(\lambda_{rf} = 1.0\sqrt{E/F_y}\right) \tag{4.4}$$

where λ_{rf} is the limiting ratio for noncompact flanges, in which case the nominal flexural strength is

$$M_n = M_p - \left(M_p - 0.7F_yS_x\right)\left(\lambda_f - \lambda_{pf}\right)/\left(\lambda_{rf} - \lambda_{pf}\right) \tag{4.5}$$

where S_x is the strong-axis elastic section modulus. The nominal flexural strength is the lower value calculated from Eq. 4.5 and LTB equations presented subsequently (see Section 4.2.3).

4.2.2.3 I-shaped sections with slender flanges

Sections have slender flanges when

$$\lambda_f > \lambda_{rf} \tag{4.6}$$

None of the European I-shaped sections considered in this study have slender flanges.

4.2.3 Lateral-torsional buckling

The limit state of LTB does not apply if the laterally unbraced length, L_b, of the member does not exceed the limiting laterally unbraced length, L_p, for the limit state of yielding:

$$L_b \leq \left(L_p = 1.76 r_y \sqrt{E/F_y}\right) \tag{4.7}$$

4.2.3.1 Inelastic LTB

Inelastic LTB occurs when

$$L_p < L_b \leq \left[L_r = 1.95 r_{ts} \frac{E}{0.7F_y} \sqrt{\frac{J \cdot c}{S_x h_o} + \sqrt{\left(\frac{J \cdot c}{S_x h_o}\right)^2 + 6.76 \left(\frac{0.7F_y}{E}\right)^2}}\right] \tag{4.8}$$

where L_r is the limiting laterally unbraced length for the limit state of inelastic LTB, r_{ts} is the effective radius of gyration:

$$r_{ts} = \sqrt{I_y h_o / 2S_x} \tag{4.9}$$

J is the torsional constant, the coefficient c is 1 for doubly symmetric I-shapes, h_o is the distance between flange centroids and I_y is the weak-axis moment of inertia. The nominal flexural strength for inelastic LTB is:

$$M_n = C_b\left[M_p - \left(M_p - 0.7F_yS_x\right)\left(L_b - L_p\right)/\left(L_r - L_p\right)\right] \leq M_p \tag{4.10}$$

where C_b is the LTB modification factor for nonuniform moment diagrams when both ends of the segment are braced.

4.2.3.2 Elastic LTB

Elastic LTB occurs when

$$L_b > L_r \tag{4.11}$$

in which case the nominal flexural strength is

$$M_n = \frac{C_b\pi^2E}{\left(\frac{L_b}{r_{ts}}\right)^2}\sqrt{1 + 0.078\frac{J\cdot c}{S_xh_o}\left(\frac{L_b}{r_{ts}}\right)^2}\,S_x \leq M_p \tag{4.12}$$

4.3 Design Equations: Shear Strength of Members Bent about Strong Axis

4.3.1 Tension field action not considered

The nominal shear strength of doubly symmetric members bent about their strong axis is

$$V_n = 0.6F_yA_wC_{v1} \tag{4.13}$$

where A_w is the area of the web, which is the overall depth times the web thickness:

$$A_w = d\cdot t_w \tag{4.14}$$

and C_{v1} is the web shear strength coefficient, which is 1.0 when

$$\lambda_w \leq 2.24\sqrt{E/F_y} \tag{4.15}$$

All European I-shaped sections considered in this study satisfy this condition; the resistance factor, ϕ_v, is 1.00 for LRFD, whereas the safety factor, Ω_v, is 1.50 for ASD.

Otherwise,

$$C_{v1} = 1.0 \text{ when } \lambda_w \leq 1.10\sqrt{k_v E/F_y} \tag{4.16}$$

$$C_{v1} = 1.10\sqrt{k_v E/F_y}/\lambda_w \text{ when } \lambda_w > 1.10\sqrt{k_v E/F_y} \tag{4.17}$$

where k_v is the web plate shear buckling coefficient. For webs without transverse stiffeners:

$$k_v = 5.34 \tag{4.18}$$

and for webs with transverse stiffeners:

$$k_v = 5 + 5/(a/h)^2 \text{ when } a/h \leq 3.0 \tag{4.19}$$

$$k_v = 5.34 \text{ when } a/h > 3.0 \tag{4.20}$$

where a is the clear distance between transverse stiffeners. The resistance factor, ϕ_v, is 0.90 for LRFD, whereas the safety factor, Ω_v, is 1.67 for ASD.

4.3.2 Tension field action considered ($a/h \leq 3.0$)

V_n is given by Eq. 4.13 when $\lambda_w \leq 1.10\sqrt{k_v E/F_y}$. Else,

$$V_n = 0.6F_y A_w \left[C_{v2} + \frac{1 - C_{v2}}{1.15\sqrt{1 + (a/h)^2}}\right] \tag{4.21}$$

when $2A_w/(A_{fc} + A_{ft}) \leq 2.5,\ h/b_{fc} \leq 6.0$ and $h/b_{ft} \leq 6.0$, and

$$V_n = 0.6F_y A_w \left\{C_{v2} + \frac{1 - C_{v2}}{1.15\left[a/h + \sqrt{1 + (a/h)^2}\right]}\right\} \tag{4.22}$$

otherwise, where C_{v2} is the web shear buckling coefficient:

$$C_{v2} = C_{v1} \text{ when } \lambda_w \leq 1.37\sqrt{k_v E/F_y} \tag{4.23}$$

$$C_{v2} = 1.51 k_v E/\left(\lambda_w^2 F_y\right) \text{ when } \lambda_w > 1.37\sqrt{k_v E/F_y} \tag{4.24}$$

A_{fc} is the area of the compression flange, A_{ft} is the area of the tension flange, b_{fc} is the width of the compression flange, and b_{ft} is the width of the tension flange. The resistance factor, ϕ_v, is 0.90 for LRFD, whereas the safety factor, Ω_v, is 1.67 for ASD. The shear strength is permitted to be taken as the larger of the values from Sections 4.3.1 and 4.3.2.

4.4 Design Equations: Flexural Strength of Members Bent about Weak Axis

The flexural strength of I-shaped members bent about their weak axis is calculated based on the limit states of yielding (plastic moment) and flange local buckling.

4.4.1 Yielding

The nominal flexural strength for members with compact sections (i.e., no local buckling) is equal to the plastic moment strength:

$$M_n = M_p = F_y Z_y \leq 1.6 F_y S_y \tag{4.25}$$

where Z_y and S_y are the weak-axis plastic and elastic section moduli, respectively.

4.4.2 Flange local buckling

4.4.2.1 Compact flanges

The limit state of flange local buckling does not apply if sections have compact flanges (see Section 4.2.2.1). Most European I-shaped sections considered in this study have compact flanges.

4.4.2.2 Noncompact flanges

The nominal flexural strength for sections with noncompact flanges (see Section 4.2.2.2) is

$$M_n = M_p - \left(M_p - 0.7F_yS_y\right)\left(\lambda_f - \lambda_{pf}\right)/\left(\lambda_{rf} - \lambda_{pf}\right) \qquad (4.26)$$

4.4.2.3 Slender flanges

None of the European I-shaped sections considered in this study have slender flanges (see Section 4.2.2.3).

4.5 Design Tables

The following design tables were developed to facilitate the design of flexural members that use European I-shaped steel sections of S235, S275 and S355 steels:

(1) Selection by the strong-axis plastic section modulus, Z_x
(2) Selection by the weak-axis plastic section modulus, Z_y
(3) Selection by the strong-axis moment of inertia, I_x
(4) Selection by the weak-axis moment of inertia, I_y
(5) Maximum total uniform load
(6) Available moment versus unbraced length

(7) Available shear stress

4.5.1 Selection by Z_x

All I-shapes were sorted in descending order by their strong-axis plastic moment strength, M_{px}, (Eq. 4.1) with the lightest I-shape in each range in bold as shown in Table D.1 in Appendix D (see Table 4.1 for a sample). The table also includes the strong-axis yield moment strength that accounts for residual stresses:

$$M_{rx} = 0.7F_yS_x \tag{4.27}$$

The term *BF*:

$$BF = \left(M_{px} - M_{rx}\right)/\left(L_r - L_p\right) \tag{4.28}$$

is also listed in the table together with L_p to facilitate the calculation of the strong-axis available flexural strength for inelastic LTB (cf. Eq. 4.10) according to LRFD and ASD, respectively:

$$\phi_b M_{nx} = C_b\left[\phi_b M_{px} - \phi_b BF\left(L_b - L_p\right)\right] \leq \phi_\mathrm{b} M_{px} \tag{4.29}$$

$$M_{nx}/\Omega_b = C_b\left[M_{px}/\Omega_b - BF/\Omega_b \cdot \left(L_b - L_p\right)\right] \leq M_{px}/\Omega_b \tag{4.30}$$

Users are referred to Table D.6 in Appendix D (see Table 4.6 for a sample), presented subsequently, for elastic LTB.

For I-shapes with noncompact flanges, the adjusted M_{px} and L_p values:

$$M'_{px} = M_n \text{ from Eq. 4.5} \tag{4.31}$$

$$L'_p = L_p + \left(L_r - L_p\right)\left(M_{px} - M'_{px}\right)/\left(M_{px} - M_{rx}\right) \tag{4.32}$$

were tabulated to account for local buckling.

Table D.1 also includes L_r, I_x and the strong-axis available shear strength without considering the tension field action according to LRFD and ASD, $\phi_v V_{nx}$ and V_{nx}/Ω_v, respectively.

4.5.2 Selection by Z_y

All I-shapes were sorted in descending order by their weak-axis plastic moment strength, M_{py}, (Eq. 4.25) with the lightest I-shape in each range in bold as shown in Table D.2 in Appendix D (see Table 4.2 for a sample). For I-shapes with noncompact flanges, the adjusted M_{py} values:

$$M'_{py} = M_n \text{ from Eq. 4.26} \tag{4.33}$$

were tabulated to account for local buckling.

4.5.3 Selection by I_x

All I-shapes were sorted in descending order by their strong-axis moment of inertia with the lightest I-shape in each range in bold as shown in Table D.3 in Appendix D (see Table 4.3 for a sample).

4.5.4 Selection by I_y

All I-shapes were sorted in descending order by their weak-axis moment of inertia with the lightest I-shape in each range in bold as shown in Table D.4 in Appendix D (see Table 4.4 for a sample).

4.5.5 Maximum total uniform load

Maximum total uniform loads that simply supported beams bent about their strong axis with $L_b \leq L_p$ can support were presented in Table D.5 in Appendix D (see Table 4.5 for a sample) for span lengths, L, ranging from 1 to 15 m. The nominal maximum total uniform loads were calculated based on the flexural and shear strengths, respectively:

$$w \cdot L = 8M_{px}/L \tag{4.34}$$

$$w \cdot L = 2V_{nx} \tag{4.35}$$

where w is the intensity of the uniform load. The calculated values according to LRFD and ASD if governed by the shear strength were tabulated in bold. Note that the tabulated values were adjusted to account for local buckling.

Table D.5 also includes the uniform load constant, W_c:

$$W_c = 8M_{px} \tag{4.36}$$

if divided by L provides the maximum total uniform load.

4.5.6 Available moment versus unbraced length

The strong-axis available flexural strength tables (see Table D.6 in Appendix D; see Table 4.6 for a sample) were developed for values of L_b ranging from 0 to 15 m. C_b was taken as unity. Note that the tabulated values were adjusted to account for local buckling.

4.5.7 Available shear stress

The available shear stress plots as a function of a/h and λ_w (see Table D.7 in Appendix D; see Table 4.7 for a sample) were developed for tension field action not included (cf. Eq. 4.13) and included (cf. Eqs. 4.21–4.22) cases.

Table 4.1 Selection by Z_x for I-shapes of S235 steel.

Z_x

I– shapes
Selection by Z_x

$F_y = 235$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	$\times 10^3$	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	$\times 10^4$	LRFD	ASD
HD 400 × 1086	**27210**	**5750**	**3830**	**3100**	**2060**	**22.3**	**14.8**	**6.11**	**125**	**596000**	**6260**	**4170**
HD 400 × 990	**24280**	**5140**	**3420**	**2790**	**1860**	**21.5**	**14.3**	**6.02**	**115**	**519000**	**5580**	**3720**
HD 400 × 900	**21620**	**4570**	**3040**	**2510**	**1670**	**20.6**	**13.7**	**5.93**	**106**	**450000**	**4930**	**3290**
HD 400 × 818	**19260**	**4070**	**2710**	**2260**	**1500**	**20.0**	**13.3**	**5.85**	**96.6**	**392000**	**4380**	**2920**
HD 400 × 744	**17170**	**3630**	**2420**	**2030**	**1350**	**19.3**	**12.9**	**5.78**	**88.3**	**342000**	**3900**	**2600**
HE 1000 M	**16570**	**3500**	**2330**	**2120**	**1410**	**172**	**114**	**3.31**	**11.4**	**722000**	**2980**	**1990**
HD 400 × 677	15350	3250	2160	1840	1220	18.7	12.5	5.71	81.0	300000	3490	2320
HE 1000 B	**14860**	**3140**	**2090**	**1910**	**1270**	**166**	**110**	**3.28**	**10.7**	**645000**	**2680**	**1790**
HE 900 M	14440	3050	2030	1860	1240	136	90.2	3.39	12.2	570000	2690	1800
HD 400 × 634	14220	3010	2000	1710	1140	18.4	12.2	5.66	76.1	274000	3180	2120
HD 400 × 592	13140	2780	1850	1590	1060	18.1	12.0	5.61	71.2	250000	2950	1970
HE 1000 A	**12820**	**2710**	**1800**	**1660**	**1100**	**154**	**103**	**3.26**	**10.1**	**554000**	**2300**	**1540**
HE 900 B	12580	2660	1770	1630	1080	131	86.8	3.35	11.3	494000	2350	1570
HE 800 M	12490	2640	1760	1610	1070	104	69.0	3.49	13.4	443000	2410	1610
HD 400 x 551	12050	2550	1700	1470	979	17.7	11.8	5.57	66.5	226000	2690	1800
HD 400 x 509	11030	2330	1550	1360	903	17.4	11.6	5.53	61.6	205000	2460	1640
HE 900 A	**10810**	**2290**	**1520**	**1400**	**934**	**123**	**81.6**	**3.34**	**10.5**	**422000**	**2010**	**1340**
HE 700 M	10540	2230	1480	1360	906	75.4	50.1	3.60	15.1	329000	2120	1410
HE 800 B	10230	2160	1440	1330	884	99.5	66.2	3.43	11.8	359000	1970	1320
HD 400 × 463	9878	2090	1390	1230	816	17.0	11.3	5.47	56.2	180000	2200	1460
HE 650 M	9657	2040	1360	1250	831	63.1	42.0	3.66	16.2	282000	1980	1320
HD 400 × 421	8880	1880	1250	1110	740	16.7	11.1	5.43	51.4	160000	1970	1310
HE 600 M	8772	1860	1230	1130	755	52.1	34.6	3.71	17.6	237000	1840	1220
HE 800 A	**8699**	**1840**	**1220**	**1140**	**757**	**93.8**	**62.4**	**3.41**	**10.9**	**303000**	**1670**	**1110**
HE 700 B	8327	1760	1170	1090	723	73.0	48.6	3.53	12.8	257000	1680	1120
HD 400 × 382	7965	1680	1120	1010	669	16.4	10.9	5.39	46.7	141000	1750	1170
HE 550 M	7933	1680	1120	1020	682	42.2	28.1	3.77	19.2	198000	1690	1130
HE 650 B	7320	1550	1030	959	638	61.2	40.7	3.59	13.2	211000	1470	978
HD 400 × 347	7139	1510	1000	909	605	16.1	10.7	5.36	42.6	125000	1560	1040
HE 500 M	7094	1500	998	915	609	33.6	22.4	3.83	21.2	162000	1550	1030
HE 700 A	**7032**	**1490**	**990**	**924**	**615**	**69.6**	**46.3**	**3.51**	**11.6**	**215000**	**1410**	**940**
HE 600 B	6425	1360	904	844	562	50.7	33.7	3.64	13.8	171000	1310	874
HD 400 × 314	6374	1350	897	818	544	16.0	10.6	5.30	38.5	110000	1400	934
HE 450 M	6331	1340	891	814	542	26.4	17.6	3.90	23.8	132000	1420	944
LRFD	**ASD**											
$\phi_b = 0.90$ $\phi_v = 1.00$	$\Omega_b = 1.67$ $\Omega_v = 1.50$											

Table 4.2 Selection by Z_y for I-shapes of S235 steel.

Z_y

I– shapes
Selection by Z_y

$F_y = 235$ MPa

Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b	Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b
	mm^3	kN·m	kN·m		mm^3	kN·m	kN·m
	× 10^3	LRFD	ASD		× 10^3	LRFD	ASD
HD 400 × 1086	**13380**	**2830**	**1880**	**HD 360 × 162**	**1516**	**321**	**213**
HD 400 × 990	**11960**	**2530**	**1680**	HE 700 B	1495	316	210
HD 400 × 900	**10710**	**2270**	**1510**	HE 1000 A	1470	311	207
HD 400 × 818	**9561**	**2020**	**1350**	HE 650 B	1441	305	203
HD 400 × 744	**8549**	**1810**	**1200**	HE 900 A	1414	299	199
HD 400 × 677	**7680**	**1620**	**1080**	HE 280 M	1397	295	197
HD 400 × 634	**7117**	**1510**	**1000**	HE 600 B	1391	294	196
HD 400 × 592	**6574**	**1390**	**925**				
HD 400 × 551	**6051**	**1280**	**851**	**HD 360 × 147**	**1369**	**290**	**193**
HD 400 × 509	**5552**	**1170**	**781**	HE 550 B	1341	284	189
HD 400 × 463	**4978**	**1050**	**700**	HE 800 A	1312	277	185
HD 400 × 421	**4489**	**949**	**632**	HE 500 B	1292	273	182
HD 400 × 382	**4031**	**853**	**567**	HE 700 A	1257	**266**	**177**
HD 400 × 347	**3629**	**768**	**511**				
HD 400 × 314	**3236**	**684**	**455**	**HD 360 × 134**	**1237**	**262**	**174**
HD 400 × 287	**2957**	**625**	**416**	HE 650 A	1205	255	170
HD 400 × 262	**2676**	**566**	**377**	HE 450 B	1198	253	169
HD 320 × 300	2414	511	340	HD 320 × 158	1194	253	168
				HD 260 × 172	1192	252	168
HD 400 × 237	**2387**	**505**	**336**	HE 260 M	1192	252	168
HD 400 × 216	**2176**	**460**	**306**	HE 600 A	1156	244	163
HE 340 M	1953	413	275	HE 550 A	1107	234	156
HD 320 × 245	1951	413	275	HE 400 B	1104	233	155
HE 320 M	1951	413	275	HE 500 A	1059	224	149
HE 360 M	1942	411	273	HE 360 B	1032	218	145
HE 1000 M	1940	410	273	HE 240 M	1006	213	142
HE 450 M	1939	410	273	HE 340 B	985.7	208	139
HE 550 M	1937	410	273	HE 450 A	965.5	204	136
HE 650 M	1936	409	272	HD 260 × 142	950.5	201	134
HE 400 M	1934	409	272				
HE 500 M	1932	409	272	**HD 320 × 127**	**939.1**	**199**	**132**
HE 600 M	1930	408	272	**HE 320 B**	**939.1**	**199**	**132**
HE 800 M	1930	408	272				
HE 700 M	1929	408	271				
HE 900 M	1929	408	271	**HE 400 A**	**872.9**	**185**	**123**
HE 300 M	1913	405	269	**HE 300 B**	**870.1**	**184**	**122**
				HE 360 A	**802.3**	**170**	**113**
HD 360 × 196	**1856**	**393**	**261**	**HE 340 A**	**755.9**	**160**	**106**
HD 400 × 187	**1855**	**392**	**261**	HD 260 × 114	752.5	159	106
HE 1000 B	1716	363	241	IPN 600	752.0	159	106
HD 360 × 179	**1683**	**356**	**237**	**HE 280 B**	**717.6**	**152**	**101**
HE 900 B	1658	351	233	**HD 320 × 97.6**	**709.7**	**150**	**99.9**
HE 800 B	1553	328	219	**HE 320 A**	**709.7**	**150**	**99.9**
HD 320 × 198	1530	324	215	HE 220 M	678.6	144	95.5

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table 4.3 Selection by I_x.

I_x

I-shapes
Selection by I_x

Shape	I_x	Shape	I_x	Shape	I_x
	mm^4		mm^4		mm^4
HE 1000 M	**722300**	**HE 600 A**	**141200**	**IPE A 550**	**59980**
		IPN 600	138800	HE 300 M	59200
HE 1000 B	**644700**	HE 550 B	136700	IPE O 500	57780
HD 400 × 1086	595700	HE 450 M	131500	HE 400 B	57680
HE 900 M	570400	HD 400 × 347	124900	HD 360 × 179	57440
				HD 320 × 198	51900
HE 1000 A	**553800**	**IPE O 600**	**118300**	HD 360 × 162	51540
HD 400 × 990	518900	HE 550 A	111900		
HE 900 B	494100	HD 400 × 314	110200	**IPE 500**	**48200**
HD 400 × 900	450200	HE 500 B	107200	HD 360 × 147	46290
HE 800 M	442600	HE 400 M	104100	IPN 450	45850
HE 900 A	422100	HD 400 × 287	99710	HE 400 A	45070
HD 400 × 818	392200	IPN 550	99180	HE 360 B	43190
HE 800 B	**359100**	**IPE 600**	**92080**	**IPE A 500**	**42930**
HD 400 × 744	342100	HD 400 × 262	89410	HD 360 × 134	41510
HE 700 M	329300	HE 500 A	86970	IPE O 450	40920
		HD 320 × 300	86900	HD 320 × 158	39640
HE 800 A	**303400**	HE 360 M	84870	HE 280 M	39550
HD 400 × 677	299500			HE 340 B	36660
HE 650 M	281700	**IPE A 600**	**82920**		
HD 400 × 634	274200	HE 450 B	79890	**IPE 450**	**33740**
HE 700 B	256900	IPE O 550	79160	HE 360 A	33090
HD 400 × 592	250200	HD 400 × 237	78780	HD 260 × 172	31310
HE 600 M	237400	HE 340 M	76370	HE 260 M	31310
HD 400 × 551	226100	HD 400 × 216	71140	HD 320 × 127	30820
		IPN 500	68740	HE 320 B	30820
HE 700 A	**215300**	HD 320 × 245	68130		
HE 650 B	210600	HE 320 M	68130	**IPE A 450**	**29760**
HD 400 × 509	204500			IPN 400	29210
HE 550 M	198000	**IPE 550**	**67120**	HE 340 A	27690
HD 400 × 463	180200	HE 450 A	63720	IPE O 400	26750
		HD 360 × 196	63630	HE 300 B	25170
HE 650 A	**175200**	HD 400 × 187	60180	HD 260 × 142	24330
HE 600 B	171000			HE 240 M	24290
HE 500 M	161900			IPN 380	24010
HD 400 × 421	159600				
HD 400 × 382	141300				

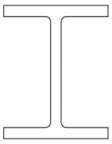
Table 4.4 Selection by I_y.

I_y

I-shapes
Selection by I_y

Shape	I_y	**Shape**	I_y	**Shape**	I_y
	mm^4		**mm^4**		**mm^4**
HD 400 × 1086	**196200**	**HD 360 × 162**	**18560**	**HE 300 B**	**8563**
HD 400 × 990	**173400**	HE 1000 M	18460	HD 260 × 142	8236
HD 400 × 900	**153300**	HE 900 M	18450	HE 240 M	8153
HD 400 × 818	**135500**				
HD 400 × 744	**119900**	**HD 360 × 147**	**16720**	**HE 360 A**	**7887**
HD 400 × 677	**106900**	HE 1000 B	16280	**HE 340 A**	**7436**
HD 400 × 634	**98250**	HE 900 B	15820	**HD 320 × 97.6**	**6985**
HD 400 × 592	**90170**	HD 320 × 198	15310	HE 320 A	6985
HD 400 × 551	**82490**			HE 280 B	6595
HD 400 × 509	**75400**	**HD 360 × 134**	**15080**	HD 260 × 114	6456
HD 400 × 463	**67040**	HE 800 B	14900		
HD 400 × 421	**60080**	HE 700 B	14440	**HE 300 A**	**6310**
HD 400 × 382	**53620**	HE 1000 A	14000	HD 260 × 93.0	5135
HD 400 × 347	**48090**	HE 650 B	13980	HE 260 B	5135
HD 400 × 314	**42600**	HE 900 A	13550	HE 220 M	5012
HD 400 × 287	**38780**	HE 600 B	13530		
HD 400 × 262	**35020**	HE 280 M	13160	**HD 320 × 74.2**	**4959**
HD 400 × 237	**31040**	HE 550 B	13080	HE 280 A	4763
HD 400 × 216	**28250**	HE 800 A	12640	IPN 600	4674
HD 320 × 300	24600	HE 500 B	12620	IPE O 600	4521
		HE 700 A	12180	HE 240 B	3923
HD 400 × 187	**23920**	HD 320 × 158	11840		
HD 360 × 196	22860	HE 650 A	11720	**HD 260 × 68.2**	**3668**
		HE 450 B	11720	HE 260 A	3668
HD 360 × 179	**20680**	HE 600 A	11270	HE 200 M	3651
HD 320 × 245	19710	HE 550 A	10820	IPN 550	3490
HE 320 M	19710	HE 400 B	10820	IPE 600	3387
HE 340 M	19710	HD 260 × 172	10450	IPE O 550	3224
HE 360 M	19520	HE 260 M	10450	IPE A 600	3116
HE 300 M	19400	HE 500 A	10370	HE 220 B	2843
HE 400 M	19340	HE 360 B	10140		
HE 450 M	19340	HE 340 B	9690	**HD 260 × 54.1**	**2788**
HE 550 M	19160	HE 450 A	9465	HE 240 A	2769
HE 500 M	19150			IPE 550	2668
HE 600 M	18980	**HD 320 × 127**	**9239**	IPE O 500	2622
HE 650 M	18980	HE 320 B	9239	HE 180 M	2580
HE 700 M	18800	HE 400 A	8564	IPN 500	2480
HE 800 M	18630			IPE A 550	2432
				IPE 500	2142
				IPE O 450	2085
				HE 200 B	2003

Table 4.5 Maximum total uniform load for HD shapes of S235 steel.



Maximum Total Uniform Load, kN
HD Shapes

F_y = 235 MPa

Shape		HD 260×54.1^f		HD 260×68.2		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**447**	**298**	**529**	**353**	**733**	**489**	**945**	**630**	**1220**	**810**	**1470**	**981**
	1.50	**447**	**298**	**529**	**353**	**733**	**489**	**945**	**630**	**1220**	**810**	**1470**	**981**
	2.00	**447**	**298**	**529**	**353**	**733**	**489**	**945**	**630**	**1220**	**810**	**1470**	**981**
	2.50	**447**	**298**	**529**	**353**	**733**	**489**	**945**	**630**	**1220**	**810**	**1470**	**981**
	3.00	382	254	519	345	724	481	902	600	1140	756	1420	947
	3.50	328	218	445	296	620	413	773	515	974	648	1220	812
	4.00	287	191	389	259	543	361	677	450	852	567	1070	710
	4.50	255	170	346	230	482	321	602	400	758	504	949	631
	5.00	229	153	311	207	434	289	541	360	682	454	854	568
	5.50	208	139	283	188	395	263	492	327	620	412	776	517
	6.00	191	127	259	173	362	241	451	300	568	378	712	474
	6.50	176	117	239	159	334	222	416	277	525	349	657	437
	7.00	164	109	222	148	310	206	387	257	487	324	610	406
	7.50	153	102	208	138	289	193	361	240	455	302	569	379
	8.00	143	95.4	195	129	271	181	338	225	426	284	534	355
	8.50	135	89.7	183	122	255	170	318	212	401	267	502	334
	9.00	127	84.8	173	115	241	160	301	200	379	252	475	316
	9.50	121	80.3	164	109	229	152	285	190	359	239	450	299
	10.0	115	76.3	156	104	217	144	271	180	341	227	427	284
	10.5	109	72.7	148	98.6	207	138	258	172	325	216	407	271
	11.0	104	69.3	141	94.1	197	131	246	164	310	206	388	258
	11.5	100	66.3	135	90.0	189	126	235	157	296	197	371	247
	12.0	95.5	63.6	130	86.3	181	120	226	150	284	189	356	237
	12.5	91.7	61.0	125	82.8	174	116	217	144	273	181	342	227
	13.0	88.2	58.7	120	79.7	167	111	208	139	262	174	329	219
	13.5	84.9	56.5	115	76.7	161	107	201	133	253	168	316	210
	14.0	81.9	54.5	111	74.0	155	103	193	129	244	162	305	203
	14.5	79.1	52.6	107	71.4	150	99.6	187	124	235	156	295	196
	15.0	76.4	50.9	104	69.0	145	96.3	180	120	227	151	285	189
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	1150	763	1560	1040	2170	1440	2710	1800	3410	2270	4270	2840
$\phi_b M_p$	M_p/Ω_b , kN·m	143	95.4	195	129	271	181	338	225	426	284	534	355
$\phi_b M_r$	M_r/Ω_b , kN·m	96.8	64.4	124	82.4	170	113	209	139	259	172	320	213
$\phi_b BF$	BF/Ω_b , kN	6.43	4.28	7.11	4.73	7.49	4.98	7.62	5.07	7.78	5.17	8.03	5.35
$\phi_v V_n$	V_n/Ω_v , kN	224	149	264	176	367	244	472	315	608	405	736	491
	$Z_x \times 10^3$, mm^3	714.5		919.8		1283		1600		2015		2524	
	L_p , m	4.48		3.34		3.38		3.42		3.47		3.54	
	L_r , m	11.7		13.3		16.9		20.4		25.0		30.2	
LRFD	ASD	^{f} Shape exceeds compact limit for fle×ure; tabulated values have been adjusted accordingly. Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table 4.6 Available moment vs. unbraced length for HD shapes of S235 steel.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 235 MPa

Shape		**HD 320×74.2^f**		**HD 320×97.6**		**HD 320×127**		**HD 320×158**		**HD 320×198**		**HD 320×245**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	240	160	344	229	455	302	575	382	736	490	938	624
	1.00	240	160	344	229	455	302	575	382	736	490	938	624
	1.50	240	160	344	229	455	302	575	382	736	490	938	624
	2.00	240	160	344	229	455	302	575	382	736	490	938	624
	2.50	240	160	344	229	455	302	575	382	736	490	938	624
	3.00	240	160	344	229	455	302	575	382	736	490	938	624
	3.50	240	160	344	229	455	302	575	382	736	490	938	624
	4.00	240	160	343	228	453	302	574	382	736	490	938	624
	4.50	240	160	337	224	447	298	568	378	730	486	933	621
	5.00	240	160	331	220	441	294	562	374	724	481	927	616
	5.50	235	157	326	217	436	290	556	370	718	477	920	612
	6.00	230	153	320	213	430	286	550	366	712	473	914	608
	6.50	225	150	314	209	424	282	544	362	705	469	908	604
	7.00	220	147	309	205	418	278	538	358	699	465	901	600
	7.50	216	143	303	202	412	274	533	354	693	461	895	596
	8.00	211	140	298	198	406	270	527	350	687	457	889	591
	8.50	206	137	292	194	401	266	521	346	681	453	883	587
	9.00	201	134	286	191	395	263	515	342	675	449	876	583
	9.50	196	130	281	187	389	259	509	339	669	445	870	579
	10.0	191	127	275	183	383	255	503	335	663	441	864	575
	10.5	186	124	270	179	377	251	497	331	657	437	858	571
	11.0	181	120	264	176	371	247	491	327	651	433	851	566
	11.5	176	117	258	172	365	243	485	323	645	429	845	562
	12.0	171	114	253	168	360	239	479	319	639	425	839	558
	12.5	166	111	247	164	354	235	473	315	633	421	833	554
	13.0	161	107	241	161	348	231	467	311	627	417	826	550
	13.5	154	102	236	157	342	228	461	307	621	413	820	546
	14.0	147	97.9	230	153	336	224	455	303	614	409	814	541
	14.5	141	93.9	225	149	330	220	449	299	608	405	807	537
	15.0	136	90.2	219	146	324	216	443	295	602	401	801	533
Properties													
$Z_x \times 10^3$, mm^3		1196		1628		2149		2718		3479		4435	
L_p, m		5.02		3.85		3.89		3.94		4.00		4.08	
L_r, m		12.9		15.0		18.4		22.4		27.7		34.1	
LRFD	**ASD**	^{f}Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly. Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table 4.7 Available shear stress for I-shapes of S235 steel.

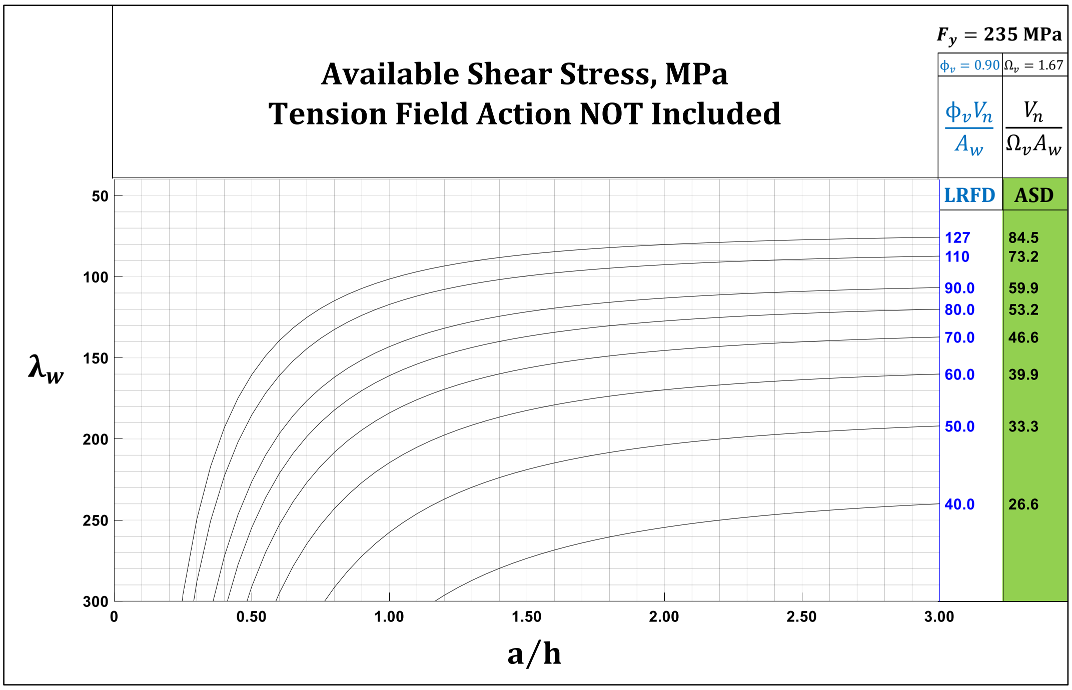
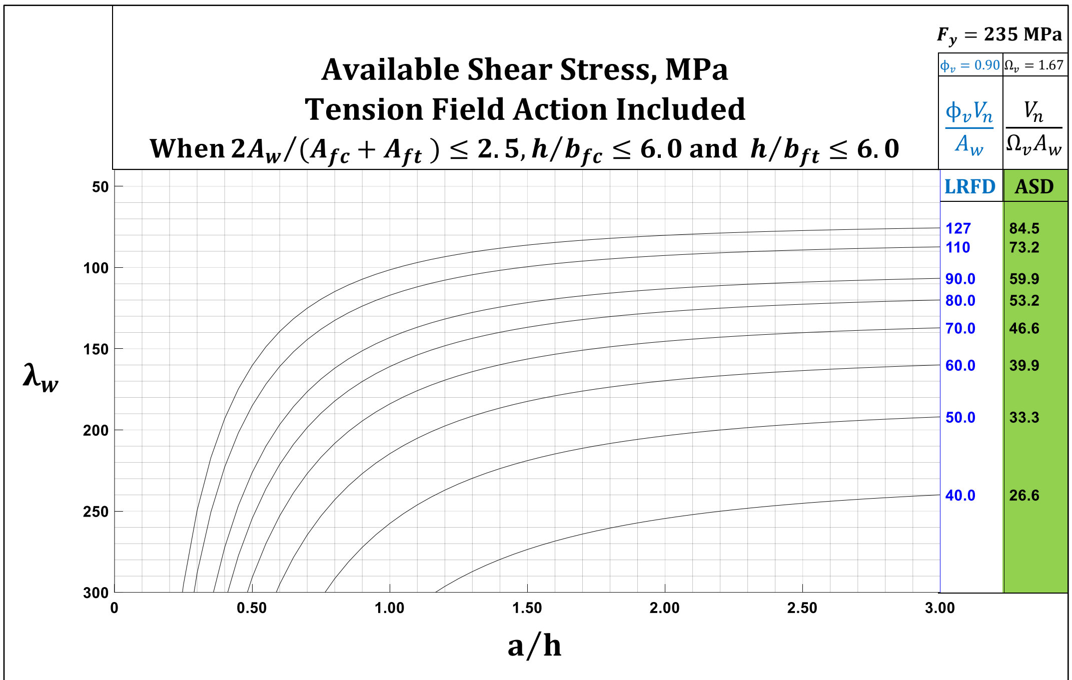
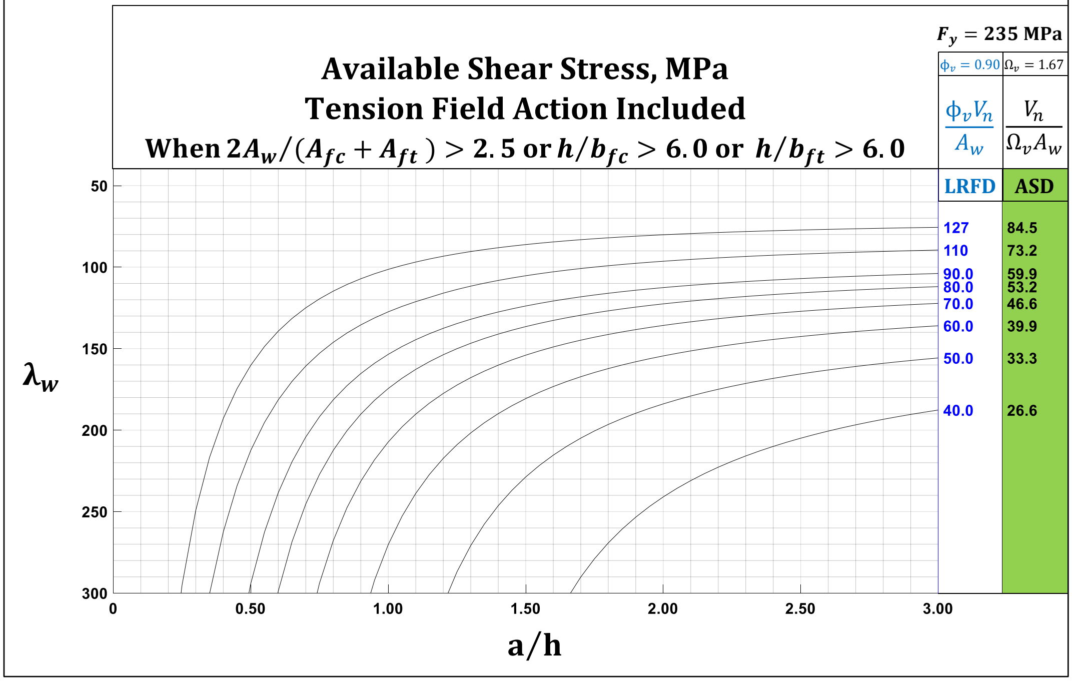


Table 4.7 Continued.



Available Shear Stress, MPa
Tension Field Action Included
When $2A_w/(A_{fc}+A_{ft}) \leq 2.5, h/b_{fc} \leq 6.0$ and $h/b_{ft} \leq 6.0$

$F_y = 235$ MPa



Available Shear Stress, MPa
Tension Field Action Included
When $2A_w/(A_{fc}+A_{ft}) > 2.5$ or $h/b_{fc} > 6.0$ or $h/b_{ft} > 6.0$

$F_y = 235$ MPa

4.6 Sample Calculations

4.6.1 Compact flanges

HD 400 × 1086; S235 steel; $L_b = 1.50 \text{ m}, 9.00 \text{ m}$:

Local buckling

$(\lambda_w = 289/78.0 = 3.71) \le \left(\lambda_{pw} = 3.76\sqrt{200000/235} = 110\right)$

∴ compact web

$\left\{\lambda_f = 454/[(2)(125)] = 1.80\right\} \le \left(\lambda_{pf} = 0.38\sqrt{200000/235} = 11.1\right)$

∴ compact flange

Strong-axis flexural strength

$M_{px} = (235)(27210 \times 10^3) \times 10^{-6} = 6390$ kN·m

$\phi_b M_{px} = (0.90)(6390) = 5750$ kN·m (LRFD)

$M_{px}/\Omega_b = 6390/1.67 = 3830$ kN·m (ASD)

$M_{rx} = (0.7)(235)(20940 \times 10^3) \times 10^{-6} = 3440$ kN·m

$\phi_b M_{rx} = (0.90)(3440) = 3100$ kN·m (LRFD)

$M_{rx}/\Omega_b = 3440/1.67 = 2060$ kN·m (ASD)

$L_p = (1.76)(119.0)\sqrt{200000/235} \times 10^{-3} = 6.11$ m

$h_o = 569 - 125 = 444$ mm

$r_{ts} = \sqrt{(196200 \times 10^4)(444)/[(2)(20940 \times 10^3)]} = 144$ mm

$$\frac{J \cdot c}{S_x h_o} = \frac{(62290 \times 10^4)(1)}{(20940 \times 10^3)(444)} = 0.0670$$

$$L_r = (1.95)(144)\frac{200000}{(0.7)(235)}\sqrt{0.0670 + \sqrt{0.0670^2 + 6.76\left[\frac{(0.7)(235)}{200000}\right]^2}}$$

$$\times 10^{-3} = 125\text{ m}$$

$BF = (6390 - 3340)/(125 - 6.11) = 24.8\text{ kN}$

$\phi_b BF = (0.90)(24.8) = 22.3\text{ kN (LRFD)}$

$BF/\Omega_b = 24.8/1.67 = 14.8\ \text{ kN (ASD)}$

$L_b = 1.50\text{ m:}$

$L_b < L_p\ \therefore$ No LTB

$L_b = 9.00\text{ m:}$

$L_p < L_b \leq L_r\ \therefore$ Inelastic LTB

$M_n = 1.00[6390 - (6390 - 3440)\,(9.00 - 6.11)/(125 - 6.11)] = 6320\text{ kN}\cdot\text{m}$

$\phi_b M_n = (0.90)(6320) = 5690\text{ kN}\cdot\text{m (LRFD)}$

$M_n/\Omega_b = 6320/1.67 = 3790\text{ kN}\cdot\text{m (ASD)}$

Weak-axis flexural strength

$$M_{py} = (235)(13380 \times 10^3) \times 10^{-6} = 3140\text{ kN}\cdot\text{m}$$
$$\leq (1.6)(235)(8645 \times 10^3) \times 10^{-6} = 3250\text{ kN}\cdot\text{m}$$

$\phi_b M_{py} = (0.90)(3140) = 2830\text{ kN}\cdot\text{m (LRFD)}$

$M_{py}/\Omega_b = 3140/1.67 = 1880\text{ kN}\cdot\text{m (ASD)}$

Strong-axis shear strength

$V_{nx} = (0.6)(235)(569)(78.0)(1.0) \times 10^{-3} = 6260\text{ kN}$

$(\lambda_w = 3.71) \leq \left(2.24\sqrt{E/F_y} = 2.24\sqrt{200000/235} = 65.3\right)$

$\phi_v V_{nx} = (1.00)(6260) = 6260$ kN (LRFD)

$V_{nx}/\Omega_v = 6260/1.50 = 4170$ kN (ASD)

Maximum total uniform load

$L = 1.50$ m:

$\phi_b\left(8M_{px}/L\right) = (0.90)(8)(6390)/1.50 = 30700$ kN

$\phi_v(2V_{nx}) = (1.00)(2)(6260) = 12500$ kN

$\phi(w \cdot L) = 12500$ kN (LRFD)

$8M_{px}/L/\Omega_b = (8)(6390)/1.50/1.67 = 20400$ kN

$2V_{nx}/\Omega_v = (2)(6260)/1.50 = 8340$ kN

$\phi(w \cdot L) = 8340$ kN (ASD)

Uniform load constant

$W_c = 8M_{px} = (8)(6390) = 51200$ kN·m

$\phi_b W_c = (0.90)(51200) = 46000$ kN·m (LRFD)

$W_c/\Omega_b = 51200/1.67 = 30600$ kN·m (ASD)

4.6.2 Noncompact flanges

HD 320 × 74.2; S235 steel; $L_b = 1.50$ m, 15.0 m:

Local buckling

$(\lambda_w = 225/8.0 = 28.1) \le \left(\lambda_{pw} = 3.76\sqrt{200000/235} = 110\right)$

∴ compact web

$$\left(\lambda_{pf} = 0.38\sqrt{200000/235} = 11.1\right) < \left\{\lambda_f = 300/[(2)(11.0)] = 13.6\right\}$$
$$\leq \left(\lambda_{rf} = 1.0\sqrt{200000/235} = 29.2\right)$$

∴ noncompact flange

Strong-axis flexural strength

$M_{px} = (235)(1196 \times 10^3) \times 10^{-6} = 281$ kN·m

$$M'_{px} = 281 - [281 - (0.7)(235)(1093 \times 10^3) \times 10^{-6}]\,(13.6 - 11.1)/(29.2 - 11.1) = 267 \text{ kN·m}$$

$\phi_b M'_{px} = (0.90)(267) = 240$ kN·m (LRFD)

$M'_{px}/\Omega_b = 267/1.67 = 160$ kN·m (ASD)

$M_{rx} = (0.7)(235)(1093 \times 10^3) \times 10^{-6} = 180$ kN·m

$\phi_b M_{rx} = (0.90)(180) = 162$ kN·m (LRFD)

$M_{rx}/\Omega_b = 180/1.67 = 108$ kN·m (ASD)

$L_p = (1.76)(72.4)\sqrt{200000/235} \times 10^{-3} = 3.72$ m

$h_o = 301 - 11.0 = 290$ mm

$r_{ts} = \sqrt{(4959 \times 10^4)(290)/[(2)(1093 \times 10^3)]} = 81.1$ mm

$$\frac{J \cdot c}{S_x h_o} = \frac{(55.87 \times 10^4)(1)}{(1093 \times 10^3)(290)} = 0.00176$$

$$L_r = (1.95)(81.1)\frac{200000}{(0.7)(235)}\sqrt{0.00176 + \sqrt{0.00176^2 + 6.76\left[\frac{(0.7)(235)}{200000}\right]^2}} \times 10^{-3} = 12.9 \text{ m}$$

$L'_p = 3.72 + (12.9 - 3.72)\,(281 - 267)/(281 - 180) = 5.02$ m

$BF = (267 - 180)/(12.9 - 5.02) = 11.0 \text{ kN}$

$\phi_b BF = (0.90)(11.0) = 9.89 \text{ kN (LRFD)}$

$BF/\Omega_b = 11.0/1.67 = 6.58 \text{ kN (ASD)}$

$L_b = 15.0 \text{ m:}$

$L_b > L_r \;\therefore$ Elastic LTB

$$M_n = \frac{(1.00)(\pi^2)(200000)}{\left(\frac{15000}{81.1}\right)^2}\sqrt{1 + (0.078)(0.00176)\left(\frac{15000}{81.1}\right)^2}(1093 \times 10^3)$$
$$\times 10^{-6} = 151 \text{ kN·m}$$

$\phi_b M_n = (0.90)(151) = 136 \text{ kN·m (LRFD)}$

$M_n/\Omega_b = 151/1.67 = 90.4 \text{ kN·m (ASD)}$

Weak-axis flexural strength

$$M_{py} = (235)(505.7 \times 10^3) \times 10^{-6} = 119 \text{ kN·m}$$
$$\leq (1.6)(235)(330.6 \times 10^3) \times 10^{-6} = 124 \text{ kN·m}$$

$$M'_{py} = 119 - [119$$
$$- (0.7)(235)(330.6 \times 10^3) \times 10^{-6}]\,(13.6 - 11.1)/(29.2 - 11.1)$$
$$= 110 \text{ kN·m}$$

$\phi_b M'_{py} = (0.90)(110) = 99.0 \text{ kN·m (LRFD)}$

$M'_{py}/\Omega_b = 110/1.67 = 66.0 \text{ kN·m (ASD)}$

Strong-axis shear strength, maximum total uniform load, and uniform load constant calculations are similar to those for the sections with compact flanges (cf. Section 4.6.1).

4.6.3 Available shear stress

Tension field action not included

$a/h = 3.00;\ \lambda_w = 150$; S235 steel:

$$(\lambda_w = 150) > \left(2.24\sqrt{200000/235} = 65.3\right)$$

$$k_v = 5 + 5/3.00^2 = 5.56$$

$$(\lambda_w = 150) > \left(1.10\sqrt{(5.56)(200000)/235} = 75.6\right)$$

$$C_{v1} = 75.6/150 = 0.504$$

$$V_n/A_w = (0.6)(235)(0.504) = 71.1 \text{ MPa}$$

$$\phi_v V_n/A_w = (0.90)(71.1) = 64.0 \text{ MPa (LRFD)}$$

$$V_n/A_w/\Omega_v = 71.1/1.67 = 42.6 \text{ MPa (ASD)}$$

Tension field action included

$a/h = 3.00;\ \lambda_w = 100$; S235 steel:

$$(\lambda_w = 100) > \left(1.10\sqrt{k_v E/F_y} = 1.10\sqrt{(5.56)(200000)/235} = 75.6\right)$$

$$(\lambda_w = 100) > \left(1.37\sqrt{k_v E/F_y} = 1.37\sqrt{(5.56)(200000)/235} = 94.2\right)$$

$$C_{v2} = (1.51)(5.56)(200000)/[(100)^2(235)] = 0.715$$

When $2A_w/(A_{fc} + A_{ft}) \leq 2.5,\ h/b_{fc} \leq 6.0$ and $h/b_{ft} \leq 6.0$

$$V_n/A_w = (0.6)(235)\left(0.715 + \frac{1 - 0.715}{1.15\sqrt{1 + 3.00^2}}\right) = 112 \text{ MPa}$$

$$\phi_v V_n/A_w = (0.90)(112) = 101 \text{ MPa (LRFD)}$$

$$V_n/A_w/\Omega_v = 112/1.67 = 60.5 \text{ MPa (ASD)}$$

Otherwise

$$V_n/A_w = (0.6)(235)\left(0.715 + \frac{1 - 0.715}{1.15\left(3.00 + \sqrt{1 + 3.00^2}\right)}\right) = 107 \text{ MPa}$$

$$\phi_v V_n/A_w = (0.90)(107) = 95.8 \text{ MPa (LRFD)}$$

$$V_n/A_w/\Omega_v = 107/1.67 = 63.8 \text{ MPa (ASD)}$$

CHAPTER 5

DESIGN OF MEMBERS FOR COMBINED FORCES

5.1 Introduction

This chapter develops the design tables for members subjected to combined forces that use European I-shaped sections of S235, S275 and S355 steels and presents the interaction equations.

5.2 Design Equations

5.2.1 Members subject to flexure and axial forces

The interaction equations for double symmetric members subject to flexure and axial force are

$$P_r/P_c + (8/9)\left(M_{rx}/M_{cx} + M_{ry}/M_{cy}\right) \leq 1.0 \text{ when } P_r/P_c \geq 0.2 \qquad (5.1)$$

$$P_r/2P_c + \left(M_{rx}/M_{cx} + M_{ry}/M_{cy}\right) \leq 1.0 \text{ when } P_r/P_c < 0.2 \qquad (5.2)$$

where P_r is the required axial strength, P_c is the available axial strength (see Chapter 2 for tension and Chapter 3 for compression), M_{rx} is the required strong-axis flexural strength, M_{cx} is the available strong-axis flexural strength (see Chapter 4), M_{ry} is the required weak-axis flexural strength, and M_{cy} is the available weak-axis flexural strength (see Chapter 4). C_b in Eq. 4.10 is permitted to be multiplied by

$$\sqrt{1 + \alpha P_r/P_{ey}} \qquad (5.3)$$

for cases involving axial tension where

$$P_{ey} = \pi^2 E \cdot I_y / L_b^2 \tag{5.4}$$

α is 1.0 for LRFD and 1.6 for ASD.

5.3 Design Tables

To facilitate the design of beam-columns, the available strength in axial tension, axial compression, and flexure tables that were developed in the previous chapters were merged (see Table E.1 in Appendix E; see Table 5.1 for a sample).

Table 5.1 Available strength for HD shapes of S235 steel subject to combined forces.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

HD Shapes

F_y = 235 MPa

HD 260×54.1		HD 260×68.2		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172		Shape	HD 260×54.1[f]		HD 260×68.2		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1460	971	1840	1220	2500	1670	3080	2050	3810	2540	4640	3090	0.00	143	95.4	195	129	271	181	338	225	426	284	534	355
1440	959	1810	1210	2480	1650	3050	2030	3770	2510	4600	3060	1.00	143	95.4	195	129	271	181	338	225	426	284	534	355
1420	944	1790	1190	2440	1620	3000	2000	3720	2480	4540	3020	1.50	143	95.4	195	129	271	181	338	225	426	284	534	355
1390	924	1750	1170	2390	1590	2950	1960	3650	2430	4450	2960	2.00	143	95.4	195	129	271	181	338	225	426	284	534	355
1350	899	1710	1130	2330	1550	2870	1910	3560	2370	4350	2890	2.50	143	95.4	195	129	271	181	338	225	426	284	534	355
1310	869	1650	1100	2260	1500	2790	1850	3460	2300	4230	2810	3.00	143	95.4	195	129	271	181	338	225	426	284	534	355
1250	835	1590	1060	2170	1450	2690	1790	3340	2220	4090	2720	3.50	143	95.4	193	129	270	180	338	225	426	283	534	355
1200	797	1520	1010	2080	1390	2570	1710	3200	2130	3930	2610	4.00	143	95.4	190	126	267	177	334	222	422	281	530	353
1140	756	1450	962	1980	1320	2450	1630	3060	2030	3760	2500	4.50	143	95.3	186	124	263	175	330	220	418	278	526	350
1070	713	1370	910	1880	1250	2330	1550	2900	1930	3580	2380	5.00	140	93.1	183	122	259	172	326	217	414	276	522	347
1000	669	1290	855	1770	1180	2190	1460	2740	1820	3380	2250	5.50	137	91.0	179	119	255	170	323	215	410	273	518	345
936	623	1200	799	1650	1100	2060	1370	2580	1710	3190	2120	6.00	134	88.8	176	117	252	167	319	212	407	270	514	342
867	577	1120	742	1540	1020	1920	1280	2410	1600	2980	1990	6.50	130	86.7	172	114	248	165	315	210	403	268	510	339
798	531	1030	685	1420	948	1780	1180	2230	1490	2780	1850	7.00	127	84.6	169	112	244	162	311	207	399	265	506	337
730	485	946	629	1310	872	1640	1090	2070	1370	2580	1720	7.50	124	82.4	165	110	240	160	307	204	395	263	502	334
663	441	863	574	1200	798	1500	999	1900	1260	2380	1580	8.00	121	80.3	161	107	237	158	303	202	391	260	498	331
599	399	783	521	1090	725	1370	911	1730	1150	2180	1450	8.50	117	78.1	158	105	233	155	300	199	387	258	494	329
537	357	706	469	986	656	1240	825	1580	1050	1990	1320	9.00	114	76.0	154	103	229	153	296	197	383	255	490	326
482	320	633	421	885	589	1120	742	1420	946	1800	1200	9.50	111	73.9	151	100	225	150	292	194	379	252	486	323
435	289	572	380	799	531	1010	670	1280	854	1630	1080	10.0	108	71.7	147	97.9	222	148	288	192	375	250	482	321
394	262	518	345	724	482	913	608	1160	775	1480	983	10.5	105	69.6	144	95.6	218	145	284	189	372	247	478	318
359	239	472	314	660	439	832	554	1060	706	1350	896	11.0	101	67.4	140	93.2	214	143	281	187	368	245	474	315
329	219	432	288	604	402	761	507	971	646	1230	819	11.5	98.2	65.3	137	90.8	211	140	277	184	364	242	470	313
302	201	397	264	555	369	699	465	891	593	1130	753	12.0	94.1	62.6	133	88.5	207	138	273	182	360	239	466	310
278	185	366	243	511	340	644	429	822	547	1040	694	12.5	89.7	59.7	129	86.1	203	135	269	179	356	237	462	307
257	171	338	225	473	314	596	396	760	505	964	641	13.0	85.6	57.0	126	83.7	199	133	265	177	352	234	458	305
238	159	314	209	438	292	552	368	704	469	894	595	13.5	82.0	54.6	122	80.9	196	130	262	174	348	232	454	302
222	148	292	194	407	271	514	342	655	436	831	553	14.0	78.6	52.3	117	77.7	192	128	258	171	344	229	450	299
207	138	272	181	380	253	479	319	611	406	775	515	14.5	75.6	50.3	112	74.7	188	125	254	169	340	226	446	297
193	129	254	169	355	236	448	298	571	380	724	482	15.0	72.7	48.4	108	71.9	184	123	250	166	337	224	442	294

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1460	971	1840	1220	2500	1670	3080	2050	3810	2540	4640	3090
Available Strength in Tensile Rupture (A_e = $0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1400	931	1760	1170	2400	1600	2950	1970	3650	2430	4450	2960
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
224	149	264	176	367	244	472	315	608	405	736	491
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
63.9	42.5	91.00	60.5	127	84.7	159	106	201	134	252	168

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.48	11.7	3.34	13.3	3.38	16.9	3.42	20.4	3.47	25.0	3.54	30.2
Area, × 10^2 mm^2											
68.97		86.82		118.4		145.7		180.3		219.6	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
7981	2788	10450	3668	14920	5135	18910	6456	24330	8236	31310	10450
r_y, × 10 mm											
6.36		6.50		6.58		6.66		6.76		6.90	
r_x/r_y											
1.69		1.69		1.71		1.71		1.72		1.73	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

CHAPTER 6

DESIGN OF COMPOSITE MEMBERS

6.1 Introduction

This chapter develops the design tables for composite members that use European I-shaped sections of S235, S275 and S355 steels and presents the equations and sample calculations in developing the tables.

6.2 Design Equations

6.2.1 Positive flexural strength

The nominal positive flexural strength, M_n, for doubly symmetric composite beams with steel headed studs that have compact webs in flexure (c.f. Eq. 4.2) is calculated from the plastic stress distribution on the composite section (see Figure 6.1) for the limit state of yielding (plastic moment):

$$M_n = M_p = (\Sigma Q_n)(Y2 + Y3) + F_y A_g(d/2 - Y3) \tag{6.1}$$

where ΣQ_n is the horizontal shear force at the interface between the steel section and the concrete slab, $Y2$ is the distance from the top of the steel section to the centroid of the compression force in the concrete slab, and $Y3$ is the distance from the top of the steel section to the centroid of the compression force in the steel section.

If the plastic neutral axis (PNA) is within the flange of the steel section,

$$Y3 = Y1/2 \tag{6.2}$$

where $Y1$ is the distance from the top of the steel section to the PNA.

If the PNA is within the fillet portion of the web of the steel section,

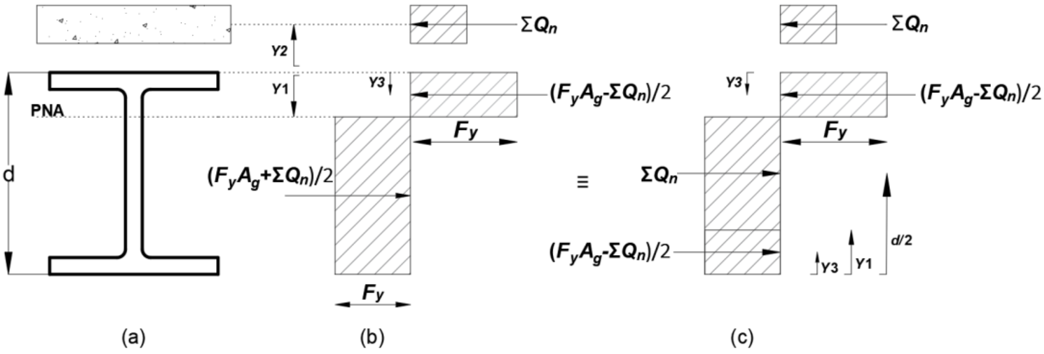


Figure 6.1 Plastic stress distribution for positive moment in composite beams.

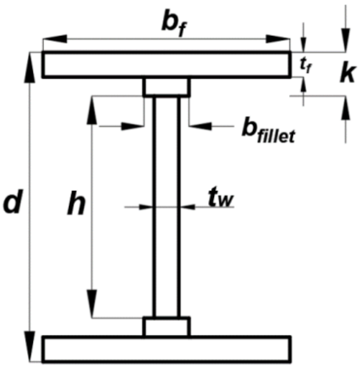


Figure 6.2 Steel section used in the calculations.

$$Y3 = \frac{\left[b_f t_f^2 + b_{fillet}\left(Y1^2 - t_f^2\right)\right]/2}{b_f t_f + b_{fillet}\left(Y1 - t_f\right)} \tag{6.3}$$

where b_{fillet} is the width of the fillet portion of the web represented by an equivalent rectangular area (see Figure 6.2) with the height of the fillet portion of the web, $k - t_f$:

$$b_{fillet} = \frac{\left(A_g - 2b_f t_f - h \cdot t_w\right)/2}{k - t_f} \tag{6.4}$$

If the PNA is within the main portion of the web of the steel section,

$$Y3 = \frac{\left[b_f t_f^2 + b_{fillet}\left(k^2 - t_f^2\right) + \left(Y1^2 - k^2\right)t_w\right]/2}{\left(A_g - h \cdot t_w\right)/2 + \left(Y1 - k\right)t_w} \tag{6.5}$$

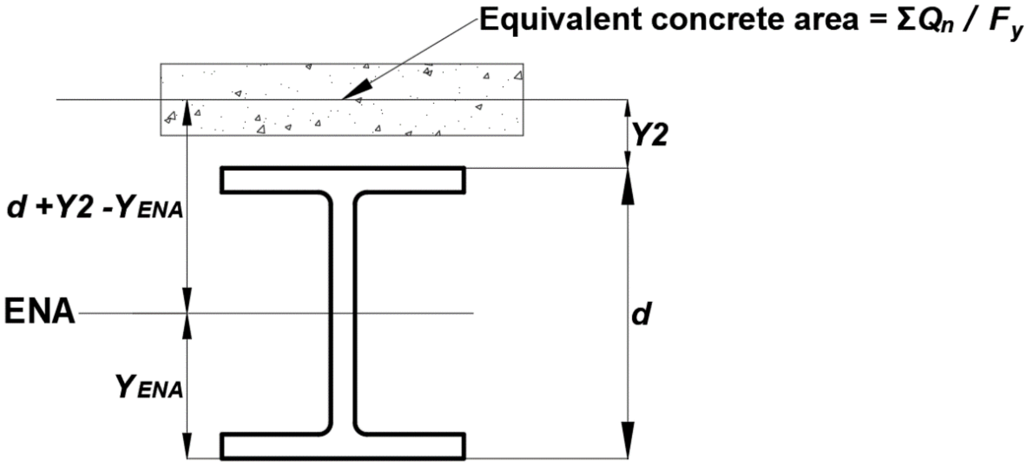


Figure 6.3 Deflection design model for composite beams.

Note that all European I-shaped sections considered in this study have compact webs. For flexure, the resistance factor, ϕ_b, is 0.90 for LRFD, whereas the safety factor, Ω_b, is 1.67 for ASD.

6.2.2 Lower-bound elastic moment of inertia

The lower-bound elastic moment of inertia for doubly symmetric I-shaped sections is

$$I_{LB} = I_x + A_g(Y_{ENA} - d/2)^2 + \left(\Sigma Q_n/F_y\right)(d + Y2 - Y_{ENA})^2 \qquad (6.6)$$

where Y_{ENA} is the elastic neutral axis (ENA) location (see Figure 6.3):

$$Y_{ENA} = \frac{A_g(d/2) + \left(\Sigma Q_n/F_y\right)(d + Y2)}{A_g + \Sigma Q_n/F_y} \qquad (6.7)$$

6.3 Design Tables

The following design tables were developed to facilitate the design of composite members that use European I-shaped sections of S235, S275 and S355 steels:

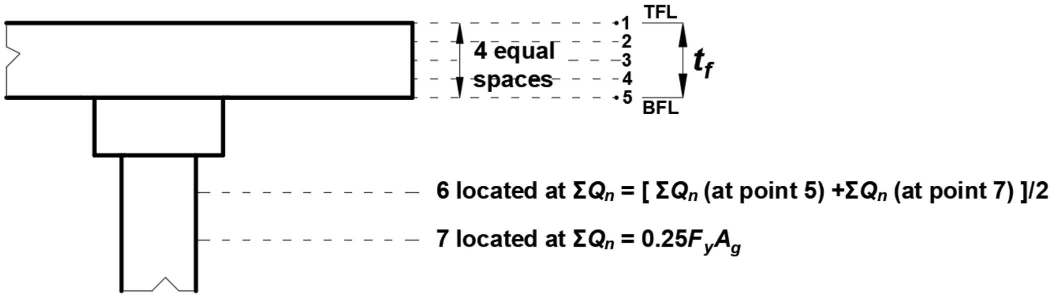


Figure 6.4 PNA locations.

(1) Available strength in flexure
(2) Lower-bound elastic moment of inertia

6.3.1 Available strength in flexure

The available positive flexural strength tables (see Table F.1 in Appendix F; see Table 6.1 for a sample) were developed for composite beams with steel headed studs. The tabulated values were calculated for seven PNA locations shown in Figure 6.4 and for $Y2$ values ranging from 50 to 180 mm. The first five PNA locations are defined within the top flange of the steel section and are spaced equally along the flange thickness, the first at the top of the flange (TFL) and the fifth at the bottom of the flange (BFL). The seventh PNA location is defined at the point where

$$\Sigma Q_n = 0.25F_yA_g \tag{6.8}$$

and the sixth PNA location is defined at the point where

$$\Sigma Q_n = [\Sigma Q_n(\text{at point 5}) + \Sigma Q_n(\text{at point 7})]/2 \tag{6.9}$$

For the first five PNA locations, ΣQ_n is calculated using

$$\Sigma Q_n = F_y\left(A_g - 2b_fY1\right) \tag{6.10}$$

The seventh PNA is within the flange of the steel section if

$$\left(\Sigma Q_n = 0.25F_yA_g\right) \geq F_y\left(A_g - 2b_ft_f\right) \tag{6.11}$$

(c.f. Figure 6.1c), i.e., the flange area

$$b_f t_f \geq 0.375 A_g \tag{6.12}$$

in which case the sixth and seventh PNAs are not tabulated. The sixth and seventh PNAs are within the fillet portion of the web of the steel section if

$$\Sigma Q_n \geq F_y h \cdot t_w \tag{6.13}$$

in which case

$$\mathrm{Y1} = k - \left(\Sigma Q_n / F_y - h \cdot t_w\right) / 2 b_{fillet} \tag{6.14}$$

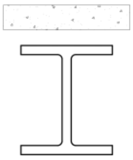
Otherwise, they are within the main portion of the web of the steel section, in which case

$$\mathrm{Y1} = \left[d - \Sigma Q_n / \left(F_y t_w\right)\right] / 2 \tag{6.15}$$

6.3.2 Lower-bound elastic moment of inertia for plastic composite sections

The lower-bound elastic moment of inertia values for plastic composite sections were presented in Table F.2 in Appendix F (see Table 6.2 for a sample) for seven PNA locations shown in Figure 6.4 and for $Y2$ values ranging from 50 to 180 mm. Table F.2 also includes the strong-axis moment of inertia, I_x, of the steel section and ΣQ_n for S235, S275 and S355 steel grades.

Table 6.1 Available strength in flexure for composite HD shapes of S355 steel.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 320×97.6	520	346	TFL	0.00	4420	815	542	855	569	894	595	934	621	974	648	1010	674	1050	701
			2	3.88	3590	776	516	809	538	841	559	873	581	905	602	938	624	970	645
			3	7.75	2770	735	489	760	505	785	522	809	539	834	555	859	572	884	588
			4	11.6	1940	690	459	708	471	725	483	743	494	760	506	778	517	795	529
			BFL	15.5	1110	643	428	653	435	663	441	673	448	683	455	693	461	703	468
			6	15.9	1110	643	428	653	434	663	441	673	448	683	454	693	461	703	468
			7	16.2	1100	643	428	652	434	662	441	672	447	682	454	692	461	702	467
HD 320×74.2	382	254	TFL	0.00	3360	606	403	636	423	666	443	697	463	727	484	757	504	787	524
			2	2.75	2770	579	385	604	402	629	418	654	435	679	451	704	468	728	485
			3	5.50	2190	550	366	570	379	590	392	609	405	629	418	649	432	668	445
			4	8.25	1600	520	346	535	356	549	365	563	375	578	384	592	394	607	404
			BFL	11.0	1010	489	325	498	331	507	337	516	343	525	350	535	356	544	362
			6	17.3	927	484	322	492	327	500	333	509	339	517	344	526	350	534	355
			7	23.6	839	478	318	486	323	493	328	501	333	508	338	516	343	524	348
HD 260×172	806	537	TFL	0.00	7800	1370	910	1440	957	1510	1000	1580	1050	1650	1100	1720	1140	1790	1190
			2	8.13	6250	1290	860	1350	898	1410	935	1460	973	1520	1010	1570	1050	1630	1080
			3	16.3	4700	1210	803	1250	831	1290	859	1330	887	1380	915	1420	943	1460	972
			4	24.4	3160	1110	738	1140	756	1170	775	1190	794	1220	813	1250	832	1280	851
			BFL	32.5	1610	999	665	1010	675	1030	684	1040	694	1060	704	1070	713	1090	723
HD 260×142	644	428	TFL	0.00	6400	1090	724	1150	763	1200	801	1260	839	1320	878	1380	916	1430	954
			2	6.63	5150	1030	685	1080	715	1120	746	1170	777	1210	808	1260	839	1310	870
			3	13.3	3910	962	640	997	663	1030	687	1070	710	1100	733	1140	757	1170	780
			4	19.9	2660	887	590	911	606	935	622	959	638	983	654	1010	670	1030	686
			BFL	26.5	1410	805	536	818	544	830	552	843	561	856	569	869	578	881	586
HD 260×114	511	340	TFL	0.00	5170	857	570	903	601	950	632	996	663	1040	694	1090	725	1140	756
			2	5.38	4170	809	538	847	563	884	588	922	613	959	638	997	663	1030	688
			3	10.8	3170	757	504	785	523	814	542	843	561	871	580	900	599	928	618
			4	16.1	2170	700	466	719	479	739	492	758	505	778	518	798	531	817	544
			BFL	21.5	1170	638	424	648	431	659	438	670	445	680	452	691	460	701	467
HD 260×93	410	273	TFL	0.00	4200	681	453	719	478	757	503	794	529	832	554	870	579	908	604
			2	4.38	3400	643	428	674	448	704	468	735	489	765	509	796	529	826	550
			3	8.75	2590	602	400	625	416	648	431	672	447	695	462	718	478	742	493
			4	13.1	1780	558	371	574	382	590	392	606	403	622	414	638	424	654	435
			BFL	17.5	973	510	339	519	345	528	351	536	357	545	363	554	369	563	374
HD260×68.2	294	196	TFL	0.00	3080	485	323	513	341	541	360	569	378	596	397	624	415	652	434
			2	3.13	2510	459	305	481	320	504	335	526	350	549	365	571	380	594	395
			3	6.25	1930	430	286	448	298	465	309	482	321	500	332	517	344	534	356
			4	9.38	1350	400	266	412	274	425	282	437	291	449	299	461	307	473	315
			BFL	12.5	775	369	245	376	250	383	255	390	259	397	264	403	268	410	273
			6	12.7	773	369	245	375	250	382	254	389	259	396	264	403	268	410	273
			7	12.8	771	368	245	375	250	382	254	389	259	396	264	403	268	410	273
HD 260×54.1	228	152	TFL	0.00	2450	379	252	401	267	423	281	445	296	467	311	489	325	511	340
			2	2.38	2010	359	239	377	251	395	263	413	275	431	287	449	299	467	311
			3	4.75	1570	338	225	352	234	366	243	380	253	394	262	408	272	423	281
			4	7.13	1130	316	210	326	217	336	224	346	230	356	237	367	244	377	251
			BFL	9.50	695	293	195	299	199	305	203	311	207	318	211	324	215	330	220
			6	13.0	653	290	193	296	197	302	201	308	205	314	209	320	213	326	217
			7	16.4	612	288	192	293	195	299	199	304	203	310	206	315	210	321	214

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

[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table 6.2 Lower-bound elastic moment of inertia for plastic composite HD shapes.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, $\times 10^4$ mm^4
HD Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HD 320×97.6	22930	TFL	0.00	2920	3420	4420	49100	51700	54400	57300	60300	63400	66600
		2	3.88	2380	2780	3590	46400	48700	51200	53700	56400	59200	62100
		3	7.75	1830	2140	2770	43100	45100	47200	49400	51700	54100	56600
		4	11.6	1280	1500	1940	38900	40500	42200	43900	45700	47600	49600
		BFL	15.5	738	864	1110	33500	34500	35600	36800	38000	39200	40500
		6	15.9	734	859	1110	33400	34500	35600	36700	37900	39200	40500
		7	16.2	731	855	1100	33400	34400	35500	36700	37900	39100	40400
HD 320×74.2	16450	TFL	0.00	2220	2600	3360	35500	37400	39400	41600	43800	46100	48500
		2	2.75	1830	2150	2770	33600	35400	37200	39200	41200	43300	45500
		3	5.50	1450	1690	2190	31400	33000	34600	36300	38000	39900	41800
		4	8.25	1060	1240	1600	28700	30000	31300	32700	34100	35600	37200
		BFL	11.0	672	786	1010	25300	26200	27100	28100	29100	30200	31300
		6	17.3	614	718	927	24700	25500	26400	27300	28300	29300	30300
		7	23.6	556	650	839	24100	24800	25600	26500	27400	28300	29300
HD 260×172	31310	TFL	0.00	5160	6040	7800	73100	77500	82100	86900	91900	97200	103000
		2	8.13	4140	4840	6250	68500	72400	76500	80800	85300	90000	94800
		3	16.3	3110	3640	4700	62700	66000	69500	73100	76900	80900	85000
		4	24.4	2090	2450	3160	55400	57900	60600	63400	66300	69300	72500
		BFL	32.5	1070	1250	1610	45600	47100	48700	50400	52100	53900	55800
HD 260×142	24330	TFL	0.00	4240	4960	6400	56500	60000	63700	67600	71600	75800	80200
		2	6.63	3410	3990	5150	53100	56200	59500	62900	66500	70300	74200
		3	13.3	2590	3030	3910	48700	51400	54200	57100	60200	63400	66700
		4	19.9	1760	2060	2660	43200	45300	47500	49700	52100	54600	57200
		BFL	26.5	936	1100	1410	36000	37300	38600	40000	41400	43000	44600
HD 260×114	18910	TFL	0.00	3420	4010	5170	43600	46300	49200	52300	55500	58800	62300
		2	5.38	2760	3230	4170	40900	43400	46000	48700	51600	54500	57600
		3	10.8	2100	2460	3170	37700	39800	42000	44300	46700	49200	51900
		4	16.1	1440	1680	2170	33500	35100	36800	38600	40500	42500	44600
		BFL	21.5	776	909	1170	28000	29000	30100	31200	32400	33700	34900
HD 260×93.0	14920	TFL	0.00	2780	3260	4200	34100	36300	38600	41000	43600	46200	49000
		2	4.38	2250	2630	3400	32100	34000	36100	38300	40500	42900	45400
		3	8.75	1710	2000	2590	29500	31200	33000	34800	36800	38800	40900
		4	13.1	1180	1380	1780	26300	27600	29000	30500	32000	33600	35200
		BFL	17.5	644	753	973	22100	23000	23800	24700	25700	26700	27700
HD 260×68.2	10450	TFL	0.00	2040	2390	3080	23700	25300	27000	28700	30500	32400	34400
		2	3.13	1660	1940	2510	22400	23800	25300	26800	28400	30200	31900
		3	6.25	1280	1490	1930	20700	21900	23200	24500	25900	27400	28900
		4	9.38	895	1050	1350	18600	19500	20500	21600	22700	23800	25100
		BFL	12.5	513	600	775	15800	16400	17100	17800	18500	19300	20100
		6	12.7	511	598	773	15800	16400	17100	17800	18500	19300	20100
		7	12.8	510	597	771	15800	16400	17100	17700	18500	19200	20000
HD 260×54.1	7981	TFL	0.00	1620	1900	2450	18200	19400	20700	22100	23500	25000	26500
		2	2.38	1330	1560	2010	17200	18300	19400	20700	22000	23300	24700
		3	4.75	1040	1220	1570	16000	16900	17900	19000	20100	21300	22500
		4	7.13	750	878	1130	14400	15200	16000	16900	17800	18700	19700
		BFL	9.50	460	538	695	12500	13000	13600	14200	14800	15500	16200
		6	13.0	433	506	653	12300	12800	13300	13900	14500	15100	15800
		7	16.4	405	474	612	12100	12600	13100	13600	14200	14800	15400

[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 F.1 for PNA locations

[d] *Ix* of noncomposite steel shape

6.4 Sample Calculations

6.4.1 Available strength in flexure

PNA = 1: TFL

HD 260 × 54.1; S355 steel; $Y2 = 50$ mm:

$Y1 = 0$

$\Sigma Q_n = (355)[6897 - (2)(260)(0)] \times 10^{-3} = 2450$ kN

$Y3 = 0/2 = 0$ mm

$M_n = [(2450 \times 10^3)(50 + 0) + (355)(6897)(244/2 - 0)] \times 10^{-6} = 421$ kN·m

$\phi_b M_n = (0.90)(421) = 379$ kN·m (LRFD)

$M_n/\Omega_b = 421/1.67 = 252$ kN·m (ASD)

PNA = 2

HD 260 × 54.1; S355 steel; $Y2 = 50$ mm:

$Y1 = 9.5/4 = 2.38$ mm

$\Sigma Q_n = (355)[6897 - (2)(260)(2.38)] \times 10^{-3} = 2010$ kN

$Y3 = 2.38/2 = 1.19$ mm

$$M_n = [(2010 \times 10^3)(50 + 1.19) + (355)(6897)(244/2 - 1.19)] \times 10^{-6}$$
$$= 399 \text{ kN·m}$$

$\phi_b M_n = (0.90)(399) = 359$ kN·m (LRFD)

$M_n/\Omega_b = 399/1.67 = 239$ kN·m (ASD)

Available strength in flexure calculations are similar for the third, fourth and fifth PNA locations.

PNA = 6 within the main portion of the web

HEA 1000; S355 steel; $Y2 = 50$ mm:

$Y1 = 31.0$ mm (PNA = 5)

ΣQ_n(at point 5) $= (355)[34680 - (2)(300)(31.0)] \times 10^{-3} = 5710$ kN

ΣQ_n(at point 7) $= (0.25)(355)(34680) \times 10^{-3} = 3080$ kN

$$[\Sigma Q_n = (5710 + 3080)/2 = 4390 \text{ kN}]$$
$$< \left[F_y h \cdot t_w = (355)(868)(16.5) \times 10^{-3} = 5080 \text{ kN}\right]$$

$Y1 = \{990 - 4390/[(355)(16.5) \times 10^{-3}]\}/2 = 120$ mm

$$b_{fillet} = \frac{[34680 - (2)(300)(31.0) - (868)(16.5)]/2}{61.0 - 31.0} = 29.3 \text{ mm}$$

$$Y3 = \frac{[(300)(31.0)^2 + (29.3)(61.0^2 - 31.0^2) + (120^2 - 61.0^2)(16.5)]/2}{[34680 - (868)(16.5)]/2 + (120 - 61.0)(16.5)}$$
$$= 24.5 \text{ mm}$$

$$M_n = [(4390 \times 10^3)(50 + 24.5) + (355)(34680)(990/2 - 24.5)] \times 10^{-6}$$
$$= 6120 \text{ kN·m}$$

$\phi_b M_n = (0.90)(6120) = 5510$ kN·m (LRFD)

$M_n/\Omega_b = 6120/1.67 = 3660$ kN·m (ASD)

PNA = 7 within the flange

HD 260 × 172:

$$\left[b_f t_f = (268)(32.5) = 8710 \text{ mm}^2\right]$$
$$\geq \left[0.375 A_g = (0.375)(21960) = 8240 \text{ mm}^2\right]$$

The sixth and seventh PNAs are not tabulated.

PNA = 7 within the fillet portion of the web

HD 260 × 54.1; S355 steel; $Y2 = 50$ mm:

$$\left[b_f t_f = (260)(9.5) = 2470 \text{ mm}^2\right] < \left[0.375 A_g = (0.375)(6897) = 2590 \text{ mm}^2\right]$$

$$\begin{aligned}[\Sigma Q_n &= (0.25)(355)(6897) \times 10^{-3} = 612 \text{ kN}] \\ &\geq \left[F_y h \cdot t_w = (355)(177)(6.5) \times 10^{-3} = 408 \text{ kN}\right]\end{aligned}$$

$$b_{fillet} = \frac{[6897 - (2)(260)(9.5) - (177)(6.5)]/2}{33.5 - 9.5} = 16.9 \text{ mm}$$

$$Y1 = 33.5 - [612 \times 10^3/355 - (177)(6.5)]/[(2)(16.9)] = 16.5 \text{ mm}$$

$$Y3 = \frac{[(260)(9.5^2) + (16.9)(16.5^2 - 9.5^2)]/2}{(260)(9.5) + (16.9)(16.5 - 9.5)} = 5.12 \text{ mm}$$

$$\begin{aligned}M_n &= [(612 \times 10^3)(50 + 5.12) + (355)(6897)(244/2 - 5.12)] \times 10^{-6} \\ &= 320 \text{ kN·m}\end{aligned}$$

$$\phi_b M_n = (0.90)(320) = 288 \text{ kN·m (LRFD)}$$

$$M_n/\Omega_b = 320/1.67 = 192 \text{ kN·m (ASD)}$$

6.4.2 Lower-bound elastic moment of inertia for plastic composite sections

HD 260 × 54.1; S355 steel; $Y1 = 0$; $Y2 = 50$ mm:

$$Y_{ENA} = \frac{(6897)(244/2) + (2450 \times 10^3/355)(244 + 50)}{6897 + 2450 \times 10^3/355} = 208 \text{ mm}$$

$$\begin{aligned}I_{LB} &= 7981 \times 10^4 + (6897)(208 - 244/2)^2 \\ &\quad + (2450 \times 10^3/355)(244 + 50 - 208)^2 = 18200 \times 10^4 \text{ mm}^4\end{aligned}$$

CHAPTER 7

DESIGN OF BOLTS

7.1 Introduction

This chapter develops the design tables for single bolts and bolt groups subjected to in-plane eccentric shear and presents the equations and sample calculations in developing the tables. The tables are developed for the bolt grades listed in Table 7.1 and the bolt diameters and hole dimensions listed in Table 7.2.

7.2 Design Equations for Single Bolts

7.2.1 Shear strength

The nominal shear strength, R_n, of a single bolt is calculated based on the limit state of shear rupture:

$$R_n = m \cdot F_{nv} A_b \tag{7.1}$$

Table 7.1 Bolt grades.

Bolt Grade	**Specified Minimum Tensile Strength, F_u^b (MPa)**
4.6[a]	400
4.8[a]	400
5.6[a]	500
5.8[a]	500
6.8	600
8.8	800
10.9	1000

[a] The tabulated values shall be reduced by 1% for each 2 mm over five diameters of length in the grip.

Table 7.2 Bolt diameters and hole dimensions.

Nominal Bolt Diameter, d (mm)	**Nominal Hole Dimensions (mm)**			
	Standard (STD) (Diameter)	**Oversize (OVS) (Diameter)**	**Short-Slot (SSLT×SSLP)[a] (Width×Length)**	**Long-Slot (LSLT×LSLP)[a] (Width×Length)**
M16	18	20	18×22	18×40
M20	22	24	22×26	22×50
M22	24	28	24×30	24×55
M24	26	30	26×32	26×60
M27	30	35	30×37	30×67
M30	33	38	33×40	33×75
≥ M36	$d + 3$	$d + 8$	$(d + 3) \times (d + 10)$	$(d + 3) \times 2.5d$

[a] SSLT/LSLT = short/long-slotted hole oriented with length transverse to the line of force; SSLP/LSLP = short/long-slotted hole oriented with length parallel to the line of force

where m is the number of shear planes, F_{nv} is the nominal shear stress of the bolt and A_b is the nominal bolt area. The nominal shear stress is

$$F_{nv} = 0.563F_u^b \tag{7.2}$$

when threads are excluded from the shear planes (i.e., X-type bolts),

$$F_{nv} = 0.450F_u^b \tag{7.3}$$

when threads are included in the shear planes (i.e., N-type bolts). The resistance factor, ϕ, for LRFD is 0.75, whereas the safety factor, Ω, for ASD is 2.00. F_{nv} shall be reduced by 15% for connections with a length greater than 950 mm.

7.2.2 Tensile strength

The nominal tensile strength, R_n, of a single bolt is calculated based on the limit state of tension rupture:

$$R_n = F_{nt}A_b \tag{7.4}$$

where F_{nt} is the nominal tensile stress of the bolt and A_b is the nominal area of the bolt. The nominal tensile stress is

$$F_{nt} = 0.75F_u^b \tag{7.5}$$

The resistance factor, ϕ, for LRFD is 0.75, whereas the safety factor, Ω, for ASD is 2.00.

7.2.3 Slip resistance

The slip resistance, R_n, of a single slip-critical bolt is calculated based on the limit state of slip:

$$R_n = \mu D_u h_f T_b n_s \tag{7.6}$$

where μ is the mean slip coefficient (0.50, 0.40, 0.30, 0.20 for Class A, B, C, D faying surfaces, respectively), D_u is a multiplier that reflects the ratio of the mean installed bolt pretension to the specified bolt pretension and is taken as 1.13, h_f is the factor for fillers (1.0 for one filler, 0.85 for two or more fillers between connected parts), T_b is the minimum bolt pretension given in Table 7.3 and n_s is the number of slip planes. The resistance factor, ϕ, for LRFD and the safety factor, Ω, for ASD depend on the type of hole. For standard size and short-slotted holes perpendicular to the direction of the load, ϕ is 1.00 and Ω is 1.50. For oversized and short-slotted holes parallel to the direction of the load, ϕ is 0.85 and Ω is 1.76. For long-slotted holes, ϕ is 0.70 and Ω is 2.14.

7.2.4 Bearing and tearout strength at bolt holes

The available strength at bolt holes, R_n, is calculated based on the limit states of bearing and tearout. For a bolt in a connection with standard, oversized, short-slotted

Table 7.3 Minimum bolt pretension.

	Minimum Bolt Pretension (kN)	
Bolt Diameter (mm)	**Grade 8.8**	**Grade 10.9**
M16	88.0	110
M20	137	172
M22	170	212
M24	198	247
M27	257	321
M30	314	393
≥ M36	458	572

holes, and a long-slotted hole parallel to the direction of the load, the bearing strength is

$$R_n = 2.4d \cdot t \cdot F_u \tag{7.7}$$

where t is the thickness and F_u is the tensile strength of the connected material, whereas the tearout strength is

$$R_n = 1.2l_c \cdot t \cdot F_u \tag{7.8}$$

where l_c is the clear distance in the direction of the force between the edge of the hole and the edge of the adjacent hole or edge of the material. These equations are used when deformation at the bolt hole at service load is a design consideration. For a bolt in connection with long-slotted holes perpendicular to the direction of the load, the bearing strength is

$$R_n = 2.0d \cdot t \cdot F_u \tag{7.9}$$

whereas the tearout strength is

$$R_n = 1.0l_c t \cdot F_u \tag{7.10}$$

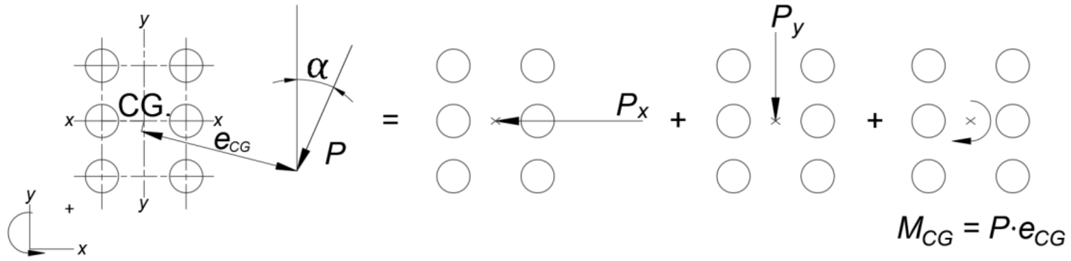


Figure 7.1 Effect of an in-plane eccentric shear force on a bolt group.

The resistance factor, ϕ, for LRFD is 0.75, whereas the safety factor, Ω, for ASD is 2.00.

7.3 Design Equations for Bolt Groups Subjected to In-Plane Eccentric Shear

When an in-plane eccentric shear force P is applied to a bolt group in a connection, bolts are subjected to shear forces due to direct shear acting through the center of gravity (CG) of the bolt group and due to torsional moment M_{CG} as shown in Figure 7.1. There are two analysis methods for eccentric shear: the elastic (vector) method and the ultimate strength method.

7.3.1 The elastic (vector) method

The elastic method is based on the superposition principle. If all bolts are identical and in the elastic range, the shear force on any bolt i due to the direct shear is the same:

$$R_i^p = P/N \tag{7.11}$$

whereas the shear force on any bolt i due to the torsional moment is proportional to its distance d_i from the CG:

$$R_i^m = M_{\text{CG}} d_i / J_{\text{CG}} \tag{7.12}$$

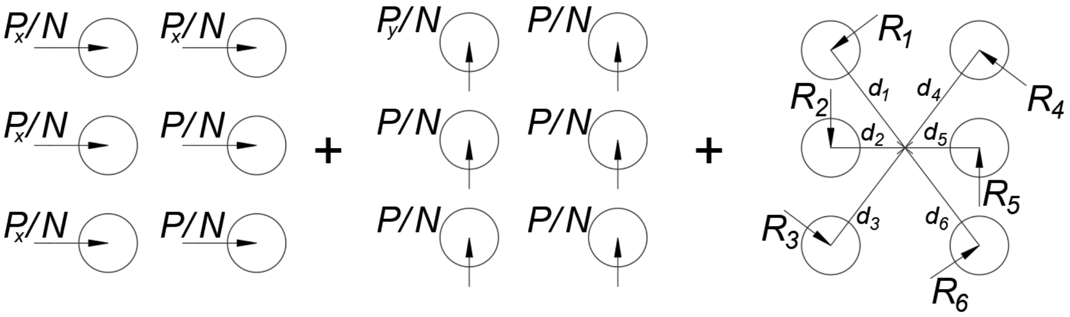


Figure 7.2 Forces on bolts.

where N is the number of bolts in the group and

$$J_{\mathrm{CG}} = \sum_{i=1}^{N} d_i^2 = \sum_{i=1}^{N} (x_i^2 + y_i^2) \tag{7.13}$$

in which x_i and y_i are the x- and y-coordinates of the center of bolt with respect to the CG [Salmon et al., 2009]. The resultant force on any bolt i is then calculated by resolving these forces (cf. Figure 7.2) into their components and taking their vectorial sum:

$$R_i = \sqrt{(P \sin \alpha / N - M_{\mathrm{CG}} y_i / J_{\mathrm{CG}})^2 + (P \cos \alpha / N + M_{\mathrm{CG}} x_i / J_{\mathrm{CG}})^2} \tag{7.14}$$

where α is the angle at which P is applied with respect to the y-axis. The elastic vector method is excessively conservative because the ductility of the bolt group is neglected [AISC, 2017].

7.3.2 The ultimate strength method

The ultimate strength method, which is more accurate than the elastic method, has been used in developing the AISC design tables. In this method, it is assumed that the bolt group rotates about an instantaneous center of rotation (IC), the deformation at each bolt is proportional to its distance d_i from the IC, and the force on each bolt is perpendicular to the line from the IC to that bolt (see Figure 7.3).

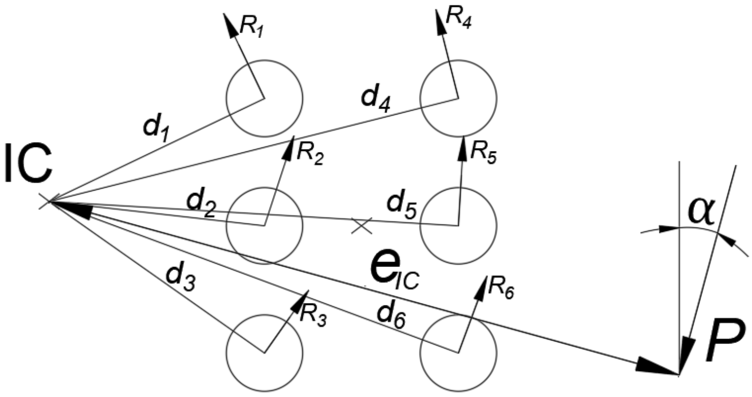


Figure 7.3. IC and forces on the bolts.

When the IC is correctly located, which requires an iterative solution [AISC, 2017], the following equilibrium equations should be satisfied:

$$\sum F_x = P\sin\alpha + \sum_{i=1}^{N} R_i\, dy_i/d_i = 0 \tag{7.15}$$

$$\sum F_y = P\cos\alpha + \sum_{i=1}^{N} R_i\, dx_i/d_i = 0 \tag{7.16}$$

$$\sum M_{\mathrm{IC}} = P\cdot e_{\mathrm{IC}} + \sum_{i=1}^{N} R_i d_i = 0 \tag{7.17}$$

where dx_i and dy_i are the distances along the x- and y-axes from the center of bolt i to the IC, respectively, and e_{IC} is the eccentricity of the applied force with respect to the IC. R_i is the nominal shear strength of bolt i at a deformation Δ_i and is given by [Crawford and Kulak, 1968]:

$$R_i = R_{ult}(1 - e^{-10\Delta_i})^{0.55} \tag{7.18}$$

where R_{ult} is the ultimate shear strength of the bolt (see Figure 7.4). R_{ult} is the minimum of the shear strength of the bolt (see Section 7.2.1) and the bearing and tearout strength at the bolt hole (see Section 7.2.4). The bolt group reaches its ultimate strength when the bolt farthest from the IC reaches its ultimate strength at a maximum deformation of 0.34 in. (8.6 mm; note that this value has to be in US units for use in Eq. 7.18), an experimentally determined value [Crawford and Kulak,

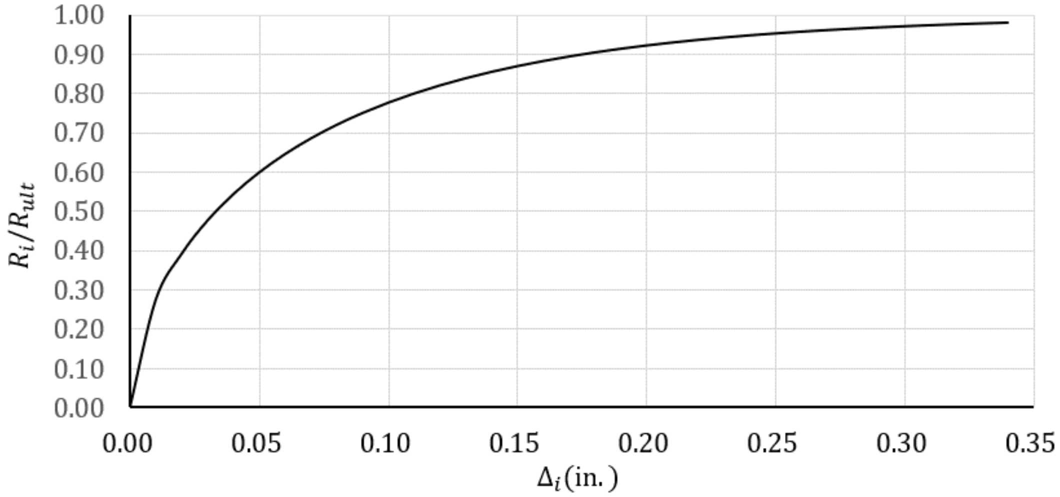


Figure 7.4 Load-deformation relationship of a bolt [Crawford and Kulak, 1968].

1968]. The nominal shear strength of the other bolts are calculated at a deformation Δ_i:

$$\Delta_i = 0.34\, d_i/d_{max} \tag{7.19}$$

where d_{max} is the distance between the IC and the bolt farthest from the IC.

7.4 Design Tables

The following design tables were developed to facilitate the design of bolts:

(1) Available shear strength of bolts
(2) Available tensile strength of bolts
(3) Available slip resistance of slip-critical connections
(4) Available bearing and tearout strength at bolt holes based on bolt spacing
(5) Available bearing and tearout strength at bolt holes based on edge distance
(6) C coefficients for eccentrically loaded bolt groups

7.4.1 Available shear strength of bolts

The available shear strength table was developed for the grades and sizes of the bolts in the Turkish Structural Steel Code as shown in Table G.1 in Appendix G (and Table 7.4). The tabulated values include the strength of the bolts, both N- and X-type bolts when applicable, in single and double shear.

7.4.2 Available tensile strength of bolts

The available tensile strength table was developed for the grades and sizes of bolts in Turkish Structural Steel Code as shown in Table G.2 in Appendix G (and Table 7.5).

7.4.3 Available slip resistance of slip-critical connections

The available slip resistance tables were developed for slip-critical connections with Grade 8.8 and 10.9 high strength bolts on Class A, B, C and D faying surfaces in Turkish Structural Steel Code as shown in Table G.3 in Appendix G (see Table 7.6 for a sample).

7.4.4 Available bearing and tearout strength at bolt holes

7.4.4.1 Based on bolt spacing

The available bearing and tearout strength at bolt holes table based on bolt spacing, s, (see Table G.4 in Appendix G and Table 7.7) was developed for connecting elements of S235, S275 and S355 steels. The tabulated values were calculated per mm of element thickness for center-to-center bolt spacings of three times the bolt diameter, $3d$, (the minimum per Turkish Structural Steel Code) and 75 mm. The table also includes the bearing strength and the bolt spacing required to develop the bearing strength, s_{full}, (i.e., the tearout strength is at least equal to the bearing strength). The minimum bolt spacing $3d$ was also provided.

7.4.4.2 Based on edge distance

The available bearing and tearout strength at bolt holes table based on edge distance, l_e, (see Table G.5 in Appendix G and Table 7.8) was developed for connecting elements of S235, S275 and S355 steels. The tabulated values were calculated per mm of element thickness for center of hole to edge distances of 32 and 50 mm. The table also includes the bearing strength and the edge distance required to develop the bearing strength, $l_{e,full}$, (i.e., the tearout strength is at least equal to the bearing strength).

7.4.5 C coefficients for eccentrically loaded bolt groups

The nominal strength of the eccentrically loaded bolt group is

$$R_n = C \cdot r_n \qquad (7.20)$$

where C is a non-dimensional coefficient that represents how many bolts in the group are effective in resisting the applied eccentric shear force and r_n is the nominal strength of a single bolt based on the limit states of shear strength (Section 7.2.1), slip resistance (for slip-critical bolts; Section 7.2.3), and bearing and tearout strength at bolt holes (Section 7.2.4). Tables that provide C coefficients for various bolt groups that are subjected to various eccentric loads at $\alpha = 0, 15, 30, 45, 60$ and $75°$ (see Table G.6 in Appendix G; see Table 7.9 for a sample) were developed. The tabulated coefficients were calculated using the ultimate strength method. The following iterative algorithm [Brandt, 1982a] (see Figure 7.1 for the sign convention) was used to locate the IC and calculate the C coefficient subsequently:

1. Locate the CG of the bolt group.
2. Set the magnitude of the eccentric shear force to unity:

$$P = 1 \tag{7.21}$$

3. As the first trial, calculate the coordinates of the IC for the elastic case:

$$x_{\mathrm{IC}} = -P_y J_{\mathrm{CG}}/(N \cdot M_{\mathrm{CG}}) \tag{7.22}$$

$$y_{\mathrm{IC}} = P_x J_{\mathrm{CG}}/(N \cdot M_{\mathrm{CG}}) \tag{7.23}$$

4. Calculate the C coefficient for the elastic case, which is usually a lower bound for the ultimate strength:

$$C_e = -J_{\mathrm{IC}}/(M_{\mathrm{IC}} d_{max}) \tag{7.24}$$

where

$$J_{\mathrm{IC}} = \sum\nolimits_{i=1}^{N} d_i^2 = \sum\nolimits_{i=1}^{N} (dx_i^2 + dy_i^2) \tag{7.25}$$

5. Calculate the deformation of each bolt, Δ_i, using Eq. 7.19.

6. Calculate the ratio of the nominal to ultimate shear strength of each bolt (cf. Eq. 7.18):

$$R_i/R_{ult} = (1 - \mathrm{e}^{-10\Delta_i})^{0.55} \tag{7.26}$$

7. Calculate the C coefficient for the ultimate case (the first approximation is usually an upper bound):

$$C_u = -\sum\nolimits_{i=1}^{N} M_i/M_{\mathrm{IC}} \tag{7.27}$$

where

$$M_i = R_i/R_{ult} \cdot d_i \tag{7.28}$$

8. Resolve the nominal shear strength of each bolt i into its components:

$$(R_i)_x = -dy_i/d_i \cdot R_i/R_{ult} \cdot R_{ult} \tag{7.29}$$

$$(R_i)_y = dx_i/d_i \cdot R_i/R_{ult} \cdot R_{ult} \tag{7.30}$$

where

$$R_{ult} = 1/C_u \tag{7.31}$$

9. Calculate the sum of the bolt forces and the eccentric shear force:

$$F_x = P_x + \sum\nolimits_{i=1}^{N} (R_i)_x \tag{7.32}$$

$$F_y = P_y + \sum\nolimits_{i=1}^{N} (R_i)_y \tag{7.33}$$

10. Calculate the coordinates of the next IC:

$$x_{\mathrm{IC}} = x_{\mathrm{IC}}^{prev} - F_y J_{\mathrm{CG}}/(N \cdot M_{\mathrm{CG}}) \tag{7.34}$$

$$y_{\mathrm{IC}} = y_{\mathrm{IC}}^{prev} + F_x J_{\mathrm{CG}}/(N \cdot M_{\mathrm{CG}}) \tag{7.35}$$

where x_{IC}^{prev} and y_{IC}^{prev} are the previous x_{IC} and y_{IC}, respectively.

11. Repeat steps 5–10 for the new IC until the unbalanced forces F_x and F_y in step 9 are sufficiently close to zero (≤0.0001 was sought).

Tables also include the C' coefficient:

$$C' = \sum\nolimits_{i=1}^{N} M_i \tag{7.36}$$

which is used in calculating the nominal pure moment strength of a bolt group:

$$M_n = C' r_n \tag{7.37}$$

in which case the IC is coincident with the CG of the bolt group.

Table 7.4 Available shear strength of bolts.

Available Shear Strength of Bolts, kN

Nominal Bolt Diameter, d, mm					16		20		22		24		27		30		36	
Nominal Bolt Area, mm^2					201		314		380		452		573		707		1018	
Grade	Thread Cond.	ϕF_{nv}	F_{nv}/Ω	Load	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		MPa																
		LRFD	ASD		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
4.6	Not applicable	135	90	S	27.1	18.1	42.4	28.3	51.3	34.2	61.1	40.7	77.3	51.5	95.4	63.6	137	91.6
				D	54.3	36.2	84.8	56.5	103	68.4	122	81.4	155	103	191	127	275	183
4.8	Not applicable	135	90	S	27.1	18.1	42.4	28.3	51.3	34.2	61.1	40.7	77.3	51.5	95.4	63.6	137	91.6
				D	54.3	36.2	84.8	56.5	103	68.4	122	81.4	155	103	191	127	275	183
5.6	Not applicable	169	113	S	33.9	22.6	53.0	35.3	64.1	42.8	76.3	50.9	96.6	64.4	119	79.5	172	115
				D	67.9	45.2	106	70.7	128	85.5	153	102	193	129	239	159	344	229
5.8	Not applicable	169	113	S	33.9	22.6	53.0	35.3	64.1	42.8	76.3	50.9	96.6	64.4	119	79.5	172	115
				D	67.9	45.2	106	70.7	128	85.5	153	102	193	129	239	159	344	229
6.8	Not applicable	203	135	S	40.7	27.1	63.6	42.4	77.0	51.3	91.6	61.1	116	77.3	143	95.4	206	137
				D	81.4	54.3	127	84.8	154	103	183	122	232	155	286	191	412	275
8.8	N	270	180	S	54.3	36.2	84.8	56.5	103	68.4	122	81.4	155	103	191	127	275	183
				D	109	72.4	170	113	205	137	244	163	309	206	382	254	550	366
	X	338	225	S	67.9	45.2	106	70.7	128	85.5	153	102	193	129	239	159	344	229
				D	136	90.5	212	141	257	171	305	204	386	258	477	318	687	458
10.9	N	338	225	S	67.9	45.2	106	70.7	128	85.5	153	102	193	129	239	159	344	229
				D	136	90.5	212	141	257	171	305	204	386	258	477	318	687	458
	X	422	282	S	84.9	56.6	133	88.4	161	107	191	127	242	161	298	199	430	287
				D	170	113	265	177	321	214	382	255	484	322	597	398	860	573
LRFD	ASD	Thread condition "N" indicates that threads are included in the shear plane. Thread condition "X" indicates that threads are excluded from the shear plane. S = single shear D = double shear Strength values shall be reduced by 15% for connections with a length greater than 950 mm.																
$\phi = 0.75$	$\Omega = 2.00$																	

Table 7.5 Available tensile strength of bolts.

Available Tensile Strength of Bolts, kN

Nominal Bolt Diameter, d, mm			16		20		22		24		27		30		36	
Nominal Bolt Area, mm^2			201		314		380		452		573		707		1018	
Grade	ϕF_{nt}	F_{nt}/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
	MPa															
	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
4.6	225	150	45.2	30.2	70.7	47.1	85.5	57.0	102	67.9	129	85.9	159	106	229	153
4.8	225	150	45.2	30.2	70.7	47.1	85.5	57.0	102	67.9	129	85.9	159	106	229	153
5.6	281	188	56.5	37.7	88.4	58.9	107	71.3	127	84.8	161	107	199	133	286	191
5.8	281	188	56.5	37.7	88.4	58.9	107	71.3	127	84.8	161	107	199	133	286	191
6.8	338	225	67.9	45.2	106	70.7	128	85.5	153	102	193	129	239	159	344	229
8.8	450	300	90.5	60.3	141	94.2	171	114	204	136	258	172	318	212	458	305
10.9	563	375	113	75.4	177	118	214	143	254	170	322	215	398	265	573	382
LRFD	ASD															
$\phi = 0.75$	$\Omega = 2.00$															

Table 7.6 Available slip resistance of slip-critical connections with Grade 8.8 bolt on Class D faying surface.

Slip-Critical Connections
Available Slip Resistance, kN
(Class D Faying Surface, μ = 0.20)

Grade 8.8 Bolt

Hole Type	Loading	Nominal Bolt Diameter, *d*, mm													
		16		20		22		24		27		30		36	
		Minimum Bolt Pretension, kN													
		88.0		137		170		198		257		314		458	
		ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
STD/SSLT	**S**	19.9	13.3	31.0	20.6	38.4	25.6	44.7	29.8	58.1	38.7	71.0	47.3	104	69.0
	D	39.8	26.5	61.9	41.3	76.8	51.2	89.5	59.7	116	77.4	142	94.6	207	138
OVS/SSLP	**S**	16.9	11.3	26.3	17.6	32.7	21.8	38.0	25.4	49.4	33.0	60.3	40.3	88.0	58.8
	D	33.8	22.6	52.6	35.2	65.3	43.7	76.1	50.9	98.7	66.0	121	80.6	176	118
LSL	**S**	13.9	9.29	21.7	14.5	26.9	18.0	31.3	20.9	40.7	27.1	49.7	33.2	72.5	48.4
	D	27.8	18.6	43.3	28.9	53.8	35.9	62.6	41.8	81.3	54.3	99.3	66.3	145	96.7

STD = standard hole
OVS = oversized hole
SSLT = short-slotted hole oriented with length transverse to the line of force
SSLP = short-slotted hole oriented with length parallel to the line of force
LSL = long-slotted hole oriented with length transverse or parallel to the line of force
S = single shear
D = double shear

Hole Type	LRFD	ASD
STD and SSLT	$\phi = 1.00$	$\Omega = 1.50$
OVS and SSLP	$\phi = 0.85$	$\Omega = 1.76$
LSL	$\phi = 0.70$	$\Omega = 2.14$

Table 7.7 Available bearing and tearout strength of bolt holes based on bolt spacing.

Available Bearing and Tearout Strength at Bolt Holes Based on Bolt Spacing kN/mm thickness																
Hole Type	**Bolt Spacing, s, mm**	**F_u, MPa**	**Nominal Bolt Diameter, d, mm**													
			16		**20**		**22**		**24**		**27**		**30**		**36**	
			ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
			LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
STD/SSLT	**$3d$**	**360**	9.72	6.48	12.3	8.21	13.6	9.07	14.9	9.94	16.5	11.0	18.5	12.3	22.4	14.9
		430	11.6	7.74	14.7	9.80	16.3	10.8	17.8	11.9	19.7	13.2	22.1	14.7	26.7	17.8
		510	13.8	9.18	17.4	11.6	19.3	12.9	21.1	14.1	23.4	15.6	26.2	17.4	31.7	21.1
	75 mm	**360**	10.4	6.91	13.0	8.64	14.3	9.5	15.6	10.4	–	–	–	–	–	–
		430	12.4	8.26	15.5	10.3	17.0	11.4	18.6	12.4	–	–	–	–	–	–
		510	14.7	9.79	18.4	12.2	20.2	13.5	22.0	14.7	–	–	–	–	–	–
SSLP	**$3d$**	**360**	8.42	5.62	11.0	7.34	11.7	7.78	13.0	8.64	14.3	9.5	16.2	10.8	20.1	13.4
		430	10.1	6.71	13.2	8.77	13.9	9.29	15.5	10.3	17.0	11.4	19.4	12.9	24.0	16.0
		510	10.1	6.71	18.4	12.2	13.9	9.29	15.5	10.3	17.0	11.4	19.4	12.9	33.0	22.0
	75 mm	**360**	10.4	6.91	13.0	8.64	14.3	9.50	13.9	9.29	–	–	–	–	–	–
		430	12.4	8.26	15.5	10.3	17.0	11.4	16.6	11.1	–	–	–	–	–	–
		510	14.7	9.79	18.4	12.2	20.2	13.5	19.7	13.2	–	–	–	–	–	–
OVS	**$3d$**	**360**	9.07	6.05	11.7	7.78	12.3	8.21	13.6	9.07	14.9	9.94	16.8	11.2	20.7	13.8
		430	10.8	7.22	13.9	9.29	14.7	9.80	16.3	10.8	17.8	11.9	20.1	13.4	24.8	16.5
		510	12.9	8.57	16.5	11.0	17.4	11.6	19.3	12.9	21.1	14.1	23.9	15.9	29.4	19.6
	75 mm	**360**	10.4	6.91	13.0	8.64	14.3	9.50	14.6	9.72	–	–	–	–	–	–
		430	12.4	8.26	15.5	10.3	17.0	11.4	17.4	11.6	–	–	–	–	–	–
		510	14.7	9.79	18.4	12.2	20.2	13.5	20.7	13.8	–	–	–	–	–	–
LSLP	**$3d$**	**360**	2.59	1.73	3.24	2.16	3.56	2.38	3.89	2.59	4.54	3.02	4.86	3.24	5.83	3.89
		430	3.10	2.06	3.87	2.58	4.26	2.84	4.64	3.10	5.42	3.61	5.81	3.87	6.97	4.64
		510	3.67	2.45	4.59	3.06	5.05	3.37	5.51	3.67	6.43	4.28	6.89	4.59	8.26	5.51
	75 mm	**360**	10.4	6.91	8.10	5.40	6.48	4.32	4.86	3.24	–	–	–	–	–	–
		430	12.4	8.26	9.68	6.45	7.74	5.16	5.81	3.87	–	–	–	–	–	–
		510	14.7	9.79	11.5	7.65	9.18	6.12	6.89	4.59	–	–	–	–	–	–
LSLT	**$3d$**	**360**	8.10	5.40	10.3	6.84	11.3	7.56	12.4	8.28	13.8	9.18	15.4	10.3	18.6	12.4
		430	9.68	6.45	12.3	8.17	13.5	9.03	14.8	9.89	16.4	11.0	18.4	12.3	22.3	14.8
		510	11.5	7.65	14.5	9.69	16.1	10.7	17.6	11.7	19.5	13.0	21.8	14.5	26.4	17.6
	75 mm	**360**	8.64	5.76	10.8	7.20	11.9	7.92	13.0	8.64	–	–	–	–	–	–
		430	10.3	6.88	12.9	8.60	14.2	9.46	15.5	10.3	–	–	–	–	–	–
		510	12.2	8.16	15.3	10.2	16.8	11.2	18.4	12.2	–	–	–	–	–	–
STD, SSLT, SSLP, OVS, LSLP	**$s \geq s_{full}$**	**360**	10.4	6.91	13.0	8.64	14.3	9.50	15.6	10.4	17.5	11.7	19.4	13.0	23.3	15.6
		430	12.4	8.26	15.5	10.3	17.0	11.4	18.6	12.4	20.9	13.9	23.2	15.5	27.9	18.6
		510	14.7	9.79	18.4	12.2	20.2	13.5	22.0	14.7	24.8	16.5	27.5	18.4	33.0	22.0
LSLT	**$s \geq s_{full}$**	**360**	8.64	5.76	10.8	7.20	11.9	7.92	13	8.64	14.6	9.72	16.2	10.8	19.4	13.0
		430	10.3	6.88	12.9	8.60	14.2	9.46	15.5	10.3	17.4	11.6	19.4	12.9	23.2	15.5
		510	12.2	8.16	15.3	10.2	16.8	11.2	18.4	12.2	20.7	13.8	23.0	15.3	27.5	18.4
Spacing for full bearing and tearout strength, s_{full}, mm		**STD, SSLT, LSLT**	50.0		62.0		68.0		74.0		84.0		93.0		111	
		OVS	52.0		64.0		72.0		78.0		89.0		98.0		116	
		SSLP	54.0		66.0		74.0		80.0		91.0		100		118	
		LSLP	72.0		90.0		99.0		108		121		135		162	
Minimum spacing = $3d$, mm			48.0		60.0		66.0		72.0		81.0		90.0		108	

STD = standard hole
OVS = oversized hole
SSLT = short–slotted hole oriented with length transverse to the line of force
SSLP = short–slotted hole oriented with length parallel to the line of force
LSLP = long–slotted hole oriented with length parallel to the line of force
LSLT = long–slotted hole oriented with length transverse to the line of force

LRFD	**ASD**	– Indicates spacing less than minimum spacing required per Turkish Structural Steel Code spacing
$\phi = 0.75$	$\Omega = 2.00$	Note: Spacing indicated is from the center of the hole or slot to the center of the adjacent hole or slot in the line of force. Hole deformation is considered.

Table 7.8 Available bearing and tearout strength of bolt holes based on edge distance.

Available Bearing and Tearout Strength at Bolt Holes Based on Edge Distance kN/mm thickness

Hole Type	Edge Distance, l_e, mm	F_u, MPa	Nominal Bolt Diameter, d, mm													
			16		20		22		24		27		30		36	
			ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
STD/SSLT	**32**	**360**	7.45	4.97	6.80	4.54	6.48	4.32	6.16	4.10	5.51	3.67	5.02	3.35	4.05	2.70
		430	8.90	5.93	8.13	5.42	7.74	5.16	7.35	4.90	6.58	4.39	6.00	4.00	4.84	3.23
		510	10.6	7.04	9.64	6.43	9.18	6.12	8.72	5.81	7.80	5.20	7.11	4.74	5.74	3.83
	50	**360**	10.4	6.91	12.6	8.42	12.3	8.21	12.0	7.99	11.3	7.56	10.9	7.24	9.88	6.59
		430	12.4	8.26	15.1	10.1	14.7	9.80	14.3	9.55	13.5	9.03	13.0	8.64	11.8	7.87
		510	14.7	9.79	17.9	11.9	17.4	11.6	17.0	11.3	16.1	10.7	15.4	10.3	14.0	9.33
SSLP	**32**	**360**	6.80	4.54	6.16	4.10	5.51	3.67	5.18	3.46	4.37	2.92	3.89	2.59	2.92	1.94
		430	8.13	5.42	7.35	4.90	6.58	4.39	6.19	4.13	5.22	3.48	4.64	3.10	3.48	2.32
		510	9.64	6.43	8.72	5.81	7.80	5.20	7.34	4.90	6.20	4.13	5.51	3.67	4.13	2.75
	50	**360**	10.4	6.91	12.0	7.99	11.3	7.56	11.0	7.34	10.2	6.80	9.72	6.48	8.75	5.83
		430	12.4	8.26	14.3	9.55	13.5	9.03	13.2	8.77	12.2	8.13	11.6	7.74	10.4	6.97
		510	9.64	9.79	8.72	11.3	7.80	10.7	7.34	10.4	6.20	9.64	5.51	9.18	4.13	8.26
OVS	**32**	**360**	7.13	4.75	6.48	4.32	5.83	3.89	5.51	3.67	4.70	3.13	4.21	2.81	3.24	2.16
		430	8.51	5.68	7.74	5.16	6.97	4.64	6.58	4.39	5.61	3.74	5.03	3.35	3.87	2.58
		510	10.1	6.73	9.18	6.12	8.26	5.51	7.80	5.20	6.66	4.44	5.97	3.98	4.59	3.06
	50	**360**	10.4	6.91	12.3	8.21	11.7	7.78	11.3	7.56	10.5	7.02	10.0	6.70	9.07	6.05
		430	12.4	8.26	14.7	9.80	13.9	9.29	13.5	9.03	12.6	8.39	12.0	8.00	10.8	7.22
		510	14.7	9.79	17.4	11.6	16.5	11.0	16.1	10.7	14.9	9.95	14.2	9.49	12.9	8.57
LSLP	**32**	**360**	3.89	2.59	2.27	1.51	1.46	0.972	0.648	0.432	–	–	–	–	–	–
		430	4.64	3.10	2.71	1.81	1.74	1.16	0.774	0.516	–	–	–	–	–	–
		510	5.51	3.67	3.21	2.14	2.07	1.38	0.918	0.612	–	–	–	–	–	–
	50	**360**	9.72	6.48	8.10	5.40	7.29	4.86	6.48	4.32	5.35	3.56	4.05	2.70	1.62	1.08
		430	11.6	7.74	9.68	6.45	8.71	5.81	7.74	5.16	6.39	4.26	4.84	3.23	1.94	1.29
		510	13.8	9.18	11.5	7.65	10.3	6.89	9.18	6.12	7.57	5.05	5.74	3.83	2.30	1.53
LSLT	**32**	**360**	6.21	4.14	5.67	3.78	5.40	3.60	5.13	3.42	4.59	3.06	4.19	2.79	3.38	2.25
		430	7.42	4.95	6.77	4.52	6.45	4.30	6.13	4.09	5.48	3.66	5.00	3.33	4.03	2.69
		510	8.80	5.87	8.03	5.36	7.65	5.10	7.27	4.85	6.50	4.34	5.93	3.95	4.78	3.19
	50	**360**	8.64	5.76	10.5	7.02	10.3	6.84	9.99	6.66	9.45	6.30	9.05	6.03	8.24	5.49
		430	10.3	6.88	12.6	8.39	12.3	8.17	11.9	7.96	11.3	7.53	10.8	7.20	9.84	6.56
		510	12.2	8.16	14.9	9.95	14.5	9.69	14.2	9.44	13.4	8.93	12.8	8.54	11.7	7.78
STD, SSLT, SSLP, OVS, LSLP	$l_e \geq l_{e\,full}$	**360**	10.4	6.91	13.0	8.64	14.3	9.50	15.6	10.4	17.5	11.7	19.4	13.0	23.3	15.6
		430	12.4	8.26	15.5	10.3	17.0	11.4	18.6	12.4	20.9	13.9	23.2	15.5	27.9	18.6
		510	14.7	9.79	18.4	12.2	20.2	13.5	22.0	14.7	24.8	16.5	27.5	18.4	33.0	22.0
LSLT	$l_e \geq l_{e\,full}$	**360**	8.64	5.76	10.8	7.20	11.9	7.92	13.0	8.64	14.6	9.72	16.2	10.8	19.4	13.0
		430	10.3	6.88	12.9	8.60	14.2	9.46	15.5	10.3	17.4	11.6	19.4	12.9	23.2	15.5
		510	12.2	8.16	15.3	10.2	16.8	11.2	18.4	12.2	20.7	13.8	23.0	15.3	27.5	18.4
Edge distance for full bearing and tearout strength, $l_e > l_{e\,full}$, mm		**STD, SSLT, LSLT**	41.0		51.0		56.0		61.0		69.0		76.5		91.5	
		OVS	42.0		52.0		58.0		63.0		71.5		79.0		94.0	
		SSLP	43.0		53.0		59.0		64.0		72.5		80.0		95.0	
		LSLP	52.0		65.0		71.5		78.0		87.5		97.5		117	

STD = standard hole
SSLT = short–slotted hole oriented with length transverse to the line of force
SSLP = short–slotted hole oriented with length parallel to the line of force
OVS = oversized hole
LSLP = long–slotted hole oriented with length parallel to the line of force
LSLT = long–slotted hole oriented with length transverse to the line of force

LRFD	ASD	– Indicates edge distance not applicable.
$\phi = 0.75$	$\Omega = 2.00$	Note: Edge distance indicated is from the center of the hole or slot to the edge of the element in the line of force. Hole deformation is considered.

Table 7.9 *C* coefficients for a bolt group subjected to an eccentric load at $\theta = 30°$.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 30°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

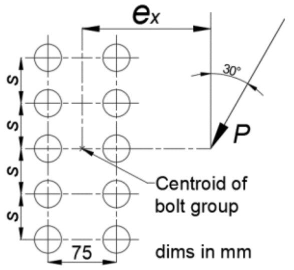
$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	0.969	2.60	4.52	6.53	8.58	10.6	12.7	14.7	16.7	18.8	20.8	22.8
	75	0.754	2.12	3.83	5.71	7.71	9.75	11.8	13.9	15.9	18.0	20.0	22.1
	100	0.617	1.78	3.29	4.99	6.88	8.87	10.9	13.0	15.0	17.1	19.2	21.2
	125	0.522	1.53	2.85	4.39	6.16	8.06	10.0	12.1	14.1	16.2	18.3	20.3
	150	0.453	1.34	2.51	3.89	5.54	7.33	9.23	11.2	13.2	15.3	17.3	19.4
	175	0.400	1.19	2.23	3.48	5.01	6.70	8.50	10.4	12.4	14.4	16.4	18.5
	200	0.358	1.07	2.00	3.15	4.57	6.14	7.86	9.68	11.6	13.5	15.6	17.6
	225	0.324	0.967	1.81	2.87	4.19	5.66	7.28	9.02	10.9	12.8	14.7	16.7
	250	0.295	0.883	1.66	2.64	3.86	5.24	6.77	8.43	10.2	12.0	13.9	15.9
	300	0.252	0.751	1.41	2.27	3.33	4.54	5.91	7.43	9.04	10.8	12.5	14.4
	350	0.219	0.652	1.23	1.98	2.93	3.99	5.24	6.61	8.09	9.67	11.3	13.1
	400	0.194	0.576	1.08	1.76	2.60	3.56	4.69	5.94	7.30	8.77	10.3	12.0
	450	0.174	0.516	0.972	1.58	2.34	3.21	4.24	5.38	6.64	8.00	9.45	11.0
	500	0.158	0.466	0.880	1.43	2.12	2.92	3.87	4.92	6.08	7.34	8.70	10.1
	600	0.133	0.391	0.739	1.21	1.79	2.48	3.29	4.18	5.19	6.29	7.48	8.75
	700	0.115	0.337	0.637	1.04	1.55	2.14	2.85	3.63	4.52	5.49	6.54	7.68
	800	0.101	0.296	0.559	0.918	1.36	1.89	2.51	3.21	4.00	4.87	5.81	6.83
	900	0.0907	0.264	0.499	0.819	1.21	1.69	2.25	2.87	3.59	4.37	5.22	6.15
150	50	0.969	3.20	5.31	7.36	9.39	11.4	13.4	15.4	17.4	19.3	21.3	
	75	0.754	2.75	4.86	6.95	9.01	11.0	13.1	15.1	17.1	19.1	21.1	23.1
	100	0.617	2.39	4.42	6.49	8.57	10.6	12.7	14.7	16.8	18.8	20.8	22.8
	125	0.522	2.10	4.02	6.04	8.11	10.2	12.3	14.3	16.4	18.4	20.4	22.5
	150	0.453	1.87	3.67	5.61	7.66	9.73	11.8	13.9	15.9	18.0	20.0	22.1
	175	0.400	1.69	3.36	5.21	7.21	9.27	11.3	13.4	15.5	17.6	19.6	21.7
	200	0.358	1.53	3.08	4.84	6.79	8.82	10.9	13.0	15.0	17.1	19.2	21.3
	225	0.324	1.40	2.84	4.51	6.40	8.39	10.4	12.5	14.6	16.7	18.7	20.8
	250	0.295	1.29	2.63	4.21	6.04	7.98	9.99	12.0	14.1	16.2	18.3	20.4
	300	0.252	1.12	2.28	3.70	5.39	7.23	9.16	11.2	13.2	15.3	17.3	19.4
	350	0.219	0.980	2.00	3.29	4.86	6.57	8.41	10.3	12.3	14.4	16.4	18.5
	400	0.194	0.872	1.78	2.95	4.40	6.01	7.75	9.60	11.5	13.5	15.5	17.6
	450	0.174	0.785	1.60	2.68	4.02	5.52	7.17	8.93	10.8	12.7	14.7	16.7
	500	0.158	0.714	1.45	2.45	3.69	5.09	6.65	8.33	10.1	12.0	13.9	15.9
	600	0.133	0.603	1.23	2.08	3.17	4.39	5.79	7.32	8.95	10.7	12.5	14.3
	700	0.115	0.522	1.06	1.82	2.77	3.85	5.11	6.49	7.99	9.59	11.3	13.0
	800	0.101	0.460	0.932	1.61	2.45	3.42	4.56	5.82	7.20	8.68	10.2	11.9
	900	0.0907	0.411	0.832	1.44	2.20	3.08	4.12	5.27	6.53	7.90	9.37	10.9

7.5 Sample Calculations

7.5.1 Available shear strength of bolts

M16 bolt; Grade 8.8:

N-type bolt

$A_b = \pi(16)^2/4 = 201\ \text{mm}^2$

$F_{nv} = (0.450)(800) = 360\ \text{MPa}$

$\phi F_{nv} = (0.75)(360) = 270\ \text{MPa (LRFD)}$

$F_{nv}/\Omega = 360/2.00 = 180\ \text{MPa (ASD)}$

Single shear

$r_n = (1)(360)(201) \times 10^{-3} = 72.4\ \text{kN}$

$\phi r_n = (0.75)(72.4) = 54.3\ \text{kN (LRFD)}$

$r_n/\Omega = 72.4/2.00 = 36.2\ \text{kN (ASD)}$

Double shear

$r_n = (2)(360)(201) \times 10^{-3} = 145\ \text{kN}$

$\phi r_n = (0.75)(145) = 109\ \text{kN (LRFD)}$

$r_n/\Omega = 145/2.00 = 72.4\ \text{kN (ASD)}$

X-type bolt

$F_{nv} = (0.563)(800) = 450\ \text{MPa}$

$\phi F_{nv} = (0.75)(450) = 338\ \text{MPa (LRFD)}$

$F_{nv}/\Omega = 450/2.00 = 225\ \text{MPa (ASD)}$

Single shear

$r_n = (1)(450)(201) \times 10^{-3} = 90.6$ kN

$\phi r_n = (0.75)(90.6) = 67.9$ kN (LRFD)

$r_n/\Omega = 90.6/2.00 = 45.2$ kN (ASD)

Double shear

$r_n = (2)(450)(201) \times 10^{-3} = 181$ kN

$\phi r_n = (0.75)(181) = 136$ kN (LRFD)

$r_n/\Omega = 181/2.00 = 90.6$ kN (ASD)

7.5.2 Available tensile strength of bolts

M16 bolt; Grade 8.8:

$F_{nt} = (0.75)(800) = 600$ MPa

$\phi F_{nt} = (0.75)(600) = 450$ MPa (LRFD)

$F_{nt}/\Omega = 600/2.00 = 300$ MPa (ASD)

$r_n = (600)(201) \times 10^{-3} = 121$ kN

$\phi r_n = (0.75)(121) = 90.5$ kN (LRFD)

$r_n/\Omega = 121/2.00 = 60.3$ kN (ASD)

7.5.3 Available slip resistance of slip-critical connections

M16 bolt in an STD hole; Grade 8.8; Class D faying surface; one filler:

Single shear

$r_n = (0.20)(1.13)(1.0)(88.0)(1) = 19.9$ kN

$\phi r_n = (1.00)(19.9) = 19.9$ kN (LRFD)

$r_n/\Omega = 19.9/1.50 = 13.3$ kN (ASD)

Double shear

$r_n = (0.20)(1.13)(1.0)(88.0)(2) = 39.8$ kN

$\phi r_n = (1.00)(39.8) = 39.8$ kN (LRFD)

$r_n/\Omega = 39.8/1.50 = 26.5$ kN (ASD)

7.5.4 Available bearing and tearout strength at bolt holes

7.5.4.1 Based on bolt spacing

M16 bolt in an OVS hole; S355 steel; $s = 75$ mm:

$(s = 75$ mm$) \geq [3d = (3)(16) = 48$ mm$]$

Bearing strength

$r_n = (2.4)(16)(1)(510) \times 10^{-3} = 19.6$ kN

Tearout strength

$r_n = (1.2)(75 - 20)(1)(510) \times 10^{-3} = 33.7$ kN

∴ Bearing strength governs.

$\phi r_n = (0.75)(19.6) = 14.7$ kN (LRFD)

$r_n/\Omega = 19.6/2.00 = 9.79$ kN (ASD)

M16 bolt in an OVS hole; S355 steel:

$19.6 = (1.2)\left(s_{full} - 20\right)(1)(510) \times 10^{-3}$

$\therefore s_{full} = 52.0$ mm

M30 bolt in an OVS hole; S355 steel; $s = 75$ mm:

$(s = 75 \text{ mm}) < [3d = (3)(30) = 90 \text{ mm}]$

∴ Spacing less than minimum spacing required per Turkish Structural Steel Code.

M16 bolt in an LSLT hole; S275 steel; $s = 3d = (3)(16) = 48$ mm:

Bearing strength

$r_n = (2.0)(16)(1)(430) \times 10^{-3} = 13.8$ kN

Tearout strength

$r_n = (1.0)(48 - 18)(1)(430) \times 10^{-3} = 12.9$ kN

∴ Tearout strength governs.

$\phi r_n = (0.75)(12.9) = 9.68$ kN (LRFD)

$r_n/\Omega = 9.68/2.00 = 6.45$ kN (ASD)

7.5.4.2 Based on edge distance

M16 bolt in an LSLP hole; S275 steel; $l_e = 50$ mm:

$(l_e = 50 \text{ mm}) > (40/2 = 20 \text{ mm})$

Bearing strength

$r_n = (2.4)(16)(1)(430) \times 10^{-3} = 16.5$ kN

Tearout strength

$r_n = (1.2)(50 - 40/2)(1)(430) \times 10^{-3} = 15.5$ kN

∴ Tearout strength governs.

$\phi r_n = (0.75)(15.5) = 11.6$ kN (LRFD)

$r_n/\Omega = 15.5/2.00 = 7.74$ kN (ASD)

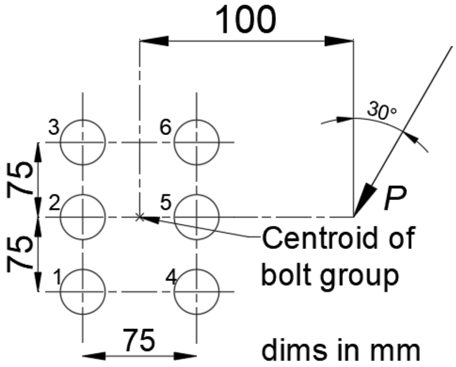


Figure 7.5 Sample problem.

M16 bolt in an LSLP hole; S275 steel:

$$16.5 = (1.2)\big(s_{full} - 40/2\big)(1)(430) \times 10^{-3}$$

$$\therefore l_{e,full} = 52.0 \text{ mm}$$

M27 bolt in an LSLP hole; S355 steel; $l_e = 32$ mm:

$$(l_e = 32 \text{ mm}) \leq (67/2 = 33.5 \text{ mm})$$

∴ Edge distance not applicable.

7.5.5 C coefficients for eccentrically loaded bolt groups

Eccentrically loaded bolt group in Figure 7.5:

$$P_x = -(1)\sin 30° = -0.500$$

$$P_y = -(1)\cos 30° = -0.866$$

$$M_{CG} = -(0.866)(100) = -86.6 \text{ mm}$$

Bolts	x (mm)	y (mm)	d (mm)
1	–37.5	–75.0	83.9
2	–37.5	0	37.5
3	–37.5	75.0	83.9
4	37.5	–75.0	83.9
5	37.5	0	37.5
6	37.5	75.0	83.9

$$J_{\mathrm{CG}} = 83.9^2 + 37.5^2 + 83.9^2 + 83.9^2 + 37.5^2 + 83.9^2 = 30900 \text{ mm}^2$$

$$x_{\mathrm{IC}} = -(-0.866)(30900)/[(6)(-86.6)] = -51.5 \text{ mm}$$

$$y_{\mathrm{IC}} = (-0.500)(30900)/[(6)(-86.6)] = 29.7 \text{ mm}$$

Bolts	dx (mm)	dy (mm)	d (mm)
1	14.1	–105	106
2	14.1	–29.8	32.9
3	14.1	45.2	47.4
4	89.1	–105	138
5	89.1	–29.8	93.9
6	89.1	45.2	100

$$dx_1 = -37 — (-51.5) = 14.1 \text{ mm}$$

$$dy_1 = -75.0 - 29.7 = -105 \text{ mm}$$

$$d_1 = \sqrt{14.1^2 + (-105)^2} = 106 \text{ mm}$$

$$J_{\mathrm{IC}} = 106^2 + 32.9^2 + 47.4^2 + 138^2 + 93.9^2 + 100^2 = 52400 \text{ mm}^2$$

$$M_{\mathrm{IC}} = -(0.500)(29.7) - (0.866)[1 — (-51.5)] = -146 \text{ mm}$$

$$C_e = -52400/[(-146)(138)] = 2.60$$

d_{max} = 138 mm

Bolts	Δ (in.)	R_i/R_{ult}	M_i (mm)	$(R_i)_x$	$(R_i)_y$
1	0.261	0.959	101	0.288	0.0386
2	0.081	0.725	23.9	0.198	0.0937
3	0.117	0.815	38.6	–0.236	0.0733
4	0.340	0.982	135	0.226	0.192
5	0.232	0.945	88.7	0.091	0.271
6	0.247	0.953	95.1	–0.131	0.257
Σ			483	0.437	0.927

Δ_4= 0.34 in.

Δ_3= (0.34) (47.4)/138 = 0.117 in.

$R_3/R_{ult} = \left[1 - e^{-(10)(0.117)}\right]^{0.55} = 0.815$

$M_3 = (0.815)(47.4) = 38.6$ mm

$C_u = -483/-146 = 3.31$

$R_{ult} = 1/3.31 = 0.302$

$(R_1)_x = -(-105/106)(0.959)(0.302) = 0.288$

$(R_1)_y = (14.1/106)(0.959)(0.302) = 0.0386$

$|F_x = -0.500 + 0.437 = -0.0630| > 0.0001$

$\left|F_y = -0.866 + 0.927 = 0.0610\right| > 0.0001$

$x_{\mathrm{IC}} = -51.5 - (0.0610)(30900)/[(6)(-86.6)] = -47.9$ mm

$y_{\mathrm{IC}} = 29.7 + (-0.0630)(30900)/[(6)(-86.6)] = -33.5$ mm

Final iteration

$x_{\mathrm{IC}} = -48.2$ mm

$y_{\mathrm{IC}} = 35.0$ mm

Bolts	dx (mm)	dy (mm)	d (mm)	Δ (in.)	R_i/R_{ult}	M_i (mm)	$(R_i)_x$	$(R_i)_y$
1	10.7	–110	110	0.269	0.962	106	0.291	0.0285
2	10.7	–34.8	36.4	0.0890	0.747	27.2	0.217	0.0670
3	10.7	40.2	41.6	0.102	0.781	32.5	–0.230	0.0612
4	85.7	–110	139	0.340	0.982	137	0.235	0.184
5	85.7	–34.8	92.5	0.226	0.941	87.1	0.108	0.265
6	85.7	40.2	95.0	0.231	0.944	89.4	–0.122	0.260
Σ						479	0.500	0.866

$M_{\mathrm{IC}} = -(0.500)(35.0) - (0.866)[1 — (-48.2)] = -146$ mm

$C_u = -479/-146 = 3.29$

$|F_x = -0.500 + 0.500 = 0.0000| \leq 0.0001$

$\left|F_y = -0.866 + 0.866 = 0.0000\right| \leq 0.0001$

$\therefore C = 3.29$

C' coefficient

$x_{\mathrm{IC}} = 0$

$y_{\mathrm{IC}} = 0$

Bolts	dx (mm)	dy (mm)	d (mm)	Δ (in.)	R_i/R_{ult}	M_i (mm)
1	–37.5	–75.0	83.9	0.340	0.982	82.3
2	–37.5	0	37.5	0.152	0.873	32.7
3	–37.5	75.0	83.9	0.340	0.982	82.3
4	37.5	–75.0	83.9	0.340	0.982	82.3
5	37.5	0	37.5	0.152	0.873	32.7
6	37.5	75.0	83.9	0.340	0.982	82.3
Σ						395

$C' = 395$ mm

CHAPTER 8

DESIGN OF WELDS

8.1 Introduction

This chapter develops the design tables for concentrically and eccentrically loaded weld groups and presents the equations and sample calculations in developing the tables. The tables are developed for the weld electrode strengths listed in Table 8.1.

8.2 Design Equations

The nominal strength, R_n, of a longitudinally loaded fillet weld is calculated based on the limit state of rupture:

$$R_n = F_{nw} A_{we} \tag{8.1}$$

where F_{nw} is the nominal stress of the weld metal:

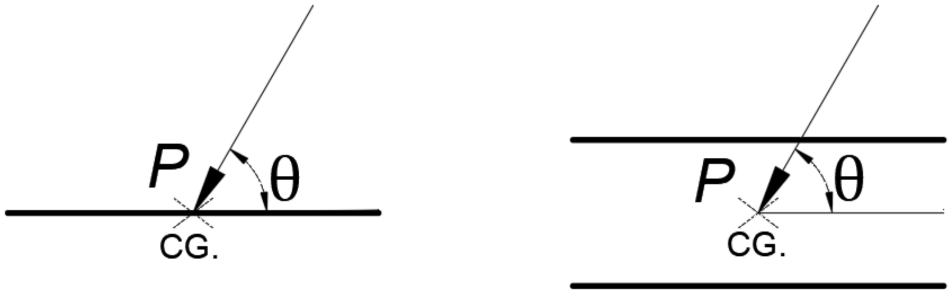
$$F_{nw} = 0.60 F_{EXX} \tag{8.2}$$

and A_{we} is the effective area of the weld:

$$A_{we} = t_e l \tag{8.3}$$

Table 8.1 Weld electrode strengths [ISO 2560, 2009].

Electrode	**Tensile Strength of Electrode Material, F_{EXX} (MPa)**
E43	430
E49	490
E55	550
E57	570



Weld group along a line

Weld group along parallel lines

Figure 8.1 Linear weld groups.

in which t_e is the effective throat dimension and l is the length of the weld.

$$t_e = 0.707w \tag{8.4}$$

where w is the size of weld leg. The resistance factor, ϕ, for LRFD is 0.75, whereas the safety factor, Ω, for ASD is 2.00.

When a weld element is loaded at an angle its strength increases but its ductility decreases [AISC, 2017]. If strain compatibility of the various weld elements in a group is considered, the increase in strength is given by

$$1.0 + 0.50\sin^{1.5}\theta \tag{8.5}$$

where θ is the angle between the line of action of the load and the longitudinal axis of the weld element in degrees.

8.2.1 Concentrically loaded weld groups

8.2.1.1 Linear weld groups

For a linear weld group, in which all elements are in a line or are parallel, with a uniform leg size (see Figure 8.1).

$$F_{nw} = 0.60F_{EXX}(1.0 + 0.50\sin^{1.5}\theta) \tag{8.6}$$

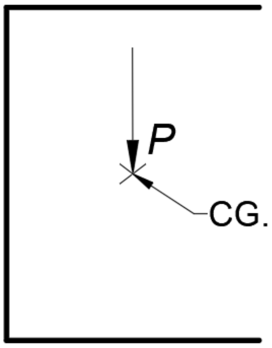


Figure 8.2 Weld group with longitudinally and transversely loaded weld elements.

8.2.1.2 Weld groups with longitudinally and transversely loaded elements

For weld groups consisting of longitudinally and transversely loaded elements with a uniform leg size (see Figure 8.2), the strength of the weld group is the greater of

$$R_n = R_{nwl} + R_{nwt} \tag{8.7}$$

and

$$R_n = 0.85R_{nwl} + 1.5R_{nwt} \tag{8.8}$$

where R_{nwl} is the total nominal strength of longitudinally loaded elements (see Eq. 8.2) and R_{nwt} is the total nominal strength of transversely loaded elements without the strength increase given by Eq. 8.5 (i.e., see Eq. 8.2).

8.2.1.3 Weld groups with elements loaded at different angles

For weld groups consisting of elements loaded at different angles (see Figure 8.3), the effect of loading angle and deformation compatibility must be considered in calculating the nominal strength of the weld group. The nominal stress in the weld element i, F_{nwi}, is limited by the ultimate deformation, Δ_u, of the weld element in the group that first reaches this limit [AISC, 2017]:

$$F_{nwi} = 0.60F_{EXX}(1.0 + 0.50\sin^{1.5}\theta_i)[p_i(1.9 - 0.9p_i)]^{0.3} \tag{8.9}$$

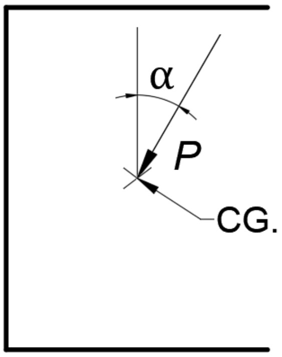


Figure 8.3 Concentrically loaded weld group.

where p_i is the ratio of element i deformation, Δ_i, to its deformation at maximum stress, Δ_{mi}:

$$p_i = \Delta_i/\Delta_{mi} \tag{8.10}$$

in which

$$\Delta_i = \Delta_u \tag{8.11}$$

of the weld element with the largest load angle (i.e., the least ultimate deformation) in the group, θ_{max}, and θ_i is the angle between the line of action of the load and the longitudinal axis of the weld element i, in degrees. The deformation at maximum stress and the ultimate deformation of the weld element are respectively given by

$$\Delta_m = 0.209(\theta + 2)^{-0.32}w \tag{8.12}$$

$$\Delta_u = 1.087(\theta + 6)^{-0.65}w \leq 0.17w \tag{8.13}$$

The available strength of the weld group is calculated by summing the available strength of each weld element in the group.

8.2.2 Eccentrically loaded weld groups

When an in-plane eccentric shear force P is applied to a weld group in a connection, weld elements are subjected to shear forces due to direct shear acting through the CG of the weld group and due to torsional moment M_{CG} as shown in Figure 8.4. There

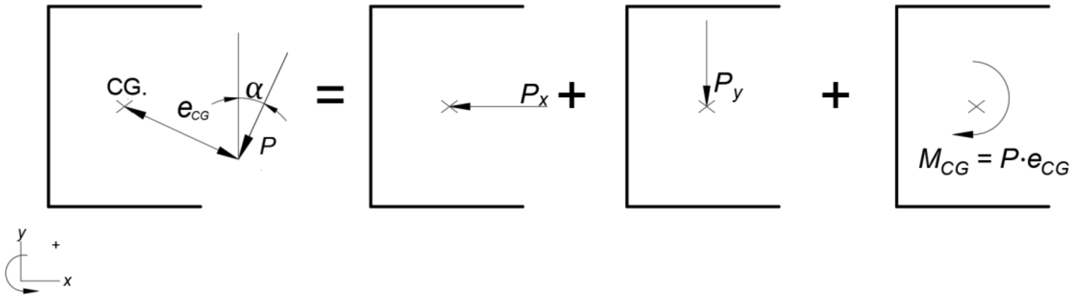


Figure 8.4 Effect of an in-plane eccentric shear force on a weld group.

are two analysis methods for eccentric shear: the elastic (vector) method and the ultimate strength method. The elastic vector method (cf. Section 7.3.1) is excessively conservative because the ductility of the weld group is neglected [AISC, 2017].

8.2.2.1 The ultimate strength method

The ultimate strength method, which is more accurate than the elastic method, has been used in developing the AISC design tables. In this method, it is assumed that the weld group rotates about an IC, the deformation at each weld segment is proportional to its distance d_i from the IC, and the force on each weld segment is perpendicular to the line from the IC to the centroid of that weld segment (cf. Section 7.3.2; see Figure 8.5). When the IC is correctly located, which requires an iterative solution [AISC, 2017], the following equilibrium equations should be satisfied:

$$\sum F_x = P \sin \alpha + \sum_{i=1}^{N} R_i \, dy_i / d_i = 0 \tag{8.14}$$

$$\sum F_y = P \cos \alpha + \sum_{i=1}^{N} R_i \, dx_i / d_i = 0 \tag{8.15}$$

$$\sum M_{\mathrm{IC}} = P \cdot e_{\mathrm{IC}} + \sum_{i=1}^{N} R_i d_i = 0 \tag{8.16}$$

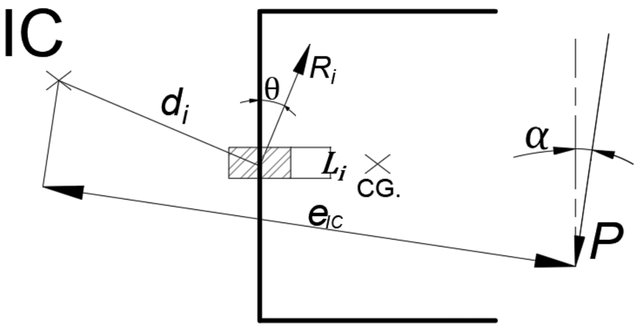


Figure 8.5 IC and forces on the weld segments.

where N is the number of weld segments that the weld group is divided into, R_i is the nominal strength of weld segment i (see Eqs. 8.1 and 8.9), dx_i and dy_i are the distances along the x- and y-axes from the IC to the centroid of weld segment i, respectively, and e_{IC} is the eccentricity of the applied force with respect to the IC. R_i is calculated at a deformation Δ_i:

$$\Delta_i = \Delta_{ucr} d_i / d_{cr} \tag{8.17}$$

where Δ_{ucr} is Δ_u of the weld segment with minimum Δ_u / d_i and d_{cr} is the distance from the IC to that weld segment, usually the segment furthest from the IC.

8.3 Design Tables

The following design tables were developed to facilitate the design of welds:

(1) C coefficients for concentrically loaded weld group elements
(2) Electrode strength coefficient, C_1
(3) C coefficients for eccentrically loaded weld groups

8.3.1 C coefficients for concentrically loaded weld group elements

The nominal strength of the concentrically loaded weld groups consisting of elements loaded at different angles (see Eqs. 8.1 and 8.9) can be rewritten as

$$R_n = 0.60F_{EXX}t_e \sum_{i=1}^{N} C_i l_i \tag{8.18}$$

where

$$C_i = (1.0 + 0.50\sin^{1.5}\theta_i)[p_i(1.9 - 0.9p_i)]^{0.3} \tag{8.19}$$

C coefficients were presented for θ and θ_{max} values of 0, 15, 30, 45, 60, 75 and 90° in Table H.1 in Appendix H (and Table 8.2).

8.3.2 Electrode strength coefficient, C_1

C coefficients for eccentrically loaded weld groups were tabulated in the next section for E49 electrodes. To adjust these tabulated values for other electrodes, electrode strength coefficients:

$$C_1 = F_{EXX}/490 \tag{8.20}$$

where F_{EXX} is in MPa were presented in Table H.2 in Appendix H (and Table 8.3). An additional reduction factor of 0.90 was included for electrodes E55 and E57.

8.3.3 C coefficients for eccentrically loaded weld groups

The nominal strength of the eccentrically loaded weld group is

$$R_n = C \cdot C_1 t_e l \tag{8.21}$$

where l is the characteristic length of the weld group (see Table 8.4) in mm, R_n is in kN, C is in kPa and t_e is in mm. Tables that provide C coefficients for various weld groups that are subjected to various eccentric loads at $\alpha = 0, 15, 30, 45, 60$ and 75° (see Table H.3 in Appendix H; see Table 8.4 for a sample) were developed for E49 electrodes.

C coefficients were also tabulated for concentrically loaded weld groups (i.e, no eccentricity; $a = 0$ in Table 8.4). R_n is calculated as presented in Section 8.2.1.1 for linear weld groups, as in Section 8.2.1.3 for weld groups with elements loaded at different angles and as in Section 8.2.1.2 for weld groups with longitudinally and transversely loaded elements (i.e., $\alpha = 0$). Then, C coefficients are calculated using (cf. Eq. 8.21):

$$C = R_n/(C_1 t_e l) \tag{8.22}$$

For eccentrically loaded weld groups, the tabulated coefficients were calculated using the ultimate strength method. The following iterative algorithm [Brandt, 1982b; Lue et al., 2017] (see Figure 8.4 for the sign convention) was used to locate the IC and calculate the C coefficient subsequently:

1. Locate the CG of the weld group.
2. Assume that the IC is located at the CG of the weld group.
3. Divide the weld elements in the weld group into segments (AISC [2017] recommends a minimum of 20 weld segments for the longest line element).
4. Calculate the distance, d_i, between the centroid of each weld segment and the IC.
5. Calculate the angle θ_i between the line of action of the force on each weld segment and its longitudinal axis.
6. Calculate Δ_m and Δ_u for each weld segment.
7. Calculate Δ_u/d_i for each weld segment, and set Δ_{ucr} to Δ_u and d_{cr} to d_i of the weld segment with minimum Δ_u/d_i.
8. Calculate Δ_i of each weld segment, using Eq. 8.17.
9. Calculate the nominal strength of each weld segment using Eqs. 8.1 and 8.9.
10. Resolve the nominal strength of each weld segment into its components, $(R_i)_x$ and $(R_i)_y$, and calculate its moment, M_i, about the IC.
11. Calculate e_{IC} [Lue et al., 2017]:

$$e_{\text{IC}} = (x_{\text{IC}} - x_{\text{CG}})\cos(180 - \phi) + (y_{\text{IC}} - y_{\text{CG}})\sin(180 - \phi) - e_x \tag{8.23}$$

where

$$e_x = \left(x_p - x_{\mathrm{CG}}\right)\cos(180 - \phi) + \left(y_p - y_{\mathrm{CG}}\right)\sin(180 - \phi) \tag{8.24}$$

x_p and y_p are the coordinates of the eccentric force, x_{CG} and y_{CG} are the coordinates of the CG of the weld group, x_{IC} and y_{IC} are the coordinates of the IC, e_x is the eccentricity of the applied force with respect to the CG.

12. Calculate the eccentric load

$$P = \sum_{i=1}^{N} M_i / e_{\mathrm{IC}} \tag{8.25}$$

13. Resolve P into its components, P_x and P_y, and calculate the equilibrium equations, F_x and F_y:

$$F_x = P_x + \sum_{i=1}^{N} (R_i)_x \tag{8.26}$$

$$F_y = P_y + \sum_{i=1}^{N} (R_i)_y \tag{8.27}$$

14. Calculate the coordinates of the next IC:

$$x_{IC} = x_{IC}^{prev} - F_y J_{\mathrm{CG}} / (L \cdot M_{\mathrm{CG}}) \tag{8.28}$$

$$y_{IC} = y_{IC}^{prev} + F_x J_{\mathrm{CG}} / (L \cdot M_{\mathrm{CG}}) \tag{8.29}$$

where x_{IC}^{prev} and y_{IC}^{prev} are the previous x_{IC} and y_{IC}, respectively, L is the total length of the weld group, J_{CG} is the polar moment of inertia of a line weld. Table 8.5 displays the polar moment of inertia equations for different line weld groups.

15. Repeat steps 4–14 for the new IC until the unbalanced forces F_x and F_y in step 13 are sufficiently close to zero (≤0.01 kN was sought).

16. Calculate the C coefficient:

$$C = \frac{|P_n|}{l \cdot t_w \cdot 1000} \tag{8.30}$$

Table 8.2 C coefficients for concentrically loaded weld group elements.

C Coefficients for Concentrically Loaded Weld Group Elements							
Load angle on weld element, degrees	**Largest load angle on any weld group element, degrees**						
	90	**75**	**60**	**45**	**30**	**15**	**0**
0	0.829	0.851	0.877	0.910	0.950	0.994	1.00
15	1.02	1.04	1.05	1.07	1.06	0.881	
30	1.16	1.17	1.18	1.17	1.10		
45	1.29	1.30	1.29	1.26			
60	1.40	1.40	1.38				
75	1.48	1.47					
90	1.50						

Table 8.3 Electrode strength coefficient, C_1.

Electrode Strength Coefficient, C_1		
Electrode	**F_{EXX} (MPa)**	**C_1**
E43	430	0.880
E49	490	1.00
E55	550	1.01
E57	570	1.05
Note: An additional reduction factor of 0.90 is used for E55 and E57 electrodes.		

Table 8.4 C coefficients for eccentrically loaded weld groups.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 30°

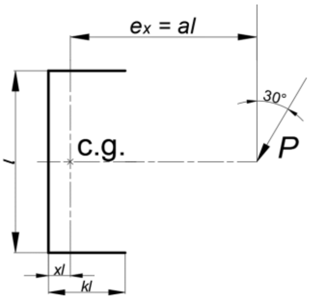
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

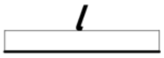
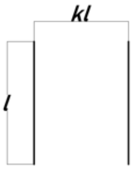
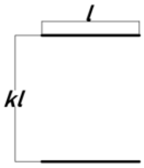
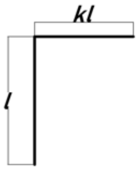
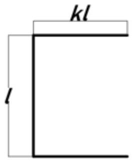
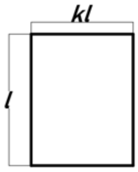
P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.



a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.346	0.428	0.509	0.591	0.672	0.753	0.835	0.916	0.998	1.08	1.16	1.32	1.49	1.65	1.81	1.97
0.10	0.321	0.407	0.491	0.574	0.657	0.739	0.822	0.905	0.987	1.07	1.15	1.32	1.48	1.65	1.82	1.98
0.15	0.304	0.385	0.467	0.550	0.631	0.712	0.793	0.874	0.955	1.04	1.12	1.28	1.45	1.61	1.78	1.94
0.20	0.289	0.363	0.442	0.521	0.600	0.678	0.757	0.835	0.915	0.994	1.07	1.23	1.40	1.56	1.72	1.89
0.25	0.272	0.342	0.416	0.492	0.567	0.643	0.719	0.794	0.870	0.947	1.02	1.18	1.34	1.50	1.66	1.83
0.30	0.255	0.320	0.389	0.462	0.534	0.608	0.680	0.754	0.827	0.901	0.976	1.13	1.28	1.44	1.60	1.77
0.40	0.224	0.280	0.341	0.405	0.471	0.539	0.607	0.675	0.744	0.814	0.884	1.03	1.18	1.33	1.48	1.64
0.50	0.196	0.245	0.299	0.356	0.416	0.478	0.541	0.605	0.669	0.735	0.802	0.939	1.08	1.23	1.38	1.53
0.60	0.172	0.216	0.264	0.315	0.370	0.426	0.485	0.544	0.605	0.666	0.729	0.860	0.996	1.14	1.28	1.43
0.70	0.153	0.193	0.236	0.282	0.331	0.383	0.437	0.493	0.549	0.607	0.667	0.791	0.922	1.06	1.20	1.34
0.80	0.137	0.173	0.212	0.254	0.299	0.347	0.397	0.449	0.502	0.557	0.613	0.732	0.857	0.987	1.12	1.26
0.90	0.124	0.157	0.192	0.231	0.272	0.316	0.363	0.412	0.461	0.513	0.567	0.679	0.798	0.922	1.05	1.19
1.0	0.114	0.143	0.176	0.211	0.249	0.290	0.334	0.380	0.426	0.475	0.526	0.632	0.745	0.864	0.988	1.12
1.2	0.0963	0.122	0.149	0.180	0.213	0.249	0.287	0.328	0.369	0.413	0.458	0.553	0.656	0.764	0.878	0.997
1.4	0.0835	0.105	0.130	0.156	0.185	0.217	0.251	0.288	0.325	0.364	0.404	0.490	0.583	0.682	0.787	0.898
1.6	0.0736	0.0930	0.114	0.138	0.164	0.193	0.224	0.256	0.289	0.324	0.361	0.439	0.524	0.615	0.712	0.815
1.8	0.0658	0.0831	0.102	0.124	0.147	0.173	0.201	0.230	0.260	0.292	0.326	0.397	0.475	0.558	0.648	0.744
2.0	0.0594	0.0751	0.0925	0.112	0.133	0.157	0.183	0.209	0.237	0.266	0.296	0.362	0.433	0.511	0.595	0.684
2.2	0.0542	0.0684	0.0844	0.102	0.122	0.144	0.167	0.191	0.217	0.243	0.272	0.332	0.399	0.471	0.549	0.632
2.4	0.0497	0.0629	0.0775	0.0939	0.112	0.132	0.154	0.176	0.200	0.225	0.251	0.307	0.369	0.436	0.509	0.587
2.6	0.0460	0.0581	0.0717	0.0869	0.104	0.123	0.143	0.164	0.185	0.208	0.233	0.285	0.343	0.406	0.474	0.548
2.8	0.0428	0.0541	0.0667	0.0809	0.0967	0.114	0.133	0.152	0.173	0.194	0.217	0.266	0.320	0.379	0.444	0.513
3.0	0.0400	0.0505	0.0624	0.0757	0.0905	0.107	0.125	0.143	0.162	0.182	0.203	0.249	0.300	0.356	0.417	0.483
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table 8.5 Polar moment of inertia of weld groups.

Weld Group	Polar moment of inertia, J	Weld Group	Polar moment of inertia, J
	$\frac{l^3}{12}$		$\frac{l \cdot (3(kl)^2 + l^2)}{6}$
	$\frac{l \cdot (3(kl)^2 + l^2)}{6}$		$\frac{(l + kl)^4 - 6l^2 \cdot (kl)^2}{12(l + kl)}$
	$\frac{8(kl)^3 + 6(l^2)kl + l^3}{12} - \frac{(kl)^4}{2kl + l}$		$\frac{(kl + l)^3}{6}$

8.4 Sample Calculations

8.4.1 C coefficients of concentrically loaded weld groups

C coefficient of weld element in a concentrically loaded weld group

Load angle $= 30^{\circ}$; Maximum load angle $= 60^{\circ}$:

$\Delta_u = 1.087(60 + 6)^{-0.65}w = 0.0714w$

$\Delta_{mi} = 0.209(30 + 2)^{-0.32}w = 0.0689w$

$p_i = 0.714w/0.0689w = 1.04$

$C = \left(1 + 0.50sin^{1.5}(30)\right) \cdot [1.04(1.9 - 0.9(1.04)]^{0.3} = 1.18$

Strength of concentrically loaded weld group

Figure 8.6 Sample problem 1; E49; $w = 6$ mm

Weld element	Length	Load angle: θ°
Element 1	40	60
Element 2	200	30
Element 3	40	60

Weld element	Length	Load angle: θ°	Max. θ	C
Element 1	40	60	60	1.39
Element 2	200	30	60	1.18
Element 3	40	60	60	1.39

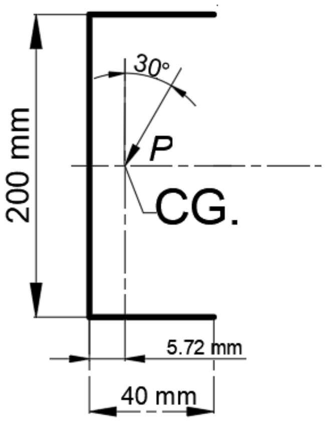


Figure 8.6 Sample problem 1.

$R_n = \{0.6(490)(\ 0.707(6))[(40(1.39)) + (200(1.18)) + (40(1.39))]\} \times 10^{-3}$

$= 433$ kN

$\phi R_n = (0.75)43.3 = 325$ kN (LRFD)

$R_n/\Omega = 43.3/2 = 217$ kN (ASD)

8.4.2 *C* coefficients for weld groups

Concentrically loaded C-shape (Figure 8.6):

Weld element	l_i	**θ°**	Δ_{mi}	Δ_{ui}	**Least** Δ_{ui}
Element 1	$0.2l$	60	0.335	0.428	0.428
Element 2	l	30	0.414	0.635	0.428
Element 3	$0.2l$	60	0.335	0.428	0.428

Least Δ_u	Δ_{mi}	p_i	$[p_i(1.9 - 0.9p_i)]^{0.3}$	$(1 + 0.50\sin^{1.5}\theta)$
0.428	0.335	1.28	0.987	1.40
0.428	0.414	1.03	1.00	1.18
0.428	0.335	1.28	0.987	1.40

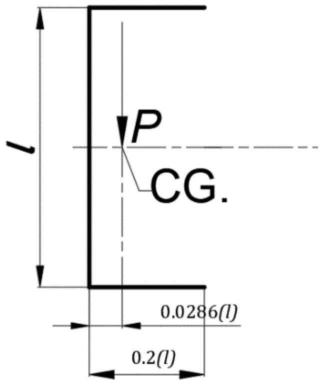


Figure 8.7 Sample problem 2.

Weld element	l_i	$l_i(1+0.50\sin^{1.5}\theta)[p_i(1.9-0.9p_i)]^{0.3}$
Element 1	$0.2l$	$0.276l$
Element 2	l	$1.18l$
Element 3	$0.2l$	$0.276l$

$C = 0.6(490)(1.73 \cdot l)/l \times 10^{-3} = 0.509$

$t = 0.707(6) = 4.24$ mm

$R_n = (0.509)(1)(4.24)(200) = 433$ kN

$\phi R_n = (0.75)433 = 325$ kN (LRFD)

$R_n/\Omega = 433/2 = 217$ kN (ASD)

C coefficient of transversely and longitudinally loaded weld group (Figure 8.7)

$[0.85(l) + 1.5(2)(0.2l) = 1.45l] > [(1)(l) + 2(0.2l) = 1.4l]$

$u = 1.45l$

$C = 0.6(490)(1.45l)/l \times 10^{-3} = 0.42$

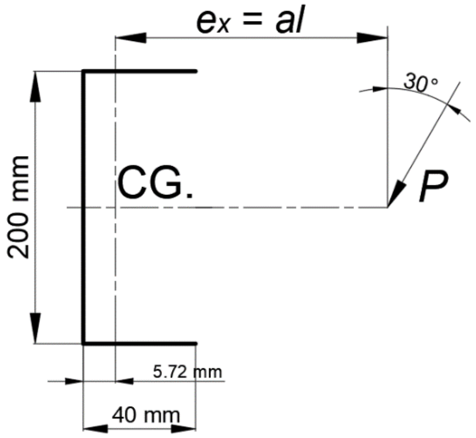


Figure 8.8 Sample problem 3.

C coefficient of eccentrically loaded weld group (Figure 8.8)

E49; $l = 200$ mm; $k = 0.20$; a $= 0.20$; $w = 6$ mm:

Sample calculation for Element 1:

$x_1 = 29.3$ mm

$y_1 = 100$ mm

$d_{x1} = 29.3 - 0 = 29.3$ mm

$d_{y1} = 100 - 0 = 100$ mm

$d_1 = \sqrt{29.3^2 + 100^2} = 104$ mm

$\boldsymbol{d_1} = [29.3\ ,100]$

$\boldsymbol{longitudinal\ axis}_{\boldsymbol{1}} = [1.00\ , 0.00]$

$cos\,\theta' = [(29.3)(1.0) + (100)(0)]/[|104| \cdot |1|] = 0.282$

$\theta' = cos^{-1}(0.282)$

$\theta' = 73.7°$

$\theta = 90 - \theta'$

$\theta = 90 - 73.7 = 16.3°$

$\Delta_{m1} = 0.209(16.3 + 2)^{-0.32}(6.0) = 0.494$

$\Delta_{u1} = 1.087(16.3 + 6)^{-0.65}(6.0) = 0.866$

$\Delta_{u1}/d_1 = 0.866/104 = 0.00831$

Element	$\boldsymbol{d_{xi}}$	$\boldsymbol{d_{yi}}$	$\boldsymbol{d_i}$	$\boldsymbol{\theta_i'}$	$\boldsymbol{\theta_i}$	$\boldsymbol{\Delta_{mi}}$	$\boldsymbol{\Delta_{ui}}$	$\boldsymbol{\Delta_{ui}/d_i}$
1	29.3	100	104	73.7	16.3	0.494	0.866	0.00831
2	19.3	100	102	79.1	10.9	0.553	1.04	0.0102
3	9.29	100	100	84.7	5.31	0.664	1.35	0.0134
4	-0.714	100	100	89.6	0.409	0.946	1.95	0.0195
5	-5.71	95.0	95.2	3.44	86.6	0.299	0.344	0.00361
6	-5.71	85.0	85.2	3.85	86.2	0.299	0.345	0.00405
7	-5.71	75.0	75.2	4.36	85.6	0.300	0.346	0.00460
8	-5.71	65.0	65.3	5.02	85.0	0.300	0.348	0.00533
9	-5.71	55.0	55.3	5.93	84.1	0.301	0.350	0.00633
10	-5.71	45.0	45.4	7.24	82.8	0.303	0.353	0.00779
11	-5.71	35.0	35.5	9.27	80.7	0.305	0.359	0.0101
12	-5.71	25.0	25.6	12.9	77.1	0.310	0.369	0.0144
13	-5.71	15.0	16.1	20.9	69.1	0.320	0.394	0.0245
14	-5.71	5.00	7.59	48.8	41.2	0.376	0.533	0.0701
15	-5.71	-5.00	7.59	48.8	41.2	0.376	0.533	0.0701
16	-5.71	-15.0	16.1	20.9	69.1	0.320	0.394	0.0245
17	-5.71	-25.0	25.6	12.9	77.1	0.310	0.369	0.0144
18	-5.71	-35.0	35.5	9.27	80.7	0.305	0.359	0.0101
19	-5.71	-45.0	45.4	7.24	82.8	0.303	0.353	0.00779
20	-5.71	-55.0	55.3	5.93	84.1	0.301	0.350	0.00633
21	-5.71	-65.0	65.3	5.02	85.0	0.300	0.348	0.00533
22	-5.71	-75.0	75.2	4.36	85.6	0.300	0.346	0.00460
23	-5.71	-85.0	85.2	3.85	86.2	0.299	0.345	0.00405
24	-5.71	-95.0	95.2	3.44	86.6	0.299	0.344	0.00361
25	-0.714	-100	100	89.6	0.409	0.946	1.95	0.0195
26	9.29	-100	100	84.7	5.31	0.664	1.35	0.0134
27	19.3	-100	102	79.1	10.9	0.553	1.04	0.0102
28	29.3	-100	104	73.7	16.3	0.494	0.866	0.00831

$\Delta_{ucr} = \Delta_{u5}/d_5 = 0.00361$

$\Delta_1 = (d_1)(\Delta_{u5}/d_5) = (104)(0.00361) = 0.376$

$p_1 = 0.376/0.494 = 0.761$

$R_1 = 0.6(490)[1 + 0.50 sin^{1.5}(16.3°)](10)[0.707(6)][0.761(1.9 - 0.9(0.761))]^{0.3} = 13100 \text{ N}$

$R_{x1} = 13100(100/104) = -12600 \text{ N}$

$R_{y1} = 13100(29.3/104) = 3680 \text{ N}$

$M_1 = 13100(104) = 1360000 \text{ N·mm}$

Element	d_{xi}	d_{yi}	d_i	$d_i\Delta_{ucr}/d_{ucr}$	Δ_{mi}	R_i	R_{xi}	R_{yi}	M_i
1	29.3	100	104	0.376	0.494	13100	-12600	3680	1360000
2	19.3	100	102	0.368	0.553	12400	-12200	2360	1270000
3	9.29	100	100	0.363	0.664	11700	-11600	1080	1170000
4	-0.714	100	100	0.361	0.946	10700	-10700	-76.2	1070000
5	-5.71	95.0	95.2	0.344	0.299	18700	-18600	-1120	1780000
6	-5.71	85.0	85.2	0.308	0.299	18700	-18700	-1250	1590000
7	-5.71	75.0	75.2	0.272	0.300	18600	-18500	-1410	1400000
8	-5.71	65.0	65.3	0.236	0.300	18300	-18200	-1600	1190000
9	-5.71	55.0	55.3	0.200	0.301	17900	-17800	-1850	987000
10	-5.71	45.0	45.4	0.164	0.303	17200	-17100	-2170	780000
11	-5.71	35.0	35.5	0.128	0.305	16200	-16000	-2620	576000
12	-5.71	25.0	25.6	0.0926	0.310	14900	-14500	-3320	382000
13	-5.71	15.0	16.1	0.0580	0.320	12800	-12000	-4560	205000
14	-5.71	5.00	7.59	0.0274	0.376	8650	-5690	-6510	65600
15	-5.71	-5.00	7.59	0.0274	0.376	8650	5690	-6510	65600
16	-5.71	-15.0	16.1	0.0580	0.320	12800	12000	-4560	205000
17	-5.71	-25.0	25.6	0.0926	0.310	14900	14500	-3320	382000
18	-5.71	-35.0	35.5	0.128	0.305	16200	16000	-2620	576000
19	-5.71	-45.0	45.4	0.164	0.303	17200	17100	-2170	780000
20	-5.71	-55.0	55.3	0.200	0.301	17900	17800	-1850	987000
21	-5.71	-65.0	65.3	0.236	0.300	18300	18200	-1600	1190000
22	-5.71	-75.0	75.2	0.272	0.300	18600	18500	-1410	1400000
23	-5.71	-85.0	85.2	0.308	0.299	18700	18700	-1250	1590000
24	-5.71	-95.0	95.2	0.344	0.299	18700	18600	-1120	1780000
25	-0.714	-100	100	0.361	0.946	10700	10700	-76.2	1070000
26	9.29	-100	100	0.363	0.664	11700	11600	1080	1170000
27	19.3	-100	102	0.368	0.553	12400	12200	2360	1270000
28	29.3	-100	104	0.376	0.494	13100	12600	3680	1360000
						Σ	0.00	-38700	27700000

$$M_{CG} = -27700000 \text{ N·mm}$$

$$e_x = 40\, cos(180 - 30) + 0\, sin(180 - 30) = -34.6 \text{ mm}$$

$$e_{IC} = (0 - 0) \cdot cos(180 - 30) + (0 - 0) \cdot sin(180 - 30) - 34.6 = 34.6 \text{ mm}$$

$$P_n = 27700000/34.6 = 799000 \text{ N}$$

$$P_x = 79900\, sin(30°) = -400000 \text{ N}$$

$$P_y = 799000\, cos(30°) = -692000 \text{ N}$$

$$|F_x = -400000 + 0.00 = -400000 \times 10^{-3} \text{ kN}| > 0.01$$

$$\left|F_y = -692000 - 38700 = -731000 \times 10^{-3} \text{ kN} \right| > 0.01$$

$$J_{CG} = \; [8(40^3) + 6(40)(200^2) + 200^3]/12 - 40^4/[2(40) + 200]$$

$$J_{CG} = 1500000 \text{ mm}^3$$

$$x_{\text{IC}} = 0 - (-731000)(1500000)/[(280)(-27700000)] = -141 \text{ mm}$$

$$y_{\text{IC}} = 0 + (-400000)(1500000)/[(280)(-27700000)] = 77.4 \text{ mm}$$

Final iteration

$x_{\mathrm{IC}} = -109\ \mathrm{mm}$

$y_{\mathrm{IC}} = 74.7\ \mathrm{mm}$

Element	d_{xi}	d_{yi}	d_i	θ_i'	θ_i	Δ_{mi}	Δ_{ui}	Δ_{ui}/d_i
1	139	25.3	141	10.3	79.7	0.307	0.361	0.00257
2	129	25.3	131	11.1	78.9	0.307	0.364	0.00277
3	119	25.3	121	12.0	78.0	0.309	0.366	0.00302
4	109	25.3	112	13.1	76.9	0.310	0.369	0.00331
5	104	20.3	106	78.9	11.1	0.551	1.03	0.00976
6	104	10.3	104	84.3	5.68	0.653	1.32	0.0127
7	104	0.309	104	89.8	0.171	0.979	2.00	0.0193
8	104	-9.69	104	84.7	5.34	0.663	1.35	0.0129
9	104	-19.7	105	79.2	10.8	0.555	1.04	0.00990
10	104	-29.7	108	74.0	16.0	0.497	0.875	0.00812
11	104	-39.7	111	69.0	21.0	0.460	0.766	0.00691
12	104	-49.7	115	64.4	25.6	0.434	0.691	0.00601
13	104	-59.7	120	60.1	29.9	0.414	0.636	0.00532
14	104	-69.7	125	56.1	33.9	0.399	0.594	0.00475
15	104	-79.7	131	52.4	37.6	0.387	0.561	0.00429
16	104	-89.7	137	49.1	40.9	0.377	0.535	0.00390
17	104	-99.7	144	46.1	43.9	0.369	0.514	0.00357
18	104	-110	151	43.4	46.6	0.362	0.496	0.00329
19	104	-120	158	40.9	49.1	0.356	0.481	0.00304
20	104	-130	166	38.6	51.4	0.351	0.469	0.00283
21	104	-140	174	36.6	53.4	0.347	0.458	0.00264
22	104	-150	182	34.7	55.3	0.343	0.449	0.00247
23	104	-160	190	33.0	57.0	0.340	0.441	0.00232
24	104	-170	199	31.4	58.6	0.337	0.434	0.00218
25	109	-175	206	58.1	31.9	0.406	0.614	0.00299
26	119	-175	211	55.8	34.2	0.398	0.591	0.00280
27	129	-175	217	53.6	36.4	0.390	0.571	0.00263
28	139	-175	223	51.6	38.4	0.384	0.554	0.00248

Element	d_{xi}	d_{yi}	d_i	$d_i\Delta_{ucr}/d_{ucr}$	Δ_{mi}	R_i	R_{xi}	R_{yi}	M_i
1	139	25.3	141	0.308	0.307	18600	-3330	18300	2620000
2	129	25.3	131	0.286	0.307	18500	-3570	18100	2420000
3	119	25.3	121	0.265	0.309	18300	-3820	17900	2220000
4	109	25.3	112	0.244	0.310	18100	-4110	17600	2020000
5	104	20.3	106	0.231	0.551	11400	-2180	11100	1200000
6	104	10.3	104	0.227	0.653	10600	-1050	10600	1100000
7	104	0.309	104	0.226	0.979	9410	-28.1	9410	976000
8	104	-9.69	104	0.227	0.663	10600	982	10500	1100000
9	104	-19.7	105	0.230	0.555	11300	2110	11100	1190000
10	104	-29.7	108	0.235	0.497	12000	3310	11500	1290000
11	104	-39.7	111	0.242	0.460	12700	4530	11800	1410000
12	104	-49.7	115	0.251	0.434	13300	5760	12000	1530000
13	104	-59.7	120	0.261	0.414	13900	6950	12100	1670000
14	104	-69.7	125	0.273	0.399	14500	8090	12000	1810000
15	104	-79.7	131	0.286	0.387	15000	9160	11900	1960000
16	104	-89.7	137	0.299	0.377	15500	10100	11700	2120000
17	104	-99.7	144	0.314	0.369	15900	11000	11500	2290000
18	104	-110	151	0.330	0.362	16300	11800	11200	2450000
19	104	-120	158	0.346	0.356	16600	12500	10800	2620000
20	104	-130	166	0.363	0.351	16800	13100	10500	2790000
21	104	-140	174	0.380	0.347	17000	13600	10100	2950000
22	104	-150	182	0.398	0.343	17100	14000	9730	3110000
23	104	-160	190	0.416	0.340	17100	14400	9340	3260000
24	104	-170	199	0.434	0.337	17100	14600	8940	3410000
25	109	-175	206	0.449	0.406	14900	12600	7850	3060000
26	119	-175	211	0.461	0.398	15100	12500	8470	3180000
27	129	-175	217	0.474	0.390	15200	12300	9030	3300000
28	139	-175	223	0.487	0.384	15300	12000	9540	3420000
						$\sum$	187000	325000	62500000

$e_{IC} = -109\, cos(180 - 30) + 74.2\, sin(180 - 30) + 34.6 = 167 \text{ mm}$

$P_n = 62500000/167 = 375000 \text{ N}$

$P_x = 375000\, sin(30°) = -187000 \text{ N}$

$P_y = 375000\, cos(30°) = -325000 \text{ N}$

$|F_x = -187000 + 187000 = 0 \text{ kN}| < 0.01$

$\left|F_y = -325000 + 325000 = 0 \text{ kN}\right| < 0.01$

$C = 375000/[(200)(0.707)(6)] \times 10^{-3} = 0.442$

CHAPTER 9

DESIGN OF CONNECTING ELEMENTS

9.1 Introduction

This chapter develops the design tables for connecting elements that use European I-shaped sections of S235, S275 and S355 steels and presents the equations and sample calculations in developing the tables.

9.2 Design Equations

9.2.1 Net area determination

The width of a bolt hole is taken as 2 mm greater than the nominal dimension of the hole in calculating the net area for tension and shear.

9.2.2 Block shear strength

The nominal strength for the limit state of block shear rupture, R_n, is

$$R_n = 0.6F_uA_{nv} + U_{bs}F_uA_{nt} \leq 0.6F_yA_{gv} + U_{bs}F_uA_{nt} \tag{9.1}$$

where A_{gv} and A_{nv} are the gross and net areas subject to shear, respectively, A_{nt} is the net area subject to tension, and U_{bs} is 1.0 when tension stress is uniform. The resistance factor, ϕ, is 0.75 for LRFD, whereas the safety factor, Ω, is 2.00 for ASD.

9.2.3 Webs with concentrated forces

The nominal strength of I-shaped members without stiffeners to resist concentrated forces applied normal to the flange face, R_n, is calculated based on the limit state of web local yielding:

$$R_n = F_y t_w (5k + l_b) \tag{9.2}$$

when the concentrated force is applied at a distance, x, greater than the section depth, d, from the member end (same as Eq. 3.14; repeated here for convenience), whereas

$$R_n = F_y t_w (2.5k + l_b) \tag{9.3}$$

when the force is applied closer, and based on the limit state of web local crippling:

$$R_n = 0.80 t_w^2 \left[1 + (3l_b/d)\left(t_w/t_f\right)^{1.5}\right] \sqrt{E \cdot F_y t_f / t_w}\, Q_f \tag{9.4}$$

when the concentrated compressive force is applied at a distance $d/2$ or greater from the member end, whereas

$$R_n = 0.40 t_w^2 \left[1 + (3\, l_b/d)\left(t_w/t_f\right)^{1.5}\right] \sqrt{E \cdot F_y t_f / t_w}\, Q_f \tag{9.5}$$

for $l_b/d \leq 0.20$ and

$$R_n = 0.40 t_w^2 \left[1 + (4l_b/d - 0.2)\left(t_w/t_f\right)^{1.5}\right] \sqrt{E \cdot F_y t_f / t_w}\, Q_f \tag{9.6}$$

for $l_b/d > 0.20$ when the force is applied closer, where l_b is not less than k for end beam reactions ($x \leq d$) and Q_f is 1.0 for wide-flange sections. For the limit state of web local yielding, the resistance factor, ϕ, is 1.00 for LRFD and the safety factor, Ω, is 1.50 for ASD. For the limit state of web local crippling, the resistance factor, ϕ, is 0.75 for LRFD and the safety factor, Ω, is 2.0 for ASD.

9.3 Design Tables

The following design tables were developed to facilitate the design of connecting elements that use European I-shaped sections of S235, S275 and S355 steels:

(1) Reduction in area for holes
(2) Elastic section modulus for coped I-shapes
(3) Block shear strength
(4) Beam bearing constants

9.3.1 Reduction in area for holes

The reduction in area for standard, oversized, short-slotted and long-slotted holes (see Table 7.2 for the hole dimensions) for element thicknesses, t, ranging from 2 to 30 mm was presented in Table I.1 in Appendix I (and Table 9.1). The tabulated values were calculated by

$$\text{area reduction} = (\text{longer hole dimension} + 2\text{ mm})(t) \qquad (9.7)$$

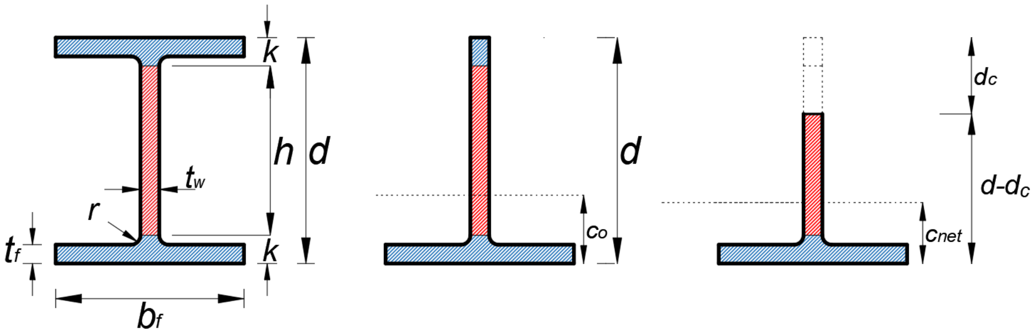
9.3.2 Elastic section modulus for coped I-shapes

The gross and net elastic section moduli, S_o and S_{net}, respectively, for coped I-shapes (Figure 9.1) were presented in Table I.2 in Appendix I (see Table 9.2 for a sample). S_{net} was calculated for cope depths, d_c, ranging from 25 to 250 mm, if not less than the flange thickness and not greater than half the section depth. The gross elastic section modulus for coped I-shapes is

$$S_o = I_o/(d - c_o) \qquad (9.8)$$

where I_o is the strong-axis moment of inertia of the gross coped section:

$$I_o = I_f + A_f\left(c_o - c_f\right)^2 + \frac{1}{12}t_w(d-k)^3 + t_w(d-k)\left(\frac{d-k}{2} + k - c_o\right)^2 \qquad (9.9)$$



S_x (a) S_o (b) S_{net} (c)

Figure 9.1 Elastic section modulus for coped I-shapes.

and c_o is the ENA depth from the section bottom:

$$c_o = \frac{A_f c_f + t_w(d-k)[k+(d-k)/2]}{A_f + t_w(d-k)} \qquad (9.10)$$

in which I_f is the strong-axis moment of inertia of the combined area of the bottom flange and the fillet portion of the web:

$$I_f = \frac{1}{2}\left(I_x - \frac{1}{12}t_w h^3\right) - A_f\left(d/2 - c_f\right)^2 \qquad (9.11)$$

A_f is the combined area of the bottom flange and the fillet portion of the web:

$$A_f = \left(A_g - t_w h\right)/2 \qquad (9.12)$$

and c_f is its ENA depth from the section bottom:

$$c_f = \frac{\left(b_f t_f\right) t_f/2 + (t_w r)\left(t_f + r/2\right) + 2(r^2 - \pi r^2/4)\left(\frac{10-3\pi}{12-3\pi}r + t_f\right)}{A_f} \qquad (9.13)$$

where r is the fillet radius. The net elastic section modulus for coped I-shapes was calculated by inserting $d - d_c$ for d in Eqs. 9.8–10.

9.3.3 Block shear strength

The tension rupture, shear yielding and shear rupture terms in the block shear strength equation (see Eq. 9.1) were presented in Table I.3 in Appendix I (see Table 9.3 for a sample). The tabulated values were given per mm of connecting element thickness.

The nominal tension rupture component for $U_{bs} = 1.0$ is

$$F_u A_{nt}/t \tag{9.14}$$

where

$$A_{nt}/t = l_{eh} - (d_h + 2\text{ mm})/2 \tag{9.15}$$

in which l_{eh} is the horizontal edge distance between the center of the hole and the edge of the element, and d_h is the hole diameter (see Table 7.2). The table was developed for l_{eh} ranging from 25 to 75 mm.

The nominal shear yielding component is

$$0.6F_y A_{gv}/t \tag{9.16}$$

where

$$A_{gv}/t = l_{ev} + (n - 1)(75\text{ mm}) \tag{9.17}$$

in which l_{ev} is the vertical edge distance between the center of the hole at the top and the edge of the element, and n is the number of bolts.

The nominal shear rupture component is

$$0.6F_u A_{nv}/t \tag{9.18}$$

where

$$A_{nv}/t = l_{ev} + (n - 1)(75\text{ mm}) - (n - 0.5)(d_h + 2\text{ mm}) \tag{9.19}$$

The table was developed for l_{ev} ranging from 25 to 75 mm and n ranging from 2 to 12 with 75 mm bolt spacing.

9.3.4 Beam bearing constants

Beam bearing constants, the terms in the available strength equations for web local yielding and web local crippling limit states (see Eqs. 9.2–6), were presented in Table I.4 in Appendix I (see Table 9.4 for a sample):

$$R_1 = 2.5k \cdot F_y t_w \tag{9.20}$$

$$R_2 = F_y t_w \tag{9.21}$$

$$R_3 = 0.40 t_w^2 \sqrt{E \cdot F_y t_f / t_w}\, Q_f \tag{9.22}$$

$$R_4 = 0.40 t_w^2 (3/d) \left(t_w/t_f\right)^{1.5} \sqrt{E \cdot F_y t_f / t_w}\, Q_f \tag{9.23}$$

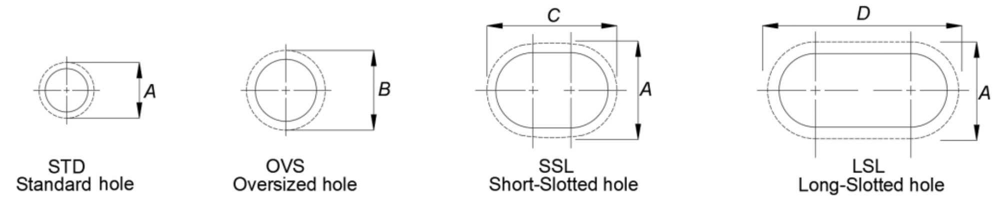
$$R_5 = 0.40 t_w^2 \left[1 - 0.2\left(t_w/t_f\right)^{1.5}\right] \sqrt{E \cdot F_y t_f / t_w}\, Q_f \tag{9.24}$$

$$R_6 = 0.40 t_w^2 (4/d) \left(t_w/t_f\right)^{1.5} \sqrt{E \cdot F_y t_f / t_w}\, Q_f \tag{9.25}$$

The table also provides the available strength based on these limit states for $l_b =$ 80 mm and the strong-axis available shear strength without considering the tension field action according to LRFD and ASD, $\phi_v V_{nx}$ and V_{nx}/Ω_v, respectively.

Table 9.1 Reduction in area for holes.

Reduction in Area for Holes, mm^2

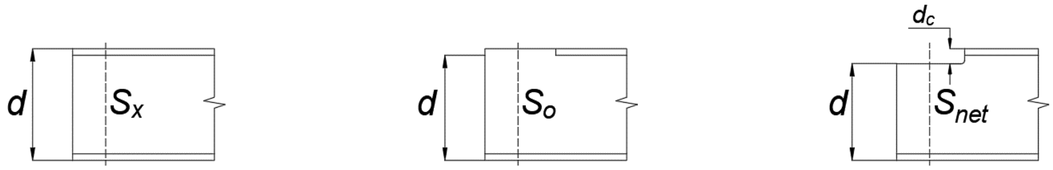


Thickness, t, mm	$A \times t$							$B \times t$						
	Bolt Diameter, d, mm							**Bolt Diameter, d, mm**						
	16	**20**	**22**	**24**	**27**	**30**	**36**	**16**	**20**	**22**	**24**	**27**	**30**	**36**
2	40.0	48.0	52.0	56.0	64.0	70.0	82.0	44.0	52.0	60.0	64.0	74.0	80.0	92.0
4	80.0	96.0	104	112	128	140	164	88.0	104	120	128	148	160	184
6	120	144	156	168	192	210	246	132	156	180	192	222	240	276
8	160	192	208	224	256	280	328	176	208	240	256	296	320	368
10	200	240	260	280	320	350	410	220	260	300	320	370	400	460
12	240	288	312	336	384	420	492	264	312	360	384	444	480	552
14	280	336	364	392	448	490	574	308	364	420	448	518	560	644
16	320	384	416	448	512	560	656	352	416	480	512	592	640	736
18	360	432	468	504	576	630	738	396	468	540	576	666	720	828
20	400	480	520	560	640	700	820	440	520	600	640	740	800	920
22	440	528	572	616	704	770	902	484	572	660	704	814	880	1010
24	480	576	624	672	768	840	984	528	624	720	768	888	960	1100
26	520	624	676	728	832	910	1070	572	676	780	832	962	1040	1200
28	560	672	728	784	896	980	1150	616	728	840	896	1040	1120	1290
30	600	720	780	840	960	1050	1230	660	780	900	960	1110	1200	1380

Thickness, t, mm	$C \times t$							$D \times t$						
	Bolt Diameter, d, mm							**Bolt Diameter, d, mm**						
	16	**20**	**22**	**24**	**27**	**30**	**36**	**16**	**20**	**22**	**24**	**27**	**30**	**36**
2	48.0	56.0	64.0	68.0	78.0	84.0	96.0	84.0	104	114	124	138	154	184
4	96.0	112	128	136	156	168	192	168	208	228	248	276	308	368
6	144	168	192	204	234	252	288	252	312	342	372	414	462	552
8	192	224	256	272	312	336	384	336	416	456	496	552	616	736
10	240	280	320	340	390	420	480	420	520	570	620	690	770	920
12	288	336	384	408	468	504	576	504	624	684	744	828	924	1100
14	336	392	448	476	546	588	672	588	728	798	868	966	1080	1290
16	384	448	512	544	624	672	768	672	832	912	992	1100	1230	1470
18	432	504	576	612	702	756	864	756	936	1030	1120	1240	1390	1660
20	480	560	640	680	780	840	960	840	1040	1140	1240	1380	1540	1840
22	528	616	704	748	858	924	1060	924	1140	1250	1360	1520	1690	2020
24	576	672	768	816	936	1010	1150	1010	1250	1370	1490	1660	1850	2210
26	624	728	832	884	1010	1090	1250	1090	1350	1480	1610	1790	2000	2390
28	672	784	896	952	1090	1180	1340	1180	1460	1600	1740	1930	2160	2580
30	720	840	960	1020	1170	1260	1440	1260	1560	1710	1860	2070	2310	2760

Table 9.2 Elastic section modulus of coped HD shapes.

Elastic Section Modulus for Coped HD Shapes

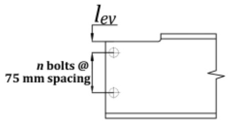


Shape	d, mm	t_f, mm	S_x, $\times10^3$ mm^3	S_o, $\times10^3$ mm^3	S_{net}, $\times10^3$ mm^3									
					d_c, mm									
					25	50	75	100	125	150	175	200	225	250
HD 400 × 1086	569	125	20940	5980	–	–	–	–	3620	3220	2850	2510	2190	1900
× 990	550	115	18870	5210	–	–	–	–	3100	2740	2410	2110	1830	1580
× 900	531	106	16960	4490	–	–	–	–	2620	2300	2010	1740	1500	1280
× 818	514	97.0	15260	3910	–	–	–	2530	2230	1950	1690	1460	1240	1050
× 744	498	88.9	13740	3400	–	–	–	2160	1900	1650	1420	1210	1020	
× 677	483	81.5	12400	2980	–	–	–	1870	1630	1410	1200	1020	852	
× 634	474	77.1	11570	2690	–	–	–	1670	1450	1250	1060	894	743	
× 592	465	72.3	10760	2460	–	–	1730	1510	1310	1120	951	796	657	
× 551	455	67.6	9939	2210	–	–	1540	1340	1160	989	833	692	566	
× 509	446	62.7	9172	2000	–	–	1380	1200	1030	874	731	603		
× 463	435	57.4	8283	1760	–	–	1200	1040	889	751	625	511		
× 421	425	52.6	7510	1550	–	–	1050	904	769	646	533	432		
× 382	416	48.0	6794	1360	–	1050	913	783	663	553	453	364		
× 347	407	43.7	6140	1200	–	922	797	681	573	475	386	307		
× 314	399	39.6	5525	1060	–	813	700	596	500	412	332			
× 287	393	36.6	5074	943	–	720	619	525	439	360	289			
× 262	387	33.3	4620	858	–	652	560	474	394	322	258			
× 237	380	30.2	4146	747	–	565	483	408	338	275	218			
× 216	375	27.7	3794	670	–	505	431	362	299	242	191			
× 187	368	24.0	3271	564	492	424	360	302	248	200	156			
HD 360 × 196	372	26.2	3421	624	–	470	400	336	277	224	176			
× 179	368	23.9	3122	561	489	421	358	300	247	198	155			
× 162	364	21.8	2832	491	427	368	312	261	214	172	134			
× 147	360	19.8	2572	446	387	333	282	235	192	153	119			
× 134	356	18.0	2332	399	346	297	251	209	170	136	105			
HD 320 × 300	375	48.0	4635	984	–	739	629	528	435	352	278			
× 245	359	40.0	3796	719	–	533	450	374	305	243	189			
× 198	343	32.0	3026	570	–	417	349	287	231	181				
× 158	330	25.5	2403	432	–	312	259	211	168	129				
× 127	320	20.5	1926	327	279	234	193	156	123	93.2				
× 97.6	310	15.5	1479	244	207	172	141	113	87.7	65.5				
× 74.2	301	11.0	1093	203	172	143	116	92.4	71.1	52.5				
HD 260 × 172	290	32.5	2159	403	–	276	221	173	130					
× 142	278	26.5	1750	322	–	217	172	132	97.3					
× 114	268	21.5	1411	246	203	163	128	97.0	70.2					
× 93.0	260	17.5	1148	188	154	124	96.1	71.9	51.3					
× 68.2	250	12.5	836.4	132	108	85.3	65.5	48.1	33.3					
× 54.1	244	9.50	654.1	110	88.8	70.0	53.4	38.9						

– Indicates that cope depth is less than flange thickness.
Note: Values are omitted when cope depth exceeds d/2.

Table 9.3 Block shear strength for coped I-shapes of S355 steel.

Block Shear
Shear Rupture Component
per mm of thickness, kN/mm

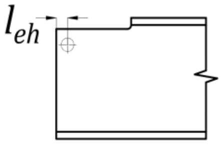


F_u, MPa		510													
n	l_{ev}, mm	Bolt diameter, d, mm[a]													
		16		20		22		24		27		30		36	
		$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
12	**25**	142	94.9	132	87.8	126	84.3	121	80.8	111	73.7	103	68.5	86.9	57.9
	30	143	95.6	133	88.6	128	85.1	122	81.5	112	74.5	104	69.2	88.0	58.7
	35	145	96.4	134	89.4	129	85.8	123	82.3	113	75.3	105	70.0	89.2	59.4
	40	146	97.2	135	90.1	130	86.6	125	83.1	114	76.0	106	70.8	90.3	60.2
	45	147	97.9	136	90.9	131	87.4	126	83.8	115	76.8	107	71.5	91.5	61.0
	50	148	98.7	137	91.6	132	88.1	127	84.6	116	77.6	108	72.3	92.6	61.7
	55	149	99.5	139	92.4	133	88.9	128	85.4	118	78.3	110	73.1	93.8	62.5
	60	150	100	140	93.2	134	89.7	129	86.1	119	79.1	111	73.8	94.9	63.3
	65	151	101	141	93.9	136	90.4	130	86.9	120	79.9	112	74.6	96.0	64.0
	70	153	102	142	94.7	137	91.2	132	87.7	121	80.6	113	75.4	97.2	64.8
	75	154	103	143	95.5	138	92.0	133	88.4	122	81.4	114	76.1	98.3	65.6
11	**25**	130	86.4	120	80.0	115	76.8	110	73.6	101	67.2	93.5	62.3	79.1	52.7
	30	131	87.2	121	80.8	116	77.6	112	74.4	102	67.9	94.7	63.1	80.2	53.5
	35	132	88.0	122	81.5	118	78.3	113	75.1	103	68.7	95.8	63.9	81.4	54.2
	40	133	88.7	123	82.3	119	79.1	114	75.9	104	69.5	97.0	64.6	82.5	55.0
	45	134	89.5	125	83.1	120	79.9	115	76.7	105	70.2	98.1	65.4	83.7	55.8
	50	135	90.3	126	83.8	121	80.6	116	77.4	106	71.0	99.3	66.2	84.8	56.5
	55	137	91.0	127	84.6	122	81.4	117	78.2	108	71.8	100	66.9	85.9	57.3
	60	138	91.8	128	85.4	123	82.2	118	78.9	109	72.5	102	67.7	87.1	58.1
	65	139	92.6	129	86.1	124	82.9	120	79.7	110	73.3	103	68.5	88.2	58.8
	70	140	93.3	130	86.9	126	83.7	121	80.5	111	74.1	104	69.2	89.4	59.6
	75	141	94.1	132	87.7	127	84.5	122	81.2	112	74.8	105	70.0	90.5	60.4
10	**25**	117	78.0	108	72.2	104	69.3	99.6	66.4	90.9	60.6	84.3	56.2	71.3	47.5
	30	118	78.8	109	73.0	105	70.1	101	67.2	92.0	61.4	85.5	57.0	72.4	48.3
	35	119	79.6	111	73.7	106	70.8	102	67.9	93.2	62.1	86.6	57.8	73.6	49.0
	40	120	80.3	112	74.5	107	71.6	103	68.7	94.3	62.9	87.8	58.5	74.7	49.8
	45	122	81.1	113	75.3	109	72.4	104	69.5	95.5	63.6	88.9	59.3	75.8	50.6
	50	123	81.9	114	76.0	110	73.1	105	70.2	96.6	64.4	90.1	60.1	77.0	51.3
	55	124	82.6	115	76.8	111	73.9	106	71.0	97.8	65.2	91.2	60.8	78.1	52.1
	60	125	83.4	116	77.6	112	74.7	108	71.8	98.9	65.9	92.4	61.6	79.3	52.9
	65	126	84.2	118	78.3	113	75.4	109	72.5	100	66.7	93.5	62.3	80.4	53.6
	70	127	84.9	119	79.1	114	76.2	110	73.3	101	67.5	94.7	63.1	81.6	54.4
	75	129	85.7	120	79.9	115	77.0	111	74.1	102	68.2	95.8	63.9	82.7	55.2
9	**25**	104	69.6	96.6	64.4	92.7	61.8	88.8	59.2	81.0	54.0	75.2	50.1	63.5	42.3
	30	106	70.4	97.8	65.2	93.9	62.6	90.0	60.0	82.2	54.8	76.3	50.9	64.6	43.1
	35	107	71.1	98.9	65.9	95.0	63.3	91.1	60.7	83.3	55.5	77.5	51.6	65.8	43.8
	40	108	71.9	100	66.7	96.2	64.1	92.3	61.5	84.5	56.3	78.6	52.4	66.9	44.6
	45	109	72.7	101	67.5	97.3	64.9	93.4	62.3	85.6	57.1	79.8	53.2	68.0	45.4
	50	110	73.4	102	68.2	98.5	65.6	94.6	63.0	86.8	57.8	80.9	53.9	69.2	46.1
	55	111	74.2	104	69.0	99.6	66.4	95.7	63.8	87.9	58.6	82.0	54.7	70.3	46.9
	60	112	75.0	105	69.8	101	67.2	96.8	64.6	89.0	59.4	83.2	55.5	71.5	47.7
	65	114	75.7	106	70.5	102	67.9	98.0	65.3	90.2	60.1	84.3	56.2	72.6	48.4
	70	115	76.5	107	71.3	103	68.7	99.1	66.1	91.3	60.9	85.5	57.0	73.8	49.2
	75	116	77.3	108	72.1	104	69.5	100	66.9	92.5	61.7	86.6	57.8	74.9	50.0
8	**25**	91.8	61.2	84.9	56.6	81.5	54.3	78.0	52.0	71.1	47.4	66.0	44.0	55.7	37.1
	30	92.9	62.0	86.1	57.4	82.6	55.1	79.2	52.8	72.3	48.2	67.1	44.8	56.8	37.9
	35	94.1	62.7	87.2	58.1	83.8	55.8	80.3	53.6	73.4	49.0	68.3	45.5	57.9	38.6
	40	95.2	63.5	88.4	58.9	84.9	56.6	81.5	54.3	74.6	49.7	69.4	46.3	59.1	39.4
	45	96.4	64.3	89.5	59.7	86.1	57.4	82.6	55.1	75.7	50.5	70.6	47.0	60.2	40.2
	50	97.5	65.0	90.7	60.4	87.2	58.1	83.8	55.8	76.9	51.3	71.7	47.8	61.4	40.9
	55	98.7	65.8	91.8	61.2	88.4	58.9	84.9	56.6	78.0	52.0	72.9	48.6	62.5	41.7
	60	99.8	66.6	92.9	62.0	89.5	59.7	86.1	57.4	79.2	52.8	74.0	49.3	63.7	42.5
	65	101	67.3	94.1	62.7	90.7	60.4	87.2	58.1	80.3	53.6	75.2	50.1	64.8	43.2
	70	102	68.1	95.2	63.5	91.8	61.2	88.4	58.9	81.5	54.3	76.3	50.9	66.0	44.0
	75	103	68.8	96.4	64.3	92.9	62.0	89.5	59.7	82.6	55.1	77.5	51.6	67.1	44.8
7	**25**	79.2	52.8	73.2	48.8	70.2	46.8	67.2	44.8	61.3	40.9	56.8	37.9	47.9	31.9
	30	80.3	53.6	74.4	49.6	71.4	47.6	68.4	45.6	62.4	41.6	57.9	38.6	49.0	32.7
	35	81.5	54.3	75.5	50.3	72.5	48.3	69.5	46.4	63.6	42.4	59.1	39.4	50.1	33.4
	40	82.6	55.1	76.7	51.1	73.7	49.1	70.7	47.1	64.7	43.1	60.2	40.2	51.3	34.2
	45	83.8	55.8	77.8	51.9	74.8	49.9	71.8	47.9	65.9	43.9	61.4	40.9	52.4	35.0
	50	84.9	56.6	78.9	52.6	76.0	50.6	73.0	48.7	67.0	44.7	62.5	41.7	53.6	35.7
	55	86.1	57.4	80.1	53.4	77.1	51.4	74.1	49.4	68.2	45.4	63.7	42.5	54.7	36.5
	60	87.2	58.1	81.2	54.2	78.3	52.2	75.3	50.2	69.3	46.2	64.8	43.2	55.9	37.3
	65	88.4	58.9	82.4	54.9	79.4	52.9	76.4	50.9	70.5	47.0	66.0	44.0	57.0	38.0
	70	89.5	59.7	83.5	55.7	80.6	53.7	77.6	51.7	71.6	47.7	67.1	44.8	58.2	38.8
	75	90.7	60.4	84.7	56.5	81.7	54.5	78.7	52.5	72.8	48.5	68.3	45.5	59.3	39.6
LRFD	**ASD**	[a] Values are for standard hole types.													
$\phi = 0.75$	**$\Omega = 2.00$**														

Table 9.3 Continued.

Block Shear
Tension Rupture Component per mm of thickness, kN/mm

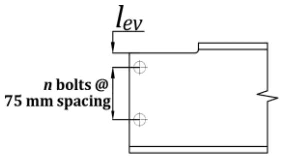
$U_{bs} = 1.0$



F_u	510 MPa													
l_{eh}, mm	Bolt diameter, d, mm[a]													
	16		20		22		24		27		30		36	
	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
25	5.74	3.83	4.97	3.32	4.59	3.06	4.21	2.81	3.44	2.30	2.87	1.91	1.72	1.15
30	7.65	5.10	6.89	4.59	6.50	4.34	6.12	4.08	5.36	3.57	4.78	3.19	3.63	2.42
35	9.56	6.38	8.80	5.87	8.42	5.61	8.03	5.36	7.27	4.85	6.69	4.46	5.55	3.70
40	11.5	7.65	10.7	7.14	10.3	6.89	9.95	6.63	9.18	6.12	8.61	5.74	7.46	4.97
45	13.4	8.92	12.6	8.42	12.2	8.16	11.9	7.91	11.1	7.40	10.5	7.01	9.37	6.25
50	15.3	10.2	14.5	9.69	14.2	9.44	13.8	9.18	13.0	8.67	12.4	8.29	11.3	7.52
55	17.2	11.5	16.4	11.0	16.1	10.7	15.7	10.5	14.9	9.95	14.3	9.56	13.2	8.80
60	19.1	12.7	18.4	12.2	18.0	12.0	17.6	11.7	16.8	11.2	16.3	10.8	15.1	10.1
65	21.0	14.0	20.3	13.5	19.9	13.3	19.5	13.0	18.7	12.5	18.2	12.1	17.0	11.3
70	23.0	15.3	22.2	14.8	21.8	14.5	21.4	14.3	20.7	13.8	20.1	13.4	18.9	12.6
75	24.9	16.6	24.1	16.1	23.7	15.8	23.3	15.6	22.6	15.0	22.0	14.7	20.8	13.9
LRFD	**ASD**	[a] Values are for standard hole types.												
$\phi = 0.75$	$\Omega = 2.00$													

Table 9.3 Continued.

Block Shear
Shear Yielding Component
per mm of thickness, kN/mm



l_{ev}, mm	n	F_y, MPa						l_{ev}, mm	n	F_y, MPa					
		235		275		355				235		275		355	
		$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$			$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**			**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
25	**12**	89.9	59.9	105	70.1	136	90.5	**25**	**9**	66.1	44.1	77.3	51.6	99.8	66.6
30		90.4	60.3	106	70.5	137	91.1	**30**		66.6	44.4	78.0	52.0	101	67.1
35		90.9	60.6	106	71.0	137	91.6	**35**		67.2	44.8	78.6	52.4	101	67.6
40		91.5	61.0	107	71.4	138	92.1	**40**		67.7	45.1	79.2	52.8	102	68.2
45		92.0	61.3	108	71.8	139	92.7	**45**		68.2	45.5	79.8	53.2	103	68.7
50		92.5	61.7	108	72.2	140	93.2	**50**		68.7	45.8	80.4	53.6	104	69.2
55		93.1	62.0	109	72.6	141	93.7	**55**		69.3	46.2	81.1	54.0	105	69.8
60		93.6	62.4	110	73.0	141	94.3	**60**		69.8	46.5	81.7	54.4	105	70.3
65		94.1	62.7	110	73.4	142	94.8	**65**		70.3	46.9	82.3	54.9	106	70.8
70		94.6	63.1	111	73.8	143	95.3	**70**		70.9	47.2	82.9	55.3	107	71.4
75		95.2	63.4	111	74.2	144	95.8	**75**		71.4	47.6	83.5	55.7	108	71.9
25	**11**	82.0	54.6	95.9	63.9	124	82.5	**25**	**8**	58.2	38.8	68.1	45.4	87.9	58.6
30		82.5	55.0	96.5	64.4	125	83.1	**30**		58.7	39.1	68.7	45.8	88.7	59.1
35		83.0	55.3	97.1	64.8	125	83.6	**35**		59.2	39.5	69.3	46.2	89.5	59.6
40		83.5	55.7	97.8	65.2	126	84.1	**40**		59.7	39.8	69.9	46.6	90.3	60.2
45		84.1	56.0	98.4	65.6	127	84.7	**45**		60.3	40.2	70.5	47.0	91.1	60.7
50		84.6	56.4	99.0	66.0	128	85.2	**50**		60.8	40.5	71.2	47.4	91.9	61.2
55		85.1	56.8	99.6	66.4	129	85.7	**55**		61.3	40.9	71.8	47.9	92.7	61.8
60		85.7	57.1	100	66.8	129	86.3	**60**		61.9	41.2	72.4	48.3	93.5	62.3
65		86.2	57.5	101	67.2	130	86.8	**65**		62.4	41.6	73.0	48.7	94.3	62.8
70		86.7	57.8	101	67.7	131	87.3	**70**		62.9	41.9	73.6	49.1	95.1	63.4
75		87.2	58.2	102	68.1	132	87.9	**75**		63.5	42.3	74.3	49.5	95.9	63.9
25	**10**	74.0	49.4	86.6	57.8	112	74.5	**25**	**7**	50.2	33.5	58.8	39.2	75.9	50.6
30		74.6	49.7	87.2	58.2	113	75.1	**30**		50.8	33.8	59.4	39.6	76.7	51.1
35		75.1	50.1	87.9	58.6	113	75.6	**35**		51.3	34.2	60.0	40.0	77.5	51.7
40		75.6	50.4	88.5	59.0	114	76.1	**40**		51.8	34.5	60.6	40.4	78.3	52.2
45		76.1	50.8	89.1	59.4	115	76.7	**45**		52.3	34.9	61.3	40.8	79.1	52.7
50		76.7	51.1	89.7	59.8	116	77.2	**50**		52.9	35.2	61.9	41.2	79.9	53.2
55		77.2	51.5	90.3	60.2	117	77.7	**55**		53.4	35.6	62.5	41.7	80.7	53.8
60		77.7	51.8	91.0	60.6	117	78.3	**60**		53.9	36.0	63.1	42.1	81.5	54.3
65		78.3	52.2	91.6	61.1	118	78.8	**65**		54.5	36.3	63.7	42.5	82.3	54.8
70		78.8	52.5	92.2	61.5	119	79.3	**70**		55.0	36.7	64.4	42.9	83.1	55.4
75		79.3	52.9	92.8	61.9	120	79.9	**75**		55.5	37.0	65.0	43.3	83.9	55.9
LRFD	**ASD**														
$\phi = 0.75$	$\Omega = 2.00$														

Table 9.4 Beam bearing constants for HD shapes of S355 steel.

Beam Bearing Constants
HD Shapes

F_y = 355 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HD 400 × 1086	9690	6460	27700	18500	19500	13000	50600	33700	17500	11700	67500	45000
× 990	8300	5530	25500	17000	16500	11000	44600	29700	14900	9930	59400	39600
× 900	7080	4720	23400	15600	13900	9280	38600	25700	12600	8370	51400	34300
× 818	6010	4010	21500	14300	11700	7810	33700	22500	10600	7040	44900	29900
× 744	5130	3420	19700	13200	9880	6590	29400	19600	8900	5940	39300	26200
× 677	4380	2920	18200	12100	8360	5570	25900	17200	7530	5020	34500	23000
× 634	3890	2590	16900	11300	7290	4860	22400	14900	6580	4390	29800	19900
× 592	3490	2320	16000	10700	6490	4330	20600	13700	5850	3900	27400	18300
× 551	3080	2050	14900	9940	5660	3770	18300	12200	5100	3400	24400	16200
× 509	2700	1800	13900	9250	4890	3260	16200	10800	4410	2940	21600	14400
× 463	2300	1530	12700	8470	4100	2730	13900	9290	3700	2470	18600	12400
× 421	1970	1310	11600	7760	3440	2300	12000	7980	3100	2070	16000	10600
× 382	1670	1110	10600	7050	2850	1900	10100	6700	2570	1710	13400	8930
× 347	1420	945	9660	6440	2370	1580	8580	5720	2140	1430	11400	7630
× 314	1210	804	8840	5890	1980	1320	7410	4940	1780	1190	9880	6590
× 287	1030	690	8020	5350	1640	1100	6090	4060	1480	989	8110	5410
× 262	904	603	7490	4990	1410	943	5530	3690	1270	847	7370	4910
× 237	758	505	6710	4470	1140	761	4460	2970	1030	686	5950	3970
× 216	656	437	6140	4090	957	638	3780	2520	863	575	5040	3360
× 187	519	346	5330	3550	719	480	2900	1930	648	432	3860	2580
HD 360 × 196	600	400	5820	3880	859	573	3430	2290	774	516	4580	3050
× 179	518	345	5330	3550	718	479	2910	1940	647	431	3880	2590
× 162	434	290	4720	3150	572	382	2250	1500	518	345	3000	2000
× 147	380	253	4370	2910	485	323	1980	1320	438	292	2640	1760
× 134	328	219	3980	2650	402	268	1660	1110	363	242	2220	1480
HD 320 × 300	1800	1200	9590	6390	2460	1640	8290	5530	2250	1500	11100	7370
× 245	1250	832	7460	4970	1540	1030	4890	3260	1420	948	6520	4350
× 198	943	628	6390	4260	1090	728	4030	2690	1000	667	5370	3580
× 158	676	450	5150	3430	705	470	2750	1830	644	430	3660	2440
× 127	485	323	4080	2720	446	298	1760	1170	409	273	2340	1560
× 97.6	339	226	3200	2130	269	179	1150	767	245	163	1530	1020
× 74.2	270	180	2840	1890	190	126	1170	782	166	111	1560	1040
HD 260 × 172	903	602	6390	4260	1100	734	4690	3130	1010	673	6260	4170
× 142	695	463	5500	3670	794	529	3830	2560	723	482	5110	3410
× 114	505	337	4440	2960	518	345	2570	1710	472	315	3430	2280
× 93.0	368	246	3550	2370	334	223	1670	1110	306	204	2220	1480
× 68.2	243	162	2660	1780	184	122	1020	683	167	111	1370	910
× 54.1	193	129	2310	1540	129	86.1	898	599	115	76.3	1200	799

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
$\phi = 1.00$	$\Omega = 1.50$	$\phi = 0.75$	$\Omega = 2.00$

Table 9.4 Continued.

Beam Bearing Constants
HD Shapes

F_y = 355 MPa

Shape	Nominal Weight	l_b = 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400 × 1086	1090	–	–	–	–	21600	14400	9450	6300
× 990	990	–	–	–	–	18600	12400	8420	5620
× 900	900	–	–	–	–	16000	10700	7450	4970
× 818	818	–	–	–	–	13700	9160	6620	4420
× 744	744	–	–	–	–	11800	7890	5900	3930
× 677	677	–	–	–	–	10200	6820	5270	3510
× 634	634	–	–	–	–	9130	6090	4810	3200
× 592	592	–	–	–	–	8250	5500	4460	2970
× 551	551	–	–	–	–	7350	4900	4070	2710
× 509	509	3810	2540	3810	2540	6500	4340	3710	2480
× 463	463	3320	2210	3320	2210	5620	3740	3320	2210
× 421	421	2900	1930	2900	1930	4870	3240	2970	1980
× 382	382	2510	1680	2510	1680	4180	2790	2640	1760
× 347	347	2190	1460	2190	1460	3610	2400	2360	1570
× 314	314	1910	1280	1910	1280	3120	2080	2120	1410
× 287	287	1680	1120	1680	1120	2710	1810	1890	1260
× 262	262	1500	1000	1500	1000	2410	1610	1740	1160
× 237	237	1290	863	1290	863	2050	1370	1530	1020
× 216	216	1150	765	1150	765	1800	1200	1380	921
× 187	187	945	630	945	630	1460	976	1180	784
HD 360 × 196	196	1070	710	1070	710	1670	1110	1300	866
× 179	179	944	629	944	629	1460	974	1180	784
× 162	162	758	505	812	541	1250	831	1030	687
× 147	147	649	433	729	486	1110	739	943	629
× 134	134	540	360	646	431	974	649	849	566
HD 320 × 300	300	2560	1710	2560	1710	4360	2910	2160	1440
× 245	245	1850	1230	1850	1230	3090	2060	1610	1070
× 198	198	1430	953	1450	969	2400	1600	1320	877
× 158	158	937	625	1090	725	1760	1180	1020	679
× 127	127	596	398	811	541	1170	783	784	523
× 97.6	97.6	368	245	595	397	722	481	594	396
× 74.2	74.2	291	194	497	331	567	378	513	342
HD 260 × 172	172	1410	943	1410	943	2320	1540	1110	741
× 142	142	1130	755	1130	757	1830	1220	918	612
× 114	114	746	498	860	573	1360	910	714	476
× 93.0	93.0	483	322	652	435	935	624	554	369
× 68.2	68.2	276	184	456	304	531	354	399	266
× 54.1	54.1	210	140	378	252	402	268	338	225

For V_{nx}	
LRFD	**ASD**
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

9.4 Sample Calculations

9.4.1 Reduction in area for holes

M16 bolt in an STD hole; $t = 4$ mm:

area reduction $= (18 + 2)(4) = 80\ \text{mm}^2$

M20 bolt in an LSLT hole; $t = 4$ mm:

area reduction $= (50 + 2)(4) = 208\ \text{mm}^2$

9.4.2 Elastic section modulus for coped I-shapes

HD 260×142; $d_c = 25$ mm, 50 mm, 150 mm:

$$A_f = [18030 - (15.5)(177)]/2 = 7640\ \text{mm}^2$$

$$c_f = \frac{(265)(26.5)\,(26.5)/2 + (15.5)(24)(26.5 + 24/2)}{7640} + \frac{(2)(24^2 - \pi \cdot 24^2/4)\left[\frac{10 - 3\pi}{12 - 3\pi}(24) + 26.5\right]}{7640} = 15.1\ \text{mm}$$

$$I_f = \frac{1}{2}\left[24330 \times 10^4 - \frac{1}{12}(15.5)(177)^3\right] - (7640)(278/2 - 15.1)^2 = 6.94 \times 10^5\ \text{mm}^4$$

$$c_o = \frac{(7640)(15.1) + (15.5)(278 - 50.5)[50.5 + (278 - 50.5)/2]}{7640 + (15.5)(278 - 50.5)} = 62.2\ \text{mm}$$

$$I_o = 6.94\ \times 10^5 + (7640)(62.2 - 15.1)^2 + \frac{1}{12}(15.5)(278 - 50.5)^3 + (15.5)(278 - 50.5)\left(\frac{278 - 50.5}{2} + 50.5 - 62.2\right)^2 = 6.96 \times 10^7\ \text{mm}^4$$

$$S_o = 6.96 \times 10^7/(278 - 62.2) = 3.22 \times 10^5\ \text{mm}^3$$

$d_c = 25$ mm:

$d_c < t_f$ ∴ no calculation

$d_c = 50$ mm:

$d_c \geq t_f$

$d_c \leq (d/2 = 278/2 = 139 \text{ mm})$

$$c_{net} = \frac{(7640)(15.1) + (15.5)(278 - 50 - 50.5)[50.5 + (278 - 50 - 50.5)/2]}{7640 + (15.5)(278 - 50 - 50.5)}$$

$$= 47.9 \text{ mm}$$

$$I_o = 6.94\ \times 10^5 + (7640)(47.9 - 15.1)^2 + \frac{1}{12}(15.5)(278 - 50 - 50.5)^3$$

$$+ (15.5)(278 - 50 - 50.5)\left(\frac{278 - 50 - 50.5}{2} + 50.5 - 47.9\right)^2$$

$$= 3.91 \times 10^7 \text{ mm}^4$$

$S_{net} = 3.91 \times 10^7/(278 - 50 - 47.9) = 2.17 \times 10^5 \text{ mm}^3$

$d_c = 150$ mm:

$d_c \geq t_f$

$d_c > d/2$ ∴ no calculation

9.4.3 Block shear strength

Tension rupture component

$l_{eh} = 70$ mm; M16 bolts; S355 steel:

$A_{nt}/t = 70 - (18 + 2)/2 = 60 \text{ mm}$

$F_u A_{nt}/t = (510)(60) \times 10^{-3} = 30.6\ \text{kN/mm}$

$\phi\, F_u A_{nt}/t = (0.75)(30.6) = 23.0\ \text{kN/mm}$ (LRFD)

$F_u A_{nt}/t/\Omega = 30.6/2.00 = 15.3\ \text{kN/mm}$ (ASD)

Shear yielding component

$l_{ev} = 25$ mm; $n = 12$; M16 bolts; S235 steel:

$A_{gv}/t = 25 + (12 - 1)(75) = 850$ mm

$0.6F_y A_{gv}/t = (0.6)(235)(850) \times 10^{-3} = 120\ \text{kN/mm}$

$\phi \cdot 0.6\, F_y A_{gv}/t = (0.75)(120) = 89.9\ \text{kN/mm}$ (LRFD)

$0.6F_y A_{gv}/t/\Omega = 120/2.00 = 59.9\ \text{kN/mm}$ (ASD)

Shear rupture component

$l_{ev} = 25$ mm; $n = 12$; M16 bolts; S355 steel:

$A_{nv}/t = 25 + (12 - 1)(75) - (12 - 0.5)(18 + 2) = 620$ mm

$0.6F_u A_{nv}/t = (0.6)(510)(620) \times 10^{-3} = 190\ \text{kN/mm}$

$\phi \cdot 0.6F_u A_{nv}/t = (0.75)(190) = 142\ \text{kN/mm}$ (LRFD)

$0.6F_u A_{nv}/t/\Omega = 142/2.00 = 94.9\ \text{kN/mm}$ (ASD)

9.4.4 Beam bearing constants

HD 260×54.1; $l_b = 80$ mm; $x < d/2$, $d/2 \leq x \leq d$, $x > d$; S355 steel:

Beam bearing constants

$R_1 = (2.5)(33.5)(355)(6.5) \times 10^{-3} = 193$ kN

$\phi R_1 = (1.00)(193) = 193$ kN (LRFD)

$R_1/\Omega = 193/1.50 = 129$ kN (ASD)

$R_2 = (355)(6.5) = 2310$ kN/m

$\phi R_2 = (1.00)(2310) = 2310$ kN/m (LRFD)

$R_2/\Omega = 2310/1.50 = 1540$ kN/m (ASD)

$R_3 = (0.40)(6.5)^2\sqrt{(200000)(355)(9.5)/6.5}\,(1.0) \times 10^{-3} = 172$ kN

$\phi R_3 = (0.75)(172) = 129$ kN (LRFD)

$R_3/\Omega = 172/2.00 = 86.1$ kN (ASD)

$$R_4 = (0.40)(6.5)^2(3/244)(6.5/9.5)^{1.5}\sqrt{(200000)(355)(9.5)/6.5}\,(1.0)$$
$$= 1200\ \text{kN/m}$$

$\phi R_4 = (0.75)(1200) = 898\ \text{kN/m}$ (LRFD)

$R_4/\Omega = 1200/2.00 = 599\ \text{kN/m}$ (ASD)

$$R_5 = (0.40)(6.5)^2[1 - (0.2)(6.5/9.5)^{1.5}]\sqrt{(200000)(355)(9.5)/6.5}\,(1.0)$$
$$= 153 \text{ kN}$$

$\phi R_5 = (0.75)(153) = 115$ kN (LRFD)

$R_5/\Omega = 153/2.00 = 76.3$ kN (ASD)

$$R_6 = (0.40)(6.5)^2(4/244)(6.5/9.5)^{1.5}\sqrt{(200000)(355)(9.5)/6.5}\,(1.0)$$
$$= 1600\ \text{kN/m}$$

$\phi R_6 = (0.75)(1600) = 1200\ \text{kN/m}$ (LRFD)

$R_6/\Omega = 1600/2.00 = 799\ \text{kN/m}$ (ASD)

Available strength

$x < d/2$:

$l_b > k$

Web local yielding

$R_n = R_1 + l_b R_2$

$\phi R_n = 193 + (80 \times 10^{-3})(2310) = 378$ kN

$R_n/\Omega = 129 + (80 \times 10^{-3})(1540) = 252$ kN

Web local crippling

$l_b/d = 80/244 = 0.328 > 0.20$

$R_n = R_5 + l_b R_6$

$\phi R_n = 115 + (80 \times 10^{-3})(1200) = 210$ kN

$R_n/\Omega = 76.3 + (80 \times 10^{-3})(799) = 140$ kN

∴ Web local crippling governs.

$\phi R_n = 210$ kN (LRFD)

$R_n/\Omega = 140$ kN (ASD)

$d/2 \leq x \leq d$:

$l_b > k$

Web local yielding

$\phi R_n = 378$ kN

$R_n/\Omega = 252$ kN

Web local crippling

$R_n = 2(R_3 + l_b R_4)$

$\phi R_n = 2[129 + (80 \times 10^{-3})(898)] = 402$ kN

$R_n/\Omega = 2[86.1 + (80 \times 10^{-3})(599)] = 268$ kN

∴ Web local yielding governs.

$\phi R_n = 378$ kN (LRFD)

$R_n/\Omega = 252$ kN (ASD)

$x > d$:

Web local yielding

$R_n = 2R_1 + l_b R_2$

$\phi R_n = (2)(193) + (80 \times 10^{-3})(2310) = 571$ kN

$R_n/\Omega = (2)(129) + (80 \times 10^{-3})(1540) = 381$ kN

Web local crippling

$\phi R_n = 402$ kN

$R_n/\Omega = 268$ kN

∴Web local crippling governs.

$\phi R_n = 402$ kN (LRFD)

$R_n/\Omega = 268$ kN (ASD)

HD 400×509; $l_b = 80$ mm; $x < d/2$; S355 steel:

Beam bearing constants

$\phi R_1 = 2700$ kN (LRFD)

$R_1/\Omega = 1800$ kN (ASD)

$\phi R_2 = 13900$ kN/m (LRFD)

$R_2/\Omega = 9250$ kN/m (ASD)

$\phi R_3 = 4890$ kN (LRFD)

$R_3/\Omega = 3260$ kN (ASD)

$\phi R_4 = 16200$ kN/m (LRFD)

$R_4/\Omega = 10800$ kN/m (ASD)

$\phi R_5 = 4410$ kN (LRFD)

$R_5/\Omega = 2940$ kN (ASD)

$\phi R_6 = 21600$ kN/m (LRFD)

$R_6/\Omega = 14400$ kN/m (ASD)

Available strength

$l_b > k$

Web local yielding

$\phi R_n = 2700 + (80 \times 10^{-3})(13900) = 3810$ kN

$R_n/\Omega = 1800 + (80 \times 10^{-3})(9250) = 2540$ kN

Web local crippling

$l_b/d = 80/446 = 0.179 \leq 0.20$

$R_n = R_3 + l_b R_4$

$\phi R_n = 4890 + (80 \times 10^{-3})(16200) = 6190$ kN

$R_n/\Omega = 3260 + (80 \times 10^{-3})(10800) = 4120$ kN

$\therefore$ Web local yielding governs.

$\phi R_n = 3810$ kN (LRFD)

$R_n/\Omega = 2540$ kN (ASD)

HD 400 × 1086; $l_b = 80$ mm; $x < d/2$, $d/2 \leq x \leq d$; S355 steel:

Available strength

$l_b \leq k$ $\therefore$ no calculation

CHAPTER 10

CONCLUSIONS

10.1 Summary

The objective of this thesis was to develop design tables similar to those in AISC Steel Construction Manual [AISC, 2017] but for steel sections and grades commonly used in Turkey. The design tables were developed in line with Turkish Structural Steel Code [Ministry of Environment and Urban Planning, 2018] and AISC Specification for Structural Steel Buildings [AISC, 2016]. Turkish Structural Steel Code was used in cases of discrepancy. The design tables were developed for eight European wide-flange steel sections: HD, HEA, HEB, HEM, IPE, IPEA, IPEO and IPN of S235, S275 and S355 steel grades. Design tables were developed for members subject to tension, compression, flexure and combined forces, composite members, connecting elements, bolts and welds.

10.2 Conclusions

AISC Steel Construction Manual provides design tables to facilitate the design process per AISC Specification for Structural Steel Buildings. Turkish Structural Steel Code has been adopted from AISC Specification; however, European steel sections are used in Turkey and hence AISC design tables are of no use to structural engineers in Turkey. In this study, similar design tables were developed for European steel sections to fill this gap in Turkey. These tables can be used for expediting the design process and verifying the design calculations in Turkey.

10.3 Future Research

The design tables developed in this study are limited to eight European wide-flange steel sections. Hence, this work can be further enhanced by developing design tables for a wider selection of steel sections other than I-shaped steel sections such as structural tube, channel, angle sections. Similar design tables can also be developed for high strength steel grades such as S420 and S460. Example problems can make the structural engineers in Turkey familiar with the use of the developed design tables.

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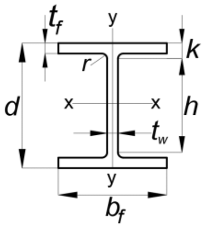
APPENDIX A

DIMENSIONS AND PROPERTIES OF SHAPES

Tables start on the next page.

Table A.1 Dimensions and properties of shapes.



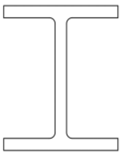
HD Shapes

Dimensions

Shape	Area	Depth	Web		Flange		Distance		Compact Section Criteria	
	A	d	h	t_w	b_f	t_f	r	k	$\frac{h}{t_w}$	$\frac{b_f}{2t_f}$
	mm^2	mm	mm	mm	mm	mm	mm	mm		
	$\times 10^2$									
HD 400 × 1086	1386	569	289.0	78.0	454	125	15	140	3.71	1.82
× 990	1262	550	290.0	71.9	448	115	15	130	4.03	1.95
× 900	1149	531	289.0	65.9	442	106	15	121	4.39	2.09
× 818	1043	514	290.0	60.5	437	97.0	15	112	4.79	2.25
× 744	948.1	498	290.2	55.6	432	88.9	15	104	5.22	2.43
× 677	863.4	483	290.0	51.2	428	81.5	15	96.5	5.66	2.63
× 634	808.0	474	289.8	47.6	424	77.1	15	92.1	6.09	2.75
× 592	754.9	465	290.4	45.0	421	72.3	15	87.3	6.45	2.91
× 551	701.4	455	289.8	42.0	418	67.6	15	82.6	6.90	3.09
× 509	649.0	446	290.6	39.1	416	62.7	15	77.7	7.43	3.32
× 463	589.5	435	290.2	35.8	412	57.4	15	72.4	8.11	3.59
× 421	537.1	425	289.8	32.8	409	52.6	15	67.6	8.84	3.89
× 382	487.1	416	290.0	29.8	406	48.0	15	63.0	9.73	4.23
× 347	442.0	407	289.6	27.2	404	43.7	15	58.7	10.7	4.62
× 314	399.2	399	289.8	24.9	401	39.6	15	54.6	11.6	5.06
× 287	366.3	393	289.8	22.6	399	36.6	15	51.6	12.8	5.45
× 262	334.6	387	290.4	21.1	398	33.3	15	48.3	13.8	5.98
× 237	300.9	380	289.6	18.9	395	30.2	15	45.2	15.3	6.54
× 216	275.5	375	289.6	17.3	394	27.7	15	42.7	16.7	7.11
× 187	237.6	368	290.0	15.0	391	24.0	15	39.0	19.3	8.15
HD 360 × 196	250.3	372	289.6	16.4	374	26.2	15	41.2	17.7	7.14
× 179	228.3	368	290.2	15.0	373	23.9	15	38.9	19.4	7.80
× 162	206.3	364	290.4	13.3	371	21.8	15	36.8	21.8	8.51
× 147	187.9	360	290.4	12.3	370	19.8	15	34.8	23.6	9.34
× 134	170.6	356	290.0	11.2	369	18.0	15	33.0	25.9	10.3
HD 320 × 300	382.1	375	225.0	27.0	313	48.0	27	75.0	8.33	3.26
× 245	312.0	359	225.0	21.0	309	40.0	27	67.0	10.7	3.86
× 198	252.3	343	225.0	18.0	306	32.0	27	59.0	12.5	4.78
× 158	201.2	330	225.0	14.5	303	25.5	27	52.5	15.5	5.94
× 127	161.3	320	225.0	11.5	300	20.5	27	47.5	19.6	7.32
× 97.6	124.4	310	225.0	9.0	300	15.5	27	42.5	25.0	9.68
× 74.2	94.58	301	225.0	8.0	300	11.0	27	38.0	28.1	13.6
HD 260 × 172	219.6	290	177.0	18.0	268	32.5	24	56.5	9.83	4.12
× 142	180.3	278	177.0	15.5	265	26.5	24	50.5	11.4	5.00
× 114	145.7	268	177.0	12.5	262	21.5	24	45.5	14.2	6.09
× 93.0	118.4	260	177.0	10.0	260	17.5	24	41.5	17.7	7.43
× 68.2	86.82	250	177.0	7.5	260	12.5	24	36.5	23.6	10.4
× 54.1	68.97	244	177.0	6.5	260	9.5	24	33.5	27.2	13.7

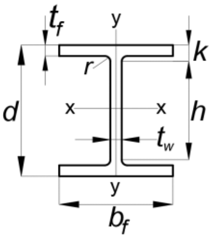
Table A.1 Continued.

HD Shapes
Properties



Shape	Nominal Weight	Axis x-x				Axis y-y				Torsional Properties		r_{ts}
	G	I_x	S_x	Z_x	r_x	I_y	S_y	Z_y	r_y	J	C_w	
	kg/m	mm^4	mm^3	mm^3	mm	mm^4	mm^3	mm^3	mm	mm^4	mm^6	mm
		$\times 10^4$	$\times 10^3$	$\times 10^3$	×10	$\times 10^4$	$\times 10^3$	$\times 10^3$	×10	$\times 10^4$	$\times 10^9$	
HD 400 × 1086	1086	595700	20940	27210	20.73	196200	8645	13380	11.90	62290	96080	144
× 990	990	518900	18870	24280	20.27	173400	7739	11960	11.72	48210	81530	141
× 900	900	450200	16960	21620	19.79	153300	6938	10710	11.55	37350	68890	138
× 818	818	392200	15260	19260	19.39	135500	6203	9561	11.40	28510	58650	136
× 744	744	342100	13740	17170	19.00	119900	5552	8549	11.25	21840	49980	134
× 677	677	299500	12400	15350	18.62	106900	4994	7680	11.13	16790	42920	131
× 634	634	274200	11570	14220	18.42	98250	4634	7117	11.03	14020	38570	130
× 592	592	250200	10760	13140	18.20	90170	4284	6574	10.93	11560	34670	128
× 551	551	226100	9939	12050	17.95	82490	3947	6051	10.85	9410	30870	127
× 509	509	204500	9172	11030	17.75	75400	3625	5552	10.78	7513	27630	125
× 463	463	180200	8283	9878	17.48	67040	3254	4978	10.66	5735	23850	124
× 421	421	159600	7510	8880	17.24	60080	2938	4489	10.58	4398	20800	122
× 382	382	141300	6794	7965	17.03	53620	2641	4031	10.49	3326	18130	121
× 347	347	124900	6140	7139	16.81	48090	2380	3629	10.43	2510	15850	119
× 314	314	110200	5525	6374	16.62	42600	2125	3236	10.33	1870	13740	118
× 287	287	99710	5074	5813	16.50	38780	1944	2957	10.29	1464	12300	117
× 262	262	89410	4620	5260	16.35	35020	1760	2676	10.23	1116	10940	116
× 237	237	78780	4146	4686	16.18	31040	1572	2387	10.16	825.5	9489	114
× 216	216	71140	3794	4262	16.07	28250	1434	2176	10.13	637.3	8515	114
× 187	187	60180	3271	3642	15.91	23920	1224	1855	10.03	414.6	7074	112
HD 360 × 196	196	63630	3421	3837	15.94	22860	1222	1856	9.56	517.1	6829	108
× 179	179	57440	3122	3482	15.86	20680	1109	1683	9.52	393.8	6119	107
× 162	162	51540	2832	3139	15.81	18560	1001	1516	9.49	295.5	5432	106
× 147	147	46290	2572	2838	15.70	16720	903.9	1369	9.43	223.7	4836	105
× 134	134	41510	2332	2562	15.60	15080	817.3	1237	9.40	168.8	4305	105
HD 320 × 300	300	86900	4635	5522	15.08	24600	1572	2414	8.02	2650	6558	93.1
× 245	245	68130	3796	4435	14.78	19710	1276	1951	7.95	1501	5004	91.0
× 198	198	51900	3026	3479	14.34	15310	1001	1530	7.79	805.3	3695	88.7
× 158	158	39640	2403	2718	14.04	11840	781.7	1194	7.67	420.5	2741	86.6
× 127	127	30820	1926	2149	13.82	9239	615.9	939.1	7.57	225.1	2069	84.7
× 97.6	97.6	22930	1479	1628	13.58	6985	465.7	709.7	7.49	108	1512	83.4
× 74.2	74.2	16450	1093	1196	13.19	4959	330.6	505.7	7.24	55.87	1041	81.1
HD 260 × 172	172	31310	2159	2524	11.94	10450	779.7	1192	6.90	719.0	1728	78.9
× 142	142	24330	1750	2015	11.62	8236	621.6	950.5	6.76	406.8	1300	76.9
× 114	114	18910	1411	1600	11.39	6456	492.8	752.5	6.66	222.4	979	75.1
× 93.0	93.0	14920	1148	1283	11.22	5135	395.0	602.2	6.58	123.8	753.7	73.6
× 68.2	68.2	10450	836.4	919.8	10.97	3668	282.1	430.2	6.50	52.37	516.4	72.1
× 54.1	54.1	7981	654.1	714.5	10.76	2788	214.5	327.7	6.36	30.31	382.6	70.7

Table A.1 Continued.



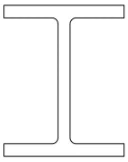
HEA Shapes

Dimensions

Shape	Area	Depth	Web		Flange		Distance		Compact Section Criteria	
	A	d	h	t_w	b_f	t_f	r	k	$\frac{h}{t_w}$	$\frac{b_f}{2t_f}$
	mm^2 $\times 10^2$	mm	mm	mm	mm	mm	mm	mm		
HE 1000 A	346.8	990	868.0	16.5	300	31.0	30	61.0	52.6	4.84
HE 900 A	320.5	890	770.0	16.0	300	30.0	30	60.0	48.1	5.00
HE 800 A	285.8	790	674.0	15.0	300	28.0	30	58.0	44.9	5.36
HE 700 A	260.5	690	582.0	14.5	300	27.0	27	54.0	40.1	5.56
HE 650 A	241.6	640	534.0	13.5	300	26.0	27	53.0	39.6	5.77
HE 600 A	226.5	590	486.0	13.0	300	25.0	27	52.0	37.4	6.00
HE 550 A	211.8	540	438.0	12.5	300	24.0	27	51.0	35.0	6.25
HE 500 A	197.5	490	390.0	12.0	300	23.0	27	50.0	32.5	6.52
HE 450 A	178.0	440	344.0	11.5	300	21.0	27	48.0	29.9	7.14
HE 400 A	159.0	390	298.0	11.0	300	19.0	27	46.0	27.1	7.89
HE 360 A	142.8	350	261.0	10.0	300	17.5	27	44.5	26.1	8.57
HE 340 A	133.5	330	243.0	9.5	300	16.5	27	43.5	25.6	9.09
HE 320 A	124.4	310	225.0	9.0	300	15.5	27	42.5	25.0	9.68
HE 300 A	112.5	290	208.0	8.5	300	14.0	27	41.0	24.5	10.7
HE 280 A	97.26	270	196.0	8.0	280	13.0	24	37.0	24.5	10.8
HE 260 A	86.82	250	177.0	7.5	260	12.5	24	36.5	23.6	10.4
HE 240 A	76.84	230	164.0	7.5	240	12.0	21	33.0	21.9	10.0
HE 220 A	64.34	210	152.0	7.0	220	11.0	18	29.0	21.7	10.0
HE 200 A	53.83	190	134.0	6.5	200	10.0	18	28.0	20.6	10.0
HE 180 A	45.25	171	122.0	6.0	180	9.5	15	24.5	20.3	9.47
HE 160 A	38.77	152	104.0	6.0	160	9.0	15	24.0	17.3	8.89
HE 140 A	31.42	133	92.0	5.5	140	8.5	12	20.5	16.7	8.24
HE 120 A	25.34	114	74.0	5.0	120	8.0	12	20.0	14.8	7.50
HE 100 A	21.24	96	56.0	5.0	100	8.0	12	20.0	11.2	6.25

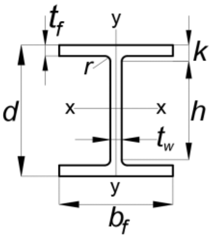
Table A.1 Continued.

HEA Shapes
Properties



Shape	Nominal Weight	Axis x-x				Axis y-y				Torsional Properties		r_{ts}
	G	I_x	S_x	Z_x	r_x	I_y	S_y	Z_y	r_y	J	C_w	
	kg/m	mm^4	mm^3	mm^3	mm	mm^4	mm^3	mm^3	mm	mm^4	mm^6	mm
		$\times10^4$	$\times10^3$	$\times10^3$	×10	$\times10^4$	$\times10^3$	$\times10^3$	×10	$\times10^4$	$\times10^9$	
HE 1000 A	272	553800	11190	12820	40	14000	933.6	1470	6.35	822.4	32070	77.4
HE 900 A	252	422100	9485	10810	36.3	13550	903.2	1414	6.50	736.8	24960	78.3
HE 800 A	224	303400	7682	8699	32.6	12640	842.6	1312	6.65	596.9	18290	79.1
HE 700 A	204	215300	6241	7032	28.8	12180	811.9	1257	6.84	513.9	13350	80.4
HE 650 A	190	175200	5474	6136	26.9	11720	781.6	1205	6.97	448.3	11030	81.0
HE 600 A	178	141200	4787	5350	25	11270	751.4	1156	7.05	397.8	8978	81.5
HE 550 A	166	111900	4146	4622	23	10820	721.3	1107	7.15	351.5	7189	82.0
HE 500 A	155	86970	3550	3949	21	10370	691.1	1059	7.24	309.3	5643	82.6
HE 450 A	140	63720	2896	3216	18.9	9465	631	965.5	7.29	243.8	4148	82.7
HE 400 A	125	45070	2311	2562	16.8	8564	570.9	872.9	7.34	189.0	2942	82.9
HE 360 A	112	33090	1891	2088	15.2	7887	525.8	802.3	7.43	148.8	2177	83.2
HE 340 A	105	27690	1678	1850	14.4	7436	495.7	755.9	7.46	127.2	1824	83.3
HE 320 A	97.6	22930	1479	1628	13.6	6985	465.7	709.7	7.49	108.0	1512	83.4
HE 300 A	88.3	18260	1260	1383	12.7	6310	420.6	641.2	7.49	85.17	1200	83.1
HE 280 A	76.4	13670	1013	1112	11.9	4763	340.2	518.1	7.00	62.10	785.4	77.7
HE 260 A	68.2	10450	836.4	919.8	11	3668	282.1	430.2	6.50	52.37	516.4	72.1
HE 240 A	60.3	7763	675.1	744.6	10.1	2769	230.7	351.7	6.00	41.55	328.5	66.8
HE 220 A	50.5	5410	515.2	568.5	9.17	1955	177.7	270.6	5.51	28.46	193.3	61.4
HE 200 A	42.3	3692	388.6	429.5	8.28	1336	133.6	203.8	4.98	20.98	108.0	55.6
HE 180 A	35.5	2510	293.6	324.9	7.45	924.6	102.7	156.5	4.52	14.8	60.21	50.4
HE 160 A	30.4	1673	220.1	245.1	6.57	615.6	76.95	117.6	3.98	12.19	31.41	44.7
HE 140 A	24.7	1033	155.4	173.5	5.73	389.3	55.62	84.85	3.52	8.13	15.06	39.5
HE 120 A	19.9	606.2	106.3	119.5	4.89	230.9	38.48	58.85	3.02	5.99	6.47	33.9
HE 100 A	16.7	349.2	72.76	83.01	4.06	133.8	26.76	41.14	2.51	5.24	2.58	28.4

Table A.1 Continued.



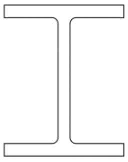
HEB Shapes

Dimensions

Shape	Area	Depth	Web		Flange		Distance		Compact Section Criteria	
	A	d	h	t_w	b_f	t_f	r	k	$\frac{h}{t_w}$	$\frac{b_f}{2t_f}$
	mm^2 ×10^2	mm	mm	mm	mm	mm	mm	mm		
HE 1000 B	400.0	1000	868.0	19.0	300	36.0	30	66.0	45.7	4.17
HE 900 B	371.3	900	770.0	18.5	300	35.0	30	65.0	41.6	4.29
HE 800 B	334.2	800	674.0	17.5	300	33.0	30	63.0	38.5	4.55
HE 700 B	306.4	700	582.0	17.0	300	32.0	27	59.0	34.2	4.69
HE 650 B	286.3	650	534.0	16.0	300	31.0	27	58.0	33.4	4.84
HE 600 B	270.0	600	486.0	15.5	300	30.0	27	57.0	31.4	5.00
HE 550 B	254.1	550	438.0	15.0	300	29.0	27	56.0	29.2	5.17
HE 500 B	238.6	500	390.0	14.5	300	28.0	27	55.0	26.9	5.36
HE 450 B	218.0	450	344.0	14.0	300	26.0	27	53.0	24.6	5.77
HE 400 B	197.8	400	298.0	13.5	300	24.0	27	51.0	22.1	6.25
HE 360 B	180.6	360	261.0	12.5	300	22.5	27	49.5	20.9	6.67
HE 340 B	170.9	340	243.0	12.0	300	21.5	27	48.5	20.3	6.98
HE 320 B	161.3	320	225.0	11.5	300	20.5	27	47.5	19.6	7.32
HE 300 B	149.1	300	208.0	11.0	300	19.0	27	46.0	18.9	7.89
HE 280 B	131.4	280	196.0	10.5	280	18.0	24	42.0	18.7	7.78
HE 260 B	118.4	260	177.0	10.0	260	17.5	24	41.5	17.7	7.43
HE 240 B	106.0	240	164.0	10.0	240	17.0	21	38.0	16.4	7.06
HE 220 B	91.04	220	152.0	9.5	220	16.0	18	34.0	16.0	6.88
HE 200 B	78.08	200	134.0	9.0	200	15.0	18	33.0	14.9	6.67
HE 180 B	65.25	180	122.0	8.5	180	14.0	15	29.0	14.4	6.43
HE 160 B	54.25	160	104.0	8.0	160	13.0	15	28.0	13.0	6.15
HE 140 B	42.96	140	92.0	7.0	140	12.0	12	24.0	13.1	5.83
HE 120 B	34.01	120	74.0	6.5	120	11.0	12	23.0	11.4	5.45
HE 100 B	26.04	100	56.0	6.0	100	10.0	12	22.0	9.33	5.00

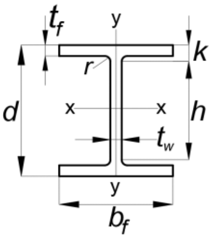
Table A.1 Continued.

HEB Shapes
Properties



Shape	Nominal Weight	Axis x-x				Axis y-y				Torsional Properties		r_{ts}
	G	I_x	S_x	Z_x	r_x	I_y	S_y	Z_y	r_y	J	C_w	
	kg/m	mm^4	mm^3	mm^3	mm	mm^4	mm^3	mm^3	mm	mm^4	mm^6	mm
		$\times 10^4$	$\times 10^3$	$\times 10^3$	×10	$\times 10^4$	$\times 10^3$	$\times 10^3$	×10	$\times 10^4$	$\times 10^9$	
HE 1000 B	314	644700	12890	14860	40.15	16280	1085	1716	6.38	1254	37640	77.9
HE 900 B	291	494100	10980	12580	36.48	15820	1054	1658	6.53	1137	29460	78.9
HE 800 B	262	359100	8977	10230	32.78	14900	993.6	1553	6.68	946.0	21840	79.7
HE 700 B	241	256900	7340	8327	28.96	14440	962.7	1495	6.87	830.9	16060	81.0
HE 650 B	225	210600	6480	7320	27.12	13980	932.3	1441	6.99	739.2	13360	81.7
HE 600 B	212	171000	5701	6425	25.17	13530	902.0	1391	7.08	667.2	10970	82.2
HE 550 B	199	136700	4971	5591	23.20	13080	871.8	1341	7.17	600.3	8856	82.7
HE 500 B	187	107200	4287	4815	21.19	12620	841.6	1292	7.27	538.4	7018	83.3
HE 450 B	171	79890	3551	3982	19.14	11720	781.4	1198	7.33	440.5	5258	83.6
HE 400 B	155	57680	2884	3232	17.08	10820	721.3	1104	7.4	355.7	3817	83.9
HE 360 B	142	43190	2400	2683	15.46	10140	676.1	1032	7.49	292.5	2883	84.4
HE 340 B	134	36660	2156	2408	14.65	9690	646.0	985.7	7.53	257.2	2454	84.6
HE 320 B	127	30820	1926	2149	13.82	9239	615.9	939.1	7.57	225.1	2069	84.7
HE 300 B	117	25170	1678	1869	12.99	8563	570.9	870.1	7.58	185.0	1688	84.7
HE 280 B	103	19270	1376	1534	12.11	6595	471.0	717.6	7.09	143.7	1130	79.2
HE 260 B	93.0	14920	1148	1283	11.22	5135	395.0	602.2	6.58	123.8	753.7	73.6
HE 240 B	83.2	11260	938.3	1053	10.31	3923	326.9	498.4	6.08	102.7	486.9	68.3
HE 220 B	71.5	8091	735.5	827.0	9.43	2843	258.5	393.9	5.59	76.57	295.4	62.8
HE 200 B	61.3	5696	569.6	642.5	8.54	2003	200.3	305.8	5.07	59.28	171.1	57.0
HE 180 B	51.2	3831	425.7	481.4	7.66	1363	151.4	231.0	4.57	42.16	93.75	51.5
HE 160 B	42.6	2492	311.5	354.0	6.78	889.2	111.2	170.0	4.05	31.24	47.94	45.8
HE 140 B	33.7	1509	215.6	245.4	5.93	549.7	78.52	119.8	3.58	20.06	22.48	40.4
HE 120 B	26.7	864.4	144.1	165.2	5.04	317.5	52.92	80.97	3.06	13.84	9.41	34.6
HE 100 B	20.4	449.5	89.91	104.2	4.16	167.3	33.45	51.42	2.53	9.25	3.38	28.9

Table A.1 Continued.



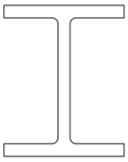
HEM Shapes

Dimensions

Shape	Area	Depth	Web		Flange		Distance		Compact Section Criteria	
	A	d	h	t_w	b_f	t_f	r	k	$\frac{h}{t_w}$	$\frac{b_f}{2t_f}$
	mm^2 $\times 10^2$	mm	mm	mm	mm	mm	mm	mm		
HE 1000 M	444.2	1008	868.0	21.0	302	40.0	30	70.0	41.3	3.78
HE 900 M	423.6	910	770.0	21.0	302	40.0	30	70.0	36.7	3.78
HE 800 M	404.3	814	674.0	21.0	303	40.0	30	70.0	32.1	3.79
HE 700 M	383.0	716	582.0	21.0	304	40.0	27	67.0	27.7	3.80
HE 650 M	373.7	668	534.0	21.0	305	40.0	27	67.0	25.4	3.81
HE 600 M	363.7	620	486.0	21.0	305	40.0	27	67.0	23.1	3.81
HE 550 M	354.4	572	438.0	21.0	306	40.0	27	67.0	20.9	3.83
HE 500 M	344.3	524	390.0	21.0	306	40.0	27	67.0	18.6	3.83
HE 450 M	335.4	478	344.0	21.0	307	40.0	27	67.0	16.4	3.84
HE 400 M	325.8	432	298.0	21.0	307	40.0	27	67.0	14.2	3.84
HE 360 M	318.8	395	261.0	21.0	308	40.0	27	67.0	12.4	3.85
HE 340 M	315.8	377	243.0	21.0	309	40.0	27	67.0	11.6	3.86
HE 320 M	312.0	359	225.0	21.0	309	40.0	27	67.0	10.7	3.86
HE 300 M	303.1	340	208.0	21.0	310	39.0	27	66.0	9.90	3.97
HE 280 M	240.2	310	196.0	18.5	288	33.0	24	57.0	10.6	4.36
HE 260 M	219.6	290	177.0	18.0	268	32.5	24	56.5	9.83	4.12
HE 240 M	199.6	270	164.0	18.0	248	32.0	21	53.0	9.11	3.88
HE 220 M	149.4	240	152.0	15.5	226	26.0	18	44.0	9.81	4.35
HE 200 M	131.3	220	134.0	15.0	206	25.0	18	43.0	8.93	4.12
HE 180 M	113.3	200	122.0	14.5	186	24.0	15	39.0	8.41	3.88
HE 160 M	97.05	180	104.0	14.0	166	23.0	15	38.0	7.43	3.61
HE 140 M	80.56	160	92.0	13.0	146	22.0	12	34.0	7.08	3.32
HE 120 M	66.41	140	74.0	12.5	126	21.0	12	33.0	5.92	3.00
HE 100 M	53.24	120	56.0	12.0	106	20.0	12	32.0	4.67	2.65

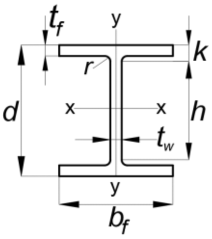
Table A.1 Continued.

HEM Shapes
Properties



Shape	Nominal Weight	Axis x-x				Axis y-y				Torsional Properties		r_{ts}
	G	I_x	S_x	Z_x	r_x	I_y	S_y	Z_y	r_y	J	C_w	
	kg/m	mm^4	mm^3	mm^3	mm	mm^4	mm^3	mm^3	mm	mm^4	mm^6	mm
		$\times10^4$	$\times10^3$	$\times10^3$	$\times10$	$\times10^4$	$\times10^3$	$\times10^3$	$\times10$	$\times10^4$	$\times10^9$	
HE 1000 M	349	722300	14330	16570	40.3	18460	1222	1940	6.45	1701	43020	78.9
HE 900 M	333	570400	12540	14440	36.70	18450	1222	1929	6.60	1671	34750	79.9
HE 800 M	317	442600	10870	12490	33.1	18630	1230	1930	6.79	1646	27780	81.4
HE 700 M	301	329300	9198	10540	29.3	18800	1237	1929	7.01	1589	21400	83.0
HE 650 M	293	281700	8433	9657	27.5	18980	1245	1936	7.13	1579	18650	84.0
HE 600 M	285	237400	7660	8772	25.6	18980	1244	1930	7.22	1564	15910	84.7
HE 550 M	278	198000	6923	7933	23.6	19160	1252	1937	7.35	1554	13520	85.7
HE 500 M	270	161900	6180	7094	21.7	19150	1252	1932	7.46	1539	11190	86.6
HE 450 M	263	131500	5501	6331	19.8	19340	1260	1939	7.59	1529	9251	87.7
HE 400 M	256	104100	4820	5571	17.9	19340	1260	1934	7.70	1515	7410	88.6
HE 360 M	250	84870	4297	4989	16.3	19520	1268	1942	7.83	1507	6137	89.8
HE 340 M	248	76370	4052	4718	15.6	19710	1276	1953	7.90	1506	5584	90.5
HE 320 M	245	68130	3796	4435	14.8	19710	1276	1951	7.95	1501	5004	91.0
HE 300 M	238	59200	3482	4078	14	19400	1252	1913	8.00	1408	4386	91.5
HE 280 M	189	39550	2551	2966	12.8	13160	914.1	1397	7.40	807.3	2520	84.5
HE 260 M	172	31310	2159	2524	11.9	10450	779.7	1192	6.90	719.0	1728	78.9
HE 240 M	157	24290	1799	2117	11	8153	657.5	1006	6.39	627.9	1152	73.4
HE 220 M	117	14600	1217	1419	9.89	5012	443.5	678.6	5.79	315.3	572.7	66.4
HE 200 M	103	10640	967.4	1135	9.00	3651	354.5	543.2	5.27	259.4	346.3	60.6
HE 180 M	88.9	7483	748.3	883.4	8.13	2580	277.4	425.2	4.77	203.3	199.3	55.1
HE 160 M	76.2	5098	566.5	674.6	7.25	1759	211.9	325.5	4.26	162.4	108.1	49.3
HE 140 M	63.2	3291	411.4	493.8	6.39	1144	156.8	240.5	3.77	120.0	54.33	43.8
HE 120 M	52.1	2018	288.2	350.6	5.51	702.8	111.6	171.6	3.25	91.66	24.79	38.1
HE 100 M	41.8	1143	190.4	235.8	4.63	399.2	75.31	116.3	2.74	68.21	9.93	32.3

Table A.1 Continued.



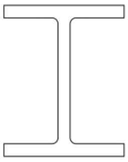
IPE Shapes

Dimensions

Shape	Area	Depth	Web		Flange		Distance		Compact Section Criteria	
	A	d	h	t_w	b_f	t_f	r	k	$\frac{h}{t_w}$	$\frac{b_f}{2t_f}$
	mm^2	mm	mm	mm	mm	mm	mm	mm		
	$\times 10^2$									
IPE 600	156.0	600	514.0	12.0	220	19.0	24	43.0	42.8	5.79
IPE 550	134.4	550	467.6	11.1	210	17.2	24	41.2	42.1	6.10
IPE 500	115.5	500	426.0	10.2	200	16.0	21	37.0	41.8	6.25
IPE 450	98.82	450	378.8	9.4	190	14.6	21	35.6	40.3	6.51
IPE 400	84.46	400	331.0	8.6	180	13.5	21	34.5	38.5	6.67
IPE 360	72.73	360	298.6	8.0	170	12.7	18	30.7	37.3	6.69
IPE 330	62.61	330	271.0	7.5	160	11.5	18	29.5	36.1	6.96
IPE 300	53.81	300	248.6	7.1	150	10.7	15	25.7	35.0	7.01
IPE 270	45.95	270	219.6	6.6	135	10.2	15	25.2	33.3	6.62
IPE 240	39.12	240	190.4	6.2	120	9.8	15	24.8	30.7	6.12
IPE 220	33.37	220	177.6	5.9	110	9.2	12	21.2	30.1	5.98
IPE 200	28.48	200	159.0	5.6	100	8.5	12	20.5	28.4	5.88
IPE 180	23.95	180	146.0	5.3	91	8.0	9	17.0	27.5	5.69
IPE 160	20.09	160	127.2	5.0	82	7.4	9	16.4	25.4	5.54
IPE 140	16.43	140	112.2	4.7	73	6.9	7	13.9	23.9	5.29
IPE 120	13.21	120	93.4	4.4	64	6.3	7	13.3	21.2	5.08
IPE 100	10.32	100	74.6	4.1	55	5.7	7	12.7	18.2	4.82
IPE 80	7.64	80	59.6	3.8	46	5.2	5	10.2	15.7	4.42

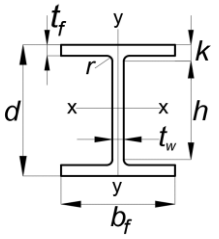
Table A.1 Continued.

IPE Shapes
Properties



Shape	Nominal Weight	Axis x-x				Axis y-y				Torsional Properties		r_{ts}
	G	I_x	S_x	Z_x	r_x	I_y	S_y	Z_y	r_y	J	C_w	
	kg/m	mm^4	mm^3	mm^3	mm	mm^4	mm^3	mm^3	mm	mm^4	mm^6	mm
		$\times 10^4$	$\times 10^3$	$\times 10^3$	×10	$\times 10^4$	$\times 10^3$	$\times 10^3$	×10	$\times 10^4$	$\times 10^9$	
IPE 600	122	92080	3069	3512	24.30	3387	307.9	485.6	4.66	165.4	2846	56.6
IPE 550	106	67120	2441	2787	22.35	2668	254.1	400.5	4.45	123.2	1884	53.9
IPE 500	90.7	48200	1928	2194	20.43	2142	214.2	335.9	4.31	89.29	1249	51.8
IPE 450	77.6	33740	1500	1702	18.48	1676	176.4	276.4	4.12	66.87	791.0	49.3
IPE 400	66.3	23130	1156	1307	16.55	1318	146.4	229.0	3.95	51.08	490.0	46.9
IPE 360	57.1	16270	903.6	1019	14.95	1043	122.8	191.1	3.79	37.32	313.6	44.7
IPE 330	49.1	11770	713.1	804.3	13.71	788.1	98.52	153.7	3.55	28.15	199.1	41.9
IPE 300	42.2	8356	557.1	628.4	12.46	603.8	80.50	125.2	3.35	20.12	125.9	39.6
IPE 270	36.1	5790	428.9	484.0	11.23	419.9	62.20	96.95	3.02	15.94	70.58	35.6
IPE 240	30.7	3892	324.3	366.6	9.97	283.6	47.27	73.92	2.69	12.88	37.39	31.7
IPE 220	26.2	2772	252	285.4	9.11	204.9	37.25	58.11	2.48	9.07	22.67	29.2
IPE 200	22.4	1943	194.3	220.6	8.26	142.4	28.47	44.61	2.24	6.98	12.99	26.5
IPE 180	18.8	1317	146.3	166.4	7.42	100.9	22.16	34.60	2.05	4.79	7.43	24.3
IPE 160	15.8	869.3	108.7	123.9	6.58	68.31	16.66	26.10	1.84	3.60	3.96	21.9
IPE 140	12.9	541.2	77.32	88.34	5.74	44.92	12.31	19.25	1.65	2.45	1.98	19.6
IPE 120	10.4	317.8	52.96	60.73	4.90	27.67	8.65	13.58	1.45	1.74	0.89	17.2
IPE 100	8.1	171.0	34.20	39.41	4.07	15.92	5.79	9.15	1.24	1.20	0.35	14.8
IPE 80	6.0	80.14	20.03	23.22	3.24	8.49	3.69	5.82	1.05	0.673	0.12	12.6

Table A.1 Continued.



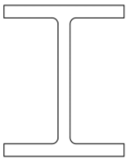
IPEA Shapes
Dimensions

Shape	Area	Depth	Web		Flange		Distance		Compact Section Criteria	
	A	d	h	t_w	b_f	t_f	r	k	$\frac{h}{t_w}$	$\frac{b_f}{2t_f}$
	mm^2	mm	mm	mm	mm	mm	mm	mm		
	$\times 10^2$									
IPE A 600	137.0	597	514.0	9.8	220	17.5	24	41.5	52.4	6.29
IPE A 550	117.3	547	467.6	9.0	210	15.7	24	39.7	52.0	6.69
IPE A 500	101.1	497	426.0	8.4	200	14.5	21	35.5	50.7	6.90
IPE A 450	85.55	447	378.8	7.6	190	13.1	21	34.1	49.8	7.25
IPE A 400	73.10	397	331.0	7.0	180	12.0	21	33.0	47.3	7.50
IPE A 360	63.96	358	298.6	6.6	170	11.5	18	29.5	45.2	7.39
IPE A 330	54.74	327	271.0	6.5	160	10.0	18	28.00	41.7	8.00
IPE A 300	46.53	297	248.6	6.1	150	9.2	15	24.2	40.8	8.15
IPE A 270	39.15	267	219.6	5.5	135	8.7	15	23.7	39.9	7.76
IPE A 240	33.31	237	190.4	5.2	120	8.3	15	23.3	36.6	7.23
IPE A 220	28.26	217	177.6	5.0	110	7.7	12	19.7	35.5	7.14
IPE A 200	23.47	197	159.0	4.5	100	7.0	12	19.0	35.3	7.14
IPE A 180	19.58	177	146.0	4.3	91	6.5	9	15.5	34.0	7.00
IPE A 160	16.18	157	127.2	4.0	82	5.9	9	14.9	31.8	6.95
IPE A 140	13.39	137.4	112.2	3.8	73	5.6	7	12.6	29.5	6.52
IPE A 120	11.03	117.6	93.4	3.8	64	5.1	7	12.1	24.6	6.27
IPE A 100	8.78	98	74.6	3.6	55	4.7	7	11.7	20.7	5.85
IPE A 80	6.38	78	59.6	3.3	46	4.2	5	9.2	18.1	5.48

Table A.1 Continued.

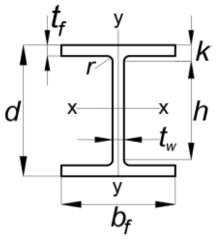
IPEA Shapes

Properties



Shape	Nominal Weight	Axis x-x				Axis y-y				Torsional Properties		r_{ts}
	G	I_x	S_x	Z_x	r_x	I_y	S_y	Z_y	r_y	J	C_w	
	kg/m	mm^4	mm^3	mm^3	mm	mm^4	mm^3	mm^3	mm	mm^4	mm^6	mm
		$\times 10^4$	$\times 10^3$	$\times 10^3$	$\times 10$	$\times 10^4$	$\times 10^3$	$\times 10^3$	$\times 10$	$\times 10^4$	$\times 10^9$	
IPE A 600	108	82920	2778	3141	24.60	3116	283.3	442.1	4.77	118.8	2607	57.0
IPE A 550	92.1	59980	2193	2475	22.61	2432	231.6	361.5	4.55	86.53	1710	54.2
IPE A 500	79.4	42930	1728	1946	20.61	1939	193.9	301.6	4.38	62.78	1125	52.0
IPE A 450	67.2	29760	1331	1494	18.65	1502	158.1	245.7	4.19	45.67	704.9	49.4
IPE A 400	57.4	20290	1022	1144	16.66	1171	130.1	202.1	4.00	34.79	432.2	46.9
IPE A 360	50.2	14520	811.8	906.8	15.06	944.3	111.1	171.9	3.84	26.51	282.0	44.8
IPE A 330	43.0	10230	625.7	701.9	13.67	685.2	85.64	133.3	3.54	19.57	171.5	41.6
IPE A 300	36.5	7173	483.1	541.8	12.42	519.0	69.20	107.3	3.34	13.43	107.2	39.3
IPE A 270	30.7	4917	368.3	412.5	11.21	358.0	53.03	82.34	3.02	10.3	59.51	35.4
IPE A 240	26.2	3290	277.7	311.6	9.94	240.1	40.02	62.40	2.68	8.35	31.26	31.4
IPE A 220	22.2	2317	213.5	240.2	9.05	171.4	31.17	48.49	2.46	5.69	18.71	29.0
IPE A 200	18.4	1591	161.6	181.7	8.23	117.2	23.43	36.54	2.23	4.11	10.53	26.2
IPE A 180	15.4	1063	120.1	135.3	7.37	81.89	18.00	27.96	2.05	2.7	5.93	24.1
IPE A 160	12.7	689.3	87.81	99.09	6.53	54.43	13.27	20.7	1.83	1.96	3.09	21.6
IPE A 140	10.5	434.9	63.30	71.60	5.70	36.42	9.98	15.52	1.65	1.36	1.58	19.5
IPE A 120	8.7	257.4	43.77	49.87	4.83	22.39	7.00	10.98	1.42	1.04	0.71	17.0
IPE A 100	6.9	141.2	28.81	32.98	4.01	13.12	4.77	7.54	1.22	0.77	0.28	14.5
IPE A 80	5.0	64.38	16.51	18.98	3.18	6.85	2.98	4.69	1.04	0.42	0.09	12.3

Table A.1 Continued.



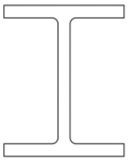
IPEO Shapes

Dimensions

Shape	Area	Depth	Web		Flange		Distance		Compact Section Criteria	
	A	d	h	t_w	b_f	t_f	r	k	$\frac{h}{t_w}$	$\frac{b_f}{2t_f}$
	mm^2 $\times 10^2$	mm	mm	mm	mm	mm	mm	mm		
IPE O 600	196.8	610	514.0	15.0	224	24.0	24	48.0	34.3	4.67
IPE O 550	156.1	556	467.6	12.7	212	20.2	24	44.2	36.8	5.25
IPE O 500	136.7	506	426.0	12.0	202	19.0	21	40.0	35.5	5.32
IPE O 450	117.7	456	378.8	11.0	192	17.6	21	38.6	34.4	5.45
IPE O 400	96.39	404	331.0	9.7	182	15.5	21	36.5	34.1	5.87
IPE O 360	84.13	364	298.6	9.2	172	14.7	18	32.7	32.5	5.85
IPE O 330	72.62	334	271.0	8.5	162	13.5	18	31.5	31.9	6.00
IPE O 300	62.83	304	248.6	8.0	152	12.7	15	27.7	31.1	5.98
IPE O 270	53.84	274	219.6	7.5	136	12.2	15	27.2	29.3	5.57
IPE O 240	43.71	242	190.4	7.0	122	10.8	15	25.8	27.2	5.65
IPE O 220	37.39	222	177.6	6.6	112	10.2	12	22.2	26.9	5.49
IPE O 200	31.96	202	159.0	6.2	102	9.5	12	21.5	25.6	5.37
IPE O 180	27.10	182	146.0	6.0	92	9.0	9	18.0	24.3	5.11

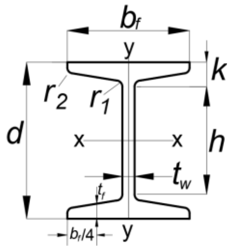
Table A.1 Continued.

IPEO Shapes
Properties



Shape	Nominal Weight	Axis x-x				Axis y-y				Torsional Properties		r_{ts}
	G	I_x	S_x	Z_x	r_x	I_y	S_y	Z_y	r_y	J	C_w	
	kg/m	mm^4	mm^3	mm^3	mm	mm^4	mm^3	mm^3	mm	mm^4	mm^6	mm
		×10^4	×10^3	×10^3	×10	×10^4	×10^3	×10^3	×10	×10^4	×10^9	
IPE O 600	154	118300	3879	4471	24.52	4521	403.6	640.1	4.79	318.1	3860	58.4
IPE O 550	123	79160	2847	3263	22.52	3224	304.2	480.5	4.55	187.5	2302	55.0
IPE O 500	107	57780	2284	2613	20.56	2622	259.6	408.5	4.38	143.5	1548	52.8
IPE O 450	92.4	40920	1795	2046	18.65	2085	217.2	341.0	4.21	109.0	997.6	50.4
IPE O 400	75.7	26750	1324	1502	16.66	1564	171.9	269.1	4.03	73.10	587.6	47.9
IPE O 360	66.0	19050	1047	1186	15.05	1251	145.5	226.9	3.86	55.76	380.3	45.6
IPE O 330	57.0	13910	833.0	942.8	13.84	960.4	118.6	185.0	3.64	42.15	245.7	42.9
IPE O 300	49.3	9994	657.5	743.8	12.61	745.7	98.12	152.6	3.45	31.06	157.7	40.6
IPE O 270	42.3	6947	507.1	574.6	11.36	513.5	75.51	117.7	3.09	24.90	87.64	36.4
IPE O 240	34.3	4369	361.1	410.3	10.00	328.5	53.86	84.40	2.74	17.18	43.68	32.4
IPE O 220	29.4	3134	282.3	321.1	9.16	239.8	42.83	66.91	2.53	12.27	26.79	30.0
IPE O 200	25.1	2211	218.9	249.4	8.32	168.9	33.11	51.89	2.30	9.45	15.57	27.2
IPE O 180	21.3	1505	165.4	189.1	7.45	117.3	25.50	39.91	2.08	6.76	8.74	24.7

Table A.1 Continued.



IPN Shapes

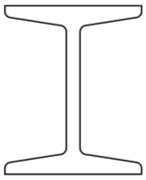
Dimensions

Shape	Area	Depth	Web		Flange		Distance			Compact Section Criteria	
	A	***d***	***h***	t_w	b_f	t_f	r_1	r_2	***k***	$\frac{h}{t_w}$	$\frac{b_f}{2t_f}$
	mm²	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**		
	×10²										
IPN 600	254.0	600	485.8	21.6	215	32.4	22	13	57.1	22.5	3.32
IPN 550	212.0	550	445.6	19.0	200	30.0	19	12	52.2	23.5	3.33
IPN 500	179.0	500	404.3	18.0	185	27.0	18	11	47.9	22.5	3.43
IPN 450	147.0	450	363.6	16.2	170	24.3	16	10	43.2	22.4	3.50
IPN 400	118.0	400	322.9	14.4	155	21.6	14	9	38.6	22.4	3.59
IPN 380	107.0	380	306.7	13.7	149	20.5	14	8	36.7	22.4	3.63
IPN 360	97.00	360	290.2	13.0	143	19.5	13	8	34.9	22.3	3.67
IPN 340	86.70	340	274.3	12.2	137	18.3	12	7	32.9	22.5	3.74
IPN 320	77.70	320	257.9	11.5	131	17.3	12	7	31.1	22.4	3.79
IPN 300	69.00	300	241.6	10.8	125	16.2	11	7	29.2	22.4	3.86
IPN 280	61.00	280	225.1	10.1	119	15.2	10	6	27.5	22.3	3.91
IPN 260	53.30	260	208.9	9.4	113	14.1	9	6	25.6	22.2	4.01
IPN 240	46.10	240	192.5	8.7	106	13.1	9	5	23.8	22.1	4.05
IPN 220	39.50	220	175.8	8.1	98	12.2	8	5	22.1	21.7	4.02
IPN 200	33.40	200	159.1	7.5	90	11.3	8	5	20.5	21.2	3.98
IPN 180	27.90	180	142.4	6.9	82	10.4	7	4	18.8	20.6	3.94
IPN 160	22.80	160	125.8	6.3	74	9.5	6	4	17.1	20.0	3.89
IPN 140	18.30	140	109.1	5.7	66	8.6	6	3	15.5	19.1	3.84
IPN 120	14.20	120	92.4	5.1	58	7.7	5	3	13.8	18.1	3.77
IPN 100	10.60	100	75.7	4.5	50	6.8	5	3	12.2	16.8	3.68
IPN 80	7.58	80	59.0	3.9	42	5.9	4	2	10.5	15.1	3.56

Table A.1 Continued.

IPN Shapes

Properties

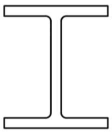


Shape	Nominal Weight	Axis x-x				Axis y-y				Torsional Properties		r_{ts}
	G	I_x	S_x	Z_x	r_x	I_y	S_y	Z_y	r_y	J	C_w	
	kg/m	mm^4	mm^3	mm^3	mm	mm^4	mm^3	mm^3	mm	mm^4	mm^6	mm
		$\times 10^4$	$\times 10^3$	$\times 10^3$	×10	$\times 10^4$	$\times 10^3$	$\times 10^3$	×10	$\times 10^4$	$\times 10^9$	
IPN 600	199	138800	4627	5452	23.39	4674	435.0	752.0	4.29	787.0	3814	53.7
IPN 550	166	99180	3610	4240	21.60	3490	349.0	592.0	4.02	544.0	2390	50.3
IPN 500	141	68740	2750	3240	19.60	2480	268.0	456.0	3.72	402.0	1400	46.3
IPN 450	115	45850	2040	2400	17.70	1730	203.0	345.0	3.43	267.0	791.0	42.6
IPN 400	92.4	29210	1460	1714	15.70	1160	149.0	253.0	3.13	170.0	420.0	38.9
IPN 380	84.0	24010	1260	1482	15.00	975.0	131.0	221.0	3.02	141.0	319.0	37.4
IPN 360	76.1	19610	1090	1276	14.20	818.0	114.0	194.0	2.90	115.0	240.0	35.9
IPN 340	68.0	15700	923	1080	13.50	674.0	98.40	166.0	2.80	90.40	176.0	34.4
IPN 320	61.0	12510	782	914	12.70	555.0	84.70	143.0	2.67	72.50	129.0	32.9
IPN 300	54.2	9800	653	762	11.90	451.0	72.20	121.0	2.56	56.80	91.80	31.4
IPN 280	47.9	7590	542.0	632.0	11.10	364.0	61.20	103.0	2.45	44.20	64.60	29.9
IPN 260	41.9	5740	442.0	514.0	10.40	288.0	51.00	85.90	2.32	33.50	44.10	28.4
IPN 240	36.2	4250	354.0	412.0	9.59	221.0	41.70	70.00	2.20	25.00	28.70	26.7
IPN 220	31.1	3060	278.0	324.0	8.80	162.0	33.10	55.70	2.02	18.60	17.80	24.7
IPN 200	26.2	2140	214.0	250.0	8.00	117.0	26.00	43.50	1.87	13.50	10.50	22.8
IPN 180	21.9	1450	161.0	187.0	7.20	81.30	19.80	33.20	1.71	9.58	5.92	20.8
IPN 160	17.9	935.0	117.0	136.0	6.40	54.70	14.80	24.90	1.55	6.57	3.14	18.8
IPN 140	14.3	573.0	81.90	95.40	5.61	35.20	10.70	17.90	1.40	4.32	1.54	16.9
IPN 120	11.1	328.0	54.70	63.60	4.81	21.50	7.41	12.40	1.23	2.71	0.69	14.9
IPN 100	8.3	171.0	34.20	39.80	4.01	12.20	4.88	8.10	1.07	1.60	0.27	13.0
IPN 80	5.9	77.80	19.50	22.80	3.20	6.29	3.00	5.00	0.91	0.87	0.09	11.0

APPENDIX B

DESIGN TABLES FOR TENSION MEMBERS

Table B.1 Available strength in axial tension.

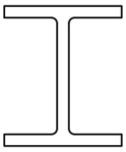


Available Strength in Axial Tension
HD Shapes

F_y = 235 MPa
F_u = 360 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HD 400 × 1086	1386	1040	29300	19500	28100	18700
× 990	1262	947	26700	17800	25600	17000
× 900	1149	862	24300	16200	23300	15500
× 818	1043	782	22100	14700	21100	14100
× 744	948.1	711	20100	13300	19200	12800
× 677	863.4	648	18300	12100	17500	11700
× 634	808.0	606	17100	11400	16400	10900
× 592	754.9	566	16000	10600	15300	10200
× 551	701.4	526	14800	9870	14200	9470
× 509	649.0	487	13700	9130	13100	8760
× 463	589.5	442	12500	8300	11900	7960
× 421	537.1	403	11400	7560	10900	7250
× 382	487.1	365	10300	6850	9860	6580
× 347	442.0	332	9350	6220	8950	5970
× 314	399.2	299	8440	5620	8080	5390
× 287	366.3	275	7750	5150	7420	4950
× 262	334.6	251	7080	4710	6780	4520
× 237	300.9	226	6360	4230	6090	4060
× 216	275.5	207	5830	3880	5580	3720
× 187	237.6	178	5030	3340	4810	3210
HD 360 × 196	250.3	188	5290	3520	5070	3380
× 179	228.3	171	4830	3210	4620	3080
× 162	206.3	155	4360	2900	4180	2790
× 147	187.9	141	3970	2640	3800	2540
× 134	170.6	128	3610	2400	3450	2300
HD 320 × 300	382.1	287	8080	5380	7740	5160
× 245	312.0	234	6600	4390	6320	4210
× 198	252.3	189	5340	3550	5110	3410
× 158	201.2	151	4260	2830	4070	2720
× 127	161.3	121	3410	2270	3270	2180
× 97.6	124.4	93.3	2630	1750	2520	1680
× 74.2	94.58	70.9	2000	1330	1920	1280
HD 260 × 172	219.6	165	4640	3090	4450	2960
× 142	180.3	135	3810	2540	3650	2430
× 114	145.7	109	3080	2050	2950	1970
× 93.0	118.4	88.8	2500	1670	2400	1600
× 68.2	86.82	65.1	1840	1220	1760	1170
× 54.1	68.97	51.7	1460	971	1400	931
Limit State	**LRFD**	**ASD**	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.783A_g$.			
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$				
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$				

Table B.1 Continued.



Available Strength in Axial Tension
HD Shapes

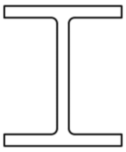
F_y = 275 MPa
F_u = 430 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HD 400 × 1086	1386	1040	34300	22800	33500	22300
× 990	1262	947	31200	20800	30500	20300
× 900	1149	862	28400	18900	27800	18500
× 818	1043	782	25800	17200	25200	16800
× 744	948.1	711	23500	15600	22900	15300
× 677	863.4	648	21400	14200	20900	13900
× 634	808.0	606	20000	13300	19500	13000
× 592	754.9	566	18700	12400	18300	12200
× 551	701.4	526	17400	11600	17000	11300
× 509	649.0	487	16100	10700	15700	10500
× 463	589.5	442	14600	9710	14300	9510
× 421	537.1	403	13300	8840	13000	8660
× 382	487.1	365	12100	8020	11800	7850
× 347	442.0	332	10900	7280	10700	7130
× 314	399.2	299	9880	6570	9660	6440
× 287	366.3	275	9070	6030	8860	5910
× 262	334.6	251	8280	5510	8090	5400
× 237	300.9	226	7450	4950	7280	4850
× 216	275.5	207	6820	4540	6660	4440
× 187	237.6	178	5880	3910	5750	3830
HD 360 × 196	250.3	188	6190	4120	6050	4040
× 179	228.3	171	5650	3760	5520	3680
× 162	206.3	155	5110	3400	4990	3330
× 147	187.9	141	4650	3090	4540	3030
× 134	170.6	128	4220	2810	4130	2750
HD 320 × 300	382.1	287	9460	6290	9240	6160
× 245	312.0	234	7720	5140	7550	5030
× 198	252.3	189	6240	4150	6100	4070
× 158	201.2	151	4980	3310	4870	3240
× 127	161.3	121	3990	2660	3900	2600
× 97.6	124.4	93.3	3080	2050	3010	2010
× 74.2	94.58	70.9	2340	1560	2290	1530
HD 260 × 172	219.6	165	5440	3620	5310	3540
× 142	180.3	135	4460	2970	4360	2910
× 114	145.7	109	3610	2400	3520	2350
× 93.0	118.4	88.8	2930	1950	2860	1910
× 68.2	86.82	65.1	2150	1430	2100	1400
× 54.1	68.97	51.7	1710	1140	1670	1110

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.767A_g$.

Table B.1 Continued.



Available Strength in Axial Tension
HD Shapes

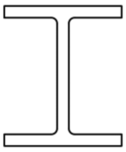
F_y = 355 MPa
F_u = 510 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HD 400 × 1086	1386	1040	44300	29500	39800	26500
× 990	1262	947	40300	26800	36200	24100
× 900	1149	862	36700	24400	33000	22000
× 818	1043	782	33300	22200	29900	19900
× 744	948.1	711	30300	20200	27200	18100
× 677	863.4	648	27600	18400	24800	16500
× 634	808.0	606	25800	17200	23200	15500
× 592	754.9	566	24100	16000	21700	14400
× 551	701.4	526	22400	14900	20100	13400
× 509	649.0	487	20700	13800	18600	12400
× 463	589.5	442	18800	12500	16900	11300
× 421	537.1	403	17200	11400	15400	10300
× 382	487.1	365	15600	10400	14000	9320
× 347	442.0	332	14100	9400	12700	8450
× 314	399.2	299	12800	8490	11500	7630
× 287	366.3	275	11700	7790	10500	7010
× 262	334.6	251	10700	7110	9600	6400
× 237	300.9	226	9610	6400	8630	5750
× 216	275.5	207	8800	5860	7900	5270
× 187	237.6	178	7590	5050	6820	4540
HD 360 × 196	250.3	188	8000	5320	7180	4790
× 179	228.3	171	7290	4850	6550	4370
× 162	206.3	155	6590	4390	5920	3950
× 147	187.9	141	6000	3990	5390	3590
× 134	170.6	128	5450	3630	4890	3260
HD 320 × 300	382.1	287	12200	8120	11000	7310
× 245	312.0	234	9970	6630	8950	5970
× 198	252.3	189	8060	5360	7240	4830
× 158	201.2	151	6430	4280	5770	3850
× 127	161.3	121	5150	3430	4630	3080
× 97.6	124.4	93.3	3970	2640	3570	2380
× 74.2	94.58	70.9	3020	2010	2710	1810
HD 260 × 172	219.6	165	7020	4670	6300	4200
× 142	180.3	135	5760	3830	5170	3450
× 114	145.7	109	4660	3100	4180	2790
× 93.0	118.4	88.8	3780	2520	3400	2260
× 68.2	86.82	65.1	2770	1850	2490	1660
× 54.1	68.97	51.7	2200	1470	1980	1320

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.835A_g$.

Table B.1 Continued.

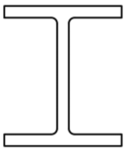


Available Strength in Axial Tension
HEA Shapes

F_y = 235 MPa
F_u = 360 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding kN		Rupture kN	
	mm²	mm²	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10²	× 10²	LRFD	ASD	LRFD	ASD
HE 1000 A	346.8	260	7330	4880	7020	4680
HE 900 A	320.5	240	6780	4510	6490	4330
HE 800 A	285.8	214	6040	4020	5790	3860
HE 700 A	260.5	195	5510	3670	5280	3520
HE 650 A	241.6	181	5110	3400	4890	3260
HE 600 A	226.5	170	4790	3190	4590	3060
HE 550 A	211.8	159	4480	2980	4290	2860
HE 500 A	197.5	148	4180	2780	4000	2670
HE 450 A	178.0	134	3760	2500	3600	2400
HE 400 A	159.0	119	3360	2240	3220	2150
HE 360 A	142.8	107	3020	2010	2890	1930
HE 340 A	133.5	100	2820	1880	2700	1800
HE 320 A	124.4	93.3	2630	1750	2520	1680
HE 300 A	112.5	84.4	2380	1580	2280	1520
HE 280 A	97.26	72.9	2060	1370	1970	1310
HE 260 A	86.82	65.1	1840	1220	1760	1170
HE 240 A	76.84	57.6	1630	1080	1560	1040
HE 220 A	64.34	48.3	1360	905	1300	869
HE 200 A	53.83	40.4	1140	757	1090	727
HE 180 A	45.25	33.9	957	637	916	611
HE 160 A	38.77	29.1	820	546	785	523
HE 140 A	31.42	23.6	665	442	636	424
HE 120 A	25.34	19.0	536	357	513	342
HE 100 A	21.24	15.9	449	299	430	287
Limit State	**LRFD**	**ASD**	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.783A_g$.			
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$				
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$				

Table B.1 Continued.



Available Strength in Axial Tension
HEA Shapes

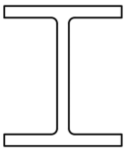
F_y = 275 MPa
F_u = 430 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding kN		Rupture kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HE 1000 A	346.8	260	8580	5710	8390	5590
HE 900 A	320.5	240	7930	5280	7750	5170
HE 800 A	285.8	214	7070	4710	6910	4610
HE 700 A	260.5	195	6450	4290	6300	4200
HE 650 A	241.6	181	5980	3980	5840	3900
HE 600 A	226.5	170	5610	3730	5480	3650
HE 550 A	211.8	159	5240	3490	5120	3420
HE 500 A	197.5	148	4890	3250	4780	3180
HE 450 A	178.0	134	4410	2930	4310	2870
HE 400 A	159.0	119	3940	2620	3850	2560
HE 360 A	142.8	107	3530	2350	3450	2300
HE 340 A	133.5	100	3300	2200	3230	2150
HE 320 A	124.4	93.3	3080	2050	3010	2010
HE 300 A	112.5	84.4	2780	1850	2720	1810
HE 280 A	97.26	72.9	2410	1600	2350	1570
HE 260 A	86.82	65.1	2150	1430	2100	1400
HE 240 A	76.84	57.6	1900	1270	1860	1240
HE 220 A	64.34	48.3	1590	1060	1560	1040
HE 200 A	53.83	40.4	1330	886	1300	868
HE 180 A	45.25	33.9	1120	745	1090	730
HE 160 A	38.77	29.1	960	638	938	625
HE 140 A	31.42	23.6	778	517	760	507
HE 120 A	25.34	19.0	627	417	613	409
HE 100 A	21.24	15.9	526	350	514	342

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.767A_g$.

Table B.1 Continued.



Available Strength in Axial Tension
HEA Shapes

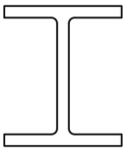
F_y = 355 MPa
F_u = 510 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HE 1000 A	346.8	260	11100	7370	9950	6630
HE 900 A	320.5	240	10200	6810	9190	6130
HE 800 A	285.8	214	9130	6080	8200	5470
HE 700 A	260.5	195	8320	5540	7470	4980
HE 650 A	241.6	181	7720	5140	6930	4620
HE 600 A	226.5	170	7240	4810	6500	4330
HE 550 A	211.8	159	6770	4500	6080	4050
HE 500 A	197.5	148	6310	4200	5670	3780
HE 450 A	178.0	134	5690	3780	5110	3400
HE 400 A	159.0	119	5080	3380	4560	3040
HE 360 A	142.8	107	4560	3040	4100	2730
HE 340 A	133.5	100	4270	2840	3830	2550
HE 320 A	124.4	93.3	3970	2640	3570	2380
HE 300 A	112.5	84.4	3590	2390	3230	2150
HE 280 A	97.26	72.9	3110	2070	2790	1860
HE 260 A	86.82	65.1	2770	1850	2490	1660
HE 240 A	76.84	57.6	2460	1630	2200	1470
HE 220 A	64.34	48.3	2060	1370	1850	1230
HE 200 A	53.83	40.4	1720	1140	1540	1030
HE 180 A	45.25	33.9	1450	962	1300	865
HE 160 A	38.77	29.1	1240	824	1110	741
HE 140 A	31.42	23.6	1000	668	901	601
HE 120 A	25.34	19.0	810	539	727	485
HE 100 A	21.24	15.9	679	452	609	406

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.835A_g$.

Table B.1 Continued.



Available Strength in Axial Tension
HEB Shapes

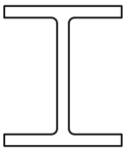
F_y = 235 MPa
F_u = 360 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HE 1000 B	400.0	300	8460	5630	8100	5400
HE 900 B	371.3	278	7850	5220	7520	5010
HE 800 B	334.2	251	7070	4700	6770	4510
HE 700 B	306.4	230	6480	4310	6200	4140
HE 650 B	286.3	215	6060	4030	5800	3870
HE 600 B	270.0	203	5710	3800	5470	3650
HE 550 B	254.1	191	5370	3580	5150	3430
HE 500 B	238.6	179	5050	3360	4830	3220
HE 450 B	218.0	164	4610	3070	4410	2940
HE 400 B	197.8	148	4180	2780	4010	2670
HE 360 B	180.6	135	3820	2540	3660	2440
HE 340 B	170.9	128	3610	2400	3460	2310
HE 320 B	161.3	121	3410	2270	3270	2180
HE 300 B	149.1	112	3150	2100	3020	2010
HE 280 B	131.4	98.6	2780	1850	2660	1770
HE 260 B	118.4	88.8	2500	1670	2400	1600
HE 240 B	106.0	79.5	2240	1490	2150	1430
HE 220 B	91.04	68.3	1930	1280	1840	1230
HE 200 B	78.08	58.6	1650	1100	1580	1050
HE 180 B	65.25	48.9	1380	918	1320	881
HE 160 B	54.25	40.7	1150	763	1100	732
HE 140 B	42.96	32.2	909	605	870	580
HE 120 B	34.01	25.5	719	479	689	459
HE 100 B	26.04	19.5	551	366	527	352

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.783A_g$.

Table B.1 Continued.



Available Strength in Axial Tension
HEB Shapes

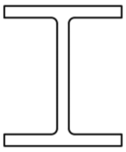
F_y = 275 MPa
F_u = 430 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HE 1000 B	400.0	300	9900	6590	9680	6450
HE 900 B	371.3	278	9190	6110	8980	5990
HE 800 B	334.2	251	8270	5500	8080	5390
HE 700 B	306.4	230	7580	5050	7410	4940
HE 650 B	286.3	215	7090	4710	6920	4620
HE 600 B	270.0	203	6680	4450	6530	4350
HE 550 B	254.1	191	6290	4180	6150	4100
HE 500 B	238.6	179	5910	3930	5770	3850
HE 450 B	218.0	164	5400	3590	5270	3520
HE 400 B	197.8	148	4900	3260	4780	3190
HE 360 B	180.6	135	4470	2970	4370	2910
HE 340 B	170.9	128	4230	2810	4130	2760
HE 320 B	161.3	121	3990	2660	3900	2600
HE 300 B	149.1	112	3690	2460	3610	2400
HE 280 B	131.4	98.6	3250	2160	3180	2120
HE 260 B	118.4	88.8	2930	1950	2860	1910
HE 240 B	106.0	79.5	2620	1750	2560	1710
HE 220 B	91.04	68.3	2250	1500	2200	1470
HE 200 B	78.08	58.6	1930	1290	1890	1260
HE 180 B	65.25	48.9	1610	1070	1580	1050
HE 160 B	54.25	40.7	1340	893	1310	875
HE 140 B	42.96	32.2	1060	707	1040	693
HE 120 B	34.01	25.5	842	560	823	548
HE 100 B	26.04	19.5	644	429	630	420

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.767A_g$.

Table B.1 Continued.

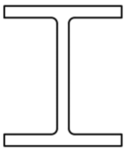


Available Strength in Axial Tension
HEB Shapes

F_y = 355 MPa
F_u = 510 MPa

Shape	**Gross Area, A_g**	**$A_e = 0.75A_g$**	**Yielding kN**		**Rupture kN**	
	mm^2	**mm^2**	**$\phi_t P_n$**	**P_n/Ω_t**	**$\phi_t P_n$**	**P_n/Ω_t**
	× 10^2	**× 10^2**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 B	400.0	300	12800	8500	11500	7650
HE 900 B	371.3	278	11900	7890	10700	7100
HE 800 B	334.2	251	10700	7100	9590	6390
HE 700 B	306.4	230	9790	6510	8790	5860
HE 650 B	286.3	215	9150	6090	8210	5480
HE 600 B	270.0	203	8630	5740	7750	5160
HE 550 B	254.1	191	8120	5400	7290	4860
HE 500 B	238.6	179	7620	5070	6840	4560
HE 450 B	218.0	164	6970	4630	6250	4170
HE 400 B	197.8	148	6320	4200	5670	3780
HE 360 B	180.6	135	5770	3840	5180	3450
HE 340 B	170.9	128	5460	3630	4900	3270
HE 320 B	161.3	121	5150	3430	4630	3080
HE 300 B	149.1	112	4760	3170	4280	2850
HE 280 B	131.4	98.6	4200	2790	3770	2510
HE 260 B	118.4	88.8	3780	2520	3400	2260
HE 240 B	106.0	79.5	3390	2250	3040	2030
HE 220 B	91.04	68.3	2910	1940	2610	1740
HE 200 B	78.08	58.6	2490	1660	2240	1490
HE 180 B	65.25	48.9	2080	1390	1870	1250
HE 160 B	54.25	40.7	1730	1150	1560	1040
HE 140 B	42.96	32.2	1370	913	1230	822
HE 120 B	34.01	25.5	1090	723	976	650
HE 100 B	26.04	19.5	832	554	747	498
Limit State	**LRFD**	**ASD**	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.835A_g$.			
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$				
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$				

Table B.1 Continued.

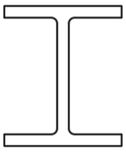


Available Strength in Axial Tension
HEM Shapes

F_y = 235 MPa
F_u = 360 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HE 1000 M	444.2	333	9390	6250	9000	6000
HE 900 M	423.6	318	8960	5960	8580	5720
HE 800 M	404.3	303	8550	5690	8190	5460
HE 700 M	383.0	287	8100	5390	7760	5170
HE 650 M	373.7	280	7900	5260	7570	5040
HE 600 M	363.7	273	7690	5120	7360	4910
HE 550 M	354.4	266	7500	4990	7180	4780
HE 500 M	344.3	258	7280	4840	6970	4650
HE 450 M	335.4	252	7090	4720	6790	4530
HE 400 M	325.8	244	6890	4580	6600	4400
HE 360 M	318.8	239	6740	4490	6460	4300
HE 340 M	315.8	237	6680	4440	6390	4260
HE 320 M	312.0	234	6600	4390	6320	4210
HE 300 M	303.1	227	6410	4270	6140	4090
HE 280 M	240.2	180	5080	3380	4860	3240
HE 260 M	219.6	165	4640	3090	4450	2960
HE 240 M	199.6	150	4220	2810	4040	2690
HE 220 M	149.4	112	3160	2100	3030	2020
HE 200 M	131.3	98.5	2780	1850	2660	1770
HE 180 M	113.3	85.0	2400	1590	2290	1530
HE 160 M	97.05	72.8	2050	1370	1970	1310
HE 140 M	80.56	60.4	1700	1130	1630	1090
HE 120 M	66.41	49.8	1400	935	1340	897
HE 100 M	53.24	39.9	1130	749	1080	719
Limit State	LRFD	ASD	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.783A_g$.			
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$				
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$				

Table B.1 Continued.

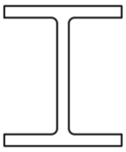


Available Strength in Axial Tension
HEM Shapes

F_y = 275 MPa
F_u = 430 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HE 1000 M	444.2	333	11000	7310	10700	7160
HE 900 M	423.6	318	10500	6980	10200	6830
HE 800 M	404.3	303	10000	6660	9780	6520
HE 700 M	383.0	287	9480	6310	9260	6180
HE 650 M	373.7	280	9250	6150	9040	6030
HE 600 M	363.7	273	9000	5990	8800	5860
HE 550 M	354.4	266	8770	5840	8570	5710
HE 500 M	344.3	258	8520	5670	8330	5550
HE 450 M	335.4	252	8300	5520	8110	5410
HE 400 M	325.8	244	8060	5360	7880	5250
HE 360 M	318.8	239	7890	5250	7710	5140
HE 340 M	315.8	237	7820	5200	7640	5090
HE 320 M	312.0	234	7720	5140	7550	5030
HE 300 M	303.1	227	7500	4990	7330	4890
HE 280 M	240.2	180	5940	3960	5810	3870
HE 260 M	219.6	165	5440	3620	5310	3540
HE 240 M	199.6	150	4940	3290	4830	3220
HE 220 M	149.4	112	3700	2460	3610	2410
HE 200 M	131.3	98.5	3250	2160	3180	2120
HE 180 M	113.3	85.0	2800	1870	2740	1830
HE 160 M	97.05	72.8	2400	1600	2350	1560
HE 140 M	80.56	60.4	1990	1330	1950	1300
HE 120 M	66.41	49.8	1640	1090	1610	1070
HE 100 M	53.24	39.9	1320	877	1290	858
Limit State	LRFD	ASD	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.767A_g$.			
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$				
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$				

Table B.1 Continued.



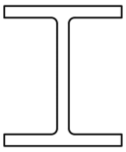
Available Strength in Axial Tension
HEM Shapes

F_y = 355 MPa
F_u = 510 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding kN		Rupture kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
HE 1000 M	444.2	333	14200	9440	12700	8500
HE 900 M	423.6	318	13500	9000	12200	8100
HE 800 M	404.3	303	12900	8590	11600	7730
HE 700 M	383.0	287	12200	8140	11000	7320
HE 650 M	373.7	280	11900	7940	10700	7150
HE 600 M	363.7	273	11600	7730	10400	6960
HE 550 M	354.4	266	11300	7530	10200	6780
HE 500 M	344.3	258	11000	7320	9880	6580
HE 450 M	335.4	252	10700	7130	9620	6410
HE 400 M	325.8	244	10400	6930	9350	6230
HE 360 M	318.8	239	10200	6780	9150	6100
HE 340 M	315.8	237	10100	6710	9060	6040
HE 320 M	312.0	234	9970	6630	8950	5970
HE 300 M	303.1	227	9680	6440	8700	5800
HE 280 M	240.2	180	7670	5110	6890	4590
HE 260 M	219.6	165	7020	4670	6300	4200
HE 240 M	199.6	150	6380	4240	5730	3820
HE 220 M	149.4	112	4770	3180	4290	2860
HE 200 M	131.3	98.5	4200	2790	3770	2510
HE 180 M	113.3	85.0	3620	2410	3250	2170
HE 160 M	97.05	72.8	3100	2060	2780	1860
HE 140 M	80.56	60.4	2570	1710	2310	1540
HE 120 M	66.41	49.8	2120	1410	1910	1270
HE 100 M	53.24	39.9	1700	1130	1530	1020

Limit State	**LRFD**	**ASD**	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.835A_g$.
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$	
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$	

Table B.1 Continued.

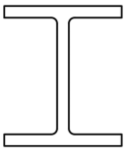


Available Strength in Axial Tension
IPE Shapes

F_y = 235 MPa
F_u = 360 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding kN		Rupture kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
IPE 600	156.0	117	3300	2200	3160	2110
IPE 550	134.4	101	2840	1890	2720	1810
IPE 500	115.5	86.6	2440	1630	2340	1560
IPE 450	98.82	74.1	2090	1390	2000	1330
IPE 400	84.46	63.3	1790	1190	1710	1140
IPE 360	72.73	54.5	1540	1020	1470	982
IPE 330	62.61	47.0	1320	881	1270	845
IPE 300	53.81	40.4	1140	757	1090	726
IPE 270	45.95	34.5	972	647	930	620
IPE 240	39.12	29.3	827	550	792	528
IPE 220	33.37	25.0	706	470	676	450
IPE 200	28.48	21.4	602	401	577	384
IPE 180	23.95	18.0	507	337	485	323
IPE 160	20.09	15.1	425	283	407	271
IPE 140	16.43	12.3	347	231	333	222
IPE 120	13.21	9.91	279	186	268	178
IPE 100	10.32	7.74	218	145	209	139
IPE 80	7.64	5.73	162	108	155	103
Limit State	**LRFD**	**ASD**	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.783A_g$.			
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$				
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$				

Table B.1 Continued.



Available Strength in Axial Tension
IPE Shapes

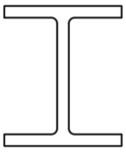
F_y = 275 MPa
F_u = 430 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
IPE 600	156.0	117	3860	2570	3770	2520
IPE 550	134.4	101	3330	2210	3250	2170
IPE 500	115.5	86.6	2860	1900	2790	1860
IPE 450	98.82	74.1	2450	1630	2390	1590
IPE 400	84.46	63.3	2090	1390	2040	1360
IPE 360	72.73	54.5	1800	1200	1760	1170
IPE 330	62.61	47.0	1550	1030	1510	1010
IPE 300	53.81	40.4	1330	886	1300	868
IPE 270	45.95	34.5	1140	757	1110	741
IPE 240	39.12	29.3	968	644	946	631
IPE 220	33.37	25.0	826	550	807	538
IPE 200	28.48	21.4	705	469	689	459
IPE 180	23.95	18.0	593	394	579	386
IPE 160	20.09	15.1	497	331	486	324
IPE 140	16.43	12.3	407	271	397	265
IPE 120	13.21	9.91	327	218	320	213
IPE 100	10.32	7.74	255	170	250	166
IPE 80	7.64	5.73	189	126	185	123

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.767A_g$.

Table B.1 Continued.

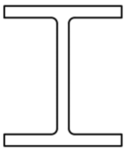


Available Strength in Axial Tension
IPE Shapes

F_y = 355 MPa
F_u = 510 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding kN		Rupture kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
IPE 600	156.0	117	4980	3320	4480	2980
IPE 550	134.4	101	4290	2860	3860	2570
IPE 500	115.5	86.6	3690	2460	3310	2210
IPE 450	98.82	74.1	3160	2100	2830	1890
IPE 400	84.46	63.3	2700	1800	2420	1620
IPE 360	72.73	54.5	2320	1550	2090	1390
IPE 330	62.61	47.0	2000	1330	1800	1200
IPE 300	53.81	40.4	1720	1140	1540	1030
IPE 270	45.95	34.5	1470	977	1320	879
IPE 240	39.12	29.3	1250	832	1120	748
IPE 220	33.37	25.0	1070	709	957	638
IPE 200	28.48	21.4	910	605	817	545
IPE 180	23.95	18.0	765	509	687	458
IPE 160	20.09	15.1	642	427	576	384
IPE 140	16.43	12.3	525	349	471	314
IPE 120	13.21	9.91	422	281	379	253
IPE 100	10.32	7.74	330	219	296	197
IPE 80	7.64	5.73	244	162	219	146
Limit State	**LRFD**	**ASD**	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.835A_g$.			
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$				
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$				

Table B.1 Continued.



Available Strength in Axial Tension
IPEA Shapes

F_y = 235 MPa
F_u = 360 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding kN		Rupture kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
IPE A 600	137.0	103	2900	1930	2770	1850
IPE A 550	117.3	88.0	2480	1650	2380	1580
IPE A 500	101.1	75.8	2140	1420	2050	1360
IPE A 450	85.55	64.2	1810	1200	1730	1150
IPE A 400	73.10	54.8	1550	1030	1480	987
IPE A 360	63.96	48.0	1350	900	1300	863
IPE A 330	54.74	41.1	1160	770	1110	739
IPE A 300	46.53	34.9	984	655	942	628
IPE A 270	39.15	29.4	828	551	793	529
IPE A 240	33.31	25.0	705	469	675	450
IPE A 220	28.26	21.2	598	398	572	382
IPE A 200	23.47	17.6	496	330	475	317
IPE A 180	19.58	14.7	414	276	396	264
IPE A 160	16.18	12.1	342	228	328	218
IPE A 140	13.39	10.0	283	188	271	181
IPE A 120	11.03	8.27	233	155	223	149
IPE A 100	8.78	6.58	186	124	178	119
IPE A 80	6.38	4.79	135	89.8	129	86.1

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.783A_g$.

Table B.1 Continued.

Available Strength in Axial Tension
IPEA Shapes

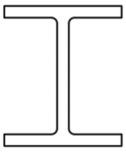
F_y = 275 MPa
F_u = 430 MPa

Shape	**Gross Area, A_g**	$A_e = 0.75A_g$	**Yielding** kN		**Rupture** kN	
	mm^2	**mm^2**	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	**× 10^2**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE A 600	137.0	103	3390	2260	3310	2210
IPE A 550	117.3	88.0	2900	1930	2840	1890
IPE A 500	101.1	75.8	2500	1660	2450	1630
IPE A 450	85.55	64.2	2120	1410	2070	1380
IPE A 400	73.10	54.8	1810	1200	1770	1180
IPE A 360	63.96	48.0	1580	1050	1550	1030
IPE A 330	54.74	41.1	1350	901	1320	883
IPE A 300	46.53	34.9	1150	766	1130	750
IPE A 270	39.15	29.4	969	645	947	631
IPE A 240	33.31	25.0	824	549	806	537
IPE A 220	28.26	21.2	699	465	684	456
IPE A 200	23.47	17.6	581	386	568	378
IPE A 180	19.58	14.7	485	322	474	316
IPE A 160	16.18	12.1	400	266	391	261
IPE A 140	13.39	10.0	331	220	324	216
IPE A 120	11.03	8.27	273	182	267	178
IPE A 100	8.78	6.58	217	145	212	142
IPE A 80	6.38	4.79	158	105	154	103

Limit State	**LRFD**	**ASD**
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.767A_g$.

Table B.1 Continued.



Available Strength in Axial Tension
IPEA Shapes

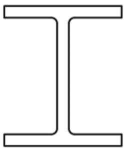
F_y = 355 MPa
F_u = 510 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
IPE A 600	137.0	103	4380	2910	3930	2620
IPE A 550	117.3	88.0	3750	2490	3370	2240
IPE A 500	101.1	75.8	3230	2150	2900	1930
IPE A 450	85.55	64.2	2730	1820	2450	1640
IPE A 400	73.10	54.8	2340	1550	2100	1400
IPE A 360	63.96	48.0	2040	1360	1830	1220
IPE A 330	54.74	41.1	1750	1160	1570	1050
IPE A 300	46.53	34.9	1490	989	1330	890
IPE A 270	39.15	29.4	1250	832	1120	749
IPE A 240	33.31	25.0	1060	708	956	637
IPE A 220	28.26	21.2	903	601	811	540
IPE A 200	23.47	17.6	750	499	673	449
IPE A 180	19.58	14.7	626	416	562	374
IPE A 160	16.18	12.1	517	344	464	309
IPE A 140	13.39	10.0	428	285	384	256
IPE A 120	11.03	8.27	352	234	316	211
IPE A 100	8.78	6.58	281	187	252	168
IPE A 80	6.38	4.79	204	136	183	122

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.835A_g$.

Table B.1 Continued.

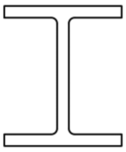


Available Strength in Axial Tension
IPEO Shapes

F_y = 235 MPa
F_u = 360 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	$\times 10^2$	$\times 10^2$	LRFD	ASD	LRFD	ASD
IPE O 600	196.8	148	4160	2770	3990	2660
IPE O 550	156.1	117	3300	2200	3160	2110
IPE O 500	136.7	103	2890	1920	2770	1850
IPE O 450	117.7	88.3	2490	1660	2380	1590
IPE O 400	96.39	72.3	2040	1360	1950	1300
IPE O 360	84.13	63.1	1780	1180	1700	1140
IPE O 330	72.62	54.5	1540	1020	1470	980
IPE O 300	62.83	47.1	1330	884	1270	848
IPE O 270	53.84	40.4	1140	758	1090	727
IPE O 240	43.71	32.8	924	615	885	590
IPE O 220	37.39	28.0	791	526	757	505
IPE O 200	31.96	24.0	676	450	647	431
IPE O 180	27.1	20.3	573	381	549	366
Limit State	**LRFD**	**ASD**	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.783A_g$.			
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$				
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$				

Table B.1 Continued.



Available Strength in Axial Tension
IPEO Shapes

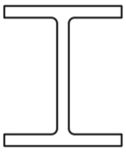
F_y = 275 MPa
F_u = 430 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding kN		Rupture kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
IPE O 600	196.8	148	4870	3240	4760	3170
IPE O 550	156.1	117	3860	2570	3780	2520
IPE O 500	136.7	103	3380	2250	3310	2200
IPE O 450	117.7	88.3	2910	1940	2850	1900
IPE O 400	96.39	72.3	2390	1590	2330	1550
IPE O 360	84.13	63.1	2080	1390	2030	1360
IPE O 330	72.62	54.5	1800	1200	1760	1170
IPE O 300	62.83	47.1	1560	1030	1520	1010
IPE O 270	53.84	40.4	1330	887	1300	868
IPE O 240	43.71	32.8	1080	720	1060	705
IPE O 220	37.39	28.0	925	616	904	603
IPE O 200	31.96	24.0	791	526	773	515
IPE O 180	27.1	20.3	671	446	655	437

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.767A_g$.

Table B.1 Continued.



Available Strength in Axial Tension
IPEO Shapes

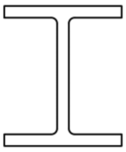
F_y = 355 MPa
F_u = 510 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
IPE O 600	196.8	148	6290	4180	5420	3620
IPE O 550	156.1	117	4990	3320	4300	2870
IPE O 500	136.7	103	4370	2910	3770	2510
IPE O 450	117.7	88.3	3760	2500	3240	2160
IPE O 400	96.39	72.3	3080	2050	2660	1770
IPE O 360	84.13	63.1	2690	1790	2320	1550
IPE O 330	72.62	54.5	2320	1540	2000	1330
IPE O 300	62.83	47.1	2010	1340	1730	1150
IPE O 270	53.84	40.4	1720	1140	1480	989
IPE O 240	43.71	32.8	1400	929	1200	803
IPE O 220	37.39	28.0	1190	795	1030	687
IPE O 200	31.96	24.0	1020	679	881	587
IPE O 180	27.1	20.3	866	576	747	498

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.835A_g$.

Table B.1 Continued.



Available Strength in Axial Tension
IPN Shapes

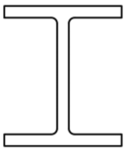
F_y = 235 MPa
F_u = 360 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding kN		Rupture kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
IPN 600	254.0	191	5370	3570	5140	3430
IPN 550	212.0	159	4480	2980	4290	2860
IPN 500	179.0	134	3790	2520	3620	2420
IPN 450	147.0	110	3110	2070	2980	1980
IPN 400	118.0	88.5	2500	1660	2390	1590
IPN 380	107.0	80.3	2260	1510	2170	1440
IPN 360	97.00	72.8	2050	1360	1960	1310
IPN 340	86.70	65.0	1830	1220	1760	1170
IPN 320	77.70	58.3	1640	1090	1570	1050
IPN 300	69.00	51.8	1460	971	1400	932
IPN 280	61.00	45.8	1290	858	1240	824
IPN 260	53.30	40.0	1130	750	1080	720
IPN 240	46.10	34.6	975	649	934	622
IPN 220	39.50	29.6	835	556	800	533
IPN 200	33.40	25.0	706	470	676	451
IPN 180	27.90	20.9	590	393	565	377
IPN 160	22.80	17.1	482	321	462	308
IPN 140	18.30	13.7	387	258	371	247
IPN 120	14.20	10.6	300	200	288	192
IPN 100	10.60	7.95	224	149	215	143
IPN 80	7.58	5.69	160	107	153	102

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.783A_g$.

Table B.1 Continued.



Available Strength in Axial Tension
IPN Shapes

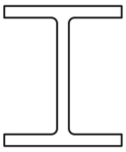
F_y = 275 MPa
F_u = 430 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding		Rupture	
			kN		kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	$\times 10^2$	$\times 10^2$	LRFD	ASD	LRFD	ASD
IPN 600	254.0	191	6290	4180	6140	4100
IPN 550	212.0	159	5250	3490	5130	3420
IPN 500	179.0	134	4430	2950	4330	2890
IPN 450	147.0	110	3640	2420	3560	2370
IPN 400	118.0	88.5	2920	1940	2850	1900
IPN 380	107.0	80.3	2650	1760	2590	1730
IPN 360	97.00	72.8	2400	1600	2350	1560
IPN 340	86.70	65.0	2150	1430	2100	1400
IPN 320	77.70	58.3	1920	1280	1880	1250
IPN 300	69.00	51.8	1710	1140	1670	1110
IPN 280	61.00	45.8	1510	1000	1480	984
IPN 260	53.30	40.0	1320	878	1290	859
IPN 240	46.10	34.6	1140	759	1120	743
IPN 220	39.50	29.6	978	650	955	637
IPN 200	33.40	25.0	827	550	808	539
IPN 180	27.90	20.9	691	459	675	450
IPN 160	22.80	17.1	564	375	551	368
IPN 140	18.30	13.7	453	301	443	295
IPN 120	14.20	10.6	351	234	343	229
IPN 100	10.60	7.95	262	175	256	171
IPN 80	7.58	5.69	188	125	183	122

Limit State	LRFD	ASD
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$

Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.767A_g$.

Table B.1 Continued.



Available Strength in Axial Tension
IPN Shapes

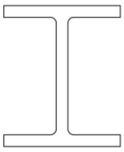
F_y = 355 MPa
F_u = 510 MPa

Shape	Gross Area, A_g	$A_e = 0.75A_g$	Yielding kN		Rupture kN	
	mm^2	mm^2	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
	× 10^2	× 10^2	LRFD	ASD	LRFD	ASD
IPN 600	254.0	191	8120	5400	7290	4860
IPN 550	212.0	159	6770	4510	6080	4050
IPN 500	179.0	134	5720	3810	5140	3420
IPN 450	147.0	110	4700	3120	4220	2810
IPN 400	118.0	88.5	3770	2510	3390	2260
IPN 380	107.0	80.3	3420	2270	3070	2050
IPN 360	97.00	72.8	3100	2060	2780	1860
IPN 340	86.70	65.0	2770	1840	2490	1660
IPN 320	77.70	58.3	2480	1650	2230	1490
IPN 300	69.00	51.8	2200	1470	1980	1320
IPN 280	61.00	45.8	1950	1300	1750	1170
IPN 260	53.30	40.0	1700	1130	1530	1020
IPN 240	46.10	34.6	1470	980	1320	882
IPN 220	39.50	29.6	1260	840	1130	755
IPN 200	33.40	25.0	1070	710	958	639
IPN 180	27.90	20.9	891	593	800	534
IPN 160	22.80	17.1	728	485	654	436
IPN 140	18.30	13.7	585	389	525	350
IPN 120	14.20	10.6	454	302	407	272
IPN 100	10.60	7.95	339	225	304	203
IPN 80	7.58	5.69	242	161	217	145
Limit State	LRFD	ASD	Note: The limit state of tensile rupture in the net section will govern if $A_e < 0.835A_g$.			
Yielding	$\phi_t = 0.90$	$\Omega_t = 1.67$				
Rupture	$\phi_t = 0.75$	$\Omega_t = 2.00$				

APPENDIX C

DESIGN TABLES FOR COMPRESSION MEMBERS

Table C.1 Available strength in axial compression.



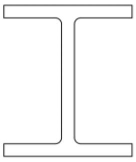
Available Strength in Axial Compression, kN

HD Shapes

F_y = 235 MPa

Shape		**HD 260 × 54.1**		**HD 260 × 68.2**		**HD 260 × 93.0**		**HD 260 × 114**		**HD 260 × 142**		**HD 260 × 172**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1460	971	1840	1220	2500	1670	3080	2050	3810	2540	4640	3090
	1.00	1440	959	1810	1210	2480	1650	3050	2030	3770	2510	4600	3060
	1.50	1420	944	1790	1190	2440	1620	3000	2000	3720	2480	4540	3020
	2.00	1390	924	1750	1170	2390	1590	2950	1960	3650	2430	4450	2960
	2.50	1350	899	1710	1130	2330	1550	2870	1910	3560	2370	4350	2890
	3.00	1310	869	1650	1100	2260	1500	2790	1850	3460	2300	4230	2810
	3.50	1250	835	1590	1060	2170	1450	2690	1790	3340	2220	4090	2720
	4.00	1200	797	1520	1010	2080	1390	2570	1710	3200	2130	3930	2610
	4.50	1140	756	1450	962	1980	1320	2450	1630	3060	2030	3760	2500
	5.00	1070	713	1370	910	1880	1250	2330	1550	2900	1930	3580	2380
	5.50	1000	669	1290	855	1770	1180	2190	1460	2740	1820	3380	2250
	6.00	936	623	1200	799	1650	1100	2060	1370	2580	1710	3190	2120
	6.50	867	577	1120	742	1540	1020	1920	1280	2410	1600	2980	1990
	7.00	798	531	1030	685	1420	948	1780	1180	2230	1490	2780	1850
	7.50	730	485	946	629	1310	872	1640	1090	2070	1370	2580	1720
	8.00	663	441	863	574	1200	798	1500	999	1900	1260	2380	1580
	8.50	599	399	783	521	1090	725	1370	911	1730	1150	2180	1450
	9.00	537	357	706	469	986	656	1240	825	1580	1050	1990	1320
	9.50	482	320	633	421	885	589	1120	742	1420	946	1800	1200
	10.0	435	289	572	380	799	531	1010	670	1280	854	1630	1080
	10.5	394	262	518	345	724	482	913	608	1160	775	1480	983
	11.0	359	239	472	314	660	439	832	554	1060	706	1350	896
	11.5	329	219	432	288	604	402	761	507	971	646	1230	819
	12.0	302	201	397	264	555	369	699	465	891	593	1130	753
	12.5	278	185	366	243	511	340	644	429	822	547	1040	694
	13.0	257	171	338	225	473	314	596	396	760	505	964	641
	13.5	238	159	314	209	438	292	552	368	704	469	894	595
	14.0	222	148	292	194	407	271	514	342	655	436	831	553
	14.5	207	138	272	181	380	253	479	319	611	406	775	515
	15.0	193	129	254	169	355	236	448	298	571	380	724	482
Properties													
P_{wo} , kN		256	171	322	214	488	325	668	446	920	613	1190	797
P_{wi} , kN/m		1530	1020	1760	1180	2350	1570	2940	1960	3640	2430	4230	2820
P_{wb} , kN		230	153	353	235	837	557	1630	1090	3120	2070	4880	3250
P_{fb} , kN		119	79.4	207	137	405	269	611	407	928	618	1400	929
L_p , m		3.27		3.34		3.38		3.42		3.47		3.54	
L_r , m		11.7		13.3		16.9		20.4		25.0		30.2	
$A_g \times 10^2$, mm²		68.97		86.82		118.4		145.7		180.3		219.6	
$I_x \times 10^4$, mm⁴		7981		10450		14920		18910		24330		31310	
$I_y \times 10^4$, mm⁴		2788		3668		5135		6456		8236		10450	
$r_y \times 10$, mm		6.36		6.50		6.58		6.66		6.76		6.90	
r_x / r_y		1.69		1.69		1.71		1.71		1.72		1.73	
$P_{ex} L_{cx}^2$, kN · m²		158000		206000		294000		373000		481000		618000	
$P_{ey} L_{cy}^2$, kN · m²		55100		72400		101000		128000		163000		206000	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.

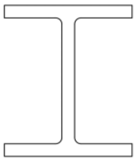


Available Strength in Axial Compression, kN
HD Shapes

F_y = 235 MPa

Shape		**HD 320 × 74.2**		**HD 320 × 97.6**		**HD 320 × 127**		**HD 320 × 158**		**HD 320 × 198**		**HD 320 × 245**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2000	1330	2630	1750	3410	2270	4260	2830	5340	3550	6600	4390
	1.00	1980	1320	2610	1740	3380	2250	4220	2810	5290	3520	6550	4360
	1.50	1960	1300	2580	1720	3350	2230	4180	2780	5240	3490	6480	4310
	2.00	1930	1280	2540	1690	3290	2190	4110	2740	5160	3440	6390	4250
	2.50	1880	1250	2490	1660	3230	2150	4040	2690	5070	3370	6280	4180
	3.00	1840	1220	2430	1620	3150	2100	3940	2620	4960	3300	6150	4090
	3.50	1780	1180	2360	1570	3070	2040	3840	2550	4830	3210	5990	3990
	4.00	1720	1140	2280	1520	2970	1970	3720	2470	4680	3110	5820	3870
	4.50	1650	1100	2200	1460	2860	1900	3580	2380	4520	3010	5630	3740
	5.00	1580	1050	2110	1400	2740	1830	3440	2290	4350	2890	5420	3610
	5.50	1500	998	2010	1340	2620	1740	3290	2190	4160	2770	5200	3460
	6.00	1420	945	1910	1270	2490	1660	3140	2090	3970	2640	4970	3310
	6.50	1340	891	1810	1200	2360	1570	2980	1980	3770	2510	4730	3150
	7.00	1260	835	1700	1130	2230	1480	2810	1870	3570	2370	4480	2980
	7.50	1170	780	1600	1060	2090	1390	2640	1760	3360	2240	4240	2820
	8.00	1090	724	1490	991	1960	1300	2470	1650	3150	2100	3980	2650
	8.50	1010	670	1380	921	1820	1210	2310	1540	2950	1960	3730	2480
	9.00	926	616	1280	853	1690	1120	2140	1430	2740	1830	3480	2320
	9.50	848	564	1180	785	1560	1040	1980	1320	2540	1690	3240	2160
	10.0	772	514	1080	720	1430	951	1820	1210	2350	1560	3000	2000
	10.5	701	466	986	656	1310	869	1670	1110	2160	1440	2770	1840
	11.0	638	425	899	598	1190	792	1520	1010	1970	1310	2540	1690
	11.5	584	389	822	547	1090	725	1390	928	1800	1200	2320	1550
	12.0	536	357	755	502	1000	665	1280	852	1660	1100	2130	1420
	12.5	494	329	696	463	922	613	1180	785	1530	1020	1970	1310
	13.0	457	304	643	428	852	567	1090	726	1410	939	1820	1210
	13.5	424	282	597	397	790	526	1010	673	1310	871	1690	1120
	14.0	394	262	555	369	735	489	941	626	1220	810	1570	1040
	14.5	367	244	517	344	685	456	877	584	1130	755	1460	972
	15.0	343	228	483	322	640	426	820	545	1060	705	1370	908
Properties													
P_{wo} , kN		357	238	449	300	642	428	894	596	1250	832	1650	1100
P_{wi} , kN/m		1880	1250	2120	1410	2700	1800	3410	2270	4230	2820	4940	3290
P_{wb} , kN		337	224	480	319	1000	666	2010	1330	3840	2550	6100	4060
P_{fb} , kN		160	106	318	211	556	370	860	572	1350	901	2120	1410
L_p , m		3.72		3.85		3.89		3.94		4.00		4.08	
L_r , m		12.9		15.0		18.4		22.4		27.7		34.1	
$A_g \times 10^2, \mathrm{mm}^2$		94.58		124.4		161.3		201.2		252.3		312.0	
$I_x \times 10^4, \mathrm{mm}^4$		16450		22930		30820		39640		51900		68130	
$I_y \times 10^4, \mathrm{mm}^4$		4959		6985		9239		11840		15310		19710	
$r_y \times 10, \mathrm{mm}$		7.24		7.49		7.57		7.67		7.79		7.95	
r_x / r_y		1.82		1.81		1.83		1.83		1.84		1.86	
$P_{ex} L_{cx}^2$, kN · m^2		325000		453000		608000		783000		1020000		1350000	
$P_{ey} L_{cy}^2$, kN · m^2		97900		138000		182000		234000		302000		389000	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.

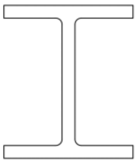


Available Strength in Axial Compression, kN
HD Shapes

F_y = 235 MPa

Shape		**HD 320 × 300**		**HD 360 × 134**		**HD 360 × 147**		**HD 360 × 162**		**HD 360 × 179**		**HD 360 × 196**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	8080	5380	3610	2400	3970	2640	4360	2900	4830	3210	5290	3520
	1.00	8020	5340	3590	2390	3950	2630	4340	2890	4800	3190	5270	3500
	1.50	7940	5280	3560	2370	3920	2610	4310	2870	4770	3170	5230	3480
	2.00	7830	5210	3530	2350	3890	2590	4270	2840	4720	3140	5180	3450
	2.50	7700	5120	3480	2320	3840	2550	4210	2800	4670	3100	5120	3400
	3.00	7540	5010	3430	2280	3780	2510	4150	2760	4600	3060	5040	3350
	3.50	7350	4890	3370	2240	3710	2470	4080	2710	4510	3000	4950	3290
	4.00	7140	4750	3300	2190	3630	2420	3990	2660	4420	2940	4850	3230
	4.50	6910	4600	3220	2140	3550	2360	3900	2600	4320	2870	4740	3150
	5.00	6660	4430	3130	2080	3450	2300	3800	2530	4210	2800	4620	3070
	5.50	6390	4250	3040	2020	3350	2230	3690	2460	4090	2720	4490	2990
	6.00	6110	4070	2950	1960	3250	2160	3580	2380	3960	2640	4350	2890
	6.50	5830	3880	2840	1890	3140	2090	3450	2300	3830	2550	4200	2800
	7.00	5530	3680	2740	1820	3020	2010	3330	2210	3690	2450	4050	2700
	7.50	5230	3480	2630	1750	2900	1930	3200	2130	3540	2360	3900	2590
	8.00	4920	3270	2520	1670	2780	1850	3060	2040	3400	2260	3730	2480
	8.50	4620	3070	2400	1600	2650	1760	2930	1950	3250	2160	3570	2380
	9.00	4310	2870	2290	1520	2520	1680	2790	1850	3090	2060	3400	2260
	9.50	4020	2670	2170	1440	2400	1590	2650	1760	2940	1960	3240	2150
	10.0	3720	2480	2050	1370	2270	1510	2510	1670	2790	1850	3070	2040
	10.5	3440	2290	1940	1290	2140	1430	2370	1580	2630	1750	2900	1930
	11.0	3170	2110	1820	1210	2020	1340	2230	1490	2480	1650	2740	1820
	11.5	2900	1930	1710	1140	1890	1260	2100	1400	2330	1550	2570	1710
	12.0	2660	1770	1600	1070	1770	1180	1970	1310	2190	1460	2410	1610
	12.5	2450	1630	1490	995	1660	1100	1840	1220	2050	1360	2260	1500
	13.0	2270	1510	1390	925	1540	1020	1710	1140	1910	1270	2110	1400
	13.5	2100	1400	1290	857	1430	950	1590	1060	1770	1180	1960	1300
	14.0	1950	1300	1200	797	1330	884	1480	983	1640	1090	1820	1210
	14.5	1820	1210	1120	743	1240	824	1380	916	1530	1020	1700	1130
	15.0	1700	1130	1040	694	1160	770	1290	856	1430	953	1580	1050
Properties													
P_{wo} , kN		2380	1590	434	290	503	335	575	383	686	457	794	529
P_{wi} , kN/m		6350	4230	2630	1750	2890	1930	3130	2080	3530	2350	3850	2570
P_{wb} , kN		13000	8620	717	477	949	631	1200	798	1720	1150	2260	1500
P_{fb} , kN		3050	2030	428	285	518	345	628	418	755	502	907	604
L_p , m		4.12		4.83		4.84		4.87		4.89		4.91	
L_r , m		41.4		17.8		19.1		20.7		22.5		24.5	
$A_g \times 10^2$, mm^2		382.1		170.6		187.9		206.3		228.3		250.3	
$I_x \times 10^4$, mm^4		86900		41510		46290		51540		57440		63630	
$I_y \times 10^4$, mm^4		24600		15080		16720		18560		20680		22860	
$r_y \times 10$, mm		8.02		9.40		9.43		9.49		9.52		9.56	
r_x / r_y		1.88		1.66		1.66		1.67		1.67		1.67	
$P_{ex} L_{cx}^2$, kN · m^2		1720000		820000		914000		1020000		1130000		1260000	
$P_{ey} L_{cy}^2$, kN · m^2		485000		298000		330000		367000		408000		452000	
LRFD		**ASD**											
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



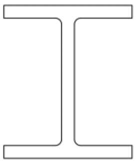
Available Strength in Axial Compression, kN
HD Shapes

F_y = 235 MPa

Shape		HD 400 × 187		HD 400 × 216		HD 400 × 237		HD 400 × 262		HD 400 × 287	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	5030	3340	5830	3880	6360	4230	7080	4710	7750	5150
	1.00	5000	3330	5800	3860	6330	4210	7040	4690	7710	5130
	1.50	4970	3310	5760	3830	6300	4190	7000	4660	7670	5100
	2.00	4930	3280	5710	3800	6240	4150	6940	4620	7600	5060
	2.50	4870	3240	5650	3760	6170	4110	6870	4570	7520	5010
	3.00	4810	3200	5580	3710	6090	4050	6780	4510	7430	4940
	3.50	4730	3150	5490	3650	6000	3990	6680	4440	7310	4870
	4.00	4640	3090	5390	3590	5890	3920	6560	4360	7190	4780
	4.50	4550	3020	5280	3510	5770	3840	6430	4280	7040	4690
	5.00	4440	2950	5160	3430	5640	3750	6280	4180	6890	4580
	5.50	4330	2880	5030	3350	5500	3660	6130	4080	6720	4470
	6.00	4200	2800	4890	3260	5350	3560	5960	3970	6540	4350
	6.50	4080	2710	4750	3160	5190	3450	5790	3850	6350	4230
	7.00	3940	2620	4590	3060	5020	3340	5600	3730	6150	4090
	7.50	3800	2530	4430	2950	4850	3230	5410	3600	5950	3960
	8.00	3660	2440	4270	2840	4670	3110	5220	3470	5730	3810
	8.50	3510	2340	4100	2730	4490	2990	5020	3340	5510	3670
	9.00	3360	2240	3930	2620	4300	2860	4810	3200	5290	3520
	9.50	3210	2140	3760	2500	4120	2740	4600	3060	5070	3370
	10.0	3060	2040	3590	2390	3930	2610	4400	2920	4840	3220
	10.5	2910	1940	3410	2270	3740	2490	4190	2790	4610	3070
	11.0	2760	1840	3240	2150	3550	2360	3980	2650	4380	2920
	11.5	2610	1740	3070	2040	3360	2240	3770	2510	4160	2770
	12.0	2460	1640	2900	1930	3180	2110	3570	2370	3930	2620
	12.5	2320	1540	2730	1820	2990	1990	3360	2240	3710	2470
	13.0	2180	1450	2560	1710	2810	1870	3160	2110	3500	2330
	13.5	2040	1360	2400	1600	2640	1760	2970	1980	3290	2190
	14.0	1900	1260	2250	1500	2470	1640	2780	1850	3080	2050
	14.5	1770	1180	2090	1390	2300	1530	2590	1730	2870	1910
	15.0	1660	1100	1960	1300	2150	1430	2420	1610	2690	1790
Properties											
P_{wo}, kN		687	458	868	579	1000	669	1200	798	1370	913
P_{wi}, kN/m		3530	2350	4070	2710	4440	2960	4960	3310	5310	3540
P_{wb}, kN		1720	1150	2650	1760	3450	2300	4790	3190	5900	3920
P_{fb}, kN		761	507	1010	675	1210	802	1470	975	1770	1180
L_p, m		5.15		5.20		5.22		5.25		5.28	
L_r, m		23.7		27.1		29.4		32.5		35.5	
$A_g \times 10^2$, mm^2		237.6		275.5		300.9		334.6		366.3	
$I_x \times 10^4$, mm^4		60180		71140		78780		89410		99710	
$I_y \times 10^4$, mm^4		23920		28250		31040		35020		38780	
$r_y \times 10$, mm		10.0		10.1		10.2		10.2		10.3	
r_x / r_y		1.59		1.59		1.59		1.60		1.60	
$P_{ex} L_{cx}^2$, kN · m^2		1190000		1400000		1550000		1770000		1970000	
$P_{ey} L_{cy}^2$, kN · m^2		472000		558000		613000		691000		766000	

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

Table C.1 Continued.

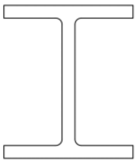


Available Strength in Axial Compression, kN
HD Shapes

F_y = 235 MPa

Shape		**HD 400 × 314**		**HD 400 × 347**		**HD 400 × 382**		**HD 400 × 421**		**HD 400 × 463**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	8440	5620	9350	6220	10300	6850	11400	7560	12500	8300
	1.00	8400	5590	9310	6190	10300	6820	11300	7520	12400	8260
	1.50	8350	5560	9250	6160	10200	6780	11200	7480	12300	8210
	2.00	8290	5510	9180	6110	10100	6730	11200	7420	12300	8150
	2.50	8200	5460	9080	6040	10000	6660	11000	7350	12100	8070
	3.00	8100	5390	8970	5970	9890	6580	10900	7260	12000	7970
	3.50	7970	5310	8840	5880	9750	6480	10800	7160	11800	7860
	4.00	7840	5210	8690	5780	9580	6380	10600	7040	11600	7730
	4.50	7680	5110	8520	5670	9400	6250	10400	6910	11400	7590
	5.00	7510	5000	8340	5550	9200	6120	10200	6760	11200	7430
	5.50	7330	4880	8140	5410	8980	5980	9930	6610	10900	7260
	6.00	7140	4750	7930	5270	8750	5820	9680	6440	10600	7080
	6.50	6930	4610	7700	5130	8510	5660	9410	6260	10400	6890
	7.00	6720	4470	7470	4970	8250	5490	9130	6080	10100	6690
	7.50	6490	4320	7220	4810	7990	5310	8840	5880	9740	6480
	8.00	6260	4170	6970	4640	7710	5130	8540	5680	9420	6270
	8.50	6030	4010	6710	4470	7430	4940	8240	5480	9080	6040
	9.00	5780	3850	6450	4290	7140	4750	7920	5270	8740	5820
	9.50	5540	3690	6180	4110	6850	4550	7600	5060	8390	5580
	10.0	5290	3520	5910	3930	6550	4360	7280	4840	8040	5350
	10.5	5050	3360	5640	3750	6250	4160	6950	4630	7690	5120
	11.0	4800	3190	5370	3570	5960	3960	6630	4410	7330	4880
	11.5	4550	3030	5100	3390	5660	3770	6310	4190	6980	4640
	12.0	4310	2870	4830	3220	5370	3570	5980	3980	6630	4410
	12.5	4070	2710	4570	3040	5080	3380	5670	3770	6280	4180
	13.0	3840	2550	4310	2870	4790	3190	5350	3560	5940	3950
	13.5	3600	2400	4060	2700	4510	3000	5050	3360	5610	3730
	14.0	3380	2250	3810	2530	4240	2820	4750	3160	5280	3510
	14.5	3160	2100	3560	2370	3970	2640	4460	2960	4960	3300
	15.0	2950	1960	3330	2220	3710	2470	4160	2770	4640	3090
Properties											
P_{wo}, kN		1600	1060	1880	1250	2210	1470	2610	1740	3050	2030
P_{wi}, kN/m		5850	3900	6390	4260	7000	4670	7710	5140	8410	5610
P_{wb}, kN		7890	5250	10300	6850	13500	8990	18000	12000	23400	15600
P_{fb}, kN		2070	1380	2520	1680	3050	2030	3660	2430	4360	2900
L_p, m		5.30		5.36		5.39		5.43		5.47	
L_r, m		38.5		42.6		46.8		51.4		56.2	
$A_g \times 10^2$, mm^2		399.2		442.0		487.1		537.1		589.5	
$I_x \times 10^4$, mm^4		110200		124900		141300		159600		180200	
$I_y \times 10^4$, mm^4		42600		48100		53600		60100		67000	
$r_y \times 10$, mm		10.3		10.4		10.5		10.6		10.7	
r_x / r_y		1.61		1.61		1.62		1.63		1.64	
$P_{ex} L_{cx}^2$, kN · m^2		2180000		2470000		2790000		3150000		3560000	
$P_{ey} L_{cy}^2$, kN · m^2		841000		949000		1060000		1190000		1320000	
LRFD		**ASD**									
$\phi_c = 0.90$		$\Omega_c = 1.67$									

Table C.1 Continued.



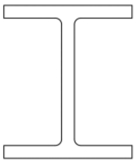
Available Strength in Axial Compression, kN
HD Shapes

F_y = 235 MPa

Shape		HD 400 × 509		HD 400 × 551		HD 400 × 592		HD 400 × 634		HD 400 × 677	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	13700	9130	14800	9870	16000	10600	17100	11400	18300	12100
	1.00	13700	9090	14800	9830	15900	10600	17000	11300	18200	12100
	1.50	13600	9040	14700	9780	15800	10500	16900	11300	18100	12000
	2.00	13500	8980	14600	9700	15700	10400	16800	11200	18000	12000
	2.50	13400	8890	14400	9610	15600	10300	16700	11100	17800	11800
	3.00	13200	8790	14300	9500	15400	10200	16500	11000	17600	11700
	3.50	13000	8670	14100	9370	15200	10100	16300	10800	17400	11600
	4.00	12800	8530	13900	9220	14900	9940	16000	10600	17100	11400
	4.50	12600	8370	13600	9060	14700	9760	15700	10500	16800	11200
	5.00	12300	8200	13300	8880	14400	9570	15400	10300	16500	11000
	5.50	12100	8020	13100	8680	14100	9360	15100	10000	16200	10800
	6.00	11800	7830	12700	8470	13700	9140	14700	9810	15800	10500
	6.50	11500	7620	12400	8250	13400	8910	14400	9560	15400	10300
	7.00	11100	7400	12100	8020	13000	8660	14000	9300	15000	9980
	7.50	10800	7180	11700	7780	12600	8400	13600	9030	14600	9690
	8.00	10400	6940	11300	7530	12200	8130	13100	8750	14100	9390
	8.50	10100	6700	10900	7270	11800	7860	12700	8460	13700	9090
	9.00	9700	6450	10500	7010	11400	7580	12300	8160	13200	8770
	9.50	9320	6200	10100	6740	11000	7290	11800	7860	12700	8450
	10.0	8940	5950	9720	6460	10500	7000	11300	7550	12200	8130
	10.5	8560	5690	9300	6190	10100	6710	10900	7240	11700	7800
	11.0	8170	5440	8890	5910	9640	6410	10400	6930	11200	7470
	11.5	7790	5180	8480	5640	9200	6120	9940	6610	10700	7140
	12.0	7400	4930	8060	5370	8760	5830	9480	6300	10200	6810
	12.5	7020	4670	7660	5090	8320	5540	9010	6000	9740	6480
	13.0	6650	4420	7250	4830	7890	5250	8550	5690	9250	6160
	13.5	6280	4180	6860	4560	7470	4970	8100	5390	8770	5840
	14.0	5920	3940	6470	4310	7050	4690	7660	5090	8300	5520
	14.5	5570	3710	6090	4050	6640	4420	7220	4810	7840	5220
	15.0	5220	3470	5720	3800	6250	4160	6800	4520	7390	4910
Properties											
P_{wo} , kN		3570	2380	4080	2720	4620	3080	5150	3430	5810	3870
P_{wi} , kN/m		9190	6130	9870	6580	10600	7050	11200	7460	12000	8020
P_{wb} , kN		30500	20300	37900	25200	46500	30900	55100	36700	68500	45600
P_{fb} , kN		5200	3460	6040	4020	6910	4600	7860	5230	8780	5840
L_p , m		5.53		5.57		5.61		5.66		5.71	
L_r , m		61.6		66.5		71.2		76.1		81.0	
$A_g \times 10^2$, mm^2		649.0		701.4		754.9		808.0		863.4	
$I_x \times 10^4$, mm^4		204500		226100		250200		274200		299500	
$I_y \times 10^4$, mm^4		75400		82490		90170		98250		106900	
$r_y \times 10$, mm		10.8		10.9		10.9		11.0		11.1	
r_x / r_y		1.65		1.65		1.67		1.67		1.67	
$P_{ex} L_{cx}^2$, kN · m^2		4040000		4460000		4940000		5410000		5910000	
$P_{ey} L_{cy}^2$, kN · m^2		1490000		1630000		1780000		1940000		2110000	

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

Table C.1 Continued.

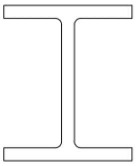


Available Strength in Axial Compression, kN
HD Shapes

F_y = 235 MPa

Shape		HD 400 × 744		HD 400 × 818		HD 400 × 900		HD 400 × 990		HD 400 × 1086	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	20100	13300	22100	14700	24300	16200	26700	17800	29300	19500
	1.00	20000	13300	22000	14600	24200	16100	26600	17700	29200	19400
	1.50	19900	13200	21900	14600	24100	16000	26500	17600	29100	19300
	2.00	19700	13100	21700	14500	23900	15900	26300	17500	28900	19200
	2.50	19600	13000	21500	14300	23700	15800	26100	17400	28700	19100
	3.00	19400	12900	21300	14200	23500	15600	25800	17200	28400	18900
	3.50	19100	12700	21000	14000	23200	15400	25500	17000	28100	18700
	4.00	18800	12500	20700	13800	22900	15200	25200	16800	27700	18400
	4.50	18500	12300	20400	13600	22500	15000	24800	16500	27300	18200
	5.00	18200	12100	20000	13300	22100	14700	24400	16200	26800	17900
	5.50	17800	11800	19600	13100	21700	14400	23900	15900	26400	17500
	6.00	17400	11600	19200	12800	21200	14100	23400	15600	25800	17200
	6.50	17000	11300	18800	12500	20800	13800	22900	15200	25300	16800
	7.00	16500	11000	18300	12200	20200	13500	22300	14900	24700	16400
	7.50	16100	10700	17800	11800	19700	13100	21800	14500	24000	16000
	8.00	15600	10400	17300	11500	19100	12700	21200	14100	23400	15600
	8.50	15100	10000	16700	11100	18600	12300	20500	13700	22700	15100
	9.00	14600	9700	16200	10800	18000	11900	19900	13200	22000	14700
	9.50	14100	9350	15600	10400	17300	11500	19200	12800	21300	14200
	10.0	13500	9000	15000	10000	16700	11100	18600	12400	20600	13700
	10.5	13000	8640	14500	9620	16100	10700	17900	11900	19900	13200
	11.0	12500	8290	13900	9230	15500	10300	17200	11400	19100	12700
	11.5	11900	7930	13300	8840	14800	9870	16500	11000	18400	12200
	12.0	11400	7570	12700	8450	14200	9440	15800	10500	17700	11800
	12.5	10800	7210	12100	8060	13600	9020	15100	10100	16900	11300
	13.0	10300	6860	11500	7680	12900	8600	14500	9620	16200	10800
	13.5	9780	6510	11000	7300	12300	8190	13800	9170	15400	10300
	14.0	9270	6170	10400	6920	11700	7780	13100	8720	14700	9790
	14.5	8760	5830	9850	6550	11100	7370	12400	8280	14000	9310
	15.0	8270	5500	9310	6190	10500	6980	11800	7850	13300	8840
Properties											
P_{wo}, kN		6790	4530	7960	5310	9370	6250	11000	7320	12800	8550
P_{wi}, kN/m		13100	8710	14200	9480	15500	10300	16900	11300	18300	12200
P_{wb}, kN		87700	58400	113000	75200	147000	97600	190000	126000	243000	162000
P_{fb}, kN		10400	6950	12400	8280	14900	9880	17500	11600	20700	13700
L_p, m		5.78		5.85		5.93		6.02		6.11	
L_r, m		88.3		96.6		106		115		125	
$A_g \times 10^2$, mm^2		948.1		1043		1149		1262		1386	
$I_x \times 10^4$, mm^4		342100		392200		450200		518900		595700	
$I_y \times 10^4$, mm^4		119900		135500		153300		173400		196200	
$r_y \times 10$, mm		11.3		11.4		11.6		11.7		11.9	
r_x / r_y		1.69		1.70		1.71		1.73		1.74	
$P_{ex} L_{cx}^2$, kN · m^2		6760000		7740000		8880000		10200000		11800000	
$P_{ey} L_{cy}^2$, kN · m^2		2370000		2680000		3030000		3420000		3870000	
LRFD		ASD									
$\phi_c = 0.90$		$\Omega_c = 1.67$									

Table C.1 Continued.



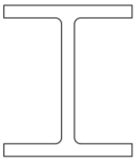
Available Strength in Axial Compression, kN
HD Shapes

F_y = 275 MPa

	Shape	HD 260 × 54.1		HD 260 × 68.2		HD 260 × 93.0		HD 260 × 114		HD 260 × 142		HD 260 × 172	
	Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1710	1140	2150	1430	2930	1950	3610	2400	4460	2970	5440	3620
	1.00	1680	1120	2120	1410	2890	1920	3560	2370	4410	2930	5370	3570
	1.50	1650	1100	2080	1390	2840	1890	3500	2330	4340	2880	5290	3520
	2.00	1610	1070	2030	1350	2780	1850	3420	2280	4240	2820	5180	3440
	2.50	1560	1040	1970	1310	2690	1790	3320	2210	4120	2740	5030	3350
	3.00	1500	998	1900	1260	2600	1730	3200	2130	3980	2650	4870	3240
	3.50	1430	952	1810	1210	2480	1650	3070	2040	3820	2540	4680	3110
	4.00	1360	902	1720	1150	2360	1570	2920	1940	3640	2420	4470	2970
	4.50	1270	848	1620	1080	2230	1480	2760	1840	3450	2290	4240	2820
	5.00	1190	792	1520	1010	2090	1390	2600	1730	3240	2160	4000	2660
	5.50	1100	734	1420	942	1950	1300	2420	1610	3030	2020	3750	2500
	6.00	1020	676	1310	870	1800	1200	2250	1490	2820	1880	3500	2330
	6.50	928	618	1200	798	1660	1100	2070	1380	2600	1730	3240	2160
	7.00	842	560	1090	727	1510	1010	1890	1260	2390	1590	2980	1980
	7.50	759	505	989	658	1370	914	1720	1150	2180	1450	2730	1820
	8.00	679	451	888	591	1240	823	1550	1030	1970	1310	2480	1650
	8.50	602	400	791	526	1110	735	1390	927	1770	1180	2240	1490
	9.00	537	357	706	469	986	656	1240	827	1580	1050	2010	1340
	9.50	482	320	633	421	885	589	1120	742	1420	946	1800	1200
	10.0	435	289	572	380	799	531	1010	670	1280	854	1630	1080
	10.5	394	262	518	345	724	482	913	608	1160	775	1480	983
	11.0	359	239	472	314	660	439	832	554	1060	706	1350	896
	11.5	329	219	432	288	604	402	761	507	971	646	1230	819
	12.0	302	201	397	264	555	369	699	465	891	593	1130	753
	12.5	278	185	366	243	511	340	644	429	822	547	1040	694
	13.0	257	171	338	225	473	314	596	396	760	505	964	641
	13.5	238	159	314	209	438	292	552	368	704	469	894	595
	14.0	222	148	292	194	407	271	514	342	655	436	831	553
	14.5	207	138	272	181	380	253	479	319	611	406	775	515
	15.0	193	129	254	169	355	236	448	298	571	380	724	482
Properties													
P_{wo} , kN		299	200	376	251	571	380	782	521	1080	718	1400	932
P_{wi} , kN/m		1790	1190	2060	1380	2750	1830	3440	2290	4260	2840	4950	3300
P_{wb} , kN		249	165	382	254	905	602	1770	1180	3370	2240	5280	3510
P_{fb} , kN		140	92.9	242	161	474	315	715	476	1090	723	1630	1090
L_p , m		3.02		3.09		3.12		3.16		3.21		3.27	
L_r , m		10.3		11.6		14.6		17.5		21.4		25.8	
$A_g \times 10^2$, mm^2		68.97		86.82		118.4		145.7		180.3		219.6	
$I_x \times 10^4$, mm^4		7981		10450		14920		18910		24330		31310	
$I_y \times 10^4$, mm^4		2788		3668		5135		6456		8236		10450	
$r_y \times 10$, mm		6.36		6.50		6.58		6.66		6.76		6.90	
r_x / r_y		1.69		1.69		1.71		1.71		1.72		1.73	
$P_{ex} L_{cx}^2$, kN · m^2		158000		206000		294000		373000		481000		618000	
$P_{ey} L_{cy}^2$, kN · m^2		55100		72400		101000		128000		163000		206000	

LRFD	ASD	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.1 Continued.

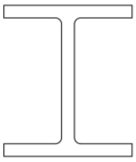


Available Strength in Axial Compression, kN
HD Shapes

F_y = 275 MPa

Shape		**HD 320 × 74.2**		**HD 320 × 97.6**		**HD 320 × 127**		**HD 320 × 158**		**HD 320 × 198**		**HD 320 × 245**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2340	1560	3080	2050	3990	2660	4980	3310	6240	4150	7720	5140
	1.00	2310	1540	3050	2030	3950	2630	4930	3280	6180	4110	7650	5090
	1.50	2280	1520	3010	2000	3900	2600	4870	3240	6110	4070	7560	5030
	2.00	2240	1490	2950	1970	3830	2550	4790	3180	6010	4000	7440	4950
	2.50	2180	1450	2890	1920	3750	2490	4680	3110	5880	3910	7290	4850
	3.00	2120	1410	2800	1870	3640	2420	4550	3030	5730	3810	7110	4730
	3.50	2040	1360	2710	1800	3520	2340	4410	2930	5550	3690	6900	4590
	4.00	1960	1300	2610	1730	3390	2260	4250	2830	5350	3560	6660	4430
	4.50	1870	1240	2490	1660	3250	2160	4070	2710	5140	3420	6410	4260
	5.00	1770	1180	2370	1580	3100	2060	3890	2590	4910	3270	6130	4080
	5.50	1670	1110	2250	1500	2930	1950	3690	2450	4670	3110	5840	3890
	6.00	1570	1040	2120	1410	2770	1840	3490	2320	4420	2940	5540	3690
	6.50	1460	973	1980	1320	2600	1730	3280	2180	4160	2770	5230	3480
	7.00	1360	903	1850	1230	2420	1610	3060	2040	3900	2590	4910	3270
	7.50	1250	833	1720	1140	2250	1500	2850	1900	3640	2420	4600	3060
	8.00	1150	764	1580	1050	2080	1380	2640	1760	3380	2250	4280	2850
	8.50	1050	697	1450	967	1910	1270	2430	1620	3120	2080	3960	2640
	9.00	951	633	1330	883	1750	1160	2230	1480	2870	1910	3660	2430
	9.50	856	569	1210	802	1590	1060	2040	1350	2620	1750	3360	2230
	10.0	772	514	1090	723	1440	958	1840	1230	2390	1590	3070	2040
	10.5	701	466	986	656	1310	869	1670	1110	2160	1440	2790	1850
	11.0	638	425	899	598	1190	792	1520	1010	1970	1310	2540	1690
	11.5	584	389	822	547	1090	725	1390	928	1800	1200	2320	1550
	12.0	536	357	755	502	1000	665	1280	852	1660	1100	2130	1420
	12.5	494	329	696	463	922	613	1180	785	1530	1020	1970	1310
	13.0	457	304	643	428	852	567	1090	726	1410	939	1820	1210
	13.5	424	282	597	397	790	526	1010	673	1310	871	1690	1120
	14.0	394	262	555	369	735	489	941	626	1220	810	1570	1040
	14.5	367	244	517	344	685	456	877	584	1130	755	1460	972
	15.0	343	228	483	322	640	426	820	545	1060	705	1370	908
Properties													
P_{wo} , kN		418	279	526	351	751	501	1050	698	1460	974	1930	1290
P_{wi} , kN/m		2200	1470	2480	1650	3160	2110	3990	2660	4950	3300	5780	3850
P_{wb} , kN		365	243	519	345	1080	720	2170	1440	4150	2760	6590	4390
P_{fb} , kN		187	125	372	247	650	433	1010	669	1580	1050	2480	1650
L_p , m		3.44		3.56		3.59		3.64		3.70		3.77	
L_r , m		11.4		13.1		15.9		19.2		23.8		29.2	
$A_g \times 10^2$, mm^2		94.58		124.4		161.3		201.2		252.3		312.0	
$I_x \times 10^4$, mm^4		16450		22930		30820		39640		51900		68130	
$I_y \times 10^4$, mm^4		4959		6985		9239		11840		15310		19710	
$r_y \times 10$, mm		7.24		7.49		7.57		7.67		7.79		7.95	
$r_x/\ r_y$		1.82		1.81		1.83		1.83		1.84		1.86	
$P_{ex}\ L_{cx}^2$, kN · m^2		325000		453000		608000		783000		1020000		1350000	
$P_{ey}\ L_{cy}^2$, kN · m^2		97900		138000		182000		234000		302000		389000	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



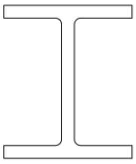
Available Strength in Axial Compression, kN
HD Shapes

F_y = 275 MPa

Shape		HD 320 × 300		HD 360 × 134		HD 360 × 147		HD 360 × 162		HD 360 × 179		HD 360 × 196	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	9460	6290	4220	2810	4650	3090	5110	3400	5650	3760	6190	4120
	1.00	9370	6240	4190	2790	4620	3070	5070	3380	5610	3740	6160	4100
	1.50	9270	6170	4160	2770	4580	3050	5030	3350	5570	3710	6110	4060
	2.00	9120	6070	4110	2740	4530	3010	4980	3310	5510	3660	6040	4020
	2.50	8940	5950	4050	2700	4460	2970	4900	3260	5430	3610	5950	3960
	3.00	8720	5800	3980	2650	4380	2920	4820	3200	5330	3550	5850	3890
	3.50	8460	5630	3890	2590	4290	2860	4720	3140	5220	3470	5730	3810
	4.00	8180	5440	3800	2530	4190	2790	4600	3060	5100	3390	5590	3720
	4.50	7870	5240	3690	2460	4070	2710	4480	2980	4960	3300	5440	3620
	5.00	7540	5020	3580	2380	3950	2630	4340	2890	4810	3200	5280	3510
	5.50	7190	4780	3460	2300	3810	2540	4200	2790	4650	3090	5110	3400
	6.00	6820	4540	3330	2220	3670	2440	4040	2690	4480	2980	4920	3280
	6.50	6450	4290	3190	2130	3530	2350	3880	2580	4310	2860	4730	3150
	7.00	6060	4040	3060	2030	3370	2240	3720	2470	4120	2740	4530	3020
	7.50	5680	3780	2910	1940	3220	2140	3550	2360	3930	2620	4330	2880
	8.00	5290	3520	2770	1840	3060	2030	3370	2240	3740	2490	4120	2740
	8.50	4910	3270	2620	1740	2900	1930	3200	2130	3550	2360	3910	2600
	9.00	4540	3020	2470	1650	2730	1820	3020	2010	3360	2230	3690	2460
	9.50	4170	2780	2330	1550	2570	1710	2850	1890	3160	2100	3480	2320
	10.0	3820	2540	2180	1450	2410	1610	2670	1780	2970	1980	3270	2180
	10.5	3470	2310	2040	1360	2260	1500	2500	1660	2780	1850	3070	2040
	11.0	3160	2110	1900	1260	2100	1400	2330	1550	2590	1730	2860	1900
	11.5	2900	1930	1760	1170	1950	1300	2170	1440	2410	1610	2660	1770
	12.0	2660	1770	1630	1090	1810	1200	2010	1340	2240	1490	2470	1640
	12.5	2450	1630	1500	1000	1670	1110	1850	1230	2060	1370	2280	1520
	13.0	2270	1510	1390	925	1540	1020	1710	1140	1910	1270	2110	1400
	13.5	2100	1400	1290	857	1430	950	1590	1060	1770	1180	1960	1300
	14.0	1950	1300	1200	797	1330	884	1480	983	1640	1090	1820	1210
	14.5	1820	1210	1120	743	1240	824	1380	916	1530	1020	1700	1130
	15.0	1700	1130	1040	694	1160	770	1290	856	1430	953	1580	1050
Properties													
P_{wo}, kN		2780	1860	508	339	589	392	673	449	802	535	929	619
P_{wi}, kN/m		7430	4950	3080	2050	3380	2260	3660	2440	4130	2750	4510	3010
P_{wb}, kN		14000	9320	776	516	1030	683	1300	863	1860	1240	2440	1620
P_{fb}, kN		3560	2370	501	333	606	403	735	489	884	588	1060	706
L_p, m		3.81		4.46		4.48		4.50		4.52		4.54	
L_r, m		35.4		15.6		16.7		17.9		19.5		21.1	
$A_g \times 10^2$, mm^2		382.1		170.6		187.9		206.3		228.3		250.3	
$I_x \times 10^4$, mm^4		86900		41510		46290		51540		57440		63630	
$I_y \times 10^4$, mm^4		24600		15080		16720		18560		20680		22860	
$r_y \times 10$, mm		8.02		9.40		9.43		9.49		9.52		9.56	
r_x / r_y		1.88		1.66		1.66		1.67		1.67		1.67	
$P_{ex} L_{cx}^2$, kN · m^2		1720000		820000		914000		1020000		1130000		1260000	
$P_{ey} L_{cy}^2$, kN · m^2		485000		298000		330000		367000		408000		452000	

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

Table C.1 Continued.



Available Strength in Axial Compression, kN

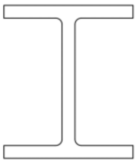
HD Shapes

F_y = 275 MPa

Shape		HD 400 × 187		HD 400 × 216		HD 400 × 237		HD 400 × 262		HD 400 × 287	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	5880	3910	6820	4540	7450	4950	8280	5510	9070	6030
	1.00	5850	3890	6780	4510	7410	4930	8240	5480	9020	6000
	1.50	5800	3860	6730	4480	7350	4890	8180	5440	8950	5960
	2.00	5750	3820	6670	4430	7280	4840	8100	5390	8870	5900
	2.50	5670	3770	6580	4380	7190	4780	8000	5320	8760	5830
	3.00	5580	3710	6480	4310	7080	4710	7880	5240	8630	5740
	3.50	5480	3640	6360	4230	6950	4620	7730	5150	8470	5640
	4.00	5360	3570	6230	4140	6800	4530	7580	5040	8300	5520
	4.50	5230	3480	6080	4040	6640	4420	7400	4920	8110	5400
	5.00	5090	3380	5920	3940	6470	4300	7200	4790	7900	5260
	5.50	4930	3280	5740	3820	6280	4180	7000	4660	7670	5110
	6.00	4770	3180	5560	3700	6080	4040	6780	4510	7440	4950
	6.50	4600	3060	5360	3570	5870	3900	6540	4350	7180	4780
	7.00	4430	2950	5160	3430	5650	3760	6300	4190	6920	4610
	7.50	4240	2820	4950	3300	5420	3610	6050	4030	6650	4430
	8.00	4060	2700	4740	3150	5190	3450	5800	3860	6370	4240
	8.50	3870	2570	4520	3010	4950	3290	5540	3680	6090	4050
	9.00	3680	2450	4300	2860	4710	3140	5270	3510	5800	3860
	9.50	3490	2320	4080	2720	4470	2980	5010	3330	5520	3670
	10.0	3290	2190	3860	2570	4230	2820	4740	3160	5230	3480
	10.5	3100	2070	3640	2420	4000	2660	4480	2980	4940	3290
	11.0	2920	1940	3430	2280	3760	2500	4220	2810	4660	3100
	11.5	2730	1820	3220	2140	3530	2350	3960	2640	4380	2910
	12.0	2550	1700	3010	2000	3300	2200	3710	2470	4100	2730
	12.5	2380	1580	2810	1870	3080	2050	3470	2310	3830	2550
	13.0	2200	1470	2610	1730	2860	1910	3230	2150	3570	2380
	13.5	2040	1360	2420	1610	2660	1770	2990	1990	3320	2210
	14.0	1900	1260	2250	1500	2470	1640	2780	1850	3080	2050
	14.5	1770	1180	2090	1390	2300	1530	2590	1730	2870	1910
	15.0	1660	1100	1960	1300	2150	1430	2420	1610	2690	1790
Properties											
P_{wo} , kN		804	536	1020	677	1170	783	1400	934	1600	1070
P_{wi} , kN/m		4130	2750	4760	3170	5200	3470	5800	3870	6220	4140
P_{wb} , kN		1860	1240	2860	1910	3730	2480	5180	3450	6380	4250
P_{fb} , kN		891	593	1190	790	1410	939	1720	1140	2070	1380
L_p , m		4.76		4.81		4.82		4.86		4.88	
L_r , m		20.5		23.4		25.3		27.9		30.4	
$A_g \times 10^2$, mm^2		237.6		275.5		300.9		334.6		366.3	
$I_x \times 10^4$, mm^4		60180		71140		78780		89410		99710	
$I_y \times 10^4$, mm^4		23920		28250		31040		35020		38780	
$r_y \times 10$, mm		10.0		10.1		10.2		10.2		10.3	
r_x / r_y		1.59		1.59		1.59		1.60		1.60	
$P_{ex} L_{cx}^2$, kN · m^2		1190000		1400000		1550000		1770000		1970000	
$P_{ey} L_{cy}^2$, kN · m^2		472000		558000		613000		691000		766000	

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

Table C.1 Continued.



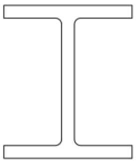
Available Strength in Axial Compression, kN
HD Shapes

F_y = 275 MPa

Shape		HD 400 × 314		HD 400 × 347		HD 400 × 382		HD 400 × 421		HD 400 × 463	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	9880	6570	10900	7280	12100	8020	13300	8840	14600	9710
	1.00	9830	6540	10900	7240	12000	7980	13200	8800	14500	9660
	1.50	9760	6490	10800	7190	11900	7930	13100	8740	14400	9600
	2.00	9670	6430	10700	7120	11800	7850	13000	8660	14300	9510
	2.50	9550	6350	10600	7040	11700	7760	12900	8560	14100	9400
	3.00	9410	6260	10400	6940	11500	7650	12700	8440	13900	9270
	3.50	9240	6150	10200	6820	11300	7520	12500	8300	13700	9120
	4.00	9050	6020	10000	6680	11100	7370	12200	8140	13400	8940
	4.50	8850	5890	9810	6530	10800	7200	12000	7960	13200	8750
	5.00	8620	5730	9570	6370	10600	7030	11700	7760	12800	8540
	5.50	8370	5570	9300	6190	10300	6830	11400	7560	12500	8310
	6.00	8120	5400	9020	6000	9960	6630	11000	7330	12100	8070
	6.50	7840	5220	8720	5800	9640	6410	10700	7100	11700	7820
	7.00	7560	5030	8410	5600	9300	6190	10300	6850	11300	7550
	7.50	7270	4830	8090	5380	8950	5950	9920	6600	10900	7270
	8.00	6960	4630	7760	5160	8590	5710	9520	6340	10500	6990
	8.50	6660	4430	7430	4940	8220	5470	9120	6070	10100	6700
	9.00	6350	4220	7090	4710	7850	5220	8720	5800	9630	6410
	9.50	6030	4010	6740	4490	7470	4970	8310	5530	9180	6110
	10.0	5720	3810	6400	4260	7100	4720	7900	5250	8730	5810
	10.5	5410	3600	6060	4030	6720	4470	7490	4980	8290	5510
	11.0	5100	3390	5720	3810	6350	4220	7080	4710	7840	5220
	11.5	4800	3190	5380	3580	5980	3980	6670	4440	7400	4920
	12.0	4500	2990	5060	3360	5620	3740	6280	4180	6970	4640
	12.5	4210	2800	4730	3150	5270	3500	5890	3920	6540	4350
	13.0	3920	2610	4420	2940	4920	3280	5510	3670	6130	4080
	13.5	3640	2420	4110	2730	4580	3050	5140	3420	5730	3810
	14.0	3390	2250	3820	2540	4260	2830	4780	3180	5320	3540
	14.5	3160	2100	3560	2370	3970	2640	4460	2960	4960	3300
	15.0	2950	1960	3330	2220	3710	2470	4160	2770	4640	3090
Properties											
P_{wo}, kN		1870	1250	2200	1460	2580	1720	3050	2030	3560	2380
P_{wi}, kN/m		6850	4570	7480	4990	8200	5460	9020	6010	9850	6560
P_{wb}, kN		8530	5680	11100	7410	14600	9730	19500	13000	25300	16900
P_{fb}, kN		2430	1610	2950	1970	3560	2370	4280	2850	5100	3390
L_p, m		4.90		4.95		4.98		5.02		5.06	
L_r, m		33.0		36.5		40.0		44.0		48.1	
$A_g \times 10^2$, mm^2		399.2		442.0		487.1		537.1		589.5	
$I_x \times 10^4$, mm^4		110200		124900		141300		159600		180200	
$I_y \times 10^4$, mm^4		42600		48100		53600		60100		67000	
$r_y \times 10$, mm		10.3		10.4		10.5		10.6		10.7	
r_x/r_y		1.61		1.61		1.62		1.63		1.64	
$P_{ex} L_{cx}^2$, kN · m^2		2180000		2470000		2790000		3150000		3560000	
$P_{ey} L_{cy}^2$, kN · m^2		841000		949000		1060000		1190000		1320000	

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

Table C.1 Continued.



Available Strength in Axial Compression, kN
HD Shapes

F_y = 275 MPa

Shape		HD 400 × 509		HD 400 × 551		HD 400 × 592		HD 400 × 634		HD 400 × 677	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	16100	10700	17400	11600	18700	12400	20000	13300	21400	14200
	1.00	16000	10600	17300	11500	18600	12400	19900	13200	21300	14200
	1.50	15900	10600	17200	11400	18500	12300	19800	13200	21100	14100
	2.00	15700	10500	17000	11300	18300	12200	19600	13100	21000	14000
	2.50	15600	10400	16800	11200	18100	12100	19400	12900	20700	13800
	3.00	15400	10200	16600	11000	17900	11900	19200	12700	20500	13600
	3.50	15100	10000	16300	10900	17600	11700	18900	12500	20200	13400
	4.00	14800	9860	16000	10700	17300	11500	18500	12300	19800	13200
	4.50	14500	9650	15700	10400	16900	11300	18100	12100	19400	12900
	5.00	14200	9430	15300	10200	16500	11000	17700	11800	19000	12600
	5.50	13800	9180	14900	9940	16100	10700	17300	11500	18500	12300
	6.00	13400	8920	14500	9660	15700	10400	16800	11200	18000	12000
	6.50	13000	8650	14100	9370	15200	10100	16300	10900	17500	11700
	7.00	12600	8360	13600	9060	14700	9790	15800	10500	17000	11300
	7.50	12100	8060	13100	8740	14200	9450	15300	10200	16400	10900
	8.00	11700	7750	12600	8410	13700	9100	14700	9790	15800	10500
	8.50	11200	7440	12100	8080	13100	8740	14100	9410	15200	10100
	9.00	10700	7120	11600	7730	12600	8370	13600	9020	14600	9710
	9.50	10200	6790	11100	7390	12000	8000	13000	8630	14000	9300
	10.0	9730	6470	10600	7040	11500	7630	12400	8240	13300	8880
	10.5	9240	6150	10100	6690	10900	7260	11800	7840	12700	8460
	11.0	8750	5820	9530	6340	10400	6890	11200	7450	12100	8040
	11.5	8270	5500	9020	6000	9800	6520	10600	7060	11500	7630
	12.0	7800	5190	8510	5660	9250	6160	10000	6670	10800	7220
	12.5	7330	4880	8010	5330	8710	5800	9460	6290	10200	6810
	13.0	6880	4580	7520	5000	8190	5450	8900	5920	9640	6420
	13.5	6440	4280	7040	4680	7680	5110	8350	5550	9060	6030
	14.0	6000	3990	6560	4370	7170	4770	7820	5200	8490	5650
	14.5	5590	3720	6120	4070	6680	4450	7280	4850	7930	5270
	15.0	5220	3470	5720	3800	6240	4150	6810	4530	7410	4930
Properties											
P_{wo} , kN		4180	2780	4770	3180	5400	3600	6030	4020	6790	4530
P_{wi} , kN/m		10800	7170	11600	7700	12400	8250	13100	8730	14100	9390
P_{wb} , kN		33000	21900	41000	27200	50300	33400	59600	39700	74100	49300
P_{fb} , kN		6080	4050	7070	4700	8090	5380	9200	6120	10300	6840
L_p , m		5.12		5.15		5.19		5.24		5.28	
L_r , m		52.7		56.9		60.9		65.0		69.3	
$A_g \times 10^2$, mm^2		649.0		701.4		754.9		808.0		863.4	
$I_x \times 10^4$, mm^4		204500		226100		250200		274200		299500	
$I_y \times 10^4$, mm^4		75400		82490		90170		98250		106900	
$r_y \times 10$, mm		10.8		10.9		10.9		11.0		11.1	
r_x / r_y		1.65		1.65		1.67		1.67		1.67	
$P_{ex} L_{cx}^2$, kN · m^2		4040000		4460000		4940000		5410000		5910000	
$P_{ey} L_{cy}^2$, kN · m^2		1490000		1630000		1780000		1940000		2110000	

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

Table C.1 Continued.

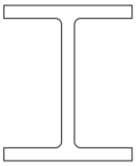
Available Strength in Axial Compression, kN
HD Shapes

F_y = 275 MPa

Shape		**HD 400 × 744**		**HD 400 × 818**		**HD 400 × 900**		**HD 400 × 990**		**HD 400 × 1086**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	23500	15600	25800	17200	28400	18900	31200	20800	34300	22800
	1.00	23400	15500	25700	17100	28300	18800	31100	20700	34200	22700
	1.50	23200	15500	25600	17000	28200	18700	30900	20600	34000	22600
	2.00	23000	15300	25400	16900	27900	18600	30700	20400	33700	22500
	2.50	22800	15200	25100	16700	27700	18400	30400	20200	33400	22200
	3.00	22500	15000	24800	16500	27300	18200	30100	20000	33100	22000
	3.50	22200	14800	24400	16300	27000	17900	29700	19700	32600	21700
	4.00	21800	14500	24000	16000	26500	17600	29200	19400	32100	21400
	4.50	21400	14200	23600	15700	26000	17300	28700	19100	31600	21000
	5.00	20900	13900	23100	15400	25500	17000	28100	18700	30900	20600
	5.50	20400	13600	22500	15000	24900	16600	27500	18300	30300	20200
	6.00	19900	13200	22000	14600	24300	16200	26800	17800	29600	19700
	6.50	19300	12900	21400	14200	23600	15700	26100	17400	28800	19200
	7.00	18700	12500	20700	13800	23000	15300	25400	16900	28000	18700
	7.50	18100	12000	20100	13300	22200	14800	24600	16400	27200	18100
	8.00	17500	11600	19400	12900	21500	14300	23800	15800	26400	17500
	8.50	16800	11200	18700	12400	20700	13800	23000	15300	25500	17000
	9.00	16200	10700	17900	11900	20000	13300	22100	14700	24600	16400
	9.50	15500	10300	17200	11500	19200	12800	21300	14200	23700	15700
	10.0	14800	9850	16500	11000	18400	12200	20400	13600	22700	15100
	10.5	14100	9390	15700	10500	17600	11700	19600	13000	21800	14500
	11.0	13400	8940	15000	9980	16800	11100	18700	12400	20800	13900
	11.5	12800	8490	14300	9490	16000	10600	17800	11900	19900	13200
	12.0	12100	8040	13500	9000	15200	10100	16900	11300	19000	12600
	12.5	11400	7600	12800	8520	14400	9560	16100	10700	18000	12000
	13.0	10800	7170	12100	8050	13600	9040	15200	10100	17100	11400
	13.5	10100	6740	11400	7580	12800	8530	14400	9590	16200	10800
	14.0	9510	6330	10700	7130	12100	8030	13600	9040	15300	10200
	14.5	8890	5920	10000	6680	11300	7550	12800	8510	14400	9600
	15.0	8310	5530	9390	6240	10600	7060	12000	7990	13600	9040
Properties											
P_{wo}, kN		7940	5300	9320	6210	11000	7310	12900	8570	15000	10000
P_{wi}, kN/m		15300	10200	16600	11100	18100	12100	19800	13200	21500	14300
P_{wb}, kN		94900	63100	122000	81400	159000	106000	205000	137000	263000	175000
P_{fb}, kN		12200	8130	14600	9680	17400	11600	20500	13600	24200	16100
L_p, m		5.34		5.41		5.48		5.56		5.65	
L_r, m		75.5		82.5		90.4		98.2		107	
$A_g \times 10^2$, mm^2		948.1		1043		1149		1262		1386	
$I_x \times 10^4$, mm^4		342100		392200		450200		518900		595700	
$I_y \times 10^4$, mm^4		119900		135500		153300		173400		196200	
$r_y \times 10$, mm		11.3		11.4		11.6		11.7		11.9	
r_x / r_y		1.69		1.70		1.71		1.73		1.74	
$P_{ex} L_{cx}^2$, kN · m^2		6760000		7740000		8880000		10200000		11800000	
$P_{ey} L_{cy}^2$, kN · m^2		2370000		2680000		3030000		3420000		3870000	

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

Table C.1 Continued.



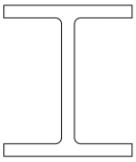
Available Strength in Axial Compression, kN
HD Shapes

F_y = 355 MPa

Shape		HD 260 × 54.1[c]		HD 260 × 68.2		HD 260 × 93.0		HD 260 × 114		HD 260 × 142		HD 260 × 172	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2200	1470	2770	1850	3780	2520	4660	3100	5760	3830	7020	4670
	1.00	2150	1430	2720	1810	3720	2470	4580	3050	5670	3770	6910	4590
	1.50	2110	1400	2660	1770	3640	2420	4480	2980	5550	3690	6770	4500
	2.00	2050	1360	2580	1720	3530	2350	4350	2890	5390	3590	6590	4380
	2.50	1960	1310	2480	1650	3390	2260	4190	2790	5200	3460	6360	4230
	3.00	1860	1240	2360	1570	3230	2150	4000	2660	4970	3300	6090	4050
	3.50	1750	1170	2230	1480	3060	2030	3780	2520	4710	3130	5780	3850
	4.00	1640	1090	2090	1390	2860	1910	3550	2360	4430	2940	5450	3620
	4.50	1510	1010	1930	1290	2660	1770	3300	2200	4130	2750	5090	3390
	5.00	1380	921	1780	1180	2450	1630	3050	2030	3820	2540	4730	3140
	5.50	1260	835	1620	1080	2240	1490	2790	1850	3500	2330	4350	2890
	6.00	1130	750	1460	972	2020	1350	2530	1680	3180	2120	3970	2640
	6.50	1000	668	1310	869	1810	1210	2270	1510	2870	1910	3600	2390
	7.00	885	589	1160	771	1610	1070	2030	1350	2570	1710	3230	2150
	7.50	773	514	1020	676	1420	945	1790	1190	2280	1520	2880	1920
	8.00	679	452	893	594	1250	830	1570	1050	2010	1330	2550	1690
	8.50	602	400	791	526	1110	735	1390	927	1780	1180	2250	1500
	9.00	537	357	706	469	986	656	1240	827	1580	1050	2010	1340
	9.50	482	320	633	421	885	589	1120	742	1420	946	1800	1200
	10.0	435	289	572	380	799	531	1010	670	1280	854	1630	1080
	10.5	394	262	518	345	724	482	913	608	1160	775	1480	983
	11.0	359	239	472	314	660	439	832	554	1060	706	1350	896
	11.5	329	219	432	288	604	402	761	507	971	646	1230	819
	12.0	302	201	397	264	555	369	699	465	891	593	1130	753
	12.5	278	185	366	243	511	340	644	429	822	547	1040	694
	13.0	257	171	338	225	473	314	596	396	760	505	964	641
	13.5	238	159	314	209	438	292	552	368	704	469	894	595
	14.0	222	148	292	194	407	271	514	342	655	436	831	553
	14.5	207	138	272	181	380	253	479	319	611	406	775	515
	15.0	193	129	254	169	355	236	448	298	571	380	724	482
Properties													
P_{wo}, kN		387	258	486	324	737	491	1010	673	1390	926	1810	1200
P_{wi}, kN/m		2310	1540	2660	1780	3550	2370	4440	2960	5500	3670	6390	4260
P_{wb}, kN		282	188	434	289	1030	684	2010	1340	3830	2550	6000	3990
P_{fb}, kN		180	120	312	208	612	407	923	614	1400	933	2110	1400
L_p, m		2.66		2.72		2.75		2.78		2.82		2.88	
L_r, m		8.41		9.33		11.5		13.7		16.7		20.1	
$A_g \times 10^2$, mm^2		68.97		86.82		118.4		145.7		180.3		219.6	
$I_x \times 10^4$, mm^4		7981		10450		14920		18910		24330		31310	
$I_y \times 10^4$, mm^4		2788		3668		5135		6456		8236		10450	
$r_y \times 10$, mm		6.36		6.50		6.58		6.66		6.76		6.90	
r_x/r_y		1.69		1.69		1.71		1.71		1.72		1.73	
$P_{ex} L_{cx}^2$, kN · m^2		158000		206000		294000		373000		481000		618000	
$P_{ey} L_{cy}^2$, kN · m^2		55100		72400		101000		128000		163000		206000	

LRFD	ASD	
$\phi_c = 0.90$	$\Omega_c = 1.67$	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200. [c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.



Available Strength in Axial Compression, kN

HD Shapes

F_y = 355 MPa

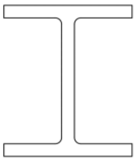
Shape		HD 320 × 74.2[c]		HD 320 × 97.6		HD 320 × 127		HD 320 × 158		HD 320 × 198		HD 320 × 245	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	3020	2010	3970	2640	5150	3430	6430	4280	8060	5360	9970	6630
	1.00	2960	1970	3920	2610	5090	3380	6350	4220	7960	5300	9850	6550
	1.50	2920	1940	3860	2570	5000	3330	6250	4160	7840	5220	9700	6460
	2.00	2850	1900	3770	2510	4890	3250	6110	4060	7670	5100	9500	6320
	2.50	2760	1840	3650	2430	4750	3160	5930	3950	7460	4960	9250	6160
	3.00	2660	1770	3520	2340	4580	3050	5730	3810	7210	4800	8960	5960
	3.50	2530	1690	3370	2240	4390	2920	5500	3660	6920	4610	8620	5730
	4.00	2400	1600	3210	2130	4180	2780	5240	3490	6610	4400	8240	5480
	4.50	2260	1500	3030	2020	3950	2630	4960	3300	6270	4170	7830	5210
	5.00	2110	1400	2840	1890	3710	2470	4670	3110	5910	3930	7400	4920
	5.50	1960	1300	2650	1760	3460	2300	4370	2900	5540	3690	6950	4630
	6.00	1800	1200	2450	1630	3210	2140	4060	2700	5160	3430	6490	4320
	6.50	1650	1100	2250	1500	2960	1970	3740	2490	4770	3180	6030	4010
	7.00	1500	995	2060	1370	2710	1800	3430	2280	4390	2920	5560	3700
	7.50	1350	896	1870	1240	2460	1640	3130	2080	4010	2670	5100	3390
	8.00	1210	802	1680	1120	2220	1480	2830	1890	3640	2420	4650	3090
	8.50	1070	711	1500	1000	1990	1330	2550	1700	3290	2190	4220	2810
	9.00	954	634	1340	893	1780	1180	2280	1510	2940	1960	3790	2520
	9.50	856	569	1200	802	1600	1060	2040	1360	2640	1760	3400	2260
	10.0	772	514	1090	723	1440	958	1840	1230	2390	1590	3070	2040
	10.5	701	466	986	656	1310	869	1670	1110	2160	1440	2790	1850
	11.0	638	425	899	598	1190	792	1520	1010	1970	1310	2540	1690
	11.5	584	389	822	547	1090	725	1390	928	1800	1200	2320	1550
	12.0	536	357	755	502	1000	665	1280	852	1660	1100	2130	1420
	12.5	494	329	696	463	922	613	1180	785	1530	1020	1970	1310
	13.0	457	304	643	428	852	567	1090	726	1410	939	1820	1210
	13.5	424	282	597	397	790	526	1010	673	1310	871	1690	1120
	14.0	394	262	555	369	735	489	941	626	1220	810	1570	1040
	14.5	367	244	517	344	685	456	877	584	1130	755	1460	972
	15.0	343	228	483	322	640	426	820	545	1060	705	1370	908
Properties													
P_{wo} , kN		540	360	679	453	970	646	1350	901	1890	1260	2500	1660
P_{wi} , kN/m		2840	1890	3200	2130	4080	2720	5150	3430	6390	4260	7460	4970
P_{wb} , kN		414	276	590	392	1230	819	2470	1640	4720	3140	7490	4980
P_{fb} , kN		242	161	480	319	839	558	1300	864	2040	1360	3200	2130
L_p , m		3.02		3.13		3.16		3.20		3.25		3.32	
L_r , m		9.37		10.6		12.6		15.1		18.5		22.7	
$A_g \times 10^2$, mm^2		94.58		124.4		161.3		201.2		252.3		312.0	
$I_x \times 10^4$, mm^4		16450		22930		30820		39640		51900		68130	
$I_y \times 10^4$, mm^4		4959		6985		9239		11840		15310		19710	
$r_y \times 10$, mm		7.24		7.49		7.57		7.67		7.79		7.95	
r_x/r_y		1.82		1.81		1.83		1.83		1.84		1.86	
$P_{ex} L_{cx}^2$, kN · m^2		325000		453000		608000		783000		1020000		1350000	
$P_{ey} L_{cy}^2$, kN · m^2		97900		138000		182000		234000		302000		389000	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.



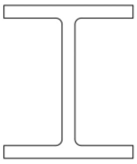
Available Strength in Axial Compression, kN
HD Shapes

F_y = 355 MPa

Shape		**HD 320 × 300**		**HD 360 × 134**		**HD 360 × 147**		**HD 360 × 162**		**HD 360 × 179**		**HD 360 × 196**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	12200	8120	5450	3630	6000	3990	6590	4390	7290	4850	8000	5320
	1.00	12100	8030	5400	3600	5950	3960	6540	4350	7230	4810	7930	5280
	1.50	11900	7910	5350	3560	5890	3920	6470	4300	7160	4760	7850	5220
	2.00	11600	7750	5270	3510	5800	3860	6370	4240	7060	4690	7740	5150
	2.50	11300	7550	5170	3440	5690	3790	6260	4160	6930	4610	7600	5050
	3.00	11000	7310	5050	3360	5560	3700	6110	4070	6770	4500	7430	4940
	3.50	10600	7040	4910	3270	5410	3600	5950	3960	6590	4380	7230	4810
	4.00	10100	6740	4760	3160	5240	3490	5770	3840	6390	4250	7010	4660
	4.50	9630	6410	4590	3050	5060	3370	5560	3700	6170	4100	6770	4500
	5.00	9110	6060	4410	2930	4860	3230	5350	3560	5930	3940	6510	4330
	5.50	8570	5700	4210	2800	4650	3090	5120	3410	5670	3770	6230	4150
	6.00	8010	5330	4010	2670	4430	2950	4880	3250	5410	3600	5950	3960
	6.50	7450	4950	3800	2530	4200	2790	4630	3080	5140	3420	5650	3760
	7.00	6880	4580	3590	2390	3970	2640	4380	2910	4860	3230	5340	3550
	7.50	6320	4210	3380	2250	3730	2480	4120	2740	4570	3040	5030	3350
	8.00	5770	3840	3160	2100	3490	2320	3860	2570	4290	2850	4720	3140
	8.50	5240	3490	2950	1960	3260	2170	3600	2400	4000	2660	4410	2930
	9.00	4730	3150	2730	1820	3020	2010	3350	2230	3720	2480	4100	2730
	9.50	4240	2820	2530	1680	2800	1860	3100	2060	3450	2290	3800	2530
	10.0	3830	2550	2330	1550	2570	1710	2860	1900	3180	2110	3510	2330
	10.5	3470	2310	2130	1420	2360	1570	2620	1750	2920	1940	3230	2150
	11.0	3160	2110	1940	1290	2150	1430	2390	1590	2660	1770	2950	1960
	11.5	2900	1930	1780	1180	1970	1310	2190	1460	2440	1620	2690	1790
	12.0	2660	1770	1630	1090	1810	1200	2010	1340	2240	1490	2480	1650
	12.5	2450	1630	1500	1000	1670	1110	1850	1230	2060	1370	2280	1520
	13.0	2270	1510	1390	925	1540	1020	1710	1140	1910	1270	2110	1400
	13.5	2100	1400	1290	857	1430	950	1590	1060	1770	1180	1960	1300
	14.0	1950	1300	1200	797	1330	884	1480	983	1640	1090	1820	1210
	14.5	1820	1210	1120	743	1240	824	1380	916	1530	1020	1700	1130
	15.0	1700	1130	1040	694	1160	770	1290	856	1430	953	1580	1050
Properties													
P_{wo} , kN		3590	2400	656	437	760	507	869	579	1040	690	1200	800
P_{wi} , kN/m		9590	6390	3980	2650	4370	2910	4720	3150	5330	3550	5820	3880
P_{wb} , kN		15900	10600	882	587	1170	776	1470	981	2120	1410	2770	1840
P_{fb} , kN		4600	3060	647	430	783	521	949	631	1140	759	1370	912
L_p , m		3.35		3.93		3.94		3.96		3.98		3.99	
L_r , m		27.5		12.7		13.5		14.4		15.5		16.7	
$A_g \times 10^2$, mm^2		382.1		170.6		187.9		206.3		228.3		250.3	
$I_x \times 10^4$, mm^4		86900		41510		46290		51540		57440		63630	
$I_y \times 10^4$, mm^4		24600		15080		16720		18560		20680		22860	
$r_y \times 10$, mm		8.02		9.40		9.43		9.49		9.52		9.56	
r_x / r_y		1.88		1.66		1.66		1.67		1.67		1.67	
$P_{ex} L_{cx}^2$, kN · m^2		1720000		820000		914000		1020000		1130000		1260000	
$P_{ey} L_{cy}^2$, kN · m^2		485000		298000		330000		367000		408000		452000	

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

Table C.1 Continued.



Available Strength in Axial Compression, kN
HD Shapes

F_y = 355 MPa

Shape		**HD 400 × 187**		**HD 400 × 216**		**HD 400 × 237**		**HD 400 × 262**		**HD 400 × 287**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	7590	5050	8800	5860	9610	6400	10700	7110	11700	7790
	1.00	7530	5010	8740	5810	9540	6350	10600	7060	11600	7730
	1.50	7460	4970	8660	5760	9460	6290	10500	7000	11500	7660
	2.00	7370	4900	8550	5690	9340	6210	10400	6910	11400	7570
	2.50	7240	4820	8410	5590	9190	6110	10200	6800	11200	7450
	3.00	7100	4720	8240	5480	9000	5990	10000	6670	11000	7300
	3.50	6930	4610	8050	5350	8790	5850	9790	6510	10700	7140
	4.00	6730	4480	7830	5210	8560	5690	9530	6340	10400	6950
	4.50	6520	4340	7590	5050	8290	5520	9240	6150	10100	6740
	5.00	6300	4190	7330	4880	8010	5330	8930	5940	9800	6520
	5.50	6050	4030	7050	4690	7710	5130	8600	5720	9440	6280
	6.00	5800	3860	6760	4500	7390	4920	8250	5490	9060	6030
	6.50	5530	3680	6460	4300	7060	4700	7890	5250	8670	5770
	7.00	5260	3500	6140	4090	6730	4470	7520	5000	8260	5500
	7.50	4980	3320	5830	3880	6380	4240	7130	4750	7850	5220
	8.00	4700	3130	5500	3660	6030	4010	6750	4490	7430	4940
	8.50	4420	2940	5180	3450	5680	3780	6360	4230	7000	4660
	9.00	4140	2760	4860	3230	5330	3540	5970	3970	6580	4380
	9.50	3860	2570	4540	3020	4980	3310	5590	3720	6160	4100
	10.0	3590	2390	4230	2810	4640	3080	5210	3460	5750	3820
	10.5	3330	2210	3920	2610	4300	2860	4840	3220	5340	3560
	11.0	3070	2040	3620	2410	3980	2650	4480	2980	4950	3290
	11.5	2820	1870	3330	2220	3660	2430	4130	2740	4570	3040
	12.0	2590	1720	3060	2040	3360	2240	3790	2520	4200	2790
	12.5	2380	1590	2820	1880	3100	2060	3490	2320	3870	2570
	13.0	2200	1470	2610	1730	2860	1910	3230	2150	3580	2380
	13.5	2040	1360	2420	1610	2660	1770	2990	1990	3320	2210
	14.0	1900	1260	2250	1500	2470	1640	2780	1850	3080	2050
	14.5	1770	1180	2090	1390	2300	1530	2590	1730	2870	1910
	15.0	1660	1100	1960	1300	2150	1430	2420	1610	2690	1790
Properties											
P_{wo}, kN		1040	692	1310	874	1520	1010	1810	1210	2070	1380
P_{wi}, kN/m		5330	3550	6140	4090	6710	4470	7490	4990	8020	5350
P_{wb}, kN		2120	1410	3250	2170	4240	2820	5890	3920	7250	4820
P_{fb}, kN		1150	765	1530	1020	1820	1210	2210	1470	2670	1780
L_p, m		4.19		4.23		4.24		4.27		4.30	
L_r, m		16.3		18.4		19.9		21.8		23.7	
$A_g \times 10^2$, mm^2		237.6		275.5		300.9		334.6		366.3	
$I_x \times 10^4$, mm^4		60180		71140		78780		89410		99710	
$I_y \times 10^4$, mm^4		23920		28250		31040		35020		38780	
$r_y \times 10$, mm		10.0		10.1		10.2		10.2		10.3	
r_x / r_y		1.59		1.59		1.59		1.60		1.60	
$P_{ex} L_{cx}^2$, kN · m^2		1190000		1400000		1550000		1770000		1970000	
$P_{ey} L_{cy}^2$, kN · m^2		472000		558000		613000		691000		766000	

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

Table C.1 Continued.

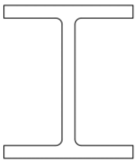
Available Strength in Axial Compression, kN
HD Shapes

F_y = 355 MPa

Shape		**HD 400 × 314**		**HD 400 × 347**		**HD 400 × 382**		**HD 400 × 421**		**HD 400 × 463**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	12800	8490	14100	9400	15600	10400	17200	11400	18800	12500
	1.00	12700	8430	14000	9330	15500	10300	17000	11300	18700	12400
	1.50	12600	8350	13900	9250	15300	10200	16900	11200	18600	12300
	2.00	12400	8250	13700	9140	15100	10100	16700	11100	18300	12200
	2.50	12200	8120	13500	9000	14900	9920	16500	10900	18100	12000
	3.00	12000	7960	13300	8830	14600	9740	16200	10700	17700	11800
	3.50	11700	7780	13000	8630	14300	9520	15800	10500	17400	11600
	4.00	11400	7580	12600	8410	13900	9280	15400	10300	16900	11300
	4.50	11100	7360	12300	8170	13500	9020	15000	9960	16500	11000
	5.00	10700	7110	11900	7900	13100	8730	14500	9650	16000	10600
	5.50	10300	6860	11500	7620	12700	8420	14000	9320	15400	10300
	6.00	9890	6580	11000	7320	12200	8090	13500	8960	14800	9870
	6.50	9470	6300	10500	7010	11700	7760	12900	8590	14200	9470
	7.00	9030	6010	10100	6690	11100	7410	12300	8210	13600	9060
	7.50	8580	5710	9570	6370	10600	7050	11800	7820	13000	8630
	8.00	8120	5400	9070	6030	10000	6680	11200	7420	12300	8200
	8.50	7660	5100	8570	5700	9490	6320	10600	7020	11700	7770
	9.00	7200	4790	8060	5360	8940	5950	9950	6620	11000	7330
	9.50	6750	4490	7560	5030	8390	5580	9350	6220	10400	6890
	10.0	6300	4190	7070	4700	7850	5220	8760	5830	9710	6460
	10.5	5860	3900	6590	4380	7320	4870	8180	5440	9070	6040
	11.0	5430	3610	6110	4070	6800	4530	7610	5060	8450	5620
	11.5	5020	3340	5660	3760	6300	4190	7050	4690	7840	5220
	12.0	4610	3070	5200	3460	5800	3860	6500	4330	7250	4820
	12.5	4250	2830	4790	3190	5340	3560	5990	3990	6680	4440
	13.0	3930	2610	4430	2950	4940	3290	5540	3690	6180	4110
	13.5	3640	2420	4110	2730	4580	3050	5140	3420	5730	3810
	14.0	3390	2250	3820	2540	4260	2830	4780	3180	5320	3540
	14.5	3160	2100	3560	2370	3970	2640	4460	2960	4960	3300
	15.0	2950	1960	3330	2220	3710	2470	4160	2770	4640	3090
Properties											
P_{wo} , kN		2410	1610	2830	1890	3330	2220	3940	2620	4600	3070
P_{wi} , kN/m		8840	5890	9660	6440	10600	7050	11600	7760	12700	8470
P_{wb} , kN		9700	6450	12600	8410	16600	11100	22200	14700	28800	19100
P_{fb} , kN		3130	2080	3810	2540	4600	3060	5520	3680	6580	4380
L_p , m		4.32		4.36		4.38		4.42		4.45	
L_r , m		25.7		28.4		31.1		34.1		37.3	
$A_g \times 10^2$, mm^2		399.2		442.0		487.1		537.1		589.5	
$I_x \times 10^4$, mm^4		110200		124900		141300		159600		180200	
$I_y \times 10^4$, mm^4		42600		48100		53600		60100		67000	
$r_y \times 10$, mm		10.3		10.4		10.5		10.6		10.7	
r_x / r_y		1.61		1.61		1.62		1.63		1.64	
$P_{ex} L_{cx}^2$, kN · m^2		2180000		2470000		2790000		3150000		3560000	
$P_{ey} L_{cy}^2$, kN · m^2		841000		949000		1060000		1190000		1320000	

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

Table C.1 Continued.



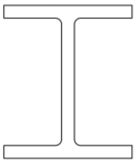
Available Strength in Axial Compression, kN
HD Shapes

F_y = 355 MPa

Shape		**HD 400 × 509**		**HD 400 × 551**		**HD 400 × 592**		**HD 400 × 634**		**HD 400 × 677**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	20700	13800	22400	14900	24100	16000	25800	17200	27600	18400
	1.00	20600	13700	22300	14800	24000	15900	25700	17100	27400	18200
	1.50	20400	13600	22100	14700	23800	15800	25500	16900	27200	18100
	2.00	20200	13400	21800	14500	23500	15600	25200	16800	26900	17900
	2.50	19900	13200	21500	14300	23200	15400	24800	16500	26600	17700
	3.00	19600	13000	21200	14100	22800	15200	24400	16200	26100	17400
	3.50	19200	12700	20700	13800	22300	14900	23900	15900	25600	17000
	4.00	18700	12400	20200	13500	21800	14500	23400	15600	25000	16700
	4.50	18200	12100	19700	13100	21200	14100	22800	15200	24400	16200
	5.00	17600	11700	19100	12700	20600	13700	22100	14700	23700	15800
	5.50	17000	11300	18500	12300	19900	13300	21400	14200	23000	15300
	6.00	16400	10900	17800	11800	19200	12800	20700	13700	22200	14700
	6.50	15800	10500	17100	11400	18500	12300	19900	13200	21300	14200
	7.00	15100	10000	16400	10900	17700	11800	19100	12700	20500	13600
	7.50	14400	9580	15600	10400	16900	11300	18200	12100	19600	13000
	8.00	13700	9110	14900	9900	16100	10700	17400	11600	18700	12400
	8.50	13000	8640	14100	9390	15300	10200	16500	11000	17800	11800
	9.00	12300	8160	13400	8880	14500	9630	15600	10400	16900	11200
	9.50	11600	7690	12600	8370	13700	9090	14800	9830	15900	10600
	10.0	10800	7220	11800	7870	12800	8550	13900	9250	15000	10000
	10.5	10200	6750	11100	7370	12000	8010	13100	8680	14100	9390
	11.0	9470	6300	10300	6880	11300	7490	12200	8120	13200	8800
	11.5	8800	5860	9620	6400	10500	6970	11400	7580	12400	8220
	12.0	8160	5430	8920	5940	9730	6480	10600	7050	11500	7650
	12.5	7520	5000	8230	5480	8990	5980	9800	6520	10700	7100
	13.0	6950	4630	7610	5060	8310	5530	9060	6030	9860	6560
	13.5	6450	4290	7060	4700	7710	5130	8400	5590	9140	6080
	14.0	6000	3990	6560	4370	7170	4770	7810	5200	8500	5660
	14.5	5590	3720	6120	4070	6680	4450	7280	4850	7930	5270
	15.0	5220	3470	5720	3800	6240	4150	6810	4530	7410	4930
Properties											
P_{wo}, kN		5390	3600	6160	4110	6970	4650	7780	5190	8770	5850
P_{wi}, kN/m		13900	9250	14900	9940	16000	10700	16900	11300	18200	12100
P_{wb}, kN		37400	24900	46500	31000	57100	38000	67700	45100	84200	56000
P_{fb}, kN		7850	5220	9130	6070	10400	6940	11900	7900	13300	8820
L_p, m		4.50		4.53		4.57		4.61		4.65	
L_r, m		40.8		44.1		47.2		50.4		53.7	
$A_g \times 10^2$, mm^2		649.0		701.4		754.9		808.0		863.4	
$I_x \times 10^4$, mm^4		204500		226100		250200		274200		299500	
$I_y \times 10^4$, mm^4		75400		82490		90170		98250		106900	
$r_y \times 10$, mm		10.8		10.9		10.9		11.0		11.1	
r_x/r_y		1.65		1.65		1.67		1.67		1.67	
$P_{ex} L_{cx}^2$, kN · m^2		4040000		4460000		4940000		5410000		5910000	
$P_{ey} L_{cy}^2$, kN · m^2		1490000		1630000		1780000		1940000		2110000	

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

Table C.1 Continued.



Available Strength in Axial Compression, kN

HD Shapes

F_y = 355 MPa

Shape		**HD 400 × 744**		**HD 400 × 818**		**HD 400 × 900**		**HD 400 × 990**		**HD 400 × 1086**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	30300	20200	33300	22200	36700	24400	40300	26800	44300	29500
	1.00	30100	20000	33100	22000	36500	24300	40100	26700	44000	29300
	1.50	29900	19900	32900	21900	36200	24100	39800	26500	43800	29100
	2.00	29600	19700	32600	21700	35900	23900	39400	26200	43400	28800
	2.50	29200	19400	32100	21400	35400	23600	39000	25900	42800	28500
	3.00	28700	19100	31600	21000	34900	23200	38400	25500	42200	28100
	3.50	28200	18700	31000	20700	34300	22800	37700	25100	41500	27600
	4.00	27500	18300	30400	20200	33500	22300	36900	24600	40700	27100
	4.50	26900	17900	29600	19700	32700	21800	36100	24000	39800	26500
	5.00	26100	17400	28800	19200	31900	21200	35200	23400	38800	25800
	5.50	25300	16800	28000	18600	31000	20600	34200	22700	37700	25100
	6.00	24500	16300	27100	18000	30000	19900	33100	22000	36600	24300
	6.50	23600	15700	26100	17400	28900	19200	32000	21300	35400	23500
	7.00	22600	15100	25100	16700	27800	18500	30800	20500	34100	22700
	7.50	21700	14400	24100	16000	26700	17800	29600	19700	32800	21800
	8.00	20700	13800	23000	15300	25600	17000	28400	18900	31500	21000
	8.50	19700	13100	21900	14600	24400	16200	27100	18100	30200	20100
	9.00	18700	12400	20800	13900	23200	15500	25900	17200	28800	19200
	9.50	17700	11800	19800	13100	22100	14700	24600	16400	27400	18200
	10.0	16700	11100	18700	12400	20900	13900	23300	15500	26000	17300
	10.5	15700	10500	17600	11700	19700	13100	22000	14700	24600	16400
	11.0	14700	9810	16500	11000	18500	12300	20800	13800	23300	15500
	11.5	13800	9180	15500	10300	17400	11600	19500	13000	21900	14600
	12.0	12900	8560	14500	9630	16300	10800	18300	12200	20600	13700
	12.5	12000	7960	13500	8970	15200	10100	17100	11400	19300	12800
	13.0	11100	7360	12500	8310	14100	9400	16000	10600	18000	12000
	13.5	10300	6830	11600	7710	13100	8720	14800	9860	16800	11200
	14.0	9540	6350	10800	7170	12200	8110	13800	9170	15600	10400
	14.5	8890	5920	10000	6680	11400	7560	12800	8550	14500	9680
	15.0	8310	5530	9390	6240	10600	7060	12000	7990	13600	9040
Properties											
P_{wo}, **kN**		10300	6840	12000	8020	14200	9440	16600	11100	19400	12900
P_{wi}, **kN/m**		19700	13200	21500	14300	23400	15600	25500	17000	27700	18500
P_{wb}, **kN**		108000	71700	139000	92500	180000	120000	233000	155000	299000	199000
P_{fb}, **kN**		15800	10500	18800	12500	22400	14900	26400	17600	31200	20800
L_p, **m**		4.70		4.76		4.82		4.90		4.97	
L_r, **m**		58.5		64.0		70.1		76.1		82.9	
$A_g \times 10^2$, **mm²**		948.1		1043		1149		1262		1386	
$I_x \times 10^4$, **mm⁴**		342100		392200		450200		518900		595700	
$I_y \times 10^4$, **mm⁴**		119900		135500		153300		173400		196200	
$r_y \times 10$, **mm**		11.3		11.4		11.6		11.7		11.9	
r_x / r_y		1.69		1.70		1.71		1.73		1.74	
$P_{ex} L_{cx}^2$, $\mathrm{kN \cdot m^2}$		6760000		7740000		8880000		10200000		11800000	
$P_{ey} L_{cy}^2$, $\mathrm{kN \cdot m^2}$		2370000		2680000		3030000		3420000		3870000	
LRFD		**ASD**									
$\phi_c = 0.90$		$\Omega_c = 1.67$									

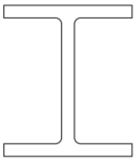
Table C.1 Continued.

Available Strength in Axial Compression, kN
HEA Shapes

F_y = 235 MPa

Shape		**HEA 100**		**HEA 120**		**HEA 140**		**HEA 160**		**HEA 180**		**HEA 200**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	449	299	536	357	665	442	820	546	957	637	1140	757
	1.00	415	276	507	338	638	425	795	529	934	621	1120	742
	1.50	376	250	474	315	607	404	764	508	906	603	1090	724
	2.00	327	218	431	287	566	376	723	481	868	578	1050	699
	2.50	274	182	381	253	517	344	674	448	822	547	1000	668
	3.00	220	147	328	218	463	308	618	411	768	511	950	632
	3.50	170	113	274	183	406	270	558	371	710	472	890	592
	4.00	130	86.7	224	149	349	232	496	330	648	431	826	549
	4.50	103	68.5	178	118	294	196	434	289	584	389	758	504
	5.00	83.4	55.5	144	95.8	243	161	373	248	520	346	689	458
	5.50	68.9	45.9	119	79.2	201	133	316	210	458	304	620	412
	6.00	57.9	38.5	100	66.5	168	112	266	177	398	265	552	367
	6.50	49.3	32.8	85.2	56.7	144	95.5	226	151	341	227	487	324
	7.00	42.5	28.3	73.5	48.9	124	82.4	195	130	294	196	424	282
	7.50	37.1	24.7	64.0	42.6	108	71.7	170	113	256	170	370	246
	8.00	32.6	21.7	56.3	37.4	94.8	63.1	150	99.5	225	150	325	216
	8.50	28.9	19.2	49.8	33.2	84.0	55.9	132	88.1	199	133	288	192
	9.00	25.7	17.1	44.5	29.6	74.9	49.8	118	78.6	178	118	257	171
	9.50	23.1	15.4	39.9	26.5	67.2	44.7	106	70.5	160	106	230	153
	10.0	20.8	13.9	36.0	24.0	60.7	40.4	95.7	63.7	144	95.8	208	138
	10.5	18.9	12.6	32.7	21.7	55.0	36.6	86.8	57.7	131	86.9	189	126
	11.0	17.2	11.5	29.8	19.8	50.1	33.4	79.1	52.6	119	79.2	172	114
	11.5	15.8	10.5	27.2	18.1	45.9	30.5	72.3	48.1	109	72.5	157	105
	12.0	14.5	9.63	25.0	16.6	42.1	28.0	66.4	44.2	100	66.5	144	96.1
	12.5	13.3	8.88	23.0	15.3	38.8	25.8	61.2	40.7	92.2	61.3	133	88.6
	13.0	12.3	8.21	21.3	14.2	35.9	23.9	56.6	37.7	85.2	56.7	123	81.9
	13.5	11.4	7.61	19.8	13.1	33.3	22.1	52.5	34.9	79.0	52.6	114	75.9
	14.0	10.6	7.08	18.4	12.2	30.9	20.6	48.8	32.5	73.5	48.9	106	70.6
	14.5	9.92	6.60	17.1	11.4	28.8	19.2	45.5	30.3	68.5	45.6	98.9	65.8
	15.0	9.27	6.16	16.0	10.6	27.0	17.9	42.5	28.3	64.0	42.6	92.4	61.5
Properties													
P_{wo}, kN		118	78.3	118	78.3	132	88.3	169	113	173	115	214	143
P_{wi}, kN/m		1180	783	1180	783	1290	862	1410	940	1410	940	1530	1020
P_{wb}, kN		331	220	250	166	268	178	308	205	262	174	303	202
P_{fb}, kN		84.6	56.3	84.6	56.3	95.5	63.5	107	71.2	119	79.4	132	87.9
L_p, m		1.29		1.55		1.81		2.04		2.32		2.56	
L_r, m		8.70		8.45		8.84		9.66		9.93		10.8	
$A_g \times 10^2$, mm^2		21.24		25.34		31.42		38.77		45.25		53.83	
$I_x \times 10^4$, mm^4		349.2		606.2		1033		1673		2510		3692	
$I_y \times 10^4$, mm^4		133.8		230.9		389.3		615.6		924.6		1336	
$r_y \times 10$, mm		2.51		3.02		3.52		3.98		4.52		4.98	
r_x / r_y		1.62		1.62		1.63		1.65		1.65		1.66	
$P_{ex} L_{cx}^2$, kN · m^2		6910		12000		20400		33000		49600		72800	
$P_{ey} L_{cy}^2$, kN · m^2		2640		4560		7680		12100		18200		26400	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



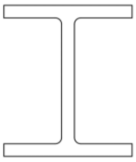
Available Strength in Axial Compression, kN

HEA Shapes

F_y = 235 MPa

Shape		HEA 220		HEA 240		HEA 260		HEA 280		HEA 300		HEA 320	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1360	905	1630	1080	1840	1220	2060	1370	2380	1580	2630	1750
	1.00	1340	891	1600	1070	1810	1210	2040	1350	2360	1570	2610	1740
	1.50	1310	873	1580	1050	1790	1190	2010	1340	2330	1550	2580	1720
	2.00	1270	848	1540	1020	1750	1170	1980	1310	2300	1530	2540	1690
	2.50	1230	817	1490	992	1710	1130	1930	1280	2250	1500	2490	1660
	3.00	1170	781	1430	955	1650	1100	1880	1250	2200	1460	2430	1620
	3.50	1110	740	1370	913	1590	1060	1820	1210	2130	1420	2360	1570
	4.00	1050	696	1300	866	1520	1010	1750	1160	2060	1370	2280	1520
	4.50	976	649	1230	817	1450	962	1670	1110	1990	1320	2200	1460
	5.00	903	601	1150	765	1370	910	1600	1060	1910	1270	2110	1400
	5.50	828	551	1070	711	1290	855	1510	1010	1820	1210	2010	1340
	6.00	754	501	987	657	1200	799	1430	949	1730	1150	1910	1270
	6.50	680	453	906	603	1120	742	1340	891	1630	1090	1810	1200
	7.00	609	405	825	549	1030	685	1250	832	1540	1020	1700	1130
	7.50	541	360	746	496	946	629	1160	772	1440	961	1600	1060
	8.00	476	316	670	446	863	574	1070	714	1350	897	1490	991
	8.50	421	280	597	397	783	521	987	656	1250	833	1380	921
	9.00	376	250	532	354	706	469	903	601	1160	771	1280	853
	9.50	337	224	478	318	633	421	822	547	1070	710	1180	785
	10.0	304	202	431	287	572	380	743	494	979	651	1080	720
	10.5	276	184	391	260	518	345	673	448	892	593	986	656
	11.0	252	167	356	237	472	314	614	408	813	541	899	598
	11.5	230	153	326	217	432	288	561	374	744	495	822	547
	12.0	211	141	299	199	397	264	516	343	683	454	755	502
	12.5	195	130	276	184	366	243	475	316	629	419	696	463
	13.0	180	120	255	170	338	225	439	292	582	387	643	428
	13.5	167	111	236	157	314	209	407	271	540	359	597	397
	14.0	155	103	220	146	292	194	379	252	502	334	555	369
	14.5	145	96.3	205	136	272	181	353	235	468	311	517	344
	15.0	135	90.0	192	127	254	169	330	220	437	291	483	322
Properties													
P_{wo}, kN		239	159	291	194	322	214	348	232	409	273	449	300
P_{wi}, kN/m		1650	1100	1760	1180	1760	1180	1880	1250	2000	1330	2120	1410
P_{wb}, kN		334	222	381	253	353	235	387	257	437	291	480	319
P_{fb}, kN		160	106	190	127	207	137	223	149	259	172	318	211
L_p, m		2.83		3.08		3.34		3.59		3.85		3.85	
L_r, m		11.5		12.6		13.3		13.8		14.9		15.0	
$A_g \times 10^2$, mm^2		64.34		76.84		86.82		97.26		112.5		124.4	
$I_x \times 10^4$, mm^4		5410		7763		10450		13670		18260		22930	
$I_y \times 10^4$, mm^4		1955		2769		3668		4763		6310		6985	
$r_y \times 10$, mm		5.51		6.00		6.50		7.00		7.49		7.49	
r_x / r_y		1.66		1.68		1.69		1.69		1.70		1.81	
$P_{ex} L_{cx}^2$, kN · m^2		107000		153000		206000		270000		360000		453000	
$P_{ey} L_{cy}^2$, kN · m^2		38600		54600		72400		94100		125000		138000	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



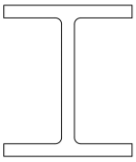
Available Strength in Axial Compression, kN
HEA Shapes

F_y = 235 MPa

Shape		HEA 340		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2820	1880	3020	2010	3360	2240	3760	2500	4180	2780	4480	2980
	1.00	2800	1860	2990	1990	3330	2220	3730	2480	4140	2750	4440	2950
	1.50	2770	1840	2960	1970	3290	2190	3690	2450	4090	2720	4380	2920
	2.00	2720	1810	2910	1940	3240	2160	3630	2410	4020	2680	4310	2870
	2.50	2670	1780	2850	1900	3170	2110	3550	2360	3940	2620	4210	2800
	3.00	2600	1730	2780	1850	3090	2060	3460	2300	3830	2550	4100	2730
	3.50	2530	1680	2700	1800	3000	2000	3360	2230	3720	2470	3980	2640
	4.00	2450	1630	2610	1740	2900	1930	3240	2160	3590	2390	3830	2550
	4.50	2360	1570	2520	1670	2790	1860	3110	2070	3450	2290	3680	2450
	5.00	2260	1500	2410	1600	2670	1780	2980	1980	3290	2190	3510	2340
	5.50	2150	1430	2300	1530	2540	1690	2830	1890	3130	2080	3340	2220
	6.00	2050	1360	2180	1450	2410	1600	2690	1790	2970	1970	3150	2100
	6.50	1930	1290	2060	1370	2280	1510	2530	1690	2800	1860	2970	1970
	7.00	1820	1210	1940	1290	2140	1420	2380	1580	2620	1740	2780	1850
	7.50	1710	1140	1820	1210	2000	1330	2220	1480	2450	1630	2590	1720
	8.00	1590	1060	1690	1130	1860	1240	2070	1370	2270	1510	2400	1600
	8.50	1480	984	1570	1050	1720	1150	1910	1270	2100	1400	2220	1470
	9.00	1370	910	1450	967	1590	1060	1760	1170	1930	1290	2030	1350
	9.50	1260	837	1340	890	1460	971	1620	1070	1770	1180	1860	1240
	10.0	1150	767	1220	815	1330	887	1470	981	1610	1070	1690	1120
	10.5	1050	699	1110	741	1210	805	1340	889	1460	973	1530	1020
	11.0	957	636	1020	675	1100	734	1220	810	1330	887	1390	928
	11.5	875	582	929	618	1010	671	1110	741	1220	811	1280	849
	12.0	804	535	853	567	927	617	1020	681	1120	745	1170	779
	12.5	741	493	786	523	854	568	943	628	1030	687	1080	718
	13.0	685	456	727	484	790	525	872	580	954	635	998	664
	13.5	635	423	674	448	732	487	809	538	885	589	926	616
	14.0	591	393	627	417	681	453	752	500	823	548	861	573
	14.5	551	366	584	389	635	422	701	466	767	510	802	534
	15.0	514	342	546	363	593	395	655	436	717	477	750	499
Properties													
P_{wo} , kN		486	324	523	349	595	396	649	432	705	470	749	499
P_{wi} , kN/m		2230	1490	2350	1570	2590	1720	2700	1800	2820	1880	2940	1960
P_{wb} , kN		522	348	567	377	661	440	655	436	656	437	660	439
P_{fb} , kN		360	239	405	269	477	317	583	388	699	465	761	507
L_p , m		3.83		3.81		3.77		3.74		3.72		3.67	
L_r , m		14.8		14.7		14.3		13.8		13.4		12.8	
$A_g \times 10^2$, mm^2		133.5		142.8		159.0		178.0		197.5		211.8	
$I_x \times 10^4$, mm^4		27690		33090		45070		637720		86970		111900	
$I_y \times 10^4$, mm^4		7436		7887		8564		9465		10370		10820	
$r_y \times 10$, mm		7.46		7.43		7.34		7.29		7.24		7.15	
r_x / r_y		1.93		2.05		2.29		2.60		2.90		3.22	
$P_{ex} L_{cx}^2$, kN · m^2		546000		653000		890000		1260000		1720000		2210000	
$P_{ey} L_{cy}^2$, kN · m^2		147000		156000		169000		187000		204000		214000	

LRFD	ASD	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.1 Continued.



Available Strength in Axial Compression, kN

HEA Shapes

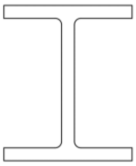
F_y = 235 MPa

Shape		HEA 600		HEA 650		HEA 700		HEA 800^c		HEA 900^c		HEA 1000^c	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	4790	3190	5110	3400	5510	3670	6040	4020	6780	4510	7330	4880
	1.00	4740	3160	5060	3370	5450	3630	5940	3950	6530	4350	6870	4570
	1.50	4680	3120	4990	3320	5380	3580	5870	3900	6450	4290	6780	4510
	2.00	4600	3060	4900	3260	5280	3510	5770	3840	6340	4220	6660	4430
	2.50	4500	2990	4790	3190	5150	3430	5630	3750	6190	4120	6500	4330
	3.00	4380	2910	4660	3100	5010	3330	5460	3630	6020	4010	6320	4200
	3.50	4240	2820	4510	3000	4840	3220	5270	3500	5820	3870	6100	4060
	4.00	4080	2710	4340	2890	4650	3090	5050	3360	5600	3730	5860	3900
	4.50	3910	2600	4150	2760	4440	2950	4810	3200	5340	3550	5610	3730
	5.00	3730	2480	3950	2630	4220	2810	4560	3030	5050	3360	5330	3550
	5.50	3540	2350	3750	2490	3990	2660	4300	2860	4740	3160	5040	3360
	6.00	3340	2220	3530	2350	3750	2500	4030	2680	4430	2950	4700	3130
	6.50	3140	2090	3310	2200	3510	2340	3760	2500	4120	2740	4350	2900
	7.00	2930	1950	3090	2060	3270	2180	3480	2320	3800	2530	4000	2660
	7.50	2730	1810	2870	1910	3030	2010	3210	2130	3490	2320	3660	2440
	8.00	2520	1680	2650	1760	2790	1850	2940	1960	3190	2120	3330	2210
	8.50	2320	1540	2440	1620	2550	1700	2680	1780	2890	1920	3000	2000
	9.00	2130	1410	2230	1480	2330	1550	2430	1610	2600	1730	2690	1790
	9.50	1940	1290	2020	1350	2100	1400	2180	1450	2340	1560	2410	1610
	10.0	1750	1170	1830	1220	1900	1260	1970	1310	2110	1400	2180	1450
	10.5	1590	1060	1660	1100	1720	1150	1790	1190	1910	1270	1980	1310
	11.0	1450	964	1510	1010	1570	1040	1630	1080	1740	1160	1800	1200
	11.5	1330	882	1380	920	1440	955	1490	991	1600	1060	1650	1100
	12.0	1220	810	1270	845	1320	877	1370	910	1470	975	1510	1010
	12.5	1120	747	1170	779	1220	809	1260	838	1350	898	1390	928
	13.0	1040	691	1080	720	1120	748	1170	775	1250	831	1290	858
	13.5	962	640	1000	668	1040	693	1080	719	1160	770	1200	795
	14.0	895	595	933	621	969	645	1000	668	1080	716	1110	740
	14.5	834	555	870	579	903	601	937	623	1000	668	1040	689
	15.0	780	519	813	541	844	562	875	582	938	624	968	644
Properties													
P_{wo}, kN		794	530	841	560	920	613	1020	682	1130	752	1180	788
P_{wi}, kN/m		3060	2040	3170	2120	3410	2270	3530	2350	3760	2510	3880	2590
P_{wb}, kN		669	445	682	454	776	516	742	493	788	524	766	510
P_{fb}, kN		826	550	894	595	964	641	1040	690	1190	792	1270	845
L_p, m		3.62		3.58		3.51		3.41		3.34		3.26	
L_r, m		12.3		11.9		11.6		10.9		10.6		10.1	
$A_g \times 10^2$, mm^2		226.5		241.6		260.5		285.8		320.5		346.8	
$I_x \times 10^4$, mm^4		141200		175200		215300		303400		422100		553800	
$I_y \times 10^4$, mm^4		11270		11720		12180		12640		13550		14000	
$r_y \times 10$, mm		7.05		6.97		6.84		6.65		6.50		6.35	
r_x/r_y		3.54		3.86		4.20		4.90		5.58		6.29	
$P_{ex} L_{cx}^2$, kN · m^2		2790000		3460000		4250000		5990000		8330000		10900000	
$P_{ey} L_{cy}^2$, kN · m^2		222000		232000		241000		249000		267000		276000	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

Table C.1 Continued.

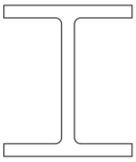


Available Strength in Axial Compression, kN
HEA Shapes

F_y = 275 MPa

Shape		**HEA 100**		**HEA 120**		**HEA 140**		**HEA 160**		**HEA 180**		**HEA 200**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	526	350	627	417	778	517	960	638	1120	745	1330	886
	1.00	479	319	588	391	742	494	925	615	1090	724	1300	866
	1.50	427	284	543	361	700	465	883	588	1050	699	1260	841
	2.00	363	242	486	323	644	429	828	551	999	665	1210	807
	2.50	295	196	421	280	579	386	762	507	937	623	1150	765
	3.00	229	152	353	235	509	339	689	458	866	576	1080	717
	3.50	170	113	287	191	437	291	611	407	789	525	999	665
	4.00	130	86.7	225	150	366	244	532	354	709	472	915	609
	4.50	103	68.5	178	118	300	199	455	303	628	418	828	551
	5.00	83.4	55.5	144	95.8	243	161	382	254	549	365	740	492
	5.50	68.9	45.9	119	79.2	201	133	316	210	472	314	654	435
	6.00	57.9	38.5	100	66.5	168	112	266	177	400	266	571	380
	6.50	49.3	32.8	85.2	56.7	144	95.5	226	151	341	227	492	328
	7.00	42.5	28.3	73.5	48.9	124	82.4	195	130	294	196	424	282
	7.50	37.1	24.7	64.0	42.6	108	71.7	170	113	256	170	370	246
	8.00	32.6	21.7	56.3	37.4	94.8	63.1	150	99.5	225	150	325	216
	8.50	28.9	19.2	49.8	33.2	84.0	55.9	132	88.1	199	133	288	192
	9.00	25.7	17.1	44.5	29.6	74.9	49.8	118	78.6	178	118	257	171
	9.50	23.1	15.4	39.9	26.5	67.2	44.7	106	70.5	160	106	230	153
	10.0	20.8	13.9	36.0	24.0	60.7	40.4	95.7	63.7	144	95.8	208	138
	10.5	18.9	12.6	32.7	21.7	55.0	36.6	86.8	57.7	131	86.9	189	126
	11.0	17.2	11.5	29.8	19.8	50.1	33.4	79.1	52.6	119	79.2	172	114
	11.5	15.8	10.5	27.2	18.1	45.9	30.5	72.3	48.1	109	72.5	157	105
	12.0	14.5	9.63	25.0	16.6	42.1	28.0	66.4	44.2	100	66.5	144	96.1
	12.5	13.3	8.88	23.0	15.3	38.8	25.8	61.2	40.7	92.2	61.3	133	88.6
	13.0	12.3	8.21	21.3	14.2	35.9	23.9	56.6	37.7	85.2	56.7	123	81.9
	13.5	11.4	7.61	19.8	13.1	33.3	22.1	52.5	34.9	79.0	52.6	114	75.9
	14.0	10.6	7.08	18.4	12.2	30.9	20.6	48.8	32.5	73.5	48.9	106	70.6
	14.5	9.92	6.60	17.1	11.4	28.8	19.2	45.5	30.3	68.5	45.6	98.9	65.8
	15.0	9.27	6.16	16.0	10.6	27.0	17.9	42.5	28.3	64.0	42.6	92.4	61.5
Properties													
P_{wo} , **kN**		138	91.7	138	91.7	155	103	198	132	202	135	250	167
P_{wi} , **kN/m**		1380	917	1380	917	1510	1010	1650	1100	1650	1100	1790	1190
P_{wb} , **kN**		358	238	271	180	290	193	333	221	284	189	328	218
P_{fb} , **kN**		99.0	65.9	99.0	65.9	112	74.4	125	83.4	140	92.9	155	103
L_p , **m**		1.19		1.43		1.67		1.89		2.15		2.36	
L_r , **m**		7.46		7.27		7.63		8.35		8.62		9.37	
$A_g \times 10^2, \mathrm{mm}^2$		21.24		25.34		31.42		38.77		45.25		53.83	
$I_x \times 10^4, \mathrm{mm}^4$		349.2		606.2		1033		1673		2510		3692	
$I_y \times 10^4, \mathrm{mm}^4$		133.8		230.9		389.3		615.6		924.6		1336	
$r_y \times 10, \mathrm{mm}$		2.51		3.02		3.52		3.98		4.52		4.98	
r_x / r_y		1.62		1.62		1.63		1.65		1.65		1.66	
$P_{ex} L_{cx}^2$, $\mathrm{kN \cdot m^2}$		6910		12000		20400		33000		49600		72800	
$P_{ey} L_{cy}^2$, $\mathrm{kN \cdot m^2}$		2640		4560		7680		12100		18200		26400	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN
HEA Shapes

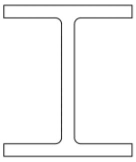
F_y = 275 MPa

Shape		HEA 220		HEA 240		HEA 260		HEA 280		HEA 300		HEA 320	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1590	1060	1900	1270	2150	1430	2410	1600	2780	1850	3080	2050
	1.00	1560	1040	1870	1240	2120	1410	2380	1580	2760	1830	3050	2030
	1.50	1530	1010	1830	1220	2080	1390	2340	1560	2720	1810	3010	2000
	2.00	1470	981	1780	1190	2030	1350	2300	1530	2670	1780	2950	1970
	2.50	1410	940	1720	1140	1970	1310	2230	1490	2610	1740	2890	1920
	3.00	1340	891	1640	1090	1900	1260	2160	1440	2540	1690	2800	1870
	3.50	1260	837	1560	1040	1810	1210	2080	1380	2450	1630	2710	1800
	4.00	1170	779	1470	976	1720	1150	1990	1320	2360	1570	2610	1730
	4.50	1080	718	1370	911	1620	1080	1890	1260	2260	1500	2490	1660
	5.00	985	655	1270	844	1520	1010	1790	1190	2150	1430	2370	1580
	5.50	891	593	1170	775	1420	942	1680	1120	2030	1350	2250	1500
	6.00	798	531	1060	706	1310	870	1570	1040	1920	1270	2120	1410
	6.50	707	471	959	638	1200	798	1460	969	1790	1190	1980	1320
	7.00	621	413	860	572	1090	727	1340	894	1670	1110	1850	1230
	7.50	541	360	765	509	989	658	1230	820	1550	1030	1720	1140
	8.00	476	316	673	448	888	591	1120	748	1430	953	1580	1050
	8.50	421	280	597	397	791	526	1020	678	1310	874	1450	967
	9.00	376	250	532	354	706	469	917	610	1200	798	1330	883
	9.50	337	224	478	318	633	421	823	547	1090	725	1210	802
	10.0	304	202	431	287	572	380	743	494	983	654	1090	723
	10.5	276	184	391	260	518	345	673	448	892	593	986	656
	11.0	252	167	356	237	472	314	614	408	813	541	899	598
	11.5	230	153	326	217	432	288	561	374	744	495	822	547
	12.0	211	141	299	199	397	264	516	343	683	454	755	502
	12.5	195	130	276	184	366	243	475	316	629	419	696	463
	13.0	180	120	255	170	338	225	439	292	582	387	643	428
	13.5	167	111	236	157	314	209	407	271	540	359	597	397
	14.0	155	103	220	146	292	194	379	252	502	334	555	369
	14.5	145	96.3	205	136	272	181	353	235	468	311	517	344
	15.0	135	90	192	127	254	169	330	220	437	291	483	322
Properties													
P_{wo}, kN		279	186	340	227	376	251	407	271	479	319	526	351
P_{wi}, kN/m		1930	1280	2060	1380	2060	1380	2200	1470	2340	1560	2480	1650
P_{wb}, kN		361	241	412	274	382	254	418	278	473	315	519	345
P_{fb}, kN		187	125	223	148	242	161	261	174	303	202	372	247
L_p, m		2.62		2.85		3.09		3.32		3.56		3.56	
L_r, m		10.0		11.0		11.6		12.0		13.0		13.1	
$A_g \times 10^2$, mm^2		64.34		76.84		86.82		97.26		112.5		124.4	
$I_x \times 10^4$, mm^4		5410		7763		10450		13670		18260		22930	
$I_y \times 10^4$, mm^4		1955		2769		3668		4763		6310		6985	
$r_y \times 10$, mm		5.51		6.00		6.50		7.00		7.49		7.49	
r_x / r_y		1.66		1.68		1.69		1.69		1.70		1.81	
$P_{ex} L_{cx}^2$, kN · m^2		107000		153000		206000		270000		360000		453000	
$P_{ey} L_{cy}^2$, kN · m^2		38600		54600		72400		94100		125000		138000	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

Table C.1 Continued.

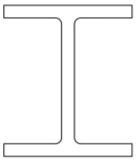


Available Strength in Axial Compression, kN
HEA Shapes

F_y = 275 MPa

Shape		HEA 340		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	3300	2200	3530	2350	3940	2620	4410	2930	4890	3250	5240	3490
	1.00	3270	2180	3500	2330	3890	2590	4360	2900	4830	3220	5180	3450
	1.50	3230	2150	3450	2300	3840	2560	4300	2860	4770	3170	5110	3400
	2.00	3170	2110	3390	2250	3770	2510	4220	2810	4680	3110	5010	3330
	2.50	3090	2060	3310	2200	3680	2450	4110	2740	4560	3030	4880	3250
	3.00	3010	2000	3210	2140	3570	2380	3990	2660	4420	2940	4730	3150
	3.50	2910	1930	3110	2070	3450	2290	3850	2560	4270	2840	4560	3030
	4.00	2790	1860	2980	1990	3310	2200	3700	2460	4090	2720	4370	2910
	4.50	2670	1780	2850	1900	3160	2100	3530	2350	3900	2600	4160	2770
	5.00	2540	1690	2710	1810	3000	2000	3350	2230	3700	2460	3940	2620
	5.50	2410	1600	2570	1710	2840	1890	3160	2100	3490	2320	3710	2470
	6.00	2270	1510	2420	1610	2670	1770	2970	1970	3280	2180	3480	2310
	6.50	2120	1410	2260	1500	2490	1660	2770	1840	3060	2030	3240	2150
	7.00	1980	1320	2110	1400	2320	1540	2570	1710	2830	1890	3000	1990
	7.50	1830	1220	1950	1300	2140	1420	2380	1580	2610	1740	2760	1840
	8.00	1690	1120	1800	1200	1970	1310	2180	1450	2400	1600	2530	1680
	8.50	1550	1030	1650	1100	1800	1200	1990	1330	2190	1460	2300	1530
	9.00	1410	941	1500	999	1640	1090	1810	1210	1990	1320	2080	1380
	9.50	1280	853	1360	905	1480	984	1630	1090	1790	1190	1870	1240
	10.0	1160	770	1230	817	1330	888	1470	981	1610	1070	1690	1120
	10.5	1050	699	1110	741	1210	805	1340	889	1460	973	1530	1020
	11.0	957	636	1020	675	1100	734	1220	810	1330	887	1390	928
	11.5	875	582	929	618	1010	671	1110	741	1220	811	1280	849
	12.0	804	535	853	567	927	617	1020	681	1120	745	1170	779
	12.5	741	493	786	523	854	568	943	628	1030	687	1080	718
	13.0	685	456	727	484	790	525	872	580	954	635	998	664
	13.5	635	423	674	448	732	487	809	538	885	589	926	616
	14.0	591	393	627	417	681	453	752	500	823	548	861	573
	14.5	551	366	584	389	635	422	701	466	767	510	802	534
	15.0	514	342	546	363	593	395	655	436	717	477	750	499
Properties													
P_{wo} , kN		568	379	612	408	696	464	759	506	825	550	877	584
P_{wi} , kN/m		2610	1740	2750	1830	3030	2020	3160	2110	3300	2200	3440	2290
P_{wb} , kN		565	376	614	408	715	476	708	471	710	472	714	475
P_{fb} , kN		421	280	474	315	558	372	682	454	818	544	891	593
L_p , m		3.54		3.53		3.48		3.46		3.44		3.39	
L_r , m		13.0		12.9		12.5		12.1		11.8		11.3	
$A_g \times 10^2$, mm^2		133.5		142.8		159.0		178.0		197.5		211.8	
$I_x \times 10^4$, mm^4		27690		33090		45070		637720		86970		111900	
$I_y \times 10^4$, mm^4		7436		7887		8564		9465		10370		10820	
$r_y \times 10$, mm		7.46		7.43		7.34		7.29		7.24		7.15	
r_x / r_y		1.93		2.05		2.29		2.60		2.90		3.22	
$P_{ex} L_{cx}^2$, kN · m^2		546000		653000		890000		1260000		1720000		2210000	
$P_{ey} L_{cy}^2$, kN · m^2		147000		156000		169000		187000		204000		214000	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN
HEA Shapes
F_y = 275 MPa

Shape		**HEA 600**		**HEA 650**		**HEA 700**		**HEA 800^c**		**HEA 900^c**		**HEA 1000^c**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	5610	3730	5980	3980	6450	4290	7070	4710	7930	5280	8580	5710
	1.00	5540	3690	5910	3930	6370	4240	6810	4530	7470	4970	7850	5220
	1.50	5460	3630	5820	3870	6270	4170	6710	4460	7360	4900	7730	5140
	2.00	5350	3560	5700	3790	6130	4080	6570	4370	7210	4800	7560	5030
	2.50	5210	3470	5550	3690	5960	3970	6400	4260	7020	4670	7350	4890
	3.00	5040	3360	5370	3570	5760	3830	6200	4130	6790	4520	7110	4730
	3.50	4860	3230	5160	3430	5530	3680	5980	3980	6530	4350	6830	4540
	4.00	4650	3090	4930	3280	5280	3510	5720	3810	6250	4160	6520	4340
	4.50	4420	2940	4690	3120	5010	3330	5420	3600	5940	3950	6180	4110
	5.00	4180	2780	4430	2950	4720	3140	5090	3380	5610	3730	5830	3880
	5.50	3930	2620	4160	2770	4420	2940	4750	3160	5230	3480	5460	3640
	6.00	3670	2440	3880	2580	4120	2740	4400	2930	4830	3210	5090	3390
	6.50	3410	2270	3600	2400	3810	2530	4050	2700	4430	2950	4660	3100
	7.00	3150	2100	3320	2210	3500	2330	3710	2470	4030	2680	4230	2810
	7.50	2900	1930	3040	2030	3200	2130	3370	2240	3650	2430	3810	2530
	8.00	2650	1760	2770	1850	2900	1930	3040	2020	3280	2180	3400	2260
	8.50	2400	1600	2510	1670	2620	1740	2730	1810	2920	1940	3020	2010
	9.00	2170	1440	2260	1500	2340	1560	2430	1620	2600	1730	2690	1790
	9.50	1940	1290	2030	1350	2100	1400	2180	1450	2340	1560	2410	1610
	10.0	1750	1170	1830	1220	1900	1260	1970	1310	2110	1400	2180	1450
	10.5	1590	1060	1660	1100	1720	1150	1790	1190	1910	1270	1980	1310
	11.0	1450	964	1510	1010	1570	1040	1630	1080	1740	1160	1800	1200
	11.5	1330	882	1380	920	1440	955	1490	991	1600	1060	1650	1100
	12.0	1220	810	1270	845	1320	877	1370	910	1470	975	1510	1010
	12.5	1120	747	1170	779	1220	809	1260	838	1350	898	1390	928
	13.0	1040	691	1080	720	1120	748	1170	775	1250	831	1290	858
	13.5	962	640	1000	668	1040	693	1080	719	1160	770	1200	795
	14.0	895	595	933	621	969	645	1000	668	1080	716	1110	740
	14.5	834	555	870	579	903	601	937	623	1000	668	1040	689
	15.0	780	519	813	541	844	562	875	582	938	624	968	644
Properties													
P_{wo} , kN		930	620	984	656	1080	718	1200	798	1320	880	1380	923
P_{wi} , kN/m		3580	2380	3710	2480	3990	2660	4130	2750	4400	2930	4540	3030
P_{wb} , kN		724	482	738	491	839	558	802	534	852	567	829	552
P_{fb} , kN		967	643	1050	696	1130	750	1210	807	1390	926	1490	989
L_p , m		3.35		3.31		3.25		3.16		3.09		3.01	
L_r , m		10.9		10.6		10.4		9.79		9.48		9.13	
$A_g \times 10^2$, mm^2		226.5		241.6		260.5		285.8		320.5		346.8	
$I_x \times 10^4$, mm^4		141200		175200		215300		303400		422100		553800	
$I_y \times 10^4$, mm^4		11270		11720		12180		12640		13550		14000	
$r_y \times 10$, mm		7.05		6.97		6.84		6.65		6.50		6.35	
r_x / r_y		3.54		3.86		4.20		4.90		5.58		6.29	
$P_{ex} L_{cx}^2$, kN · m^2		2790000		3460000		4250000		5990000		8330000		10900000	
$P_{ey} L_{cy}^2$, kN · m^2		222000		232000		241000		249000		267000		276000	
LRFD	**ASD**	Note: Tabulated values in gray indicate L_c / r_y equal to or greater than 200.											
$\phi_c = 0.90$	$\Omega_c = 1.67$												

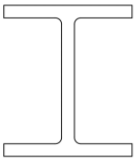
Table C.1 Continued.

Available Strength in Axial Compression, kN
HEA Shapes

F_y = 355 MPa

Shape		**HEA 100**		**HEA 120**		**HEA 140**		**HEA 160**		**HEA 180**		**HEA 200**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	679	452	810	539	1000	668	1240	824	1450	962	1720	1140
	1.00	602	401	745	496	945	629	1180	786	1390	927	1670	1110
	1.50	519	345	672	447	876	583	1110	741	1330	885	1610	1070
	2.00	421	280	582	387	787	524	1020	681	1250	830	1520	1010
	2.50	322	214	483	322	687	457	920	612	1150	764	1420	947
	3.00	232	154	385	256	581	387	808	537	1040	690	1310	871
	3.50	170	113	294	196	477	317	692	460	921	613	1190	789
	4.00	130	86.7	225	150	379	252	579	385	802	533	1060	704
	4.50	103	68.5	178	118	300	199	473	314	686	456	930	619
	5.00	83.4	55.5	144	95.8	243	161	383	255	576	383	805	536
	5.50	68.9	45.9	119	79.2	201	133	316	210	476	317	687	457
	6.00	57.9	38.5	100	66.5	168	112	266	177	400	266	578	384
	6.50	49.3	32.8	85.2	56.7	144	95.5	226	151	341	227	492	328
	7.00	42.5	28.3	73.5	48.9	124	82.4	195	130	294	196	424	282
	7.50	37.1	24.7	64.0	42.6	108	71.7	170	113	256	170	370	246
	8.00	32.6	21.7	56.3	37.4	94.8	63.1	150	99.5	225	150	325	216
	8.50	28.9	19.2	49.8	33.2	84.0	55.9	132	88.1	199	133	288	192
	9.00	25.7	17.1	44.5	29.6	74.9	49.8	118	78.6	178	118	257	171
	9.50	23.1	15.4	39.9	26.5	67.2	44.7	106	70.5	160	106	230	153
	10.0	20.8	13.9	36.0	24.0	60.7	40.4	95.7	63.7	144	95.8	208	138
	10.5	18.9	12.6	32.7	21.7	55.0	36.6	86.8	57.7	131	86.9	189	126
	11.0	17.2	11.5	29.8	19.8	50.1	33.4	79.1	52.6	119	79.2	172	114
	11.5	15.8	10.5	27.2	18.1	45.9	30.5	72.3	48.1	109	72.5	157	105
	12.0	14.5	9.63	25.0	16.6	42.1	28.0	66.4	44.2	100	66.5	144	96.1
	12.5	13.3	8.88	23.0	15.3	38.8	25.8	61.2	40.7	92.2	61.3	133	88.6
	13.0	12.3	8.21	21.3	14.2	35.9	23.9	56.6	37.7	85.2	56.7	123	81.9
	13.5	11.4	7.61	19.8	13.1	33.3	22.1	52.5	34.9	79.0	52.6	114	75.9
	14.0	10.6	7.08	18.4	12.2	30.9	20.6	48.8	32.5	73.5	48.9	106	70.6
	14.5	9.92	6.60	17.1	11.4	28.8	19.2	45.5	30.3	68.5	45.6	98.9	65.8
	15.0	9.27	6.16	16.0	10.6	27.0	17.9	42.5	28.3	64.0	42.6	92.4	61.5
Properties													
P_{wo}, kN		178	118	178	118	200	133	256	170	261	174	323	215
P_{wi}, kN/m		1780	1180	1780	1180	1950	1300	2130	1420	2130	1420	2310	1540
P_{wb}, kN		406	270	307	205	329	219	378	252	322	214	373	248
P_{fb}, kN		128	85.0	128	85.0	144	96.0	162	108	180	120	200	133
L_p, m		1.05		1.26		1.47		1.66		1.89		2.08	
L_r, m		5.82		5.72		6.04		6.63		6.90		7.51	
$A_g \times 10^2, \mathrm{mm}^2$		21.24		25.34		31.42		38.77		45.25		53.83	
$I_x \times 10^4, \mathrm{mm}^4$		349.2		606.2		1033		1673		2510		3692	
$I_y \times 10^4, \mathrm{mm}^4$		133.8		230.9		389.3		615.6		924.6		1336	
$r_y \times 10, \mathrm{mm}$		2.51		3.02		3.52		3.98		4.52		4.98	
r_x / r_y		1.62		1.62		1.63		1.65		1.65		1.66	
$P_{ex} L_{cx}^2$, kN · m²		6910		12000		20400		33000		49600		72800	
$P_{ey} L_{cy}^2$, kN · m²		2640		4560		7680		12100		18200		26400	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.

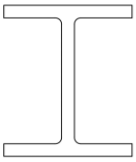


Available Strength in Axial Compression, kN
HEA Shapes

F_y = 355 MPa

Shape		HEA 220		HEA 240		HEA 260		HEA 280		HEA 300		HEA 320	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2060	1370	2460	1630	2770	1850	3110	2070	3590	2390	3970	2640
	1.00	2010	1330	2400	1600	2720	1810	3060	2040	3550	2360	3920	2610
	1.50	1940	1290	2340	1560	2660	1770	3000	2000	3490	2320	3860	2570
	2.00	1860	1240	2260	1500	2580	1720	2920	1940	3410	2270	3770	2510
	2.50	1760	1170	2150	1430	2480	1650	2820	1880	3310	2200	3650	2430
	3.00	1640	1090	2030	1350	2360	1570	2710	1800	3190	2120	3520	2340
	3.50	1520	1010	1900	1260	2230	1480	2570	1710	3050	2030	3370	2240
	4.00	1380	920	1760	1170	2090	1390	2430	1620	2900	1930	3210	2130
	4.50	1240	828	1610	1070	1930	1290	2280	1510	2740	1820	3030	2020
	5.00	1110	736	1460	968	1780	1180	2120	1410	2570	1710	2840	1890
	5.50	971	646	1300	868	1620	1080	1950	1300	2400	1590	2650	1760
	6.00	842	560	1160	769	1460	972	1790	1190	2220	1480	2450	1630
	6.50	720	479	1010	675	1310	869	1620	1080	2040	1360	2250	1500
	7.00	621	413	880	585	1160	771	1460	974	1860	1240	2060	1370
	7.50	541	360	766	510	1020	676	1310	871	1690	1120	1870	1240
	8.00	476	316	673	448	893	594	1160	772	1520	1010	1680	1120
	8.50	421	280	597	397	791	526	1030	684	1360	906	1500	1000
	9.00	376	250	532	354	706	469	917	610	1210	808	1340	893
	9.50	337	224	478	318	633	421	823	547	1090	725	1200	802
	10.0	304	202	431	287	572	380	743	494	983	654	1090	723
	10.5	276	184	391	260	518	345	673	448	892	593	986	656
	11.0	252	167	356	237	472	314	614	408	813	541	899	598
	11.5	230	153	326	217	432	288	561	374	744	495	822	547
	12.0	211	141	299	199	397	264	516	343	683	454	755	502
	12.5	195	130	276	184	366	243	475	316	629	419	696	463
	13.0	180	120	255	170	338	225	439	292	582	387	643	428
	13.5	167	111	236	157	314	209	407	271	540	359	597	397
	14.0	155	103	220	146	292	194	379	252	502	334	555	369
	14.5	145	96.3	205	136	272	181	353	235	468	311	517	344
	15.0	135	90	192	127	254	169	330	220	437	291	483	322
Properties													
P_{wo} , kN		360	240	439	293	486	324	525	350	619	412	679	453
P_{wi} , kN/m		2490	1660	2660	1780	2660	1780	2840	1890	3020	2010	3200	2130
P_{wb} , kN		411	273	468	312	434	289	475	316	537	358	590	392
P_{fb} , kN		242	161	288	191	312	208	337	225	391	260	480	319
L_p , m		2.30		2.51		2.72		2.92		3.13		3.13	
L_r , m		8.08		8.84		9.33		9.75		10.5		10.6	
$A_g \times 10^2$, mm^2		64.34		76.84		86.82		97.26		112.5		124.4	
$I_x \times 10^4$, mm^4		5410		7763		10450		13670		18260		22930	
$I_y \times 10^4$, mm^4		1955		2769		3668		4763		6310		6985	
$r_y \times 10$, mm		5.51		6.00		6.50		7.00		7.49		7.49	
r_x / r_y		1.66		1.68		1.69		1.69		1.70		1.81	
$P_{ex} L_{cx}^2$, kN · m^2		107000		153000		206000		270000		360000		453000	
$P_{ey} L_{cy}^2$, kN · m^2		38600		54600		72400		94100		125000		138000	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.

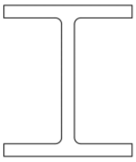


Available Strength in Axial Compression, kN
HEA Shapes

F_y = 355 MPa

Shape		**HEA 340**		**HEA 360**		**HEA 400**		**HEA 450**		**HEA 500**		**HEA 550**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	4270	2840	4560	3040	5080	3380	5690	3780	6310	4200	6770	4500
	1.00	4210	2800	4500	2990	5010	3330	5610	3730	6220	4140	6670	4440
	1.50	4140	2750	4420	2940	4920	3280	5510	3670	6110	4060	6550	4360
	2.00	4040	2690	4320	2870	4800	3200	5370	3580	5960	3960	6380	4240
	2.50	3920	2610	4190	2790	4660	3100	5210	3460	5770	3840	6170	4110
	3.00	3780	2510	4040	2680	4480	2980	5010	3330	5550	3690	5930	3940
	3.50	3610	2400	3860	2570	4280	2850	4780	3180	5290	3520	5650	3760
	4.00	3440	2290	3670	2440	4060	2700	4530	3020	5010	3340	5350	3560
	4.50	3240	2160	3460	2300	3830	2550	4270	2840	4720	3140	5020	3340
	5.00	3040	2020	3240	2160	3580	2380	3990	2660	4410	2930	4680	3120
	5.50	2830	1880	3020	2010	3330	2210	3710	2470	4090	2720	4330	2880
	6.00	2620	1740	2790	1860	3070	2040	3420	2270	3760	2500	3980	2650
	6.50	2410	1600	2560	1710	2820	1870	3130	2080	3440	2290	3630	2420
	7.00	2200	1460	2340	1560	2560	1700	2840	1890	3120	2080	3290	2190
	7.50	1990	1330	2120	1410	2310	1540	2560	1710	2810	1870	2960	1970
	8.00	1790	1190	1910	1270	2080	1380	2300	1530	2520	1670	2640	1750
	8.50	1600	1070	1700	1130	1850	1230	2040	1360	2230	1490	2330	1550
	9.00	1430	951	1520	1010	1650	1100	1820	1210	1990	1320	2080	1390
	9.50	1280	853	1360	905	1480	984	1630	1090	1790	1190	1870	1240
	10.0	1160	770	1230	817	1330	888	1470	981	1610	1070	1690	1120
	10.5	1050	699	1110	741	1210	805	1340	889	1460	973	1530	1020
	11.0	957	636	1020	675	1100	734	1220	810	1330	887	1390	928
	11.5	875	582	929	618	1010	671	1110	741	1220	811	1280	849
	12.0	804	535	853	567	927	617	1020	681	1120	745	1170	779
	12.5	741	493	786	523	854	568	943	628	1030	687	1080	718
	13.0	685	456	727	484	790	525	872	580	954	635	998	664
	13.5	635	423	674	448	732	487	809	538	885	589	926	616
	14.0	591	393	627	417	681	453	752	500	823	548	861	573
	14.5	551	366	584	389	635	422	701	466	767	510	802	534
	15.0	514	342	546	363	593	395	655	436	717	477	750	499
Properties													
P_{wo} , kN		734	489	790	527	898	599	980	653	1070	710	1130	754
P_{wi} , kN/m		3370	2250	3550	2370	3910	2600	4080	2720	4260	2840	4440	2960
P_{wb} , kN		642	427	697	464	813	541	805	535	806	537	812	540
P_{fb} , kN		544	362	612	407	721	480	881	586	1060	703	1150	765
L_p , m		3.12		3.10		3.07		3.05		3.02		2.99	
L_r , m		10.5		10.4		10.2		9.90		9.70		9.35	
$A_g \times 10^2$, mm^2		133.5		142.8		159.0		178.0		197.5		211.8	
$I_x \times 10^4$, mm^4		27690		33090		45070		637720		86970		111900	
$I_y \times 10^4$, mm^4		7436		7887		8564		9465		10370		10820	
$r_y \times 10$, mm		7.46		7.43		7.34		7.29		7.24		7.15	
r_x / r_y		1.93		2.05		2.29		2.60		2.90		3.22	
$P_{ex} L_{cx}^2$, kN · m^2		546000		653000		890000		1260000		1720000		2210000	
$P_{ey} L_{cy}^2$, kN · m^2		147000		156000		169000		187000		204000		214000	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
ϕ_c = 0.90		Ω_c = 1.67											

Table C.1 Continued.

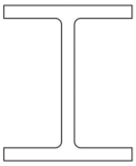


Available Strength in Axial Compression, kN
HEA Shapes

F_y = 355 MPa

Shape		HEA 600^c		HEA 650^c		HEA 700^c		HEA 800^c		HEA 900^c		HEA 1000^c	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	7240	4810	7720	5140	8320	5540	9130	6080	10200	6810	11100	7370
	1.00	7060	4700	7440	4950	7980	5310	8490	5650	9290	6180	9740	6480
	1.50	6940	4620	7310	4870	7840	5210	8330	5540	9110	6060	9540	6350
	2.00	6780	4510	7140	4750	7640	5090	8110	5400	8870	5900	9280	6170
	2.50	6570	4370	6920	4600	7400	4920	7850	5220	8570	5700	8950	5960
	3.00	6310	4200	6660	4430	7120	4730	7530	5010	8210	5460	8560	5700
	3.50	6010	4000	6360	4230	6790	4520	7170	4770	7810	5200	8130	5410
	4.00	5680	3780	6020	4010	6430	4280	6780	4510	7370	4900	7660	5090
	4.50	5330	3540	5640	3750	6010	4000	6370	4240	6900	4590	7150	4760
	5.00	4960	3300	5240	3490	5570	3700	5930	3950	6410	4270	6630	4410
	5.50	4580	3050	4830	3210	5120	3400	5460	3630	5910	3940	6100	4060
	6.00	4200	2790	4420	2940	4660	3100	4950	3290	5390	3590	5560	3700
	6.50	3820	2540	4010	2670	4220	2810	4450	2960	4820	3210	5030	3350
	7.00	3450	2290	3610	2400	3780	2520	3970	2640	4280	2850	4440	2950
	7.50	3090	2050	3230	2150	3370	2240	3500	2330	3750	2500	3870	2580
	8.00	2740	1820	2860	1900	2970	1970	3080	2050	3300	2190	3400	2260
	8.50	2430	1620	2530	1680	2630	1750	2730	1810	2920	1940	3020	2010
	9.00	2170	1440	2260	1500	2340	1560	2430	1620	2600	1730	2690	1790
	9.50	1940	1290	2030	1350	2100	1400	2180	1450	2340	1560	2410	1610
	10.0	1750	1170	1830	1220	1900	1260	1970	1310	2110	1400	2180	1450
	10.5	1590	1060	1660	1100	1720	1150	1790	1190	1910	1270	1980	1310
	11.0	1450	964	1510	1010	1570	1040	1630	1080	1740	1160	1800	1200
	11.5	1330	882	1380	920	1440	955	1490	991	1600	1060	1650	1100
	12.0	1220	810	1270	845	1320	877	1370	910	1470	975	1510	1010
	12.5	1120	747	1170	779	1220	809	1260	838	1350	898	1390	928
	13.0	1040	691	1080	720	1120	748	1170	775	1250	831	1290	858
	13.5	962	640	1000	668	1040	693	1080	719	1160	770	1200	795
	14.0	895	595	933	621	969	645	1000	668	1080	716	1110	740
	14.5	834	555	870	579	903	601	937	623	1000	668	1040	689
	15.0	780	519	813	541	844	562	875	582	938	624	968	644
						Properties							
P_{wo} , kN		1200	800	1270	847	1390	927	1540	1030	1700	1140	1790	1190
P_{wi} , kN/m		4620	3080	4790	3200	5150	3430	5330	3550	5680	3790	5860	3910
P_{wb} , kN		823	547	839	558	953	634	911	606	968	644	942	627
P_{fb} , kN		1250	830	1350	898	1460	969	1570	1040	1800	1200	1920	1280
L_p , m		2.95		2.91		2.86		2.78		2.72		2.65	
L_r , m		9.07		8.84		8.66		8.25		8.03		7.77	
$A_g \times 10^2$, mm^2		226.5		241.6		260.5		285.8		320.5		346.8	
$I_x \times 10^4$, mm^4		141200		175200		215300		303400		422100		553800	
$I_y \times 10^4$, mm^4		11270		11720		12180		12640		13550		14000	
$r_y \times 10$, mm		7.05		6.97		6.84		6.65		6.50		6.35	
r_x/ r_y		3.54		3.86		4.20		4.90		5.58		6.29	
$P_{ex} L_{cx}^2$, kN · m^2		2790000		3460000		4250000		5990000		8330000		10900000	
$P_{ey} L_{cy}^2$, kN · m^2		222000		232000		241000		249000		267000		276000	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN

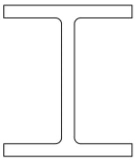
HEB Shapes

F_y = 235 MPa

Shape		HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	551	366	719	479	909	605	1150	763	1380	918	1650	1100
	1.00	509	339	682	454	874	581	1110	741	1350	897	1620	1080
	1.50	462	308	638	425	832	554	1070	713	1310	870	1580	1050
	2.00	403	268	581	387	778	517	1020	676	1250	835	1530	1020
	2.50	339	225	516	343	713	474	949	631	1190	791	1460	973
	3.00	273	182	446	296	640	426	873	581	1110	741	1390	923
	3.50	212	141	375	249	564	375	791	526	1030	685	1300	866
	4.00	162	108	307	204	488	325	706	470	942	627	1210	806
	4.50	128	85.3	245	163	413	275	620	413	851	566	1120	742
	5.00	104	69.1	198	132	343	228	537	357	760	506	1020	677
	5.50	85.8	57.1	164	109	284	189	458	305	671	446	919	611
	6.00	72.1	48.0	138	91.7	238	159	385	256	585	389	822	547
	6.50	61.5	40.9	117	78.1	203	135	328	218	503	334	728	484
	7.00	53.0	35.3	101	67.4	175	116	283	188	433	288	638	425
	7.50	46.2	30.7	88.2	58.7	153	101	246	164	377	251	556	370
	8.00	40.6	27.0	77.5	51.6	134	89.2	217	144	332	221	489	325
	8.50	35.9	23.9	68.7	45.7	119	79.0	192	128	294	196	433	288
	9.00	32.1	21.3	61.3	40.8	106	70.5	171	114	262	174	386	257
	9.50	28.8	19.1	55.0	36.6	95.1	63.2	154	102	235	157	346	231
	10.0	26.0	17.3	49.6	33.0	85.8	57.1	139	92.2	212	141	313	208
	10.5	23.6	15.7	45.0	29.9	77.8	51.8	126	83.7	193	128	284	189
	11.0	21.5	14.3	41.0	27.3	70.9	47.2	115	76.2	175	117	258	172
	11.5	19.6	13.1	37.5	25.0	64.9	43.2	105	69.7	161	107	236	157
	12.0	18.0	12.0	34.5	22.9	59.6	39.6	96.3	64.1	147	98.1	217	144
	12.5	16.6	11.1	31.8	21.1	54.9	36.5	88.7	59.0	136	90.4	200	133
	13.0	15.4	10.2	29.4	19.5	50.8	33.8	82.0	54.6	126	83.6	185	123
	13.5	14.2	9.48	27.2	18.1	47.1	31.3	76.1	50.6	116	77.5	172	114
	14.0	13.2	8.82	25.3	16.8	43.8	29.1	70.7	47.1	108	72.1	160	106
	14.5	12.4	8.22	23.6	15.7	40.8	27.1	65.9	43.9	101	67.2	149	99.0
	15.0	11.5	7.68	22.1	14.7	38.1	25.4	61.6	41.0	94.4	62.8	139	92.5
Properties													
P_{wo}, kN		155	103	176	117	197	132	263	175	290	193	349	233
P_{wi}, kN/m		1410	940	1530	1020	1650	1100	1880	1250	2000	1330	2120	1410
P_{wb}, kN		571	380	550	366	552	367	729	485	745	496	806	536
P_{fb}, kN		132	87.9	160	106	190	127	223	149	259	172	297	198
L_p, m		1.30		1.57		1.84		2.08		2.35		2.60	
L_r, m		10.4		11.0		11.7		12.8		13.6		14.6	
$A_g \times 10^2, \text{mm}^2$		26.04		34.01		42.96		54.25		65.25		78.08	
$I_x \times 10^4, \text{mm}^4$		449.5		864.4		1509		2492		3831		5696	
$I_y \times 10^4, \text{mm}^4$		167.3		317.5		549.7		889.2		1363		2003	
$r_y \times 10$, mm		2.53		3.06		3.58		4.05		4.57		5.07	
r_x / r_y		1.64		1.65		1.66		1.67		1.68		1.68	
$P_{ex} L_{cx}^2$, kN · m²		8900		17100		29800		49200		75600		112000	
$P_{ey} L_{cy}^2$, kN · m²		3290		6290		10900		17600		26900		39600	

LRFD	ASD	
$\phi_c = 0.90$	$\Omega_c = 1.67$	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

Table C.1 Continued.



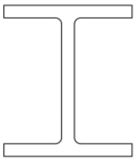
Available Strength in Axial Compression, kN
HEB Shapes

F_y = 235 MPa

Shape		HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	1930	1280	2240	1490	2500	1670	2780	1850	3150	2100	3410	2270
	1.00	1900	1260	2210	1470	2480	1650	2750	1830	3130	2080	3380	2250
	1.50	1860	1240	2170	1450	2440	1620	2720	1810	3090	2060	3350	2230
	2.00	1810	1200	2120	1410	2390	1590	2670	1780	3050	2030	3290	2190
	2.50	1740	1160	2060	1370	2330	1550	2610	1740	2990	1990	3230	2150
	3.00	1670	1110	1990	1320	2260	1500	2540	1690	2920	1940	3150	2100
	3.50	1580	1050	1900	1260	2170	1450	2460	1640	2840	1890	3070	2040
	4.00	1490	993	1810	1200	2080	1390	2370	1580	2740	1830	2970	1970
	4.50	1390	928	1710	1140	1980	1320	2270	1510	2650	1760	2860	1900
	5.00	1290	860	1600	1060	1880	1250	2170	1440	2540	1690	2740	1830
	5.50	1190	791	1490	992	1770	1180	2060	1370	2430	1610	2620	1740
	6.00	1080	722	1380	918	1650	1100	1950	1290	2310	1540	2490	1660
	6.50	982	653	1270	844	1540	1020	1830	1220	2190	1450	2360	1570
	7.00	881	586	1160	771	1420	948	1710	1140	2060	1370	2230	1480
	7.50	785	522	1050	699	1310	872	1590	1060	1940	1290	2090	1390
	8.00	693	461	946	629	1200	798	1470	980	1810	1200	1960	1300
	8.50	613	408	845	562	1090	725	1360	903	1690	1120	1820	1210
	9.00	547	364	754	501	986	656	1250	828	1560	1040	1690	1120
	9.50	491	327	676	450	885	589	1140	756	1440	959	1560	1040
	10.0	443	295	610	406	799	531	1030	685	1320	881	1430	951
	10.5	402	267	554	368	724	482	933	621	1210	805	1310	869
	11.0	366	244	505	336	660	439	850	566	1100	734	1190	792
	11.5	335	223	462	307	604	402	778	518	1010	671	1090	725
	12.0	308	205	424	282	555	369	715	475	927	617	1000	665
	12.5	284	189	391	260	511	340	659	438	854	568	922	613
	13.0	262	174	361	240	473	314	609	405	790	525	852	567
	13.5	243	162	335	223	438	292	565	376	732	487	790	526
	14.0	226	150	311	207	407	271	525	349	681	453	735	489
	14.5	211	140	290	193	380	253	489	326	635	422	685	456
	15.0	197	131	271	181	355	236	457	304	593	395	640	426
Properties													
P_{wo} , kN		380	253	447	298	488	325	518	345	595	396	642	428
P_{wi} , kN/m		2230	1490	2350	1570	2350	1570	2470	1650	2590	1720	2700	1800
P_{wb} , kN		835	556	903	601	837	557	875	582	948	630	1000	666
P_{fb} , kN		338	225	382	254	405	269	428	285	477	317	556	370
L_p , m		2.87		3.12		3.38		3.64		3.89		3.89	
L_r , m		15.4		16.4		16.9		17.3		18.4		18.4	
$A_g \times 10^2$, mm^2		91.04		106.0		118.4		131.4		149.1		161.3	
$I_x \times 10^4$, mm^4		8091		11260		14920		19270		25170		30820	
$I_y \times 10^4$, mm^4		2843		3923		5135		6595		8653		9239	
$r_y \times 10$, mm		5.59		6.08		6.58		7.09		7.58		7.57	
r_x / r_y		1.69		1.70		1.71		1.71		1.71		1.83	
$P_{ex} L_{cx}^2$, kN · m^2		160000		222000		294000		380000		497000		608000	
$P_{ey} L_{cy}^2$, kN · m^2		56200		77300		101000		130000		169000		182000	

LRFD	ASD	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.1 Continued.



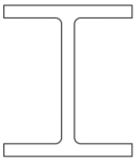
Available Strength in Axial Compression, kN
HEB Shapes

F_y = 235 MPa

Shape		HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	3610	2400	3820	2540	4180	2780	4610	3070	5050	3360	5370	3580
	1.00	3580	2380	3790	2520	4150	2760	4570	3040	5000	3330	5320	3540
	1.50	3540	2360	3740	2490	4100	2730	4520	3000	4940	3290	5260	3500
	2.00	3490	2320	3690	2450	4030	2680	4440	2960	4860	3230	5170	3440
	2.50	3420	2280	3610	2400	3950	2630	4350	2890	4760	3170	5060	3370
	3.00	3340	2220	3530	2350	3850	2560	4240	2820	4640	3080	4930	3280
	3.50	3250	2160	3430	2280	3740	2490	4120	2740	4500	2990	4770	3180
	4.00	3140	2090	3310	2200	3620	2410	3970	2640	4340	2890	4600	3060
	4.50	3030	2010	3190	2120	3480	2320	3820	2540	4170	2770	4420	2940
	5.00	2900	1930	3060	2040	3330	2220	3660	2430	3990	2650	4220	2810
	5.50	2770	1840	2920	1940	3180	2110	3480	2320	3790	2520	4010	2670
	6.00	2630	1750	2770	1850	3010	2010	3300	2200	3590	2390	3790	2520
	6.50	2490	1660	2620	1750	2850	1900	3120	2070	3390	2250	3570	2370
	7.00	2350	1560	2470	1640	2680	1780	2930	1950	3180	2120	3340	2220
	7.50	2200	1470	2320	1540	2510	1670	2740	1820	2970	1980	3120	2070
	8.00	2060	1370	2160	1440	2340	1550	2550	1690	2760	1840	2890	1920
	8.50	1920	1270	2010	1340	2170	1440	2360	1570	2550	1700	2670	1780
	9.00	1770	1180	1860	1240	2000	1330	2180	1450	2350	1560	2450	1630
	9.50	1640	1090	1710	1140	1840	1220	2000	1330	2160	1430	2240	1490
	10.0	1500	999	1570	1050	1680	1120	1820	1210	1960	1310	2040	1350
	10.5	1370	911	1430	953	1530	1020	1660	1100	1780	1190	1850	1230
	11.0	1250	830	1300	868	1390	928	1510	1000	1620	1080	1680	1120
	11.5	1140	760	1190	794	1280	849	1380	918	1490	988	1540	1020
	12.0	1050	698	1100	729	1170	780	1270	843	1360	908	1410	940
	12.5	966	643	1010	672	1080	719	1170	777	1260	837	1300	867
	13.0	893	594	934	621	999	664	1080	718	1160	774	1200	801
	13.5	828	551	866	576	926	616	1000	666	1080	717	1120	743
	14.0	770	512	805	536	861	573	931	619	1000	667	1040	691
	14.5	718	478	751	500	803	534	868	577	934	622	968	644
	15.0	671	446	702	467	750	499	811	540	873	581	905	602
Properties													
P_{wo}, kN		684	456	727	485	809	539	872	581	937	625	987	658
P_{wi}, kN/m		2820	1880	2940	1960	3170	2120	3290	2190	3410	2270	3530	2350
P_{wb}, kN		1050	701	1110	737	1220	813	1180	786	1160	770	1140	759
P_{fb}, kN		611	407	669	445	761	507	894	595	1040	690	1110	740
L_p, m		3.87		3.85		3.80		3.76		3.73		3.68	
L_r, m		18.0		17.7		16.9		16.0		15.4		14.5	
$A_g \times 10^2$, mm^2		170.9		180.6		197.8		218.0		238.6		254.1	
$I_x \times 10^4$, mm^4		36660		43190		57680		79890		107200		136700	
$I_y \times 10^4$, mm^4		9690		10140		10820		11720		12620		13080	
$r_y \times 10$, mm		7.53		7.49		7.40		7.33		7.27		7.17	
r_x/r_y		1.95		2.06		2.31		2.61		2.91		3.24	
$P_{ex} L_{cx}^2$, kN · m^2		724000		852000		1140000		1580000		2110000		2700000	
$P_{ey} L_{cy}^2$, kN · m^2		191000		200000		214000		231000		249000		258000	

LRFD	ASD	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.1 Continued.



Available Strength in Axial Compression, kN
HEB Shapes

F_y = 235 MPa

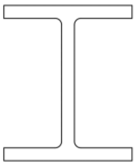
Shape		**HEB 600**		**HEB 650**		**HEB 700**		**HEB 800**		**HEB 900**		**HEB 1000**[c]	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	5710	3800	6060	4030	6480	4310	7070	4700	7850	5220	8460	5630
	1.00	5650	3760	5990	3990	6410	4270	6990	4650	7760	5160	8260	5490
	1.50	5580	3720	5920	3940	6330	4210	6890	4590	7650	5090	8150	5420
	2.00	5490	3650	5810	3870	6210	4130	6760	4500	7490	4990	8000	5320
	2.50	5370	3570	5680	3780	6070	4040	6590	4390	7300	4860	7810	5200
	3.00	5220	3470	5520	3680	5890	3920	6390	4250	7070	4700	7580	5040
	3.50	5060	3360	5340	3560	5690	3790	6160	4100	6810	4530	7280	4840
	4.00	4870	3240	5140	3420	5470	3640	5910	3930	6510	4330	6960	4630
	4.50	4670	3110	4930	3280	5230	3480	5640	3750	6200	4120	6600	4390
	5.00	4450	2960	4690	3120	4980	3310	5350	3560	5860	3900	6230	4140
	5.50	4230	2810	4450	2960	4710	3130	5040	3350	5510	3670	5840	3890
	6.00	3990	2660	4190	2790	4430	2950	4730	3150	5160	3430	5440	3620
	6.50	3750	2500	3940	2620	4150	2760	4410	2930	4790	3190	5040	3360
	7.00	3510	2330	3670	2440	3860	2570	4090	2720	4430	2950	4640	3090
	7.50	3260	2170	3410	2270	3580	2380	3770	2510	4070	2710	4250	2830
	8.00	3020	2010	3150	2100	3300	2190	3460	2300	3720	2470	3860	2570
	8.50	2780	1850	2900	1930	3020	2010	3150	2100	3380	2250	3490	2320
	9.00	2550	1700	2650	1760	2760	1830	2860	1900	3050	2030	3130	2080
	9.50	2330	1550	2410	1600	2500	1660	2570	1710	2730	1820	2810	1870
	10.0	2110	1400	2180	1450	2250	1500	2320	1550	2470	1640	2540	1690
	10.5	1910	1270	1980	1320	2040	1360	2110	1400	2240	1490	2300	1530
	11.0	1740	1160	1800	1200	1860	1240	1920	1280	2040	1360	2100	1390
	11.5	1590	1060	1650	1100	1700	1130	1760	1170	1870	1240	1920	1280
	12.0	1460	974	1510	1010	1560	1040	1610	1070	1710	1140	1760	1170
	12.5	1350	898	1390	928	1440	959	1490	989	1580	1050	1620	1080
	13.0	1250	830	1290	858	1330	887	1370	915	1460	971	1500	999
	13.5	1160	770	1200	796	1240	823	1270	848	1350	901	1390	926
	14.0	1080	716	1110	740	1150	765	1190	789	1260	837	1290	861
	14.5	1000	667	1040	690	1070	713	1110	735	1170	781	1210	803
	15.0	937	624	969	644	1000	666	1030	687	1100	729	1130	750
Properties													
P_{wo}, kN		1040	692	1090	727	1180	786	1300	864	1410	942	1470	982
P_{wi}, kN/m		3640	2430	3760	2510	4000	2660	4110	2740	4350	2900	4470	2980
P_{wb}, kN		1130	755	1140	756	1250	832	1180	783	1220	810	1170	779
P_{fb}, kN		1190	792	1270	845	1350	901	1440	958	1620	1080	1710	1140
L_p, m		3.64		3.59		3.53		3.43		3.35		3.28	
L_r, m		13.8		13.2		12.8		11.8		11.3		10.7	
$A_g \times 10^2$, mm^2		270.0		286.3		306.4		334.2		371.3		400.0	
$I_x \times 10^4$, mm^4		171000		210600		256900		359100		494100		644700	
$I_y \times 10^4$, mm^4		13530		13980		14400		14900		15820		16820	
$r_y \times 10$, mm		7.08		6.99		6.87		6.68		6.53		6.38	
r_x/r_y		3.56		3.88		4.22		4.91		5.59		6.29	
$P_{ex} L_{cx}^2$, kN · m^2		3380000		4160000		5070000		7090000		9750000		12700000	
$P_{ey} L_{cy}^2$, kN · m^2		267000		276000		285000		294000		313000		321000	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.

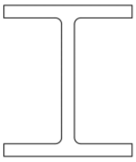


Available Strength in Axial Compression, kN
HEB Shapes

F_y = 275 MPa

Shape		HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	644	429	842	560	1060	707	1340	893	1610	1070	1930	1290
	1.00	588	391	791	526	1020	676	1300	862	1570	1040	1890	1260
	1.50	525	349	732	487	960	639	1240	825	1520	1010	1840	1220
	2.00	448	298	656	437	886	590	1160	775	1440	961	1760	1170
	2.50	365	243	570	379	800	532	1080	715	1360	902	1680	1120
	3.00	284	189	481	320	706	470	975	649	1260	836	1580	1050
	3.50	212	141	393	261	609	405	869	578	1150	763	1460	974
	4.00	162	108	310	206	513	342	760	506	1030	687	1340	894
	4.50	128	85.3	245	163	423	282	654	435	918	610	1220	812
	5.00	104	69.1	198	132	343	228	552	367	804	535	1100	729
	5.50	85.8	57.1	164	109	284	189	458	305	694	462	973	647
	6.00	72.1	48.0	138	91.7	238	159	385	256	590	392	854	568
	6.50	61.5	40.9	117	78.1	203	135	328	218	503	334	740	492
	7.00	53.0	35.3	101	67.4	175	116	283	188	433	288	638	425
	7.50	46.2	30.7	88.2	58.7	153	101	246	164	377	251	556	370
	8.00	40.6	27.0	77.5	51.6	134	89.2	217	144	332	221	489	325
	8.50	35.9	23.9	68.7	45.7	119	79.0	192	128	294	196	433	288
	9.00	32.1	21.3	61.3	40.8	106	70.5	171	114	262	174	386	257
	9.50	28.8	19.1	55	36.6	95.1	63.2	154	102	235	157	346	231
	10.0	26.0	17.3	49.6	33.0	85.8	57.1	139	92.2	212	141	313	208
	10.5	23.6	15.7	45.0	29.9	77.8	51.8	126	83.7	193	128	284	189
	11.0	21.5	14.3	41.0	27.3	70.9	47.2	115	76.2	175	117	258	172
	11.5	19.6	13.1	37.5	25.0	64.9	43.2	105	69.7	161	107	236	157
	12.0	18.0	12.0	34.5	22.9	59.6	39.6	96.3	64.1	147	98.1	217	144
	12.5	16.6	11.1	31.8	21.1	54.9	36.5	88.7	59.0	136	90.4	200	133
	13.0	15.4	10.2	29.4	19.5	50.8	33.8	82.0	54.6	126	83.6	185	123
	13.5	14.2	9.48	27.2	18.1	47.1	31.3	76.1	50.6	116	77.5	172	114
	14.0	13.2	8.82	25.3	16.8	43.8	29.1	70.7	47.1	108	72.1	160	106
	14.5	12.4	8.22	23.6	15.7	40.8	27.1	65.9	43.9	101	67.2	149	99.0
	15.0	11.5	7.68	22.1	14.7	38.1	25.4	61.6	41.0	94.4	62.8	139	92.5
Properties													
P_{wo} , kN		182	121	206	137	231	154	308	205	339	226	408	272
P_{wi} , kN/m		1650	1100	1790	1190	1930	1280	2200	1470	2340	1560	2480	1650
P_{wb} , kN		618	411	594	396	597	397	789	525	806	537	871	580
P_{fb} , kN		155	103	187	125	223	148	261	174	303	202	348	232
L_p , m		1.20		1.45		1.70		1.92		2.17		2.41	
L_r , m		8.92		9.41		10.0		11.0		11.6		12.5	
$A_g \times 10^2$, mm^2		26.04		34.01		42.96		54.25		65.25		78.08	
$I_x \times 10^4$, mm^4		449.5		864.4		1509		2492		3831		5696	
$I_y \times 10^4$, mm^4		167.3		317.5		549.7		889.2		1363		2003	
$r_y \times 10$, mm		2.53		3.06		3.58		4.05		4.57		5.07	
r_x / r_y		1.64		1.65		1.66		1.67		1.68		1.68	
$P_{ex} L_{cx}^2$, kN · m^2		8900		17100		29800		49200		75600		112000	
$P_{ey} L_{cy}^2$, kN · m^2		3290		6290		10900		17600		26900		39600	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



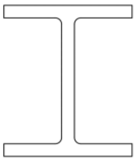
Available Strength in Axial Compression, kN
HEB Shapes

F_y = 275 MPa

Shape		**HEB 220**		**HEB 240**		**HEB 260**		**HEB 280**		**HEB 300**		**HEB 320**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2250	1500	2620	1750	2930	1950	3250	2160	3690	2460	3990	2660
	1.00	2210	1470	2580	1720	2890	1920	3210	2140	3650	2430	3950	2630
	1.50	2160	1440	2530	1680	2840	1890	3170	2110	3610	2400	3900	2600
	2.00	2090	1390	2460	1640	2780	1850	3100	2070	3540	2360	3830	2550
	2.50	2010	1330	2380	1580	2690	1790	3020	2010	3460	2300	3750	2490
	3.00	1900	1270	2280	1510	2600	1730	2930	1950	3370	2240	3640	2420
	3.50	1790	1190	2160	1440	2480	1650	2820	1880	3260	2170	3520	2340
	4.00	1670	1110	2040	1360	2360	1570	2700	1800	3140	2090	3390	2260
	4.50	1540	1030	1910	1270	2230	1480	2570	1710	3000	2000	3250	2160
	5.00	1410	940	1770	1180	2090	1390	2430	1620	2860	1910	3100	2060
	5.50	1280	853	1630	1080	1950	1300	2290	1520	2710	1810	2930	1950
	6.00	1150	766	1490	989	1800	1200	2140	1430	2560	1700	2770	1840
	6.50	1020	681	1350	896	1660	1100	1990	1330	2400	1600	2600	1730
	7.00	903	601	1210	806	1510	1010	1840	1230	2240	1490	2420	1610
	7.50	788	524	1080	719	1370	914	1690	1130	2090	1390	2250	1500
	8.00	693	461	954	635	1240	823	1550	1030	1930	1280	2080	1380
	8.50	613	408	845	562	1110	735	1410	936	1770	1180	1910	1270
	9.00	547	364	754	501	986	656	1270	846	1620	1080	1750	1160
	9.50	491	327	676	450	885	589	1140	759	1480	982	1590	1060
	10.0	443	295	610	406	799	531	1030	685	1330	888	1440	958
	10.5	402	267	554	368	724	482	933	621	1210	805	1310	869
	11.0	366	244	505	336	660	439	850	566	1100	734	1190	792
	11.5	335	223	462	307	604	402	778	518	1010	671	1090	725
	12.0	308	205	424	282	555	369	715	475	927	617	1000	665
	12.5	284	189	391	260	511	340	659	438	854	568	922	613
	13.0	262	174	361	240	473	314	609	405	790	525	852	567
	13.5	243	162	335	223	438	292	565	376	732	487	790	526
	14.0	226	150	311	207	407	271	525	349	681	453	735	489
	14.5	211	140	290	193	380	253	489	326	635	422	685	456
	15.0	197	131	271	181	355	236	457	304	593	395	640	426
							Properties						
P_{wo}, kN		444	296	523	348	571	380	606	404	696	464	751	501
P_{wi}, kN/m		2610	1740	2750	1830	2750	1830	2890	1930	3030	2020	3160	2110
P_{wb}, kN		904	601	977	650	905	602	946	629	1030	682	1080	720
P_{fb}, kN		396	263	447	297	474	315	501	333	558	372	650	433
L_p, m		2.65		2.89		3.12		3.37		3.60		3.59	
L_r, m		13.2		14.1		14.6		15.0		15.9		15.9	
$A_g \times 10^2$, mm^2		91.04		106.0		118.4		131.4		149.1		161.3	
$I_x \times 10^4$, mm^4		8091		11260		14920		19270		25170		30820	
$I_y \times 10^4$, mm^4		2843		3923		5135		6595		8653		9239	
$r_y \times 10$, mm		5.59		6.08		6.58		7.09		7.58		7.57	
r_x/r_y		1.69		1.70		1.71		1.71		1.71		1.83	
$P_{ex} L_{cx}^2$, kN · m^2		160000		222000		294000		380000		497000		608000	
$P_{ey} L_{cy}^2$, kN · m^2		56200		77300		101000		130000		169000		182000	

LRFD	**ASD**	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.1 Continued.

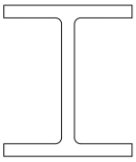


Available Strength in Axial Compression, kN
HEB Shapes

F_y = 275 MPa

Shape		**HEB 340**		**HEB 360**		**HEB 400**		**HEB 450**		**HEB 500**		**HEB 550**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	4230	2810	4470	2970	4900	3260	5400	3590	5910	3930	6290	4180
	1.00	4190	2790	4420	2940	4840	3220	5340	3550	5840	3890	6220	4140
	1.50	4130	2750	4370	2910	4780	3180	5270	3500	5760	3830	6130	4080
	2.00	4060	2700	4290	2850	4690	3120	5170	3440	5650	3760	6010	4000
	2.50	3970	2640	4190	2790	4580	3050	5040	3350	5510	3670	5860	3900
	3.00	3860	2570	4070	2710	4450	2960	4890	3260	5350	3560	5680	3780
	3.50	3730	2480	3940	2620	4300	2860	4720	3140	5160	3430	5470	3640
	4.00	3590	2390	3790	2520	4130	2750	4540	3020	4950	3290	5250	3490
	4.50	3430	2290	3620	2410	3950	2630	4330	2880	4720	3140	5000	3330
	5.00	3270	2180	3450	2290	3750	2500	4110	2740	4480	2980	4740	3150
	5.50	3100	2060	3260	2170	3550	2360	3890	2590	4230	2810	4460	2970
	6.00	2920	1940	3070	2050	3340	2220	3650	2430	3970	2640	4180	2780
	6.50	2740	1820	2880	1920	3120	2080	3410	2270	3710	2470	3890	2590
	7.00	2560	1700	2690	1790	2910	1930	3170	2110	3440	2290	3610	2400
	7.50	2370	1580	2490	1660	2690	1790	2930	1950	3170	2110	3320	2210
	8.00	2190	1460	2300	1530	2480	1650	2690	1790	2910	1940	3040	2020
	8.50	2010	1340	2110	1400	2270	1510	2460	1640	2660	1770	2770	1840
	9.00	1840	1220	1930	1280	2070	1370	2240	1490	2420	1610	2510	1670
	9.50	1670	1110	1750	1160	1870	1240	2020	1350	2180	1450	2260	1500
	10.0	1510	1000	1580	1050	1690	1120	1820	1210	1960	1310	2040	1350
	10.5	1370	911	1430	953	1530	1020	1660	1100	1780	1190	1850	1230
	11.0	1250	830	1300	868	1390	928	1510	1000	1620	1080	1680	1120
	11.5	1140	760	1190	794	1280	849	1380	918	1490	988	1540	1020
	12.0	1050	698	1100	729	1170	780	1270	843	1360	908	1410	940
	12.5	966	643	1010	672	1080	719	1170	777	1260	837	1300	867
	13.0	893	594	934	621	999	664	1080	718	1160	774	1200	801
	13.5	828	551	866	576	926	616	1000	666	1080	717	1120	743
	14.0	770	512	805	536	861	573	931	619	1000	667	1040	691
	14.5	718	478	751	500	803	534	868	577	934	622	968	644
	15.0	671	446	702	467	750	499	811	540	873	581	905	602
		Properties											
P_{wo} , kN		800	534	851	567	947	631	1020	680	1100	731	1160	770
P_{wi} , kN/m		3300	2200	3440	2290	3710	2480	3850	2570	3990	2660	4130	2750
P_{wb} , kN		1140	758	1200	798	1320	880	1280	850	1250	833	1230	821
P_{fb} , kN		715	476	783	521	891	593	1050	696	1210	807	1300	866
L_p , m		3.57		3.56		3.51		3.48		3.45		3.40	
L_r , m		15.6		15.3		14.6		13.9		13.4		12.7	
$A_g \times 10^2$, mm^2		170.9		180.6		197.8		218.0		238.6		254.1	
$I_x \times 10^4$, mm^4		36660		43190		57680		79890		107200		136700	
$I_y \times 10^4$, mm^4		9690		10140		10820		11720		12620		13080	
$r_y \times 10$, mm		7.53		7.49		7.40		7.33		7.27		7.17	
r_x / r_y		1.95		2.06		2.31		2.61		2.91		3.24	
$P_{ex} L_{cx}^2$, kN · m^2		724000		852000		1140000		1580000		2110000		2700000	
$P_{ey} L_{cy}^2$, kN · m^2		191000		200000		214000		231000		249000		258000	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN
HEB Shapes

F_y = 275 MPa

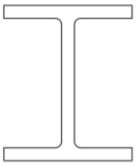
Shape		HEB 600		HEB 650		HEB 700		HEB 800		HEB 900[c]		HEB 1000[c]	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	6680	4450	7090	4710	7580	5050	8270	5500	9190	6110	9900	6590
	1.00	6610	4390	7000	4660	7490	4980	8160	5430	9000	5990	9430	6270
	1.50	6510	4330	6900	4590	7380	4910	8030	5340	8870	5900	9290	6180
	2.00	6380	4240	6760	4490	7220	4800	7850	5220	8690	5780	9090	6050
	2.50	6210	4130	6580	4380	7020	4670	7620	5070	8440	5610	8840	5880
	3.00	6020	4000	6360	4230	6790	4510	7350	4890	8130	5410	8550	5690
	3.50	5790	3860	6120	4070	6520	4340	7050	4690	7770	5170	8210	5470
	4.00	5550	3690	5850	3900	6220	4140	6710	4460	7380	4910	7840	5220
	4.50	5280	3510	5560	3700	5900	3930	6350	4220	6970	4640	7410	4930
	5.00	5000	3320	5260	3500	5570	3700	5970	3970	6530	4340	6920	4600
	5.50	4700	3130	4940	3290	5220	3470	5570	3710	6080	4040	6420	4270
	6.00	4400	2920	4610	3070	4860	3230	5170	3440	5620	3740	5910	3930
	6.50	4090	2720	4280	2850	4500	2990	4760	3170	5160	3430	5400	3600
	7.00	3780	2510	3950	2630	4140	2750	4360	2900	4700	3130	4910	3260
	7.50	3470	2310	3620	2410	3780	2520	3970	2640	4260	2830	4420	2940
	8.00	3170	2110	3300	2200	3440	2290	3580	2380	3830	2550	3960	2630
	8.50	2880	1920	2990	1990	3110	2070	3220	2140	3410	2270	3510	2340
	9.00	2600	1730	2690	1790	2780	1850	2870	1910	3050	2030	3130	2080
	9.50	2340	1550	2410	1610	2500	1660	2570	1710	2730	1820	2810	1870
	10.0	2110	1400	2180	1450	2250	1500	2320	1550	2470	1640	2540	1690
	10.5	1910	1270	1980	1320	2040	1360	2110	1400	2240	1490	2300	1530
	11.0	1740	1160	1800	1200	1860	1240	1920	1280	2040	1360	2100	1390
	11.5	1590	1060	1650	1100	1700	1130	1760	1170	1870	1240	1920	1280
	12.0	1460	974	1510	1010	1560	1040	1610	1070	1710	1140	1760	1170
	12.5	1350	898	1390	928	1440	959	1490	989	1580	1050	1620	1080
	13.0	1250	830	1290	858	1330	887	1370	915	1460	971	1500	999
	13.5	1160	770	1200	796	1240	823	1270	848	1350	901	1390	926
	14.0	1080	716	1110	740	1150	765	1190	789	1260	837	1290	861
	14.5	1000	667	1040	690	1070	713	1110	735	1170	781	1210	803
	15.0	937	624	969	644	1000	666	1030	687	1100	729	1130	750
Properties													
P_{wo} , kN		1210	810	1280	851	1380	919	1520	1010	1650	1100	1720	1150
P_{wi} , kN/m		4260	2840	4400	2930	4680	3120	4810	3210	5090	3390	5230	3480
P_{wb} , kN		1230	817	1230	818	1350	900	1270	847	1320	876	1270	842
P_{fb} , kN		1390	926	1490	989	1580	1050	1680	1120	1890	1260	2000	1330
L_p , m		3.36		3.32		3.26		3.17		3.10		3.03	
L_r , m		12.1		11.6		11.3		10.5		10.1		9.62	
$A_g \times 10^2$, mm^2		270.0		286.3		306.4		334.2		371.3		400.0	
$I_x \times 10^4$, mm^4		171000		210600		256900		359100		494100		644700	
$I_y \times 10^4$, mm^4		13530		13980		14400		14900		15820		16820	
$r_y \times 10$, mm		7.08		6.99		6.87		6.68		6.53		6.38	
r_x / r_y		3.56		3.88		4.22		4.91		5.59		6.29	
$P_{ex} L_{cx}^2$, kN · m^2		3380000		4160000		5070000		7090000		9750000		12700000	
$P_{ey} L_{cy}^2$, kN · m^2		267000		276000		285000		294000		313000		321000	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.



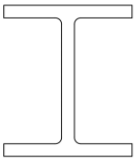
Available Strength in Axial Compression, kN

HEB Shapes

F_y = 355 MPa

Shape		HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	832	554	1090	723	1370	913	1730	1150	2080	1390	2490	1660
	1.00	740	492	1000	667	1290	861	1660	1100	2010	1340	2420	1610
	1.50	639	425	907	603	1200	800	1560	1040	1920	1280	2340	1550
	2.00	520	346	788	524	1090	722	1440	960	1800	1200	2220	1480
	2.50	399	265	657	437	951	633	1300	866	1660	1110	2080	1380
	3.00	289	192	527	351	809	538	1150	763	1510	1000	1920	1280
	3.50	212	141	405	269	668	445	988	657	1340	892	1740	1160
	4.00	162	108	310	206	536	357	832	553	1170	779	1560	1040
	4.50	128	85.3	245	163	424	282	684	455	1000	669	1380	917
	5.00	104	69.1	198	132	343	228	555	369	847	563	1200	798
	5.50	85.8	57.1	164	109	284	189	458	305	702	467	1030	684
	6.00	72.1	48.0	138	91.7	238	159	385	256	590	392	869	578
	6.50	61.5	40.9	117	78.1	203	135	328	218	503	334	740	492
	7.00	53.0	35.3	101	67.4	175	116	283	188	433	288	638	425
	7.50	46.2	30.7	88.2	58.7	153	101	246	164	377	251	556	370
	8.00	40.6	27.0	77.5	51.6	134	89.2	217	144	332	221	489	325
	8.50	35.9	23.9	68.7	45.7	119	79.0	192	128	294	196	433	288
	9.00	32.1	21.3	61.3	40.8	106	70.5	171	114	262	174	386	257
	9.50	28.8	19.1	55.0	36.6	95.1	63.2	154	102	235	157	346	231
	10.0	26.0	17.3	49.6	33.0	85.8	57.1	139	92.2	212	141	313	208
	10.5	23.6	15.7	45.0	29.9	77.8	51.8	126	83.7	193	128	284	189
	11.0	21.5	14.3	41.0	27.3	70.9	47.2	115	76.2	175	117	258	172
	11.5	19.6	13.1	37.5	25.0	64.9	43.2	105	69.7	161	107	236	157
	12.0	18.0	12.0	34.5	22.9	59.6	39.6	96.3	64.1	147	98.1	217	144
	12.5	16.6	11.1	31.8	21.1	54.9	36.5	88.7	59.0	136	90.4	200	133
	13.0	15.4	10.2	29.4	19.5	50.8	33.8	82.0	54.6	126	83.6	185	123
	13.5	14.2	9.48	27.2	18.1	47.1	31.3	76.1	50.6	116	77.5	172	114
	14.0	13.2	8.82	25.3	16.8	43.8	29.1	70.7	47.1	108	72.1	160	106
	14.5	12.4	8.22	23.6	15.7	40.8	27.1	65.9	43.9	101	67.2	149	99.0
	15.0	11.5	7.68	22.1	14.7	38.1	25.4	61.6	41.0	94.4	62.8	139	92.5
Properties													
P_{wo} , kN		234	156	265	177	298	199	398	265	438	292	527	351
P_{wi} , kN/m		2130	1420	2310	1540	2490	1660	2840	1890	3020	2010	3200	2130
P_{wb} , kN		702	467	675	449	679	451	896	596	916	610	990	659
P_{fb} , kN		200	133	242	161	288	191	337	225	391	260	449	299
L_p , m		1.06		1.28		1.50		1.69		1.91		2.12	
L_r , m		6.93		7.34		7.82		8.62		9.14		9.85	
$A_g \times 10^2$, mm^2		26.04		34.01		42.96		54.25		65.25		78.08	
$I_x \times 10^4$, mm^4		449.5		864.4		1509		2492		3831		5696	
$I_y \times 10^4$, mm^4		167.3		317.5		549.7		889.2		1363		2003	
$r_y \times 10$, mm		2.53		3.06		3.58		4.05		4.57		5.07	
r_x / r_y		1.64		1.65		1.66		1.67		1.68		1.68	
$P_{ex} L_{cx}^2$, kN · m^2		8900		17100		29800		49200		75600		112000	
$P_{ey} L_{cy}^2$, kN · m^2		3290		6290		10900		17600		26900		39600	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



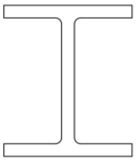
Available Strength in Axial Compression, kN

HEB Shapes

F_y = 355 MPa

Shape		HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2910	1940	3390	2250	3780	2520	4200	2790	4760	3170	5150	3430
	1.00	2840	1890	3320	2210	3720	2470	4140	2750	4700	3130	5090	3380
	1.50	2760	1830	3240	2150	3640	2420	4060	2700	4630	3080	5000	3330
	2.00	2640	1760	3120	2080	3530	2350	3950	2630	4520	3010	4890	3250
	2.50	2500	1660	2980	1980	3390	2260	3820	2540	4390	2920	4750	3160
	3.00	2340	1560	2820	1880	3230	2150	3670	2440	4230	2820	4580	3050
	3.50	2170	1440	2640	1760	3060	2030	3490	2330	4060	2700	4390	2920
	4.00	1980	1320	2450	1630	2860	1910	3300	2200	3860	2570	4180	2780
	4.50	1790	1190	2240	1490	2660	1770	3100	2060	3650	2430	3950	2630
	5.00	1590	1060	2040	1350	2450	1630	2890	1920	3430	2280	3710	2470
	5.50	1400	934	1830	1220	2240	1490	2670	1780	3210	2130	3460	2300
	6.00	1220	813	1630	1080	2020	1350	2450	1630	2970	1980	3210	2140
	6.50	1050	698	1430	953	1810	1210	2230	1480	2740	1820	2960	1970
	7.00	905	602	1250	829	1610	1070	2020	1340	2510	1670	2710	1800
	7.50	788	524	1090	722	1420	945	1810	1200	2280	1520	2460	1640
	8.00	693	461	954	635	1250	830	1610	1070	2060	1370	2220	1480
	8.50	613	408	845	562	1110	735	1420	948	1850	1230	1990	1330
	9.00	547	364	754	501	986	656	1270	845	1650	1100	1780	1180
	9.50	491	327	676	450	885	589	1140	759	1480	984	1600	1060
	10.0	443	295	610	406	799	531	1030	685	1330	888	1440	958
	10.5	402	267	554	368	724	482	933	621	1210	805	1310	869
	11.0	366	244	505	336	660	439	850	566	1100	734	1190	792
	11.5	335	223	462	307	604	402	778	518	1010	671	1090	725
	12.0	308	205	424	282	555	369	715	475	927	617	1000	665
	12.5	284	189	391	260	511	340	659	438	854	568	922	613
	13.0	262	174	361	240	473	314	609	405	790	525	852	567
	13.5	243	162	335	223	438	292	565	376	732	487	790	526
	14.0	226	150	311	207	407	271	525	349	681	453	735	489
	14.5	211	140	290	193	380	253	489	326	635	422	685	456
	15.0	197	131	271	181	355	236	457	304	593	395	640	426
Properties													
P_{wo}, kN		573	382	675	450	737	491	783	522	898	599	970	646
P_{wi}, kN/m		3370	2250	3550	2370	3550	2370	3730	2490	3910	2600	4080	2720
P_{wb}, kN		1030	683	1110	738	1030	684	1070	715	1160	775	1230	819
P_{fb}, kN		511	340	577	384	612	407	647	430	721	480	839	558
L_p, m		2.34		2.54		2.75		2.96		3.17		3.16	
L_r, m		10.4		11.1		11.5		11.9		12.6		12.6	
$A_g \times 10^2$, mm^2		91.04		106.0		118.4		131.4		149.1		161.3	
$I_x \times 10^4$, mm^4		8091		11260		14920		19270		25170		30820	
$I_y \times 10^4$, mm^4		2843		3923		5135		6595		8653		9239	
$r_y \times 10$, mm		5.59		6.08		6.58		7.09		7.58		7.57	
r_x / r_y		1.69		1.70		1.71		1.71		1.71		1.83	
$P_{ex} L_{cx}^2$, kN · m^2		160000		222000		294000		380000		497000		608000	
$P_{ey} L_{cy}^2$, kN · m^2		56200		77300		101000		130000		169000		182000	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN
HEB Shapes

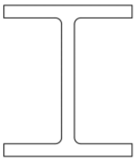
F_y = 355 MPa

Shape		HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	5460	3630	5770	3840	6320	4200	6970	4630	7620	5070	8120	5400
	1.00	5390	3580	5690	3790	6230	4150	6870	4570	7520	5000	8000	5320
	1.50	5300	3530	5600	3720	6130	4080	6750	4490	7380	4910	7860	5230
	2.00	5180	3450	5470	3640	5980	3980	6590	4380	7200	4790	7660	5090
	2.50	5030	3340	5310	3530	5800	3860	6380	4250	6970	4640	7410	4930
	3.00	4850	3220	5110	3400	5580	3720	6140	4090	6710	4460	7120	4730
	3.50	4640	3090	4900	3260	5340	3550	5870	3900	6400	4260	6790	4510
	4.00	4420	2940	4660	3100	5070	3370	5570	3700	6070	4040	6420	4270
	4.50	4170	2780	4400	2930	4780	3180	5240	3490	5710	3800	6040	4020
	5.00	3920	2610	4130	2750	4480	2980	4910	3260	5340	3550	5630	3750
	5.50	3650	2430	3850	2560	4170	2770	4560	3030	4950	3300	5210	3470
	6.00	3390	2250	3560	2370	3850	2560	4210	2800	4570	3040	4790	3190
	6.50	3120	2070	3270	2180	3540	2350	3850	2560	4180	2780	4370	2910
	7.00	2850	1900	2990	1990	3220	2140	3510	2330	3790	2520	3960	2640
	7.50	2590	1720	2710	1800	2920	1940	3170	2110	3420	2280	3560	2370
	8.00	2330	1550	2440	1630	2620	1740	2840	1890	3060	2040	3180	2120
	8.50	2090	1390	2180	1450	2340	1550	2530	1680	2720	1810	2820	1870
	9.00	1860	1240	1950	1300	2080	1390	2250	1500	2430	1610	2510	1670
	9.50	1670	1110	1750	1160	1870	1240	2020	1350	2180	1450	2260	1500
	10.0	1510	1000	1580	1050	1690	1120	1820	1210	1960	1310	2040	1350
	10.5	1370	911	1430	953	1530	1020	1660	1100	1780	1190	1850	1230
	11.0	1250	830	1300	868	1390	928	1510	1000	1620	1080	1680	1120
	11.5	1140	760	1190	794	1280	849	1380	918	1490	988	1540	1020
	12.0	1050	698	1100	729	1170	780	1270	843	1360	908	1410	940
	12.5	966	643	1010	672	1080	719	1170	777	1260	837	1300	867
	13.0	893	594	934	621	999	664	1080	718	1160	774	1200	801
	13.5	828	551	866	576	926	616	1000	666	1080	717	1120	743
	14.0	770	512	805	536	861	573	931	619	1000	667	1040	691
	14.5	718	478	751	500	803	534	868	577	934	622	968	644
	15.0	671	446	702	467	750	499	811	540	873	581	905	602
Properties													
P_{wo} , kN		1030	689	1100	732	1220	815	1320	878	1420	944	1490	994
P_{wi} , kN/m		4260	2840	4440	2960	4790	3200	4970	3310	5150	3430	5330	3550
P_{wb} , kN		1290	861	1360	906	1500	1000	1450	966	1420	947	1400	933
P_{fb} , kN		923	614	1010	673	1150	765	1350	898	1570	1040	1680	1120
L_p , m		3.15		3.13		3.09		3.06		3.04		3.00	
L_r , m		12.4		12.2		11.7		11.2		10.8		10.3	
$A_g \times 10^2$, mm^2		170.9		180.6		197.8		218.0		238.6		254.1	
$I_x \times 10^4$, mm^4		36660		43190		57680		79890		107200		136700	
$I_y \times 10^4$, mm^4		9690		10140		10820		11720		12620		13080	
$r_y \times 10$, mm		7.53		7.49		7.40		7.33		7.27		7.17	
r_x / r_y		1.95		2.06		2.31		2.61		2.91		3.24	
$P_{ex} L_{cx}^2$, kN · m^2		724000		852000		1140000		1580000		2110000		2700000	
$P_{ey} L_{cy}^2$, kN · m^2		191000		200000		214000		231000		249000		258000	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

Table C.1 Continued.



Available Strength in Axial Compression, kN

HEB Shapes

F_y = 355 MPa

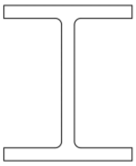
Shape		HEB 600		HEB 650		HEB 700		HEB 800^c		HEB 900^c		HEB 1000^c	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	8630	5740	9150	6090	9790	6510	10700	7100	11900	7890	12800	8500
	1.00	8500	5650	9010	5990	9630	6410	10300	6860	11200	7450	11700	7780
	1.50	8340	5550	8840	5880	9440	6280	10100	6730	11000	7300	11500	7630
	2.00	8120	5400	8600	5720	9180	6110	9860	6560	10700	7110	11100	7420
	2.50	7850	5230	8310	5530	8860	5900	9540	6350	10300	6870	10800	7160
	3.00	7540	5010	7960	5300	8480	5640	9160	6090	9900	6590	10300	6850
	3.50	7180	4780	7570	5040	8050	5360	8680	5780	9420	6270	9780	6510
	4.00	6780	4510	7150	4760	7580	5050	8150	5420	8900	5920	9220	6130
	4.50	6360	4230	6700	4450	7090	4720	7590	5050	8300	5520	8620	5740
	5.00	5930	3940	6220	4140	6570	4370	7000	4660	7630	5080	8000	5320
	5.50	5480	3640	5740	3820	6040	4020	6410	4260	6950	4630	7300	4860
	6.00	5020	3340	5250	3500	5510	3670	5820	3870	6280	4180	6570	4370
	6.50	4570	3040	4770	3170	4990	3320	5240	3480	5630	3740	5850	3890
	7.00	4130	2750	4300	2860	4480	2980	4670	3110	4990	3320	5160	3440
	7.50	3710	2470	3850	2560	3990	2660	4130	2750	4390	2920	4510	3000
	8.00	3290	2190	3410	2270	3520	2340	3630	2420	3850	2560	3960	2640
	8.50	2920	1940	3020	2010	3120	2070	3220	2140	3410	2270	3510	2340
	9.00	2600	1730	2690	1790	2780	1850	2870	1910	3050	2030	3130	2080
	9.50	2340	1550	2410	1610	2500	1660	2570	1710	2730	1820	2810	1870
	10.0	2110	1400	2180	1450	2250	1500	2320	1550	2470	1640	2540	1690
	10.5	1910	1270	1980	1320	2040	1360	2110	1400	2240	1490	2300	1530
	11.0	1740	1160	1800	1200	1860	1240	1920	1280	2040	1360	2100	1390
	11.5	1590	1060	1650	1100	1700	1130	1760	1170	1870	1240	1920	1280
	12.0	1460	974	1510	1010	1560	1040	1610	1070	1710	1140	1760	1170
	12.5	1350	898	1390	928	1440	959	1490	989	1580	1050	1620	1080
	13.0	1250	830	1290	858	1330	887	1370	915	1460	971	1500	999
	13.5	1160	770	1200	796	1240	823	1270	848	1350	901	1390	926
	14.0	1080	716	1110	740	1150	765	1190	789	1260	837	1290	861
	14.5	1000	667	1040	690	1070	713	1110	735	1170	781	1210	803
	15.0	937	624	969	644	1000	666	1030	687	1100	729	1130	750
Properties													
P_{wo}, kN		1570	1050	1650	1100	1780	1190	1960	1300	2130	1420	2230	1480
P_{wi}, kN/m		5500	3670	5680	3790	6040	4020	6210	4140	6570	4380	6750	4500
P_{wb}, kN		1390	928	1400	929	1540	1020	1450	963	1500	996	1440	957
P_{fb}, kN		1800	1200	1920	1280	2040	1360	2170	1450	2450	1630	2590	1720
L_p, m		2.96		2.92		2.87		2.79		2.73		2.67	
L_r, m		9.90		9.56		9.30		8.75		8.44		8.12	
$A_g \times 10^2$, mm^2		270.0		286.3		306.4		334.2		371.3		400.0	
$I_x \times 10^4$, mm^4		171000		210600		256900		359100		494100		644700	
$I_y \times 10^4$, mm^4		13530		13980		14400		14900		15820		16820	
$r_y \times 10$, mm		7.08		6.99		6.87		6.68		6.53		6.38	
r_x / r_y		3.56		3.88		4.22		4.91		5.59		6.29	
$P_{ex} L_{cx}^2$, kN · m^2		3380000		4160000		5070000		7090000		9750000		12700000	
$P_{ey} L_{cy}^2$, kN · m^2		267000		276000		285000		294000		313000		321000	

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

Note: Tabulated values in gray indicate L_c / r_y equal to or greater than 200.

^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.

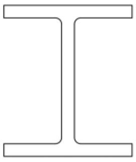


Available Strength in Axial Compression, kN
HEM Shapes

F_y = 235 MPa

Shape		HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1130	749	1400	935	1700	1130	2050	1370	2400	1590	2780	1850
	1.00	1050	701	1340	891	1650	1090	2000	1330	2340	1560	2730	1810
	1.50	970	645	1260	840	1570	1050	1930	1280	2280	1520	2670	1770
	2.00	863	574	1160	774	1480	985	1840	1220	2200	1460	2580	1720
	2.50	744	495	1050	696	1370	911	1730	1150	2090	1390	2480	1650
	3.00	620	412	919	611	1240	827	1600	1070	1970	1310	2360	1570
	3.50	499	332	788	524	1110	738	1470	976	1830	1220	2230	1480
	4.00	389	259	660	439	972	647	1320	880	1690	1120	2080	1390
	4.50	308	205	540	359	838	557	1180	783	1540	1020	1930	1280
	5.00	249	166	437	291	709	472	1030	687	1390	922	1770	1180
	5.50	206	137	361	240	590	392	895	595	1240	822	1610	1070
	6.00	173	115	304	202	496	330	762	507	1090	725	1460	969
	6.50	147	98.1	259	172	422	281	649	432	950	632	1300	866
	7.00	127	84.6	223	148	364	242	560	373	820	545	1150	767
	7.50	111	73.7	194	129	317	211	488	325	714	475	1010	672
	8.00	97.3	64.7	171	114	279	185	429	285	628	418	888	591
	8.50	86.2	57.3	151	101	247	164	380	253	556	370	786	523
	9.00	76.9	51.2	135	89.8	220	147	339	225	496	330	701	467
	9.50	69.0	45.9	121	80.6	198	132	304	202	445	296	630	419
	10.0	62.3	41.4	109	72.7	178	119	274	183	402	267	568	378
	10.5	56.5	37.6	99.1	66.0	162	108	249	166	364	242	515	343
	11.0	51.5	34.2	90.3	60.1	147	98.1	227	151	332	221	470	312
	11.5	47.1	31.3	82.6	55.0	135	89.7	207	138	304	202	430	286
	12.0	43.2	28.8	75.9	50.5	124	82.4	191	127	279	186	395	263
	12.5	39.9	26.5	69.9	46.5	114	76.0	176	117	257	171	364	242
	13.0	36.8	24.5	64.7	43.0	106	70.2	162	108	238	158	336	224
	13.5	34.2	22.7	60.0	39.9	97.9	65.1	151	100	220	147	312	207
	14.0	31.8	21.1	55.8	37.1	91.0	60.6	140	93.1	205	136	290	193
	14.5	29.6	19.7	52.0	34.6	84.8	56.5	131	86.8	191	127	270	180
	15.0	27.7	18.4	48.6	32.3	79.3	52.8	122	81.1	179	119	253	168
Properties													
P_{wo} , kN		451	301	485	323	519	346	625	417	664	443	758	505
P_{wi} , kN/m		2820	1880	2940	1960	3060	2040	3290	2190	3410	2270	3530	2350
P_{wb} , kN		4570	3040	3910	2600	3540	2350	3910	2600	3700	2460	3730	2480
P_{fb} , kN		529	352	583	388	640	426	699	465	761	507	826	550
L_p , m		1.41		1.67		1.94		2.19		2.45		2.71	
L_r , m		20.6		20.9		21.4		22.4		23.0		23.9	
$A_g \times 10^2$, mm^2		53.24		66.41		80.56		97.05		113.3		131.3	
$I_x \times 10^4$, mm^4		1143		2018		3291		5098		7483		10640	
$I_y \times 10^4$, mm^4		399.2		702.8		1144		1759		2580		3651	
$r_y \times 10$, mm		2.74		3.25		3.77		4.26		4.77		5.27	
r_x/ r_y		1.69		1.70		1.70		1.70		1.70		1.71	
$P_{ex} L_{cx}^2$, kN · m^2		22500		39800		64900		101000		148000		210000	
$P_{ey} L_{cy}^2$, kN · m^2		7890		13800		22600		34800		50900		72000	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN
HEM Shapes

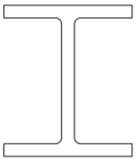
F_y = 235 MPa

Shape		HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	3160	2100	4220	2810	4640	3090	5080	3380	6410	4270	6600	4390
	1.00	3110	2070	4170	2770	4600	3060	5030	3350	6360	4230	6550	4360
	1.50	3060	2030	4110	2730	4540	3020	4980	3310	6300	4190	6480	4310
	2.00	2980	1980	4020	2670	4450	2960	4900	3260	6210	4130	6390	4250
	2.50	2880	1920	3910	2600	4350	2890	4800	3190	6110	4060	6280	4180
	3.00	2760	1840	3780	2520	4230	2810	4680	3110	5980	3980	6150	4090
	3.50	2630	1750	3640	2420	4090	2720	4540	3020	5830	3880	5990	3990
	4.00	2490	1660	3470	2310	3930	2610	4390	2920	5660	3770	5820	3870
	4.50	2340	1560	3300	2190	3760	2500	4230	2810	5480	3640	5630	3740
	5.00	2180	1450	3110	2070	3580	2380	4050	2690	5280	3510	5420	3610
	5.50	2020	1340	2920	1940	3380	2250	3860	2570	5070	3370	5200	3460
	6.00	1850	1230	2720	1810	3190	2120	3660	2440	4840	3220	4970	3310
	6.50	1690	1120	2520	1680	2980	1990	3460	2300	4610	3070	4730	3150
	7.00	1530	1010	2320	1540	2780	1850	3250	2160	4380	2910	4480	2980
	7.50	1370	911	2120	1410	2580	1720	3050	2030	4140	2750	4240	2820
	8.00	1220	811	1930	1290	2380	1580	2840	1890	3890	2590	3980	2650
	8.50	1080	719	1750	1160	2180	1450	2630	1750	3650	2430	3730	2480
	9.00	963	641	1570	1040	1990	1320	2430	1620	3410	2270	3480	2320
	9.50	865	575	1410	936	1800	1200	2230	1490	3170	2110	3240	2160
	10.0	780	519	1270	845	1630	1080	2040	1360	2940	1960	3000	2000
	10.5	708	471	1150	766	1480	983	1860	1240	2720	1810	2770	1840
	11.0	645	429	1050	698	1350	896	1690	1130	2500	1660	2540	1690
	11.5	590	393	960	639	1230	819	1550	1030	2290	1520	2320	1550
	12.0	542	361	882	587	1130	753	1420	947	2100	1400	2130	1420
	12.5	499	332	813	541	1040	694	1310	873	1930	1290	1970	1310
	13.0	462	307	751	500	964	641	1210	807	1790	1190	1820	1210
	13.5	428	285	697	464	894	595	1120	748	1660	1100	1690	1120
	14.0	398	265	648	431	831	553	1050	696	1540	1030	1570	1040
	14.5	371	247	604	402	775	515	975	649	1440	956	1460	972
	15.0	347	231	564	375	724	482	911	606	1340	894	1370	908
Properties													
P_{wo}, kN		801	534	1120	747	1190	797	1240	826	1630	1090	1650	1100
P_{wi}, kN/m		3640	2430	4230	2820	4230	2820	4350	2900	4940	3290	4940	3290
P_{wb}, kN		3630	2410	5270	3500	4880	3250	4780	3180	6590	4390	6100	4060
P_{fb}, kN		894	595	1350	901	1400	929	1440	958	2010	1340	2120	1410
L_p, m		2.97		3.28		3.54		3.80		4.11		4.08	
L_r, m		24.6		29.9		30.2		30.4		35.7		34.1	
$A_g \times 10^2$, mm^2		149.4		199.6		219.6		240.2		303.1		312.0	
$I_x \times 10^4$, mm^4		14600		24290		31310		39550		59200		68130	
$I_y \times 10^4$, mm^4		5012		8153		10450		13160		19400		19710	
$r_y \times 10$, mm		5.79		6.39		6.90		7.40		8.00		7.95	
r_x / r_y		1.71		1.73		1.73		1.73		1.75		1.86	
$P_{ex} L_{cx}^2$, kN · m^2		288000		479000		618000		780000		1170000		1350000	
$P_{ey} L_{cy}^2$, kN · m^2		98900		161000		206000		260000		383000		389000	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

Table C.1 Continued.



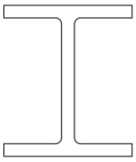
Available Strength in Axial Compression, kN

HEM Shapes

F_y = 235 MPa

Shape		**HEM 340**		**HEM 360**		**HEM 400**		**HEM 450**		**HEM 500**		**HEM 550**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	6680	4440	6740	4490	6890	4580	7090	4720	7280	4840	7500	4990
	1.00	6630	4410	6690	4450	6830	4550	7030	4680	7220	4800	7430	4940
	1.50	6560	4360	6620	4400	6760	4500	6960	4630	7140	4750	7340	4880
	2.00	6470	4300	6530	4340	6660	4430	6850	4560	7030	4670	7220	4810
	2.50	6350	4230	6410	4260	6540	4350	6720	4470	6890	4580	7080	4710
	3.00	6220	4140	6270	4170	6390	4250	6560	4370	6720	4470	6900	4590
	3.50	6060	4030	6100	4060	6220	4140	6380	4250	6530	4340	6690	4450
	4.00	5880	3910	5920	3940	6020	4010	6180	4110	6310	4200	6470	4300
	4.50	5680	3780	5720	3810	5810	3870	5950	3960	6070	4040	6220	4140
	5.00	5470	3640	5500	3660	5580	3720	5710	3800	5820	3870	5950	3960
	5.50	5250	3490	5270	3510	5340	3560	5460	3630	5550	3700	5670	3770
	6.00	5010	3330	5030	3350	5090	3390	5200	3460	5280	3510	5380	3580
	6.50	4770	3170	4780	3180	4830	3210	4920	3270	4990	3320	5080	3380
	7.00	4520	3010	4530	3010	4560	3040	4640	3090	4700	3120	4770	3170
	7.50	4260	2840	4270	2840	4290	2860	4360	2900	4400	2930	4460	2970
	8.00	4010	2670	4010	2670	4020	2680	4080	2710	4110	2730	4150	2760
	8.50	3750	2500	3750	2490	3750	2500	3800	2530	3810	2540	3850	2560
	9.00	3500	2330	3490	2320	3490	2320	3520	2340	3530	2350	3550	2360
	9.50	3250	2160	3240	2150	3230	2150	3250	2160	3250	2160	3260	2170
	10.0	3010	2000	2990	1990	2970	1980	2990	1990	2970	1980	2980	1980
	10.5	2770	1840	2750	1830	2730	1820	2730	1820	2710	1800	2710	1800
	11.0	2540	1690	2520	1670	2490	1650	2490	1660	2470	1640	2470	1640
	11.5	2320	1540	2300	1530	2280	1510	2280	1510	2260	1500	2260	1500
	12.0	2130	1420	2110	1410	2090	1390	2090	1390	2070	1380	2070	1380
	12.5	1970	1310	1950	1300	1930	1280	1930	1280	1910	1270	1910	1270
	13.0	1820	1210	1800	1200	1780	1180	1780	1190	1770	1180	1770	1170
	13.5	1680	1120	1670	1110	1650	1100	1650	1100	1640	1090	1640	1090
	14.0	1570	1040	1550	1030	1540	1020	1540	1020	1520	1010	1520	1010
	14.5	1460	972	1450	964	1430	952	1430	953	1420	945	1420	944
	15.0	1360	908	1350	900	1340	890	1340	890	1330	883	1330	882
Properties													
P_{wo} , kN		1650	1100	1650	1100	1650	1100	1650	1100	1650	1100	1650	1100
P_{wi} , kN/m		4940	3290	4940	3290	4940	3290	4940	3290	4940	3290	4940	3290
P_{wb} , kN		5640	3750	5250	3500	4600	3060	3990	2650	3520	2340	3130	2080
P_{fb} , kN		2120	1410	2120	1410	2120	1410	2120	1410	2120	1410	2120	1410
L_p , m		4.06		4.02		3.95		3.90		3.83		3.77	
L_r , m		32.0		30.1		26.9		23.8		21.3		19.2	
$A_g \times 10^2$, mm^2		315.8		318.8		325.8		335.4		344.3		354.4	
$I_x \times 10^4$, mm^4		76370		84870		104100		131500		161900		198000	
$I_y \times 10^4$, mm^4		19710		19520		19340		19340		19150		19160	
$r_y \times 10$, mm		7.90		7.83		7.70		7.59		7.46		7.35	
r_x/r_y		1.97		2.08		2.32		2.61		2.91		3.22	
$P_{ex} L_{cx}^2$, kN · m^2		1510000		1680000		2060000		2600000		3200000		3910000	
$P_{ey} L_{cy}^2$, kN · m^2		389000		386000		381000		381000		378000		378000	
LRFD	**ASD**	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.											
$\phi_c = 0.90$	$\Omega_c = 1.67$												

Table C.1 Continued.



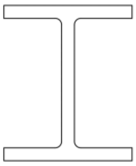
Available Strength in Axial Compression, kN

HEM Shapes

F_y = 235 MPa

Shape		HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	7690	5120	7900	5260	8100	5390	8550	5690	8960	5960	9390	6250
	1.00	7620	5070	7830	5210	8020	5340	8460	5630	8860	5890	9280	6180
	1.50	7530	5010	7730	5140	7920	5270	8350	5550	8730	5810	9150	6080
	2.00	7400	4930	7600	5060	7780	5180	8190	5450	8560	5690	8960	5960
	2.50	7250	4820	7430	4950	7600	5060	7990	5320	8340	5550	8720	5800
	3.00	7060	4700	7240	4810	7390	4920	7760	5160	8080	5380	8430	5610
	3.50	6840	4550	7010	4660	7150	4760	7490	4980	7790	5180	8110	5400
	4.00	6600	4390	6760	4500	6890	4580	7190	4790	7460	4960	7760	5160
	4.50	6340	4220	6480	4310	6600	4390	6870	4570	7110	4730	7370	4900
	5.00	6060	4030	6190	4120	6290	4180	6530	4340	6730	4480	6960	4630
	5.50	5760	3830	5880	3910	5960	3970	6170	4100	6340	4220	6540	4350
	6.00	5450	3630	5550	3700	5620	3740	5790	3860	5930	3950	6100	4060
	6.50	5140	3420	5220	3480	5280	3510	5420	3600	5530	3680	5660	3770
	7.00	4820	3200	4890	3250	4930	3280	5040	3350	5110	3400	5220	3480
	7.50	4490	2990	4550	3030	4580	3050	4660	3100	4710	3130	4790	3190
	8.00	4170	2780	4220	2810	4230	2820	4280	2850	4310	2870	4360	2900
	8.50	3860	2570	3890	2590	3890	2590	3920	2610	3920	2610	3950	2630
	9.00	3550	2360	3570	2380	3560	2370	3560	2370	3550	2360	3550	2360
	9.50	3250	2160	3260	2170	3240	2160	3220	2140	3190	2120	3190	2120
	10.0	2950	1970	2960	1970	2930	1950	2900	1930	2870	1910	2880	1920
	10.5	2680	1780	2680	1790	2660	1770	2630	1750	2610	1730	2610	1740
	11.0	2440	1620	2450	1630	2420	1610	2400	1600	2380	1580	2380	1580
	11.5	2230	1490	2240	1490	2220	1480	2200	1460	2170	1450	2180	1450
	12.0	2050	1360	2060	1370	2040	1350	2020	1340	2000	1330	2000	1330
	12.5	1890	1260	1890	1260	1880	1250	1860	1240	1840	1220	1840	1230
	13.0	1750	1160	1750	1170	1740	1150	1720	1140	1700	1130	1700	1130
	13.5	1620	1080	1620	1080	1610	1070	1590	1060	1580	1050	1580	1050
	14.0	1510	1000	1510	1000	1500	995	1480	986	1470	976	1470	977
	14.5	1400	935	1410	937	1390	928	1380	919	1370	910	1370	911
	15.0	1310	873	1320	875	1300	867	1290	859	1280	850	1280	851
Properties													
P_{wo}, kN		1650	1100	1650	1100	1650	1100	1730	1150	1730	1150	1730	1150
P_{wi}, kN/m		4940	3290	4940	3290	4940	3290	4940	3290	4940	3290	4940	3290
P_{wb}, kN		2820	1880	2570	1710	2360	1570	2030	1350	1780	1180	1580	1050
P_{fb}, kN		2120	1410	2120	1410	2120	1410	2120	1410	2120	1410	2120	1410
L_p, m		3.71		3.66		3.60		3.49		3.39		3.31	
L_r, m		17.6		16.3		15.1		13.5		12.2		11.4	
$A_g \times 10^2$, mm^2		363.7		373.3		383.0		404.3		423.6		444.2	
$I_x \times 10^4$, mm^4		237400		281700		329300		442600		570400		722300	
$I_y \times 10^4$, mm^4		18980		18980		18800		18630		18450		18460	
$r_y \times 10$, mm		7.22		7.13		7.01		6.79		6.60		6.45	
r_x / r_y		3.54		3.85		4.18		4.87		5.56		6.25	
$P_{ex} L_{cx}^2$, kN · m^2		4690000		5560000		6500000		8740000		11300000		14300000	
$P_{ey} L_{cy}^2$, kN · m^2		374000		375000		372000		368000		364000		365000	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$		[c] Shape is slender for compression; tabulated values have been adjusted accordingly.									

Table C.1 Continued.



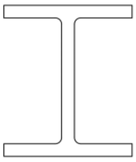
Available Strength in Axial Compression, kN

HEM Shapes

F_y = 275 MPa

Shape		**HEM 100**		**HEM 120**		**HEM 140**		**HEM 160**		**HEM 180**		**HEM 200**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1320	877	1640	1090	1990	1330	2400	1600	2800	1870	3250	2160
	1.00	1220	811	1560	1030	1910	1270	2330	1550	2730	1820	3180	2120
	1.50	1110	736	1450	966	1820	1210	2230	1490	2650	1760	3100	2060
	2.00	966	643	1320	877	1690	1130	2110	1410	2530	1680	2990	1990
	2.50	811	540	1160	774	1540	1030	1960	1310	2390	1590	2850	1900
	3.00	655	436	1000	665	1380	917	1800	1200	2230	1480	2690	1790
	3.50	508	338	836	556	1210	803	1620	1080	2050	1360	2510	1670
	4.00	389	259	680	452	1030	688	1440	956	1860	1240	2320	1550
	4.50	308	205	540	359	869	578	1250	834	1670	1110	2120	1410
	5.00	249	166	437	291	714	475	1080	716	1480	983	1920	1280
	5.50	206	137	361	240	590	392	907	604	1290	859	1720	1150
	6.00	173	115	304	202	496	330	762	507	1110	742	1530	1020
	6.50	147	98.1	259	172	422	281	649	432	951	632	1340	890
	7.00	127	84.6	223	148	364	242	560	373	820	545	1160	771
	7.50	111	73.7	194	129	317	211	488	325	714	475	1010	672
	8.00	97.3	64.7	171	114	279	185	429	285	628	418	888	591
	8.50	86.2	57.3	151	101	247	164	380	253	556	370	786	523
	9.00	76.9	51.2	135	89.8	220	147	339	225	496	330	701	467
	9.50	69.0	45.9	121	80.6	198	132	304	202	445	296	630	419
	10.0	62.3	41.4	109	72.7	178	119	274	183	402	267	568	378
	10.5	56.5	37.6	99.1	66.0	162	108	249	166	364	242	515	343
	11.0	51.5	34.2	90.3	60.1	147	98.1	227	151	332	221	470	312
	11.5	47.1	31.3	82.6	55.0	135	89.7	207	138	304	202	430	286
	12.0	43.2	28.8	75.9	50.5	124	82.4	191	127	279	186	395	263
	12.5	39.9	26.5	69.9	46.5	114	76.0	176	117	257	171	364	242
	13.0	36.8	24.5	64.7	43.0	106	70.2	162	108	238	158	336	224
	13.5	34.2	22.7	60.0	39.9	97.9	65.1	151	100	220	147	312	207
	14.0	31.8	21.1	55.8	37.1	91.0	60.6	140	93.1	205	136	290	193
	14.5	29.6	19.7	52.0	34.6	84.8	56.5	131	86.8	191	127	270	180
	15.0	27.7	18.4	48.6	32.3	79.3	52.8	122	81.1	179	119	253	168
Properties													
P_{wo} , kN		528	352	567	378	608	405	732	488	778	518	887	591
P_{wi} , kN/m		3300	2200	3440	2290	3580	2380	3850	2570	3990	2660	4130	2750
P_{wb} , kN		4940	3290	4230	2810	3830	2550	4230	2810	4000	2660	4030	2680
P_{fb} , kN		619	412	682	454	749	498	818	544	891	593	967	643
L_p , m		1.30		1.54		1.79		2.02		2.26		2.50	
L_r , m		17.6		17.9		18.3		19.2		19.7		20.5	
$A_g \times 10^2$, mm^2		53.24		66.41		80.56		97.05		113.3		131.3	
$I_x \times 10^4$, mm^4		1143		2018		3291		5098		7483		10640	
$I_y \times 10^4$, mm^4		399.2		702.8		1144		1759		2580		3651	
$r_y \times 10$, mm		2.74		3.25		3.77		4.26		4.77		5.27	
r_x / r_y		1.69		1.70		1.70		1.70		1.70		1.71	
$P_{ex} L_{cx}^2$, kN · m^2		22500		39800		64900		101000		148000		210000	
$P_{ey} L_{cy}^2$, kN · m^2		7890		13800		22600		34800		50900		72000	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.

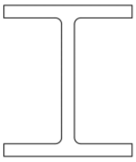


Available Strength in Axial Compression, kN
HEM Shapes

F_y = 275 MPa

Shape		HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	3700	2460	4940	3290	5440	3620	5940	3960	7500	4990	7720	5140
	1.00	3630	2420	4870	3240	5370	3570	5880	3910	7430	4950	7650	5090
	1.50	3560	2370	4780	3180	5290	3520	5800	3860	7350	4890	7560	5030
	2.00	3450	2290	4670	3100	5180	3440	5700	3790	7230	4810	7440	4950
	2.50	3320	2210	4520	3010	5030	3350	5560	3700	7090	4710	7290	4850
	3.00	3160	2100	4340	2890	4870	3240	5400	3590	6910	4600	7110	4730
	3.50	2990	1990	4150	2760	4680	3110	5220	3470	6710	4460	6900	4590
	4.00	2800	1860	3930	2620	4470	2970	5010	3340	6480	4310	6660	4430
	4.50	2600	1730	3700	2460	4240	2820	4790	3190	6240	4150	6410	4260
	5.00	2390	1590	3460	2300	4000	2660	4560	3030	5970	3970	6130	4080
	5.50	2180	1450	3210	2130	3750	2500	4310	2870	5690	3790	5840	3890
	6.00	1980	1320	2950	1970	3500	2330	4050	2700	5400	3600	5540	3690
	6.50	1770	1180	2700	1800	3240	2160	3790	2520	5100	3400	5230	3480
	7.00	1580	1050	2450	1630	2980	1980	3530	2350	4800	3190	4910	3270
	7.50	1390	923	2210	1470	2730	1820	3270	2170	4490	2990	4600	3060
	8.00	1220	811	1980	1320	2480	1650	3010	2000	4190	2790	4280	2850
	8.50	1080	719	1760	1170	2240	1490	2750	1830	3880	2580	3960	2640
	9.00	963	641	1570	1040	2010	1340	2510	1670	3590	2390	3660	2430
	9.50	865	575	1410	936	1800	1200	2270	1510	3300	2190	3360	2230
	10.0	780	519	1270	845	1630	1080	2050	1360	3020	2010	3070	2040
	10.5	708	471	1150	766	1480	983	1860	1240	2740	1820	2790	1850
	11.0	645	429	1050	698	1350	896	1690	1130	2500	1660	2540	1690
	11.5	590	393	960	639	1230	819	1550	1030	2290	1520	2320	1550
	12.0	542	361	882	587	1130	753	1420	947	2100	1400	2130	1420
	12.5	499	332	813	541	1040	694	1310	873	1930	1290	1970	1310
	13.0	462	307	751	500	964	641	1210	807	1790	1190	1820	1210
	13.5	428	285	697	464	894	595	1120	748	1660	1100	1690	1120
	14.0	398	265	648	431	831	553	1050	696	1540	1030	1570	1040
	14.5	371	247	604	402	775	515	975	649	1440	956	1460	972
	15.0	347	231	564	375	724	482	911	606	1340	894	1370	908
Properties													
P_{wo}, kN		938	625	1310	875	1400	932	1450	967	1910	1270	1930	1290
P_{wi}, kN/m		4260	2840	4950	3300	4950	3300	5090	3390	5780	3850	5780	3850
P_{wb}, kN		3920	2610	5700	3790	5280	3510	5170	3440	7130	4750	6590	4390
P_{fb}, kN		1050	696	1580	1050	1630	1090	1680	1120	2350	1570	2480	1650
L_p, m		2.75		3.03		3.27		3.51		4.11		3.77	
L_r, m		21.0		25.6		25.8		26.0		30.5		29.2	
$A_g \times 10^2$, mm^2		149.4		199.6		219.6		240.2		303.1		312.0	
$I_x \times 10^4$, mm^4		14600		24290		31310		39550		59200		68130	
$I_y \times 10^4$, mm^4		5012		8153		10450		13160		19400		19710	
$r_y \times 10$, mm		5.79		6.39		6.90		7.40		8.00		7.95	
r_x/r_y		1.71		1.73		1.73		1.73		1.75		1.86	
$P_{ex} L_{cx}^2$, kN · m^2		288000		479000		618000		780000		1170000		1350000	
$P_{ey} L_{cy}^2$, kN · m^2		98900		161000		206000		260000		383000		389000	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.

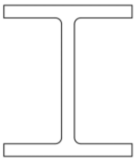


Available Strength in Axial Compression, kN
HEM Shapes

F_y = 275 MPa

Shape		HEM 340		HEM 360		HEM 400		HEM 450		HEM 500		HEM 550	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	7820	5200	7890	5250	8060	5360	8300	5520	8520	5670	8770	5840
	1.00	7740	5150	7820	5200	7980	5310	8220	5470	8430	5610	8680	5770
	1.50	7650	5090	7720	5140	7890	5250	8110	5400	8320	5540	8560	5700
	2.00	7530	5010	7600	5050	7750	5160	7970	5300	8170	5440	8400	5590
	2.50	7370	4910	7430	4950	7580	5050	7790	5180	7980	5310	8200	5460
	3.00	7190	4780	7240	4820	7380	4910	7580	5040	7750	5160	7960	5300
	3.50	6970	4640	7020	4670	7150	4760	7330	4880	7490	4990	7690	5110
	4.00	6730	4480	6780	4510	6890	4580	7060	4700	7210	4790	7380	4910
	4.50	6470	4300	6510	4330	6610	4400	6760	4500	6890	4590	7050	4690
	5.00	6190	4120	6220	4140	6310	4200	6450	4290	6560	4360	6700	4460
	5.50	5890	3920	5920	3940	5990	3980	6110	4070	6210	4130	6330	4210
	6.00	5580	3710	5600	3730	5660	3770	5770	3840	5840	3890	5950	3960
	6.50	5270	3500	5280	3510	5320	3540	5410	3600	5470	3640	5560	3700
	7.00	4940	3290	4950	3290	4980	3310	5060	3360	5100	3390	5170	3440
	7.50	4620	3070	4620	3070	4640	3090	4700	3130	4730	3140	4780	3180
	8.00	4300	2860	4290	2860	4300	2860	4340	2890	4360	2900	4400	2920
	8.50	3980	2650	3970	2640	3960	2640	4000	2660	4000	2660	4020	2680
	9.00	3670	2440	3650	2430	3640	2420	3660	2430	3650	2430	3660	2430
	9.50	3360	2240	3340	2230	3320	2210	3330	2220	3310	2200	3310	2200
	10.0	3070	2040	3050	2030	3010	2000	3010	2000	2990	1990	2980	1980
	10.5	2790	1850	2760	1840	2730	1820	2730	1820	2710	1800	2710	1800
	11.0	2540	1690	2520	1670	2490	1650	2490	1660	2470	1640	2470	1640
	11.5	2320	1540	2300	1530	2280	1510	2280	1510	2260	1500	2260	1500
	12.0	2130	1420	2110	1410	2090	1390	2090	1390	2070	1380	2070	1380
	12.5	1970	1310	1950	1300	1930	1280	1930	1280	1910	1270	1910	1270
	13.0	1820	1210	1800	1200	1780	1180	1780	1190	1770	1180	1770	1170
	13.5	1680	1120	1670	1110	1650	1100	1650	1100	1640	1090	1640	1090
	14.0	1570	1040	1550	1030	1540	1020	1540	1020	1520	1010	1520	1010
	14.5	1460	972	1450	964	1430	952	1430	953	1420	945	1420	944
	15.0	1360	908	1350	900	1340	890	1340	890	1330	883	1330	882
Properties													
P_{wo} , kN		1930	1290	1930	1290	1930	1290	1930	1290	1930	1290	1930	1290
P_{wi} , kN/m		5780	3850	5780	3850	5780	3850	5780	3850	5780	3850	5780	3850
P_{wb} , kN		6110	4060	5680	3780	4980	3310	4310	2870	3800	2530	3390	2250
P_{fb} , kN		2480	1650	2480	1650	2480	1650	2480	1650	2480	1650	2480	1650
L_p , m		3.75		3.72		3.65		3.60		3.54		3.49	
L_r , m		27.4		25.8		23.0		20.4		18.3		16.6	
$A_g \times 10^2$, mm^2		315.8		318.8		325.8		335.4		344.3		354.4	
$I_x \times 10^4$, mm^4		76370		84870		104100		131500		161900		198000	
$I_y \times 10^4$, mm^4		19710		19520		19340		19340		19150		19160	
$r_y \times 10$, mm		7.90		7.83		7.70		7.59		7.46		7.35	
r_x / r_y		1.97		2.08		2.32		2.61		2.91		3.22	
$P_{ex} L_{cx}^2$, kN · m^2		1510000		1680000		2060000		2600000		3200000		3910000	
$P_{ey} L_{cy}^2$, kN · m^2		389000		386000		381000		381000		378000		378000	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN
HEM Shapes

F_y = 275 MPa

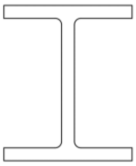
Shape		**HEM 600**		**HEM 650**		**HEM 700**		**HEM 800**		**HEM 900**		**HEM 1000** ^{c}	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	9000	5990	9250	6150	9480	6310	10000	6660	10500	6980	11000	7310
	1.00	8900	5920	9140	6080	9370	6230	9880	6570	10300	6880	10800	7170
	1.50	8780	5840	9010	6000	9230	6140	9730	6470	10200	6770	10600	7070
	2.00	8610	5730	8830	5880	9040	6010	9510	6330	9940	6610	10400	6920
	2.50	8390	5580	8610	5730	8800	5860	9250	6150	9640	6420	10100	6700
	3.00	8140	5420	8340	5550	8520	5670	8930	5940	9290	6180	9690	6450
	3.50	7850	5220	8040	5350	8200	5450	8570	5700	8900	5920	9260	6160
	4.00	7530	5010	7700	5120	7840	5220	8170	5440	8460	5630	8790	5850
	4.50	7180	4780	7330	4880	7450	4960	7750	5150	7990	5320	8280	5510
	5.00	6810	4530	6940	4620	7050	4690	7290	4850	7500	4990	7740	5150
	5.50	6420	4270	6540	4350	6620	4400	6830	4540	6990	4650	7190	4790
	6.00	6020	4000	6120	4070	6180	4110	6350	4220	6480	4310	6640	4420
	6.50	5610	3730	5700	3790	5740	3820	5860	3900	5960	3960	6080	4050
	7.00	5200	3460	5270	3510	5300	3530	5380	3580	5440	3620	5530	3680
	7.50	4800	3190	4850	3230	4860	3240	4910	3270	4940	3290	5000	3320
	8.00	4400	2930	4440	2950	4440	2950	4450	2960	4450	2960	4480	2980
	8.50	4010	2670	4040	2690	4020	2680	4010	2670	3980	2650	3990	2650
	9.00	3640	2420	3650	2430	3620	2410	3590	2390	3550	2360	3550	2360
	9.50	3270	2180	3280	2180	3250	2160	3220	2140	3190	2120	3190	2120
	10.0	2950	1970	2960	1970	2930	1950	2900	1930	2870	1910	2880	1920
	10.5	2680	1780	2680	1790	2660	1770	2630	1750	2610	1730	2610	1740
	11.0	2440	1620	2450	1630	2420	1610	2400	1600	2380	1580	2380	1580
	11.5	2230	1490	2240	1490	2220	1480	2200	1460	2170	1450	2180	1450
	12.0	2050	1360	2060	1370	2040	1350	2020	1340	2000	1330	2000	1330
	12.5	1890	1260	1890	1260	1880	1250	1860	1240	1840	1220	1840	1230
	13.0	1750	1160	1750	1170	1740	1150	1720	1140	1700	1130	1700	1130
	13.5	1620	1080	1620	1080	1610	1070	1590	1060	1580	1050	1580	1050
	14.0	1510	1000	1510	1000	1500	995	1480	986	1470	976	1470	977
	14.5	1400	935	1410	937	1390	928	1380	919	1370	910	1370	911
	15.0	1310	873	1320	875	1300	867	1290	859	1280	850	1280	851
						Properties							
P_{wo}, kN		1930	1290	1930	1290	1930	1290	2020	1350	2020	1350	2020	1350
P_{wi}, kN/m		5780	3850	5780	3850	5780	3850	5780	3850	5780	3850	5780	3850
P_{wb}, kN		3050	2030	2780	1850	2550	1700	2200	1460	1930	1280	1710	1140
P_{fb}, kN		2480	1650	2480	1650	2480	1650	2480	1650	2480	1650	2480	1650
L_p, m		3.43		3.38		3.33		3.22		3.13		3.06	
L_r, m		15.2		14.1		13.2		11.8		10.8		10.1	
$A_g \times 10^2$, mm^2		363.7		373.3		383.0		404.3		423.6		444.2	
$I_x \times 10^4$, mm^4		237400		281700		329300		442600		570400		722300	
$I_y \times 10^4$, mm^4		18980		18980		18800		18630		18450		18460	
$r_y \times 10$, mm		7.22		7.13		7.01		6.79		6.60		6.45	
r_x / r_y		3.54		3.85		4.18		4.87		5.56		6.25	
$P_{ex} L_{cx}^2$, kN · m^2		4690000		5560000		6500000		8740000		11300000		14300000	
$P_{ey} L_{cy}^2$, kN · m^2		374000		375000		372000		368000		364000		365000	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.



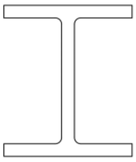
Available Strength in Axial Compression, kN
HEM Shapes

F_y = 355 MPa

Shape		**HEM 100**		**HEM 120**		**HEM 140**		**HEM 160**		**HEM 180**		**HEM 200**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1700	1130	2120	1410	2570	1710	3100	2060	3620	2410	4200	2790
	1.00	1540	1020	1980	1310	2440	1620	2970	1980	3500	2330	4080	2720
	1.50	1360	903	1810	1200	2280	1520	2820	1880	3360	2240	3950	2630
	2.00	1140	758	1600	1060	2080	1390	2630	1750	3170	2110	3760	2500
	2.50	909	605	1360	904	1850	1230	2390	1590	2940	1960	3540	2360
	3.00	690	459	1120	743	1600	1060	2130	1420	2690	1790	3290	2190
	3.50	508	338	886	590	1350	895	1870	1240	2410	1610	3010	2000
	4.00	389	259	683	454	1100	734	1600	1060	2130	1420	2720	1810
	4.50	308	205	540	359	881	586	1340	891	1850	1230	2420	1610
	5.00	249	166	437	291	714	475	1100	730	1580	1050	2130	1420
	5.50	206	137	361	240	590	392	907	604	1330	883	1850	1230
	6.00	173	115	304	202	496	330	762	507	1120	742	1580	1050
	6.50	147	98.1	259	172	422	281	649	432	951	632	1340	895
	7.00	127	84.6	223	148	364	242	560	373	820	545	1160	771
	7.50	111	73.7	194	129	317	211	488	325	714	475	1010	672
	8.00	97.3	64.7	171	114	279	185	429	285	628	418	888	591
	8.50	86.2	57.3	151	101	247	164	380	253	556	370	786	523
	9.00	76.9	51.2	135	89.8	220	147	339	225	496	330	701	467
	9.50	69.0	45.9	121	80.6	198	132	304	202	445	296	630	419
	10.0	62.3	41.4	109	72.7	178	119	274	183	402	267	568	378
	10.5	56.5	37.6	99.1	66.0	162	108	249	166	364	242	515	343
	11.0	51.5	34.2	90.3	60.1	147	98.1	227	151	332	221	470	312
	11.5	47.1	31.3	82.6	55.0	135	89.7	207	138	304	202	430	286
	12.0	43.2	28.8	75.9	50.5	124	82.4	191	127	279	186	395	263
	12.5	39.9	26.5	69.9	46.5	114	76.0	176	117	257	171	364	242
	13.0	36.8	24.5	64.7	43.0	106	70.2	162	108	238	158	336	224
	13.5	34.2	22.7	60.0	39.9	97.9	65.1	151	100	220	147	312	207
	14.0	31.8	21.1	55.8	37.1	91.0	60.6	140	93.1	205	136	290	193
	14.5	29.6	19.7	52.0	34.6	84.8	56.5	131	86.8	191	127	270	180
	15.0	27.7	18.4	48.6	32.3	79.3	52.8	122	81.1	179	119	253	168
Properties													
P_{wo} , kN		682	454	732	488	785	523	944	630	1000	669	1140	763
P_{wi} , kN/m		4260	2840	4440	2960	4620	3080	4970	3310	5150	3430	5330	3550
P_{wb} , kN		5620	3740	4800	3200	4350	2890	4800	3200	4550	3030	4580	3050
P_{fb} , kN		799	531	881	586	966	643	1060	703	1150	765	1250	830
L_p , m		1.14		1.36		1.57		1.78		1.99		2.20	
L_r , m		13.6		13.8		14.2		14.9		15.3		15.9	
$A_g \times 10^2$, mm^2		53.24		66.41		80.56		97.05		113.3		131.3	
$I_x \times 10^4$, mm^4		1143		2018		3291		5098		7483		10640	
$I_y \times 10^4$, mm^4		399.2		702.8		1144		1759		2580		3651	
$r_y \times 10$, mm		2.74		3.25		3.77		4.26		4.77		5.27	
r_x / r_y		1.69		1.70		1.70		1.70		1.70		1.71	
$P_{ex} L_{cx}^2$, kN · m^2		22500		39800		64900		101000		148000		210000	
$P_{ey} L_{cy}^2$, kN · m^2		7890		13800		22600		34800		50900		72000	

LRFD	**ASD**	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.1 Continued.



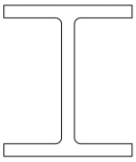
Available Strength in Axial Compression, kN
HEM Shapes

F_y = 355 MPa

Shape		HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	4770	3180	6380	4240	7020	4670	7670	5110	9680	6440	9970	6630
	1.00	4670	3110	6260	4170	6910	4590	7570	5040	9570	6370	9850	6550
	1.50	4540	3020	6120	4070	6770	4500	7440	4950	9430	6270	9700	6460
	2.00	4360	2900	5920	3940	6590	4380	7260	4830	9240	6150	9500	6320
	2.50	4150	2760	5680	3780	6360	4230	7040	4690	9000	5990	9250	6160
	3.00	3900	2590	5400	3590	6090	4050	6780	4510	8710	5800	8960	5960
	3.50	3630	2410	5090	3390	5780	3850	6490	4310	8380	5580	8620	5730
	4.00	3330	2220	4750	3160	5450	3620	6160	4100	8020	5340	8240	5480
	4.50	3030	2020	4390	2920	5090	3390	5810	3870	7630	5080	7830	5210
	5.00	2720	1810	4020	2680	4730	3140	5440	3620	7220	4800	7400	4920
	5.50	2420	1610	3650	2430	4350	2890	5060	3370	6780	4510	6950	4630
	6.00	2130	1420	3280	2180	3970	2640	4680	3110	6340	4220	6490	4320
	6.50	1850	1230	2930	1950	3600	2390	4290	2860	5890	3920	6030	4010
	7.00	1590	1060	2580	1720	3230	2150	3910	2600	5440	3620	5560	3700
	7.50	1390	923	2260	1500	2880	1920	3540	2360	5000	3320	5100	3390
	8.00	1220	811	1980	1320	2550	1690	3180	2120	4560	3040	4650	3090
	8.50	1080	719	1760	1170	2250	1500	2840	1890	4140	2750	4220	2810
	9.00	963	641	1570	1040	2010	1340	2530	1680	3730	2480	3790	2520
	9.50	865	575	1410	936	1800	1200	2270	1510	3350	2230	3400	2260
	10.0	780	519	1270	845	1630	1080	2050	1360	3020	2010	3070	2040
	10.5	708	471	1150	766	1480	983	1860	1240	2740	1820	2790	1850
	11.0	645	429	1050	698	1350	896	1690	1130	2500	1660	2540	1690
	11.5	590	393	960	639	1230	819	1550	1030	2290	1520	2320	1550
	12.0	542	361	882	587	1130	753	1420	947	2100	1400	2130	1420
	12.5	499	332	813	541	1040	694	1310	873	1930	1290	1970	1310
	13.0	462	307	751	500	964	641	1210	807	1790	1190	1820	1210
	13.5	428	285	697	464	894	595	1120	748	1660	1100	1690	1120
	14.0	398	265	648	431	831	553	1050	696	1540	1030	1570	1040
	14.5	371	247	604	402	775	515	975	649	1440	956	1460	972
	15.0	347	231	564	375	724	482	911	606	1340	894	1370	908
Properties													
P_{wo} , kN		1210	807	1690	1130	1810	1200	1870	1250	2460	1640	2500	1660
P_{wi} , kN/m		5500	3670	6390	4260	6390	4260	6570	4380	7460	4970	7460	4970
P_{wb} , kN		4460	2970	6470	4310	6000	3990	5880	3910	8100	5390	7490	4980
P_{fb} , kN		1350	898	2040	1360	2110	1400	2170	1450	3040	2020	3200	2130
L_p , m		2.42		2.67		2.88		3.09		4.11		3.32	
L_r , m		16.4		19.9		20.1		20.2		23.7		22.7	
$A_g \times 10^2$, mm^2		149.4		199.6		219.6		240.2		303.1		312.0	
$I_x \times 10^4$, mm^4		14600		24290		31310		39550		59200		68130	
$I_y \times 10^4$, mm^4		5012		8153		10450		13160		19400		19710	
$r_y \times 10$, mm		5.79		6.39		6.90		7.40		8.00		7.95	
r_x / r_y		1.71		1.73		1.73		1.73		1.75		1.86	
$P_{ex} L_{cx}^2$, kN · m^2		288000		479000		618000		780000		1170000		1350000	
$P_{ey} L_{cy}^2$, kN · m^2		98900		161000		206000		260000		383000		389000	

LRFD	ASD	Note: Tabulated values in gray indicate L_c / r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.1 Continued.

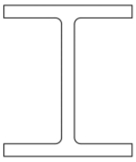


Available Strength in Axial Compression, kN
HEM Shapes

F_y = 355 MPa

Shape		**HEM 340**		**HEM 360**		**HEM 400**		**HEM 450**		**HEM 500**		**HEM 550**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	10100	6710	10200	6780	10400	6930	10700	7130	11000	7320	11300	7530
	1.00	9970	6630	10100	6690	10300	6840	10600	7040	10900	7220	11200	7430
	1.50	9820	6530	9910	6590	10100	6730	10400	6920	10700	7100	11000	7300
	2.00	9610	6400	9700	6450	9890	6580	10200	6770	10400	6930	10700	7130
	2.50	9360	6230	9430	6280	9620	6400	9880	6570	10100	6730	10400	6910
	3.00	9050	6020	9120	6070	9290	6180	9530	6340	9740	6480	9990	6650
	3.50	8700	5790	8760	5830	8910	5930	9130	6080	9320	6200	9550	6350
	4.00	8320	5530	8370	5570	8500	5650	8690	5780	8860	5890	9060	6030
	4.50	7900	5260	7940	5290	8050	5360	8220	5470	8360	5570	8540	5680
	5.00	7460	4970	7490	4990	7580	5040	7730	5140	7840	5220	7990	5320
	5.50	7010	4660	7030	4670	7090	4720	7220	4800	7310	4860	7430	4940
	6.00	6540	4350	6550	4360	6590	4380	6690	4450	6760	4500	6860	4560
	6.50	6060	4030	6060	4030	6090	4050	6170	4110	6210	4130	6280	4180
	7.00	5590	3720	5580	3710	5590	3720	5650	3760	5670	3770	5720	3810
	7.50	5120	3410	5110	3400	5100	3390	5140	3420	5140	3420	5170	3440
	8.00	4660	3100	4640	3090	4620	3070	4640	3090	4630	3080	4640	3090
	8.50	4220	2810	4200	2790	4160	2770	4170	2770	4130	2750	4130	2750
	9.00	3790	2520	3760	2500	3720	2470	3720	2470	3690	2450	3680	2450
	9.50	3400	2260	3370	2240	3330	2220	3340	2220	3310	2200	3310	2200
	10.0	3070	2040	3050	2030	3010	2000	3010	2000	2990	1990	2980	1980
	10.5	2790	1850	2760	1840	2730	1820	2730	1820	2710	1800	2710	1800
	11.0	2540	1690	2520	1670	2490	1650	2490	1660	2470	1640	2470	1640
	11.5	2320	1540	2300	1530	2280	1510	2280	1510	2260	1500	2260	1500
	12.0	2130	1420	2110	1410	2090	1390	2090	1390	2070	1380	2070	1380
	12.5	1970	1310	1950	1300	1930	1280	1930	1280	1910	1270	1910	1270
	13.0	1820	1210	1800	1200	1780	1180	1780	1190	1770	1180	1770	1170
	13.5	1680	1120	1670	1110	1650	1100	1650	1100	1640	1090	1640	1090
	14.0	1570	1040	1550	1030	1540	1020	1540	1020	1520	1010	1520	1010
	14.5	1460	972	1450	964	1430	952	1430	953	1420	945	1420	944
	15.0	1360	908	1350	900	1340	890	1340	890	1330	883	1330	882
Properties													
P_{wo}, kN		2500	1660	2500	1660	2500	1660	2500	1660	2500	1660	2500	1660
P_{wi}, kN/m		7460	4970	7460	4970	7460	4970	7460	4970	7460	4970	7460	4970
P_{wb}, kN		6940	4620	6460	4300	5660	3760	4900	3260	4320	2880	3850	2560
P_{fb}, kN		3200	2130	3200	2130	3200	2130	3200	2130	3200	2130	3200	2130
L_p, m		3.30		3.27		3.22		3.17		3.12		3.07	
L_r, m		21.3		20.1		18.0		16.0		14.4		13.1	
$A_g \times 10^2$, mm^2		315.8		318.8		325.8		335.4		344.3		354.4	
$I_x \times 10^4$, mm^4		76370		84870		104100		131500		161900		198000	
$I_y \times 10^4$, mm^4		19710		19520		19340		19340		19150		19160	
$r_y \times 10$, mm		7.90		7.83		7.70		7.59		7.46		7.35	
r_x/r_y		1.97		2.08		2.32		2.61		2.91		3.22	
$P_{ex} L_{cx}^2$, kN · m^2		1510000		1680000		2060000		2600000		3200000		3910000	
$P_{ey} L_{cy}^2$, kN · m^2		389000		386000		381000		381000		378000		378000	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



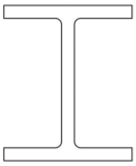
Available Strength in Axial Compression, kN
HEM Shapes

F_y = 355 MPa

Shape		HEM 600		HEM 650		HEM 700		HEM 800		HEM 900^c		HEM 1000 ^{c}	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	11600	7730	11900	7940	12200	8140	12900	8590	13500	9000	14200	9440
	1.00	11500	7620	11800	7830	12100	8020	12700	8460	13200	8790	13400	8900
	1.50	11200	7480	11500	7680	11800	7870	12500	8280	13000	8630	13100	8730
	2.00	11000	7300	11300	7490	11500	7660	12100	8050	12600	8400	12800	8490
	2.50	10600	7060	10900	7240	11100	7400	11700	7760	12100	8080	12300	8200
	3.00	10200	6790	10500	6950	10700	7090	11200	7420	11600	7710	11800	7860
	3.50	9740	6480	9960	6630	10100	6750	10600	7040	11000	7290	11200	7470
	4.00	9220	6140	9420	6270	9580	6370	9950	6620	10300	6830	10600	7050
	4.50	8670	5770	8850	5890	8970	5970	9280	6170	9540	6350	9840	6550
	5.00	8100	5390	8250	5490	8340	5550	8590	5710	8790	5850	9030	6010
	5.50	7510	5000	7630	5080	7700	5120	7880	5240	8020	5340	8210	5460
	6.00	6910	4600	7010	4660	7050	4690	7180	4770	7270	4830	7400	4920
	6.50	6310	4200	6390	4250	6410	4260	6480	4310	6520	4340	6610	4400
	7.00	5730	3810	5780	3850	5780	3840	5800	3860	5800	3860	5850	3890
	7.50	5160	3430	5190	3450	5170	3440	5160	3430	5110	3400	5120	3410
	8.00	4610	3070	4620	3080	4580	3050	4540	3020	4490	2990	4500	2990
	8.50	4090	2720	4100	2730	4060	2700	4020	2670	3980	2650	3990	2650
	9.00	3650	2430	3650	2430	3620	2410	3590	2390	3550	2360	3550	2360
	9.50	3270	2180	3280	2180	3250	2160	3220	2140	3190	2120	3190	2120
	10.0	2950	1970	2960	1970	2930	1950	2900	1930	2870	1910	2880	1920
	10.5	2680	1780	2680	1790	2660	1770	2630	1750	2610	1730	2610	1740
	11.0	2440	1620	2450	1630	2420	1610	2400	1600	2380	1580	2380	1580
	11.5	2230	1490	2240	1490	2220	1480	2200	1460	2170	1450	2180	1450
	12.0	2050	1360	2060	1370	2040	1350	2020	1340	2000	1330	2000	1330
	12.5	1890	1260	1890	1260	1880	1250	1860	1240	1840	1220	1840	1230
	13.0	1750	1160	1750	1170	1740	1150	1720	1140	1700	1130	1700	1130
	13.5	1620	1080	1620	1080	1610	1070	1590	1060	1580	1050	1580	1050
	14.0	1510	1000	1510	1000	1500	995	1480	986	1470	976	1470	977
	14.5	1400	935	1410	937	1390	928	1380	919	1370	910	1370	911
	15.0	1310	873	1320	875	1300	867	1290	859	1280	850	1280	851
Properties													
P_{wo} , kN		2500	1660	2500	1660	2500	1660	2610	1740	2610	1740	2610	1740
P_{wi} , kN/m		7460	4970	7460	4970	7460	4970	7460	4970	7460	4970	7460	4970
P_{wb} , kN		3470	2310	3160	2100	2900	1930	2500	1660	2190	1460	1940	1290
P_{fb} , kN		3200	2130	3200	2130	3200	2130	3200	2130	3200	2130	3200	2130
L_p , m		3.02		2.98		2.93		2.84		2.76		2.69	
L_r , m		12.1		11.3		10.7		9.68		8.97		8.48	
$A_g \times 10^2$, mm^2		363.7		373.3		383.0		404.3		423.6		444.2	
$I_x \times 10^4$, mm^4		237400		281700		329300		442600		570400		722300	
$I_y \times 10^4$, mm^4		18980		18980		18800		18630		18450		18460	
$r_y \times 10$, mm		7.22		7.13		7.01		6.79		6.60		6.45	
r_x / r_y		3.54		3.85		4.18		4.87		5.56		6.25	
$P_{ex} L_{cx}^2$, kN · m^2		4690000		5560000		6500000		8740000		11300000		14300000	
$P_{ey} L_{cy}^2$, kN · m^2		374000		375000		372000		368000		364000		365000	

LRFD	ASD	
$\phi_c = 0.90$	$\Omega_c = 1.67$	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200. ^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.

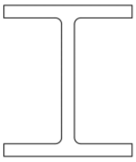


Available Strength in Axial Compression, kN
IPE Shapes

F_y = 235 MPa

Shape		**IPE 80**		**IPE 100**		**IPE 120**		**IPE 140**		**IPE 160**		**IPE 180**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	162	108	218	145	279	186	347	231	425	283	507	337
	1.00	103	68.4	158	105	220	147	289	193	367	244	450	299
	1.50	58.3	38.8	105	70.0	164	109	230	153	305	203	388	258
	2.00	32.8	21.8	61.8	41.1	108	72.0	167	111	236	157	315	210
	2.50	21.0	14.0	39.6	26.3	69.2	46.1	112	74.2	169	113	241	161
	3.00	14.6	9.70	27.5	18.3	48.1	32.0	77.4	51.5	118	78.3	174	116
	3.50	10.7	7.13	20.2	13.4	35.3	23.5	56.9	37.9	86.5	57.6	128	85.2
	4.00	8.20	5.46	15.5	10.3	27.0	18.0	43.6	29.0	66.2	44.1	98.0	65.2
	4.50	6.48	4.31	12.2	8.12	21.4	14.2	34.4	22.9	52.3	34.8	77.4	51.5
	5.00	5.25	3.49	9.89	6.58	17.3	11.5	27.9	18.5	42.4	28.2	62.7	41.7
	5.50	4.34	2.89	8.17	5.44	14.3	9.52	23.0	15.3	35.0	23.3	51.8	34.5
	6.00	3.65	2.43	6.87	4.57	12.0	8.00	19.4	12.9	29.4	19.6	43.6	29.0
	6.50	3.11	2.07	5.85	3.89	10.2	6.81	16.5	11.0	25.1	16.7	37.1	24.7
	7.00	2.68	1.78	5.05	3.36	8.83	5.88	14.2	9.46	21.6	14.4	32.0	21.3
	7.50	2.33	1.55	4.40	2.92	7.69	5.12	12.4	8.24	18.8	12.5	27.9	18.5
	8.00	2.05	1.36	3.86	2.57	6.76	4.50	10.9	7.24	16.6	11.0	24.5	16.3
	8.50	1.82	1.21	3.42	2.28	5.99	3.98	9.65	6.42	14.7	9.76	21.7	14.4
	9.00	1.62	1.08	3.05	2.03	5.34	3.55	8.60	5.72	13.1	8.70	19.4	12.9
	9.50	1.45	0.967	2.74	1.82	4.79	3.19	7.72	5.14	11.7	7.81	17.4	11.6
	10.0	1.31	0.873	2.47	1.64	4.33	2.88	6.97	4.64	10.6	7.05	15.7	10.4
	10.5	1.19	0.792	2.24	1.49	3.92	2.61	6.32	4.21	9.61	6.40	14.2	9.46
	11.0	1.08	0.722	2.04	1.36	3.58	2.38	5.76	3.83	8.76	5.83	13.0	8.62
	11.5	0.992	0.660	1.87	1.24	3.27	2.18	5.27	3.51	8.01	5.33	11.9	7.89
	12.0	0.911	0.606	1.72	1.14	3.01	2.00	4.84	3.22	7.36	4.90	10.9	7.25
	12.5	0.840	0.559	1.58	1.05	2.77	1.84	4.46	2.97	6.78	4.51	10.0	6.68
	13.0	0.777	0.517	1.46	0.973	2.56	1.70	4.12	2.74	6.27	4.17	9.28	6.17
	13.5	0.720	0.479	1.36	0.903	2.37	1.58	3.82	2.54	5.81	3.87	8.60	5.72
	14.0	0.670	0.445	1.26	0.839	2.21	1.47	3.56	2.37	5.41	3.60	8.00	5.32
	14.5	0.624	0.415	1.18	0.782	2.06	1.37	3.31	2.21	5.04	3.35	7.46	4.96
	15.0	0.583	0.388	1.10	0.731	1.92	1.28	3.10	2.06	4.71	3.13	6.97	4.64
Properties													
P_{wo} , kN		45.5	30.4	122	81.6	138	91.7	154	102	193	128	212	141
P_{wi} , kN/m		893	595	963	642	1030	689	1100	736	1180	783	1250	830
P_{wb} , kN		136	90.7	137	91.0	135	89.9	137	91.2	146	96.8	151	100
P_{fb} , kN		35.7	23.8	42.9	28.6	52.5	34.9	62.9	41.9	72.4	48.2	84.6	56.3
L_p , m		0.539		0.637		0.744		0.847		0.945		1.05	
L_r , m		2.90		3.14		3.29		3.48		3.75		3.99	
$A_g \times 10^2$, mm^2		7.64		10.32		13.21		16.43		20.09		23.95	
$I_x \times 10^4$, mm^4		80.14		171.0		317.8		541.2		869.3		1317.0	
$I_y \times 10^4$, mm^4		8.49		15.92		27.67		44.92		68.31		100.9	
$r_y \times 10$, mm		1.05		1.24		1.45		1.65		1.84		2.05	
r_x / r_y		3.09		3.28		3.38		3.48		3.58		3.62	
$P_{ex} L_{cx}^2$, kN · m^2		1660		3370		6260		10700		17200		26000	
$P_{ey} L_{cy}^2$, kN · m^2		174		313		548		883		1340		1990	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN
IPE Shapes

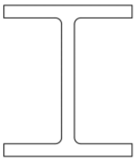
F_y = 235 MPa

Shape		IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	602	401	706	470	827	550	972	647	1140	757	1320	881
	1.00	545	363	651	433	772	514	920	612	1090	724	1270	847
	1.50	482	321	588	391	709	471	859	572	1030	685	1210	806
	2.00	405	269	510	340	628	418	781	520	953	634	1130	752
	2.50	324	215	425	283	538	358	691	460	862	574	1030	688
	3.00	246	164	340	226	445	296	594	395	763	508	928	617
	3.50	182	121	261	174	356	237	498	331	661	440	816	543
	4.00	139	92.6	200	133	276	183	405	270	559	372	703	468
	4.50	110	73.2	158	105	218	145	322	215	463	308	595	396
	5.00	89.1	59.3	128	85.1	176	117	261	174	376	250	492	327
	5.50	73.6	49.0	106	70.3	146	97.0	216	144	311	207	406	270
	6.00	61.8	41.1	88.8	59.1	123	81.5	181	121	261	174	341	227
	6.50	52.7	35.1	75.7	50.4	104	69.5	155	103	223	148	291	194
	7.00	45.4	30.2	65.3	43.4	90.0	59.9	133	88.7	192	128	251	167
	7.50	39.6	26.3	56.8	37.8	78.4	52.2	116	77.2	167	111	219	145
	8.00	34.8	23.1	50.0	33.2	68.9	45.8	102	67.9	147	97.8	192	128
	8.50	30.8	20.5	44.3	29.4	61.0	40.6	90.4	60.1	130	86.6	170	113
	9.00	27.5	18.3	39.5	26.3	54.4	36.2	80.6	53.6	116	77.3	152	101
	9.50	24.7	16.4	35.4	23.6	48.9	32.5	72.3	48.1	104	69.4	136	90.6
	10.0	22.3	14.8	32.0	21.3	44.1	29.3	65.3	43.4	94.1	62.6	123	81.8
	10.5	20.2	13.4	29.0	19.3	40.0	26.6	59.2	39.4	85.3	56.8	112	74.2
	11.0	18.4	12.2	26.4	17.6	36.4	24.3	54.0	35.9	77.8	51.7	102	67.6
	11.5	16.8	11.2	24.2	16.1	33.3	22.2	49.4	32.8	71.1	47.3	93.0	61.8
	12.0	15.5	10.3	22.2	14.8	30.6	20.4	45.3	30.2	65.3	43.5	85.4	56.8
	12.5	14.2	9.48	20.5	13.6	28.2	18.8	41.8	27.8	60.2	40.1	78.7	52.3
	13.0	13.2	8.77	18.9	12.6	26.1	17.4	38.6	25.7	55.7	37.0	72.7	48.4
	13.5	12.2	8.13	17.5	11.7	24.2	16.1	35.8	23.8	51.6	34.3	67.5	44.9
	14.0	11.4	7.56	16.3	10.9	22.5	15.0	33.3	22.2	48.0	31.9	62.7	41.7
	14.5	10.6	7.05	15.2	10.1	21.0	14.0	31.1	20.7	44.7	29.8	58.5	38.9
	15.0	9.90	6.58	14.2	9.46	19.6	13.0	29.0	19.3	41.8	27.8	54.6	36.4
Properties													
P_{wo}, kN		270	180	294	196	362	241	391	261	429	286	520	347
P_{wi}, kN/m		1320	877	1390	924	1460	971	1550	1030	1670	1110	1760	1180
P_{wb}, kN		164	109	171	114	185	123	194	129	213	142	231	153
P_{fb}, kN		95.5	63.5	112	74.4	127	84.5	138	91.5	151	101	175	116
L_p, m		1.15		1.27		1.38		1.55		1.72		1.82	
L_r, m		4.32		4.63		5.03		5.35		5.73		6.06	
$A_g \times 10^2$, mm^2		28.48		33.37		39.12		45.95		53.81		62.61	
$I_x \times 10^4$, mm^4		1943		2772		3892		5790		8356		11770	
$I_y \times 10^4$, mm^4		142.4		204.9		283.6		419.9		603.8		788.1	
$r_y \times 10$, mm		2.24		2.48		2.69		3.02		3.35		3.55	
r_x / r_y		3.69		3.67		3.71		3.72		3.72		3.86	
$P_{ex} L_{cx}^2$, kN · m^2		38400		54700		76800		114000		165000		232000	
$P_{ey} L_{cy}^2$, kN · m^2		2820		4050		5590		8270		11900		15600	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

Table C.1 Continued.



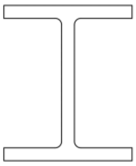
Available Strength in Axial Compression, kN
IPE Shapes

F_y = 235 MPa

Shape		IPE 360		IPE 400		IPE 450		IPE 500		IPE 550		IPE 600	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1540	1020	1790	1190	2090	1390	2440	1630	2840	1890	3300	2200
	1.00	1490	989	1730	1150	2030	1350	2380	1580	2770	1840	3220	2150
	1.50	1420	947	1660	1110	1960	1300	2300	1530	2690	1790	3130	2080
	2.00	1340	891	1570	1050	1860	1240	2190	1460	2570	1710	3010	2000
	2.50	1240	824	1460	973	1740	1160	2070	1370	2430	1620	2860	1900
	3.00	1130	749	1340	892	1600	1070	1920	1280	2270	1510	2680	1790
	3.50	1010	669	1210	804	1460	971	1760	1170	2090	1390	2490	1660
	4.00	883	588	1070	713	1310	869	1590	1060	1900	1260	2290	1520
	4.50	762	507	936	622	1150	767	1420	944	1710	1140	2070	1380
	5.00	646	430	804	535	1000	668	1250	831	1520	1010	1860	1240
	5.50	538	358	679	452	860	572	1090	722	1330	883	1650	1100
	6.00	452	301	570	379	726	483	929	618	1150	764	1440	961
	6.50	385	256	486	323	619	412	791	526	981	653	1250	831
	7.00	332	221	419	279	533	355	682	454	846	563	1080	717
	7.50	289	193	365	243	465	309	594	395	737	490	938	624
	8.00	254	169	321	213	408	272	522	348	648	431	825	549
	8.50	225	150	284	189	362	241	463	308	574	382	731	486
	9.00	201	134	253	169	323	215	413	275	512	341	652	434
	9.50	180	120	227	151	290	193	370	246	459	306	585	389
	10.0	163	108	205	137	261	174	334	222	415	276	528	351
	10.5	148	98.2	186	124	237	158	303	202	376	250	479	319
	11.0	135	89.5	170	113	216	144	276	184	343	228	436	290
	11.5	123	81.9	155	103	198	131	253	168	314	209	399	266
	12.0	113	75.2	143	94.9	181	121	232	154	288	192	367	244
	12.5	104	69.3	131	87.4	167	111	214	142	265	177	338	225
	13.0	96.3	64.1	121	80.8	155	103	198	132	245	163	312	208
	13.5	89.3	59.4	113	75.0	143	95.4	183	122	228	151	290	193
	14.0	83.0	55.3	105	69.7	133	88.7	171	113	212	141	269	179
	14.5	77.4	51.5	97.7	65.0	124	82.7	159	106	197	131	251	167
	15.0	72.3	48.1	91.3	60.7	116	77.3	149	98.8	184	123	235	156
Properties													
P_{wo}, kN		577	385	697	465	786	524	887	591	1070	716	1210	808
P_{wi}, kN/m		1880	1250	2020	1350	2210	1470	2400	1600	2610	1740	2820	1880
P_{wb}, kN		254	169	285	189	325	216	369	245	433	288	498	331
P_{fb}, kN		213	142	241	160	282	187	338	225	391	260	477	317
L_p, m		1.95		2.03		2.12		2.21		2.28		2.39	
L_r, m		6.40		6.65		6.81		7.06		7.33		7.66	
$A_g \times 10^2$, mm^2		72.73		84.46		98.82		115.5		134.4		156.0	
$I_x \times 10^4$, mm^4		16270		23130		33740		48200		67120		92080	
$I_y \times 10^4$, mm^4		1043		1318		1676		2142		2668		3387	
$r_y \times 10$, mm		3.79		3.95		4.12		4.31		4.45		4.66	
r_x/r_y		3.94		4.19		4.49		4.74		5.02		5.21	
$P_{ex} L_{cx}^2$, kN · m^2		321000		457000		666000		952000		1330000		1820000	
$P_{ey} L_{cy}^2$, kN · m^2		20600		26000		33100		42400		52500		66900	

LRFD	ASD	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.1 Continued.



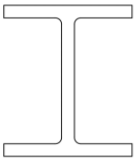
Available Strength in Axial Compression, kN

IPE Shapes

F_y = 275 MPa

Shape		**IPE 80**		**IPE 100**		**IPE 120**		**IPE 140**		**IPE 160**		**IPE 180**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	189	126	255	170	327	218	407	271	497	331	593	394
	1.00	111	74.1	175	116	248	165	328	218	419	278	516	343
	1.50	58.3	38.8	105	70.0	175	117	251	167	337	225	434	289
	2.00	32.8	21.8	61.8	41.1	108	72.0	173	115	250	166	340	226
	2.50	21.0	14.0	39.6	26.3	69.2	46.1	112	74.2	170	113	249	166
	3.00	14.6	9.70	27.5	18.3	48.1	32.0	77.4	51.5	118	78.3	174	116
	3.50	10.7	7.13	20.2	13.4	35.3	23.5	56.9	37.9	86.5	57.6	128	85.2
	4.00	8.20	5.46	15.5	10.3	27.0	18.0	43.6	29.0	66.2	44.1	98.0	65.2
	4.50	6.48	4.31	12.2	8.12	21.4	14.2	34.4	22.9	52.3	34.8	77.4	51.5
	5.00	5.25	3.49	9.89	6.58	17.3	11.5	27.9	18.5	42.4	28.2	62.7	41.7
	5.50	4.34	2.89	8.17	5.44	14.3	9.52	23.0	15.3	35.0	23.3	51.8	34.5
	6.00	3.65	2.43	6.87	4.57	12.0	8.00	19.4	12.9	29.4	19.6	43.6	29.0
	6.50	3.11	2.07	5.85	3.89	10.2	6.81	16.5	11.0	25.1	16.7	37.1	24.7
	7.00	2.68	1.78	5.05	3.36	8.83	5.88	14.2	9.46	21.6	14.4	32.0	21.3
	7.50	2.33	1.55	4.40	2.92	7.69	5.12	12.4	8.24	18.8	12.5	27.9	18.5
	8.00	2.05	1.36	3.86	2.57	6.76	4.50	10.9	7.24	16.6	11.0	24.5	16.3
	8.50	1.82	1.21	3.42	2.28	5.99	3.98	9.65	6.42	14.7	9.76	21.7	14.4
	9.00	1.62	1.08	3.05	2.03	5.34	3.55	8.60	5.72	13.1	8.70	19.4	12.9
	9.50	1.45	0.967	2.74	1.82	4.79	3.19	7.72	5.14	11.7	7.81	17.4	11.6
	10.0	1.31	0.873	2.47	1.64	4.33	2.88	6.97	4.64	10.6	7.05	15.7	10.4
	10.5	1.19	0.792	2.24	1.49	3.92	2.61	6.32	4.21	9.61	6.40	14.2	9.46
	11.0	1.08	0.722	2.04	1.36	3.58	2.38	5.76	3.83	8.76	5.83	13.0	8.62
	11.5	0.992	0.660	1.87	1.24	3.27	2.18	5.27	3.51	8.01	5.33	11.9	7.89
	12.0	0.911	0.606	1.72	1.14	3.01	2.00	4.84	3.22	7.36	4.90	10.9	7.25
	12.5	0.840	0.559	1.58	1.05	2.77	1.84	4.46	2.97	6.78	4.51	10.0	6.68
	13.0	0.777	0.517	1.46	0.973	2.56	1.70	4.12	2.74	6.27	4.17	9.28	6.17
	13.5	0.720	0.479	1.36	0.903	2.37	1.58	3.82	2.54	5.81	3.87	8.60	5.72
	14.0	0.670	0.445	1.26	0.839	2.21	1.47	3.56	2.37	5.41	3.60	8.00	5.32
	14.5	0.624	0.415	1.18	0.782	2.06	1.37	3.31	2.21	5.04	3.35	7.46	4.96
	15.0	0.583	0.388	1.10	0.731	1.92	1.28	3.10	2.06	4.71	3.13	6.97	4.64
Properties													
P_{wo}, kN		53.3	35.5	143	95.5	161	107	180	120	225	150	248	165
P_{wi}, kN/m		1050	697	1130	752	1210	807	1290	862	1380	917	1460	972
P_{wb}, kN		147	98.1	148	98.5	146	97.2	148	98.6	157	105	163	109
P_{fb}, kN		41.8	27.8	50.3	33.4	61.4	40.8	73.6	49.0	84.7	56.4	99.0	65.9
L_p, m		0.498		0.589		0.688		0.783		0.873		0.973	
L_r, m		2.50		2.72		2.86		3.04		3.28		3.51	
$A_g \times 10^2$, mm^2		7.64		10.32		13.21		16.43		20.09		23.95	
$I_x \times 10^4$, mm^4		80.14		171.0		317.8		541.2		869.3		1317.0	
$I_y \times 10^4$, mm^4		8.49		15.92		27.67		44.92		68.31		100.9	
$r_y \times 10$, mm		1.05		1.24		1.45		1.65		1.84		2.05	
r_x / r_y		3.09		3.28		3.38		3.48		3.58		3.62	
$P_{ex} L_{cx}^2$, kN · m^2		1660		3370		6260		10700		17200		26000	
$P_{ey} L_{cy}^2$, kN · m^2		174		313		548		883		1340		1990	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.

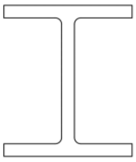


Available Strength in Axial Compression, kN
IPE Shapes

F_y = 275 MPa

Shape		**IPE 200**		**IPE 220**		**IPE 240**		**IPE 270**		**IPE 300**		**IPE 330**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	705	469	826	550	968	644	1140	757	1330	886	1550	1030
	1.00	628	418	751	500	893	594	1070	710	1260	841	1480	984
	1.50	543	361	667	444	808	537	985	655	1180	788	1400	929
	2.00	443	295	565	376	701	467	881	586	1080	720	1290	857
	2.50	341	227	457	304	585	389	763	507	963	640	1160	772
	3.00	247	165	352	234	469	312	640	426	834	555	1020	680
	3.50	182	121	261	174	360	240	520	346	705	469	879	585
	4.00	139	92.6	200	133	276	183	408	272	580	386	739	492
	4.50	110	73.2	158	105	218	145	322	215	465	309	607	404
	5.00	89.1	59.3	128	85.1	176	117	261	174	376	250	492	327
	5.50	73.6	49.0	106	70.3	146	97.0	216	144	311	207	406	270
	6.00	61.8	41.1	88.8	59.1	123	81.5	181	121	261	174	341	227
	6.50	52.7	35.1	75.7	50.4	104	69.5	155	103	223	148	291	194
	7.00	45.4	30.2	65.3	43.4	90.0	59.9	133	88.7	192	128	251	167
	7.50	39.6	26.3	56.8	37.8	78.4	52.2	116	77.2	167	111	219	145
	8.00	34.8	23.1	50.0	33.2	68.9	45.8	102	67.9	147	97.8	192	128
	8.50	30.8	20.5	44.3	29.4	61.0	40.6	90.4	60.1	130	86.6	170	113
	9.00	27.5	18.3	39.5	26.3	54.4	36.2	80.6	53.6	116	77.3	152	101
	9.50	24.7	16.4	35.4	23.6	48.9	32.5	72.3	48.1	104	69.4	136	90.6
	10.0	22.3	14.8	32.0	21.3	44.1	29.3	65.3	43.4	94.1	62.6	123	81.8
	10.5	20.2	13.4	29.0	19.3	40.0	26.6	59.2	39.4	85.3	56.8	112	74.2
	11.0	18.4	12.2	26.4	17.6	36.4	24.3	54.0	35.9	77.8	51.7	102	67.6
	11.5	16.8	11.2	24.2	16.1	33.3	22.2	49.4	32.8	71.1	47.3	93.0	61.8
	12.0	15.5	10.3	22.2	14.8	30.6	20.4	45.3	30.2	65.3	43.5	85.4	56.8
	12.5	14.2	9.48	20.5	13.6	28.2	18.8	41.8	27.8	60.2	40.1	78.7	52.3
	13.0	13.2	8.77	18.9	12.6	26.1	17.4	38.6	25.7	55.7	37.0	72.7	48.4
	13.5	12.2	8.13	17.5	11.7	24.2	16.1	35.8	23.8	51.6	34.3	67.5	44.9
	14.0	11.4	7.56	16.3	10.9	22.5	15.0	33.3	22.2	48.0	31.9	62.7	41.7
	14.5	10.6	7.05	15.2	10.1	21.0	14.0	31.1	20.7	44.7	29.8	58.5	38.9
	15.0	9.90	6.58	14.2	9.46	19.6	13.0	29.0	19.3	41.8	27.8	54.6	36.4
							Properties						
P_{wo}, kN		316	210	344	229	423	282	457	305	502	335	608	406
P_{wi}, kN/m		1540	1030	1620	1080	1710	1140	1820	1210	1950	1300	2060	1370
P_{wb}, kN		177	118	185	123	201	133	210	140	231	153	249	166
P_{fb}, kN		112	74.4	131	87.1	149	98.8	161	107	177	118	205	136
L_p, m		1.06		1.18		1.28		1.43		1.59		1.68	
L_r, m		3.80		4.08		4.44		4.74		5.10		5.40	
$A_g \times 10^2$, mm^2		28.48		33.37		39.12		45.95		53.81		62.61	
$I_x \times 10^4$, mm^4		1943		2772		3892		5790		8356		11770	
$I_y \times 10^4$, mm^4		142.4		204.9		283.6		419.9		603.8		788.1	
$r_y \times 10$, mm		2.24		2.48		2.69		3.02		3.35		3.55	
r_x/r_y		3.69		3.67		3.71		3.72		3.72		3.86	
$P_{ex} L_{cx}^2$, kN · m^2		38400		54700		76800		114000		165000		232000	
$P_{ey} L_{cy}^2$, kN · m^2		2820		4050		5590		8270		11900		15600	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN
IPE Shapes

F_y = 275 MPa

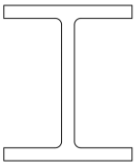
Shape		IPE 360		IPE 400		IPE 450^c		IPE 500^c		IPE 550^c		IPE 600^c	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1800	1200	2090	1390	2450	1630	2860	1900	3330	2210	3860	2570
	1.00	1730	1150	2010	1340	2360	1570	2750	1830	3200	2130	3710	2470
	1.50	1640	1090	1920	1280	2260	1510	2660	1770	3100	2060	3600	2400
	2.00	1530	1020	1800	1200	2130	1420	2520	1680	2960	1970	3460	2300
	2.50	1400	929	1650	1100	1970	1310	2350	1560	2770	1840	3260	2170
	3.00	1250	831	1490	994	1800	1190	2160	1430	2550	1700	3030	2020
	3.50	1090	728	1320	880	1610	1070	1950	1290	2320	1540	2780	1850
	4.00	940	626	1150	765	1410	939	1730	1150	2080	1380	2510	1670
	4.50	791	526	981	653	1220	812	1510	1010	1830	1220	2240	1490
	5.00	651	433	821	546	1040	689	1300	868	1590	1060	1970	1310
	5.50	538	358	679	452	864	575	1110	735	1360	908	1710	1140
	6.00	452	301	570	379	726	483	929	618	1150	766	1470	975
	6.50	385	256	486	323	619	412	791	526	981	653	1250	831
	7.00	332	221	419	279	533	355	682	454	846	563	1080	717
	7.50	289	193	365	243	465	309	594	395	737	490	938	624
	8.00	254	169	321	213	408	272	522	348	648	431	825	549
	8.50	225	150	284	189	362	241	463	308	574	382	731	486
	9.00	201	134	253	169	323	215	413	275	512	341	652	434
	9.50	180	120	227	151	290	193	370	246	459	306	585	389
	10.0	163	108	205	137	261	174	334	222	415	276	528	351
	10.5	148	98.2	186	124	237	158	303	202	376	250	479	319
	11.0	135	89.5	170	113	216	144	276	184	343	228	436	290
	11.5	123	81.9	155	103	198	131	253	168	314	209	399	266
	12.0	113	75.2	143	94.9	181	121	232	154	288	192	367	244
	12.5	104	69.3	131	87.4	167	111	214	142	265	177	338	225
	13.0	96.3	64.1	121	80.8	155	103	198	132	245	163	312	208
	13.5	89.3	59.4	113	75.0	143	95.4	183	122	228	151	290	193
	14.0	83.0	55.3	105	69.7	133	88.7	171	113	212	141	269	179
	14.5	77.4	51.5	97.7	65.0	124	82.7	159	106	197	131	251	167
	15.0	72.3	48.1	91.3	60.7	116	77.3	149	98.8	184	123	235	156
Properties													
P_{wo} , kN		675	450	816	544	920	614	1040	692	1260	838	1420	946
P_{wi} , kN/m		2200	1470	2370	1580	2590	1720	2810	1870	3050	2030	3300	2200
P_{wb} , kN		275	183	308	205	351	234	399	266	469	312	539	358
P_{fb} , kN		249	166	282	188	330	219	396	263	458	304	558	372
L_p , m		1.80		1.87		1.96		2.05		2.11		2.21	
L_r , m		5.71		5.93		6.10		6.33		6.58		6.88	
$A_g \times 10^2$, mm^2		72.73		84.46		98.82		115.5		134.4		156.0	
$I_x \times 10^4$, mm^4		16270		23130		33740		48200		67120		92080	
$I_y \times 10^4$, mm^4		1043		1318		1676		2142		2668		3387	
$r_y \times 10$, mm		3.79		3.95		4.12		4.31		4.45		4.66	
r_x / r_y		3.94		4.19		4.49		4.74		5.02		5.21	
$P_{ex} L_{cx}^2$, kN · m^2		321000		457000		666000		952000		1330000		1820000	
$P_{ey} L_{cy}^2$, kN · m^2		20600		26000		33100		42400		52500		66900	

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

Note: Tabulated values in gray indicate L_c / r_y equal to or greater than 200.

^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.

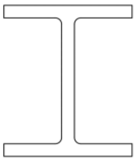


Available Strength in Axial Compression, kN
IPE Shapes

F_y = 355 MPa

Shape		IPE 80		IPE 100		IPE 120		IPE 140		IPE 160		IPE 180	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	244	162	330	219	422	281	525	349	642	427	765	509
	1.00	123	82.1	202	134	295	196	398	265	514	342	640	426
	1.50	58.3	38.8	105	70.0	189	125	282	187	389	259	511	340
	2.00	32.8	21.8	61.8	41.1	108	72.0	174	116	264	175	374	249
	2.50	21.0	14.0	39.6	26.3	69.2	46.1	112	74.2	170	113	251	167
	3.00	14.6	9.70	27.5	18.3	48.1	32.0	77.4	51.5	118	78.3	174	116
	3.50	10.7	7.13	20.2	13.4	35.3	23.5	56.9	37.9	86.5	57.6	128	85.2
	4.00	8.20	5.46	15.5	10.3	27.0	18.0	43.6	29.0	66.2	44.1	98.0	65.2
	4.50	6.48	4.31	12.2	8.12	21.4	14.2	34.4	22.9	52.3	34.8	77.4	51.5
	5.00	5.25	3.49	9.89	6.58	17.3	11.5	27.9	18.5	42.4	28.2	62.7	41.7
	5.50	4.34	2.89	8.17	5.44	14.3	9.52	23.0	15.3	35.0	23.3	51.8	34.5
	6.00	3.65	2.43	6.87	4.57	12.0	8.00	19.4	12.9	29.4	19.6	43.6	29.0
	6.50	3.11	2.07	5.85	3.89	10.2	6.81	16.5	11.0	25.1	16.7	37.1	24.7
	7.00	2.68	1.78	5.05	3.36	8.83	5.88	14.2	9.46	21.6	14.4	32.0	21.3
	7.50	2.33	1.55	4.40	2.92	7.69	5.12	12.4	8.24	18.8	12.5	27.9	18.5
	8.00	2.05	1.36	3.86	2.57	6.76	4.50	10.9	7.24	16.6	11.0	24.5	16.3
	8.50	1.82	1.21	3.42	2.28	5.99	3.98	9.65	6.42	14.7	9.76	21.7	14.4
	9.00	1.62	1.08	3.05	2.03	5.34	3.55	8.60	5.72	13.1	8.70	19.4	12.9
	9.50	1.45	0.967	2.74	1.82	4.79	3.19	7.72	5.14	11.7	7.81	17.4	11.6
	10.0	1.31	0.873	2.47	1.64	4.33	2.88	6.97	4.64	10.6	7.05	15.7	10.4
	10.5	1.19	0.792	2.24	1.49	3.92	2.61	6.32	4.21	9.61	6.40	14.2	9.46
	11.0	1.08	0.722	2.04	1.36	3.58	2.38	5.76	3.83	8.76	5.83	13.0	8.62
	11.5	0.992	0.660	1.87	1.24	3.27	2.18	5.27	3.51	8.01	5.33	11.9	7.89
	12.0	0.911	0.606	1.72	1.14	3.01	2.00	4.84	3.22	7.36	4.90	10.9	7.25
	12.5	0.840	0.559	1.58	1.05	2.77	1.84	4.46	2.97	6.78	4.51	10.0	6.68
	13.0	0.777	0.517	1.46	0.973	2.56	1.70	4.12	2.74	6.27	4.17	9.28	6.17
	13.5	0.720	0.479	1.36	0.903	2.37	1.58	3.82	2.54	5.81	3.87	8.60	5.72
	14.0	0.670	0.445	1.26	0.839	2.21	1.47	3.56	2.37	5.41	3.60	8.00	5.32
	14.5	0.624	0.415	1.18	0.782	2.06	1.37	3.31	2.21	5.04	3.35	7.46	4.96
	15.0	0.583	0.388	1.10	0.731	1.92	1.28	3.10	2.06	4.71	3.13	6.97	4.64
Properties													
P_{wo} , kN		68.8	45.9	185	123	208	138	232	155	291	194	320	213
P_{wi} , kN/m		1350	899	1460	970	1560	1040	1670	1110	1780	1180	1880	1250
P_{wb} , kN		168	111	168	112	166	110	168	112	179	119	186	123
P_{fb} , kN		54.0	35.9	64.9	43.2	79.3	52.7	95.1	63.3	109	72.8	128	85.0
L_p , m		0.439		0.518		0.606		0.689		0.769		0.856	
L_r , m		1.98		2.16		2.30		2.47		2.68		2.87	
$A_g \times 10^2$, mm^2		7.64		10.32		13.21		16.43		20.09		23.95	
$I_x \times 10^4$, mm^4		80.14		171.0		317.8		541.2		869.3		1317.0	
$I_y \times 10^4$, mm^4		8.49		15.92		27.67		44.92		68.31		100.9	
$r_y \times 10$, mm		1.05		1.24		1.45		1.65		1.84		2.05	
r_x / r_y		3.09		3.28		3.38		3.48		3.58		3.62	
$P_{ex} L_{cx}^2$, kN · m^2		1660		3370		6260		10700		17200		26000	
$P_{ey} L_{cy}^2$, kN · m^2		174		313		548		883		1340		1990	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN

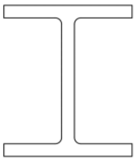
IPE Shapes

F_y = 355 MPa

Shape		IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330^c	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	910	605	1070	709	1250	832	1470	977	1720	1140	2000	1330
	1.00	783	521	943	628	1130	749	1350	899	1610	1070	1880	1250
	1.50	649	432	810	539	989	658	1220	811	1480	984	1750	1160
	2.00	499	332	653	435	824	549	1060	702	1310	875	1580	1050
	2.50	356	237	496	330	652	434	876	583	1130	752	1380	916
	3.00	247	165	355	236	490	326	698	465	940	625	1170	777
	3.50	182	121	261	174	360	240	533	355	756	503	962	640
	4.00	139	92.6	200	133	276	183	408	272	588	391	768	511
	4.50	110	73.2	158	105	218	145	322	215	465	309	607	404
	5.00	89.1	59.3	128	85.1	176	117	261	174	376	250	492	327
	5.50	73.6	49.0	106	70.3	146	97.0	216	144	311	207	406	270
	6.00	61.8	41.1	88.8	59.1	123	81.5	181	121	261	174	341	227
	6.50	52.7	35.1	75.7	50.4	104	69.5	155	103	223	148	291	194
	7.00	45.4	30.2	65.3	43.4	90.0	59.9	133	88.7	192	128	251	167
	7.50	39.6	26.3	56.8	37.8	78.4	52.2	116	77.2	167	111	219	145
	8.00	34.8	23.1	50.0	33.2	68.9	45.8	102	67.9	147	97.8	192	128
	8.50	30.8	20.5	44.3	29.4	61.0	40.6	90.4	60.1	130	86.6	170	113
	9.00	27.5	18.3	39.5	26.3	54.4	36.2	80.6	53.6	116	77.3	152	101
	9.50	24.7	16.4	35.4	23.6	48.9	32.5	72.3	48.1	104	69.4	136	90.6
	10.0	22.3	14.8	32.0	21.3	44.1	29.3	65.3	43.4	94.1	62.6	123	81.8
	10.5	20.2	13.4	29.0	19.3	40.0	26.6	59.2	39.4	85.3	56.8	112	74.2
	11.0	18.4	12.2	26.4	17.6	36.4	24.3	54.0	35.9	77.8	51.7	102	67.6
	11.5	16.8	11.2	24.2	16.1	33.3	22.2	49.4	32.8	71.1	47.3	93.0	61.8
	12.0	15.5	10.3	22.2	14.8	30.6	20.4	45.3	30.2	65.3	43.5	85.4	56.8
	12.5	14.2	9.48	20.5	13.6	28.2	18.8	41.8	27.8	60.2	40.1	78.7	52.3
	13.0	13.2	8.77	18.9	12.6	26.1	17.4	38.6	25.7	55.7	37.0	72.7	48.4
	13.5	12.2	8.13	17.5	11.7	24.2	16.1	35.8	23.8	51.6	34.3	67.5	44.9
	14.0	11.4	7.56	16.3	10.9	22.5	15.0	33.3	22.2	48.0	31.9	62.7	41.7
	14.5	10.6	7.05	15.2	10.1	21.0	14.0	31.1	20.7	44.7	29.8	58.5	38.9
	15.0	9.90	6.58	14.2	9.46	19.6	13.0	29.0	19.3	41.8	27.8	54.6	36.4
Properties													
P_{wo} , kN		408	272	444	296	546	364	590	394	648	432	785	524
P_{wi} , kN/m		1990	1330	2090	1400	2200	1470	2340	1560	2520	1680	2660	1780
P_{wb} , kN		201	134	210	140	228	152	238	159	262	174	283	189
P_{fb} , kN		144	96.0	169	112	192	128	208	138	229	152	264	176
L_p , m		0.936		1.04		1.12		1.26		1.40		1.48	
L_r , m		3.11		3.36		3.65		3.94		4.27		4.51	
$A_g \times 10^2$, mm^2		28.48		33.37		39.12		45.95		53.81		62.61	
$I_x \times 10^4$, mm^4		1943		2772		3892		5790		8356		11770	
$I_y \times 10^4$, mm^4		142.4		204.9		283.6		419.9		603.8		788.1	
$r_y \times 10$, mm		2.24		2.48		2.69		3.02		3.35		3.55	
r_x / r_y		3.69		3.67		3.71		3.72		3.72		3.86	
$P_{ex} L_{cx}^2$, kN · m^2		38400		54700		76800		114000		165000		232000	
$P_{ey} L_{cy}^2$, kN · m^2		2820		4050		5590		8270		11900		15600	

LRFD	ASD	Note: Tabulated values in gray indicate L_c / r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.



Available Strength in Axial Compression, kN
IPE Shapes

F_y = 355 MPa

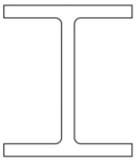
Shape		IPE 360^c		IPE 400^c		IPE 450^c		IPE 500^c		IPE 550^c		IPE 600^c	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2320	1550	2700	1800	3160	2100	3690	2460	4290	2860	4980	3320
	1.00	2190	1460	2540	1690	2940	1960	3410	2270	3970	2640	4590	3050
	1.50	2070	1370	2400	1600	2800	1860	3270	2170	3810	2530	4420	2940
	2.00	1880	1250	2220	1480	2620	1740	3070	2040	3590	2390	4200	2790
	2.50	1670	1110	2000	1330	2390	1590	2840	1890	3340	2220	3920	2610
	3.00	1450	965	1750	1160	2120	1410	2560	1700	3050	2030	3610	2400
	3.50	1220	814	1490	994	1830	1220	2250	1490	2700	1790	3260	2170
	4.00	1000	668	1250	830	1550	1030	1930	1280	2340	1560	2860	1900
	4.50	804	535	1010	675	1290	856	1620	1080	1990	1320	2470	1640
	5.00	651	433	821	546	1050	696	1340	890	1660	1100	2100	1390
	5.50	538	358	679	452	864	575	1110	735	1370	912	1740	1160
	6.00	452	301	570	379	726	483	929	618	1150	766	1470	975
	6.50	385	256	486	323	619	412	791	526	981	653	1250	831
	7.00	332	221	419	279	533	355	682	454	846	563	1080	717
	7.50	289	193	365	243	465	309	594	395	737	490	938	624
	8.00	254	169	321	213	408	272	522	348	648	431	825	549
	8.50	225	150	284	189	362	241	463	308	574	382	731	486
	9.00	201	134	253	169	323	215	413	275	512	341	652	434
	9.50	180	120	227	151	290	193	370	246	459	306	585	389
	10.0	163	108	205	137	261	174	334	222	415	276	528	351
	10.5	148	98.2	186	124	237	158	303	202	376	250	479	319
	11.0	135	89.5	170	113	216	144	276	184	343	228	436	290
	11.5	123	81.9	155	103	198	131	253	168	314	209	399	266
	12.0	113	75.2	143	94.9	181	121	232	154	288	192	367	244
	12.5	104	69.3	131	87.4	167	111	214	142	265	177	338	225
	13.0	96.3	64.1	121	80.8	155	103	198	132	245	163	312	208
	13.5	89.3	59.4	113	75.0	143	95.4	183	122	228	151	290	193
	14.0	83.0	55.3	105	69.7	133	88.7	171	113	212	141	269	179
	14.5	77.4	51.5	97.7	65.0	124	82.7	159	106	197	131	251	167
	15.0	72.3	48.1	91.3	60.7	116	77.3	149	98.8	184	123	235	156
Properties													
P_{wo}, kN		872	581	1050	702	1190	792	1340	893	1620	1080	1830	1220
P_{wi}, kN/m		2840	1890	3050	2040	3340	2220	3620	2410	3940	2630	4260	2840
P_{wb}, kN		312	208	350	233	399	266	453	302	532	354	612	407
P_{fb}, kN		322	214	364	242	426	283	511	340	591	393	721	480
L_p, m		1.58		1.65		1.72		1.80		1.86		1.95	
L_r, m		4.78		4.98		5.14		5.35		5.56		5.82	
$A_g \times 10^2$, mm^2		72.73		84.46		98.82		115.5		134.4		156.0	
$I_x \times 10^4$, mm^4		16270		23130		33740		48200		67120		92080	
$I_y \times 10^4$, mm^4		1043		1318		1676		2142		2668		3387	
$r_y \times 10$, mm		3.79		3.95		4.12		4.31		4.45		4.66	
r_x / r_y		3.94		4.19		4.49		4.74		5.02		5.21	
$P_{ex} L_{cx}^2$, kN · m^2		321000		457000		666000		952000		1330000		1820000	
$P_{ey} L_{cy}^2$, kN · m^2		20600		26000		33100		42400		52500		66900	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.



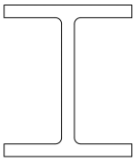
Available Strength in Axial Compression, kN
IPEA Shapes

F_y = 235 MPa

Shape		IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	135	89.8	186	124	233	155	283	188	342	228	414	276
	1.00	85.1	56.6	133	88.4	182	121	236	157	295	196	368	245
	1.50	47.8	31.8	87.4	58.2	134	89.0	188	125	245	163	317	211
	2.00	26.9	17.9	50.9	33.9	86.6	57.6	136	90.6	189	126	258	171
	2.50	17.2	11.4	32.6	21.7	55.4	36.9	90.9	60.5	135	89.8	197	131
	3.00	11.9	7.95	22.6	15.1	38.5	25.6	63.1	42.0	93.8	62.4	142	94.8
	3.50	8.78	5.84	16.6	11.1	28.3	18.8	46.4	30.8	68.9	45.9	105	69.6
	4.00	6.72	4.47	12.7	8.47	21.7	14.4	35.5	23.6	52.8	35.1	80.1	53.3
	4.50	5.31	3.53	10.1	6.69	17.1	11.4	28.0	18.7	41.7	27.7	63.3	42.1
	5.00	4.30	2.86	8.14	5.42	13.9	9.22	22.7	15.1	33.8	22.5	51.3	34.1
	5.50	3.55	2.36	6.73	4.48	11.5	7.62	18.8	12.5	27.9	18.6	42.4	28.2
	6.00	2.99	1.99	5.66	3.76	9.63	6.40	15.8	10.5	23.5	15.6	35.6	23.7
	6.50	2.54	1.69	4.82	3.21	8.20	5.46	13.4	8.94	20.0	13.3	30.3	20.2
	7.00	2.19	1.46	4.16	2.76	7.07	4.71	11.6	7.71	17.2	11.5	26.2	17.4
	7.50	1.91	1.27	3.62	2.41	6.16	4.10	10.1	6.72	15.0	9.99	22.8	15.2
	8.00	1.68	1.12	3.18	2.12	5.41	3.60	8.87	5.90	13.2	8.78	20.0	13.3
	8.50	1.49	0.99	2.82	1.87	4.80	3.19	7.86	5.23	11.7	7.77	17.7	11.8
	9.00	1.33	0.883	2.51	1.67	4.28	2.85	7.01	4.67	10.4	6.93	15.8	10.5
	9.50	1.19	0.793	2.26	1.50	3.84	2.55	6.29	4.19	9.35	6.22	14.2	9.45
	10.0	1.08	0.715	2.04	1.35	3.47	2.31	5.68	3.78	8.44	5.62	12.8	8.53
	10.5	0.975	0.649	1.85	1.23	3.14	2.09	5.15	3.43	7.66	5.09	11.6	7.74
	11.0	0.889	0.591	1.68	1.12	2.86	1.91	4.69	3.12	6.98	4.64	10.6	7.05
	11.5	0.813	0.541	1.54	1.02	2.62	1.74	4.29	2.86	6.38	4.25	9.69	6.45
	12.0	0.747	0.497	1.41	0.941	2.41	1.60	3.94	2.62	5.86	3.90	8.90	5.92
	12.5	0.688	0.458	1.30	0.867	2.22	1.48	3.63	2.42	5.40	3.59	8.20	5.46
	13.0	0.636	0.423	1.20	0.802	2.05	1.36	3.36	2.24	5.00	3.32	7.59	5.05
	13.5	0.59	0.392	1.12	0.743	1.90	1.27	3.12	2.07	4.63	3.08	7.03	4.68
	14.0	0.549	0.365	1.04	0.691	1.77	1.18	2.90	1.93	4.31	2.87	6.54	4.35
	14.5	0.511	0.34	0.968	0.644	1.65	1.10	2.70	1.80	4.02	2.67	6.10	4.06
	15.0	0.478	0.318	0.905	0.602	1.54	1.02	2.52	1.68	3.75	2.50	5.70	3.79
Properties													
P_{wo}, kN		35.7	23.8	49.5	33.0	54.0	36.0	56.3	37.5	70.0	46.7	78.3	52.2
P_{wi}, kN/m		776	517	846	564	893	595	893	595	940	627	1010	674
P_{wb}, kN		89.3	59.4	92.6	61.6	87.0	57.9	72.4	48.2	74.5	49.6	80.6	53.7
P_{fb}, kN		23.3	15.5	29.2	19.4	34.4	22.9	41.5	27.6	46.0	30.6	55.8	37.2
L_p, m		0.534		0.626		0.729		0.847		0.940		1.05	
L_r, m		2.54		2.77		2.88		3.03		3.28		3.54	
$A_g \times 10^2$, mm^2		6.38		8.78		11.03		13.39		16.18		19.58	
$I_x \times 10^4$, mm^4		64.38		141.2		257.4		434.9		689.3		1063	
$I_y \times 10^4$, mm^4		6.85		13.12		22.39		36.42		54.43		81.89	
$r_y \times 10$, mm		1.04		1.22		1.42		1.65		1.83		2.05	
r_x / r_y		3.06		3.29		3.40		3.45		3.57		3.60	
$P_{ex} L_{cx}^2$, kN · m^2		1270		2790		5080		8590		13600		21000	
$P_{ey} L_{cy}^2$, kN · m^2		136		258		439		720		1070		1620	

LRFD	ASD	
$\phi_c = 0.90$	$\Omega_c = 1.67$	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

Table C.1 Continued.

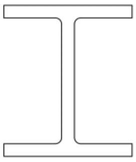


Available Strength in Axial Compression, kN
IPEA Shapes

F_y = 235 MPa

Shape		**IPEA 200**		**IPEA 220**		**IPEA 240**		**IPEA 270**		**IPEA 300**		**IPEA 330**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	496	330	598	398	705	469	828	551	984	655	1160	770
	1.00	449	299	550	366	657	437	784	522	941	626	1110	740
	1.50	396	264	497	330	603	401	732	487	890	592	1060	704
	2.00	332	221	430	286	534	355	665	443	823	548	988	657
	2.50	265	177	357	238	457	304	588	392	744	495	903	601
	3.00	201	134	285	190	377	251	506	337	658	438	809	539
	3.50	148	98.8	218	145	301	200	424	282	569	379	711	473
	4.00	114	75.6	167	111	233	155	345	230	482	320	613	408
	4.50	89.8	59.7	132	87.5	184	122	275	183	398	265	518	344
	5.00	72.7	48.4	107	70.9	149	99.2	223	148	323	215	428	284
	5.50	60.1	40.0	88.1	58.6	123	82.0	184	122	267	178	353	235
	6.00	50.5	33.6	74.0	49.2	104	68.9	155	103	225	149	297	198
	6.50	43.0	28.6	63.1	42.0	88.2	58.7	132	87.6	191	127	253	168
	7.00	37.1	24.7	54.4	36.2	76.1	50.6	114	75.5	165	110	218	145
	7.50	32.3	21.5	47.4	31.5	66.3	44.1	98.9	65.8	144	95.7	190	126
	8.00	28.4	18.9	41.6	27.7	58.2	38.8	86.9	57.8	126	84.1	167	111
	8.50	25.2	16.7	36.9	24.5	51.6	34.3	77.0	51.2	112	74.5	148	98.4
	9.00	22.4	14.9	32.9	21.9	46.0	30.6	68.7	45.7	99.8	66.4	132	87.8
	9.50	20.1	13.4	29.5	19.6	41.3	27.5	61.6	41.0	89.6	59.6	118	78.8
	10.0	18.2	12.1	26.6	17.7	37.3	24.8	55.6	37.0	80.9	53.8	107	71.1
	10.5	16.5	11.0	24.2	16.1	33.8	22.5	50.5	33.6	73.4	48.8	96.9	64.5
	11.0	15.0	10.0	22.0	14.7	30.8	20.5	46.0	30.6	66.8	44.5	88.3	58.8
	11.5	13.7	9.15	20.1	13.4	28.2	18.8	42.1	28.0	61.2	40.7	80.8	53.8
	12.0	12.6	8.40	18.5	12.3	25.9	17.2	38.6	25.7	56.2	37.4	74.2	49.4
	12.5	11.6	7.74	17.1	11.3	23.9	15.9	35.6	23.7	51.8	34.4	68.4	45.5
	13.0	10.8	7.16	15.8	10.5	22.1	14.7	32.9	21.9	47.9	31.8	63.2	42.1
	13.5	9.98	6.64	14.6	9.73	20.5	13.6	30.5	20.3	44.4	29.5	58.6	39.0
	14.0	9.28	6.17	13.6	9.04	19.0	12.7	28.4	18.9	41.3	27.5	54.5	36.3
	14.5	8.65	5.75	12.7	8.43	17.7	11.8	26.5	17.6	38.5	25.6	50.8	33.8
	15.0	8.08	5.38	11.8	7.88	16.6	11.0	24.7	16.5	35.9	23.9	47.5	31.6
							Properties						
P_{wo} , kN		100	67.0	116	77.2	142	94.9	153	102	173	116	214	143
P_{wi} , kN/m		1060	705	1180	783	1220	815	1290	862	1430	956	1530	1020
P_{wb} , kN		84.9	56.5	104	69.3	109	72.8	112	74.6	135	90.0	150	99.8
P_{fb} , kN		64.8	43.1	78.4	52.1	91.1	60.6	100	66.6	112	74.4	132	87.9
L_p , m		1.14		1.26		1.38		1.55		1.71		1.82	
L_r , m		3.87		4.22		4.61		4.96		5.37		5.71	
$A_g \times 10^2, \mathrm{mm}^2$		23.47		28.26		33.31		39.15		46.53		54.74	
$I_x \times 10^4, \mathrm{mm}^4$		1591		2317		3290		4917		7173		10230	
$I_y \times 10^4, \mathrm{mm}^4$		117.2		171.4		240.1		358.0		519.0		685.2	
$r_y \times 10, \mathrm{mm}$		2.23		2.46		2.68		3.02		3.34		3.54	
r_x / r_y		3.69		3.68		3.71		3.71		3.72		3.86	
$P_{ex} L_{cx}^2$, kN · m²		31400		45700		65000		97100		142000		202000	
$P_{ey} L_{cy}^2$, kN · m²		2300		3380		4720		7050		10200		13500	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



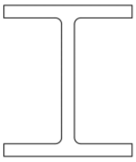
Available Strength in Axial Compression, kN
IPEA Shapes

F_y = 235 MPa

Shape		IPEA 360^c		IPEA 400^c		IPEA 450^c		IPEA 500^c		IPEA 550^c		IPEA 600^c	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1350	900	1550	1030	1810	1200	2140	1420	2480	1650	2900	1930
	1.00	1300	866	1480	983	1710	1140	2010	1340	2320	1550	2710	1800
	1.50	1250	834	1430	949	1660	1100	1960	1300	2260	1510	2650	1760
	2.00	1180	786	1360	904	1590	1060	1880	1250	2180	1450	2560	1700
	2.50	1100	729	1270	847	1500	997	1790	1190	2080	1380	2450	1630
	3.00	998	664	1170	777	1400	931	1680	1120	1960	1310	2330	1550
	3.50	894	595	1060	702	1280	850	1560	1030	1830	1220	2190	1450
	4.00	788	524	939	625	1150	764	1410	939	1690	1120	2040	1350
	4.50	682	454	823	547	1020	678	1260	841	1520	1010	1860	1240
	5.00	581	387	710	472	890	592	1120	743	1360	904	1680	1120
	5.50	486	323	602	401	767	510	975	648	1200	797	1490	994
	6.00	408	272	506	337	650	432	839	558	1040	694	1320	876
	6.50	348	231	431	287	554	368	715	476	896	596	1150	764
	7.00	300	200	372	247	478	318	617	410	772	514	991	659
	7.50	261	174	324	216	416	277	537	357	673	448	863	574
	8.00	230	153	285	189	366	243	472	314	591	393	759	505
	8.50	203	135	252	168	324	215	418	278	524	348	672	447
	9.00	181	121	225	150	289	192	373	248	467	311	600	399
	9.50	163	108	202	134	259	173	335	223	419	279	538	358
	10.0	147	97.8	182	121	234	156	302	201	378	252	486	323
	10.5	133	88.7	165	110	212	141	274	182	343	228	441	293
	11.0	121	80.8	151	100	193	129	250	166	313	208	401	267
	11.5	111	73.9	138	91.7	177	118	228	152	286	190	367	244
	12.0	102	67.9	127	84.2	163	108	210	140	263	175	337	224
	12.5	94.0	62.6	117	77.6	150	99.6	193	129	242	161	311	207
	13.0	86.9	57.8	108	71.7	138	92.1	179	119	224	149	287	191
	13.5	80.6	53.6	100	66.5	128	85.4	166	110	208	138	266	177
	14.0	75.0	49.9	93.0	61.9	119	79.4	154	103	193	128	248	165
	14.5	69.9	46.5	86.7	57.7	111	74.0	144	95.6	180	120	231	154
	15.0	65.3	43.5	81.0	53.9	104	69.2	134	89.4	168	112	216	144
Properties													
P_{wo} , kN		229	153	271	181	305	203	350	234	420	280	478	319
P_{wi} , kN/m		1550	1030	1650	1100	1790	1190	1970	1320	2120	1410	2300	1540
P_{wb} , kN		143	94.9	153	102	172	114	206	137	231	154	271	180
P_{fb} , kN		175	116	190	127	227	151	278	185	326	217	405	269
L_p , m		1.97		2.05		2.15		2.25		2.34		2.45	
L_r , m		6.09		6.30		6.50		6.78		7.06		7.40	
$A_g \times 10^2$, mm^2		63.96		73.10		85.55		101.1		117.3		137.0	
$I_x \times 10^4$, mm^4		14520		20290		29760		42930		59980		82920	
$I_y \times 10^4$, mm^4		944.3		1171		1502		1939		2432		3116	
$r_y \times 10$, mm		3.84		4.00		4.19		4.38		4.55		4.77	
r_x / r_y		3.92		4.17		4.45		4.71		4.97		5.16	
$P_{ex} L_{cx}^2$, kN · m^2		286000		400000		587000		848000		1180000		1640000	
$P_{ey} L_{cy}^2$, kN · m^2		18600		23100		29600		38300		47900		61500	

LRFD	**ASD**	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.

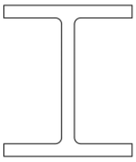


Available Strength in Axial Compression, kN
IPEA Shapes

F_y = 275 MPa

Shape		IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	158	105	217	145	273	182	331	220	400	266	485	322
	1.00	92.1	61.3	147	97.7	204	136	268	178	336	224	422	281
	1.50	47.8	31.8	90.0	59.9	142	94.8	205	136	271	180	355	236
	2.00	26.9	17.9	50.9	33.9	86.6	57.6	141	93.6	200	133	278	185
	2.50	17.2	11.4	32.6	21.7	55.4	36.9	90.9	60.5	135	89.9	204	135
	3.00	11.9	7.95	22.6	15.1	38.5	25.6	63.1	42.0	93.8	62.4	142	94.8
	3.50	8.78	5.84	16.6	11.1	28.3	18.8	46.4	30.8	68.9	45.9	105	69.6
	4.00	6.72	4.47	12.7	8.47	21.7	14.4	35.5	23.6	52.8	35.1	80.1	53.3
	4.50	5.31	3.53	10.1	6.69	17.1	11.4	28.0	18.7	41.7	27.7	63.3	42.1
	5.00	4.30	2.86	8.14	5.42	13.9	9.22	22.7	15.1	33.8	22.5	51.3	34.1
	5.50	3.55	2.36	6.73	4.48	11.5	7.62	18.8	12.5	27.9	18.6	42.4	28.2
	6.00	2.99	1.99	5.66	3.76	9.63	6.40	15.8	10.5	23.5	15.6	35.6	23.7
	6.50	2.54	1.69	4.82	3.21	8.20	5.46	13.4	8.94	20.0	13.3	30.3	20.2
	7.00	2.19	1.46	4.16	2.76	7.07	4.71	11.6	7.71	17.2	11.5	26.2	17.4
	7.50	1.91	1.27	3.62	2.41	6.16	4.10	10.1	6.72	15.0	9.99	22.8	15.2
	8.00	1.68	1.12	3.18	2.12	5.41	3.60	8.87	5.90	13.2	8.78	20.0	13.3
	8.50	1.49	0.99	2.82	1.87	4.80	3.19	7.86	5.23	11.7	7.77	17.7	11.8
	9.00	1.33	0.883	2.51	1.67	4.28	2.85	7.01	4.67	10.4	6.93	15.8	10.5
	9.50	1.19	0.793	2.26	1.50	3.84	2.55	6.29	4.19	9.35	6.22	14.2	9.45
	10.0	1.08	0.715	2.04	1.35	3.47	2.31	5.68	3.78	8.44	5.62	12.8	8.53
	10.5	0.975	0.649	1.85	1.23	3.14	2.09	5.15	3.43	7.66	5.09	11.6	7.74
	11.0	0.889	0.591	1.68	1.12	2.86	1.91	4.69	3.12	6.98	4.64	10.6	7.05
	11.5	0.813	0.541	1.54	1.02	2.62	1.74	4.29	2.86	6.38	4.25	9.69	6.45
	12.0	0.747	0.497	1.41	0.941	2.41	1.60	3.94	2.62	5.86	3.90	8.90	5.92
	12.5	0.688	0.458	1.30	0.867	2.22	1.48	3.63	2.42	5.40	3.59	8.20	5.46
	13.0	0.636	0.423	1.20	0.802	2.05	1.36	3.36	2.24	5.00	3.32	7.59	5.05
	13.5	0.59	0.392	1.12	0.743	1.90	1.27	3.12	2.07	4.63	3.08	7.03	4.68
	14.0	0.549	0.365	1.04	0.691	1.77	1.18	2.90	1.93	4.31	2.87	6.54	4.35
	14.5	0.511	0.34	0.968	0.644	1.65	1.10	2.70	1.80	4.02	2.67	6.10	4.06
	15.0	0.478	0.318	0.905	0.602	1.54	1.02	2.52	1.68	3.75	2.50	5.70	3.79
Properties													
P_{wo}, kN		41.7	27.8	57.9	38.6	63.2	42.1	65.8	43.9	81.9	54.6	91.6	61.1
P_{wi}, kN/m		908	605	990	660	1050	697	1050	697	1100	733	1180	788
P_{wb}, kN		96.6	64.3	100	66.7	94.1	62.6	78.3	52.1	80.6	53.6	87.2	58.0
P_{fb}, kN		27.3	18.2	34.2	22.7	40.2	26.8	48.5	32.3	53.8	35.8	65.4	43.5
L_p, m		0.494		0.579		0.674		0.783		0.869		0.973	
L_r, m		2.20		2.41		2.52		2.68		2.90		3.15	
$A_g \times 10^2$, mm^2		6.38		8.78		11.03		13.39		16.18		19.58	
$I_x \times 10^4$, mm^4		64.38		141.2		257.4		434.9		689.3		1063	
$I_y \times 10^4$, mm^4		6.85		13.12		22.39		36.42		54.43		81.89	
$r_y \times 10$, mm		1.04		1.22		1.42		1.65		1.83		2.05	
r_x / r_y		3.06		3.29		3.40		3.45		3.57		3.60	
$P_{ex} L_{cx}^2$, kN · m^2		1270		2790		5080		8590		13600		21000	
$P_{ey} L_{cy}^2$, kN · m^2		136		258		439		720		1070		1620	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c / r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



Available Strength in Axial Compression, kN
IPEA Shapes

F_y = 275 MPa

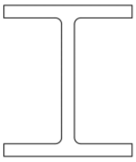
Shape		IPEA 200		IPEA 220		IPEA 240		IPEA 270		IPEA 300^c		IPEA 330^c	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	581	386	699	465	824	549	969	645	1150	766	1350	901
	1.00	517	344	635	423	760	506	909	605	1090	727	1290	858
	1.50	446	297	563	375	687	457	839	558	1020	681	1220	812
	2.00	363	242	476	317	596	396	750	499	934	622	1120	748
	2.50	279	186	383	255	496	330	650	432	831	553	1010	674
	3.00	202	134	294	196	397	264	545	363	719	479	891	593
	3.50	148	98.8	218	145	304	202	443	295	607	404	766	510
	4.00	114	75.6	167	111	233	155	348	231	499	332	643	428
	4.50	89.8	59.7	132	87.5	184	122	275	183	399	266	528	351
	5.00	72.7	48.4	107	70.9	149	99.2	223	148	323	215	428	284
	5.50	60.1	40.0	88.1	58.6	123	82.0	184	122	267	178	353	235
	6.00	50.5	33.6	74.0	49.2	104	68.9	155	103	225	149	297	198
	6.50	43.0	28.6	63.1	42.0	88.2	58.7	132	87.6	191	127	253	168
	7.00	37.1	24.7	54.4	36.2	76.1	50.6	114	75.5	165	110	218	145
	7.50	32.3	21.5	47.4	31.5	66.3	44.1	98.9	65.8	144	95.7	190	126
	8.00	28.4	18.9	41.6	27.7	58.2	38.8	86.9	57.8	126	84.1	167	111
	8.50	25.2	16.7	36.9	24.5	51.6	34.3	77.0	51.2	112	74.5	148	98.4
	9.00	22.4	14.9	32.9	21.9	46.0	30.6	68.7	45.7	99.8	66.4	132	87.8
	9.50	20.1	13.4	29.5	19.6	41.3	27.5	61.6	41.0	89.6	59.6	118	78.8
	10.0	18.2	12.1	26.6	17.7	37.3	24.8	55.6	37.0	80.9	53.8	107	71.1
	10.5	16.5	11.0	24.2	16.1	33.8	22.5	50.5	33.6	73.4	48.8	96.9	64.5
	11.0	15.0	10.0	22.0	14.7	30.8	20.5	46.0	30.6	66.8	44.5	88.3	58.8
	11.5	13.7	9.15	20.1	13.4	28.2	18.8	42.1	28.0	61.2	40.7	80.8	53.8
	12.0	12.6	8.40	18.5	12.3	25.9	17.2	38.6	25.7	56.2	37.4	74.2	49.4
	12.5	11.6	7.74	17.1	11.3	23.9	15.9	35.6	23.7	51.8	34.4	68.4	45.5
	13.0	10.8	7.16	15.8	10.5	22.1	14.7	32.9	21.9	47.9	31.8	63.2	42.1
	13.5	9.98	6.64	14.6	9.73	20.5	13.6	30.5	20.3	44.4	29.5	58.6	39.0
	14.0	9.28	6.17	13.6	9.04	19.0	12.7	28.4	18.9	41.3	27.5	54.5	36.3
	14.5	8.65	5.75	12.7	8.43	17.7	11.8	26.5	17.6	38.5	25.6	50.8	33.8
	15.0	8.08	5.38	11.8	7.88	16.6	11.0	24.7	16.5	35.9	23.9	47.5	31.6
Properties													
P_{wo}, kN		118	78.4	135	90.3	167	111	179	119	203	135	250	167
P_{wi}, kN/m		1240	825	1380	917	1430	953	1510	1010	1680	1120	1790	1190
P_{wb}, kN		91.8	61.1	113	75.0	118	78.7	121	80.7	146	97.3	162	108
P_{fb}, kN		75.8	50.4	91.7	61.0	107	70.9	117	77.9	131	87.1	155	103
L_p, m		1.06		1.17		1.27		1.43		1.59		1.68	
L_r, m		3.44		3.75		4.10		4.43		4.81		5.12	
$A_g \times 10^2$, mm^2		23.47		28.26		33.31		39.15		46.53		54.74	
$I_x \times 10^4$, mm^4		1591		2317		3290		4917		7173		10230	
$I_y \times 10^4$, mm^4		117.2		171.4		240.1		358.0		519.0		685.2	
$r_y \times 10$, mm		2.23		2.46		2.68		3.02		3.34		3.54	
r_x / r_y		3.69		3.68		3.71		3.71		3.72		3.86	
$P_{ex} L_{cx}^2$, kN · m^2		31400		45700		65000		97100		142000		202000	
$P_{ey} L_{cy}^2$, kN · m^2		2300		3380		4720		7050		10200		13500	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.

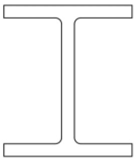


Available Strength in Axial Compression, kN
IPEA Shapes

F_y = 275 MPa

Shape		**IPEA 360^c**		**IPEA 400^c**		**IPEA 450^c**		**IPEA 500^c**		**IPEA 550^c**		**IPEA 600^c**	
Design		ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1580	1050	1810	1200	2120	1410	2500	1660	2900	1930	3390	2260
	1.00	1490	992	1690	1120	1960	1300	2300	1530	2660	1770	3100	2060
	1.50	1430	949	1620	1080	1890	1250	2230	1480	2580	1710	3010	2010
	2.00	1340	892	1530	1020	1790	1190	2120	1410	2470	1640	2900	1930
	2.50	1240	823	1430	949	1680	1120	2000	1330	2340	1550	2760	1830
	3.00	1110	738	1300	867	1550	1030	1860	1240	2180	1450	2590	1720
	3.50	975	649	1160	770	1410	936	1710	1130	2010	1340	2410	1600
	4.00	841	559	1010	672	1240	828	1540	1020	1840	1220	2220	1470
	4.50	711	473	865	575	1080	719	1350	900	1640	1090	2020	1340
	5.00	588	391	727	484	923	614	1170	779	1440	955	1790	1190
	5.50	486	323	602	401	774	515	998	664	1240	824	1560	1040
	6.00	408	272	506	337	650	432	839	558	1050	699	1350	897
	6.50	348	231	431	287	554	368	715	476	896	596	1150	765
	7.00	300	200	372	247	478	318	617	410	772	514	991	659
	7.50	261	174	324	216	416	277	537	357	673	448	863	574
	8.00	230	153	285	189	366	243	472	314	591	393	759	505
	8.50	203	135	252	168	324	215	418	278	524	348	672	447
	9.00	181	121	225	150	289	192	373	248	467	311	600	399
	9.50	163	108	202	134	259	173	335	223	419	279	538	358
	10.0	147	97.8	182	121	234	156	302	201	378	252	486	323
	10.5	133	88.7	165	110	212	141	274	182	343	228	441	293
	11.0	121	80.8	151	100	193	129	250	166	313	208	401	267
	11.5	111	73.9	138	91.7	177	118	228	152	286	190	367	244
	12.0	102	67.9	127	84.2	163	108	210	140	263	175	337	224
	12.5	94.0	62.6	117	77.6	150	99.6	193	129	242	161	311	207
	13.0	86.9	57.8	108	71.7	138	92.1	179	119	224	149	287	191
	13.5	80.6	53.6	100	66.5	128	85.4	166	110	208	138	266	177
	14.0	75.0	49.9	93.0	61.9	119	79.4	154	103	193	128	248	165
	14.5	69.9	46.5	86.7	57.7	111	74.0	144	95.6	180	120	231	154
	15.0	65.3	43.5	81.0	53.9	104	69.2	134	89.4	168	112	216	144
						Properties							
P_{wo} , kN		268	178	318	212	356	238	410	273	491	328	559	373
P_{wi} , kN/m		1820	1210	1930	1280	2090	1390	2310	1540	2480	1650	2700	1800
P_{wb} , kN		154	103	166	110	186	124	223	148	250	166	293	195
P_{fb} , kN		205	136	223	148	265	177	325	216	381	254	474	315
L_p , m		1.82		1.90		1.99		2.08		2.16		2.26	
L_r , m		5.47		5.66		5.86		6.12		6.37		6.68	
$A_g \times 10^2$, mm^2		63.96		73.10		85.55		101.1		117.3		137.0	
$I_x \times 10^4$, mm^4		14520		20290		29760		42930		59980		82920	
$I_y \times 10^4$, mm^4		944.3		1171		1502		1939		2432		3116	
$r_y \times 10$, mm		3.84		4.00		4.19		4.38		4.55		4.77	
r_x / r_y		3.92		4.17		4.45		4.71		4.97		5.16	
$P_{ex} L_{cx}^2$, kN · m^2		286000		400000		587000		848000		1180000		1640000	
$P_{ey} L_{cy}^2$, kN · m^2		18600		23100		29600		38300		47900		61500	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$		^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.									

Table C.1 Continued.



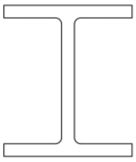
Available Strength in Axial Compression, kN

IPEA Shapes

F_y = 355 MPa

Shape		IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	204	136	281	187	352	234	428	285	517	344	626	416
	1.00	102	67.6	169	113	243	161	324	216	413	275	523	348
	1.50	47.8	31.8	90.5	60.2	152	101	230	153	312	207	418	278
	2.00	26.9	17.9	50.9	33.9	86.6	57.6	142	94.5	210	140	306	203
	2.50	17.2	11.4	32.6	21.7	55.4	36.9	90.9	60.5	135	89.9	205	136
	3.00	11.9	7.95	22.6	15.1	38.5	25.6	63.1	42.0	93.8	62.4	142	94.8
	3.50	8.78	5.84	16.6	11.1	28.3	18.8	46.4	30.8	68.9	45.9	105	69.6
	4.00	6.72	4.47	12.7	8.47	21.7	14.4	35.5	23.6	52.8	35.1	80.1	53.3
	4.50	5.31	3.53	10.1	6.69	17.1	11.4	28.0	18.7	41.7	27.7	63.3	42.1
	5.00	4.30	2.86	8.14	5.42	13.9	9.22	22.7	15.1	33.8	22.5	51.3	34.1
	5.50	3.55	2.36	6.73	4.48	11.5	7.62	18.8	12.5	27.9	18.6	42.4	28.2
	6.00	2.99	1.99	5.66	3.76	9.63	6.40	15.8	10.5	23.5	15.6	35.6	23.7
	6.50	2.54	1.69	4.82	3.21	8.20	5.46	13.4	8.94	20.0	13.3	30.3	20.2
	7.00	2.19	1.46	4.16	2.76	7.07	4.71	11.6	7.71	17.2	11.5	26.2	17.4
	7.50	1.91	1.27	3.62	2.41	6.16	4.10	10.1	6.72	15.0	9.99	22.8	15.2
	8.00	1.68	1.12	3.18	2.12	5.41	3.60	8.87	5.90	13.2	8.78	20.0	13.3
	8.50	1.49	0.99	2.82	1.87	4.80	3.19	7.86	5.23	11.7	7.77	17.7	11.8
	9.00	1.33	0.883	2.51	1.67	4.28	2.85	7.01	4.67	10.4	6.93	15.8	10.5
	9.50	1.19	0.793	2.26	1.50	3.84	2.55	6.29	4.19	9.35	6.22	14.2	9.45
	10.0	1.08	0.715	2.04	1.35	3.47	2.31	5.68	3.78	8.44	5.62	12.8	8.53
	10.5	0.975	0.649	1.85	1.23	3.14	2.09	5.15	3.43	7.66	5.09	11.6	7.74
	11.0	0.889	0.591	1.68	1.12	2.86	1.91	4.69	3.12	6.98	4.64	10.6	7.05
	11.5	0.813	0.541	1.54	1.02	2.62	1.74	4.29	2.86	6.38	4.25	9.69	6.45
	12.0	0.747	0.497	1.41	0.941	2.41	1.60	3.94	2.62	5.86	3.90	8.90	5.92
	12.5	0.688	0.458	1.30	0.867	2.22	1.48	3.63	2.42	5.40	3.59	8.20	5.46
	13.0	0.636	0.423	1.20	0.802	2.05	1.36	3.36	2.24	5.00	3.32	7.59	5.05
	13.5	0.590	0.392	1.12	0.743	1.90	1.27	3.12	2.07	4.63	3.08	7.03	4.68
	14.0	0.549	0.365	1.04	0.691	1.77	1.18	2.90	1.93	4.31	2.87	6.54	4.35
	14.5	0.511	0.34	0.968	0.644	1.65	1.10	2.70	1.80	4.02	2.67	6.10	4.06
	15.0	0.478	0.318	0.905	0.602	1.54	1.02	2.52	1.68	3.75	2.50	5.70	3.79
Properties													
P_{wo} , kN		53.9	35.9	74.8	49.8	81.6	54.4	85	56.7	106	70.5	118	78.9
P_{wi} , kN/m		1170	781	1280	852	1350	899	1350	899	1420	947	1530	1020
P_{wb} , kN		110	73	114	75.7	107	71.1	89	59.2	91.6	60.9	99.1	65.9
P_{fb} , kN		35.2	23.4	44.1	29.3	51.9	34.6	62.6	41.7	69.5	46.2	84.4	56.1
L_p , m		0.434		0.510		0.593		0.689		0.764		0.856	
L_r , m		1.76		1.94		2.06		2.21		2.41		2.62	
$A_g \times 10^2$, mm^2		6.38		8.78		11.03		13.39		16.18		19.58	
$I_x \times 10^4$, mm^4		64.38		141.2		257.4		434.9		689.3		1063	
$I_y \times 10^4$, mm^4		6.85		13.12		22.39		36.42		54.43		81.89	
$r_y \times 10$, mm		1.04		1.22		1.42		1.65		1.83		2.05	
r_x/ r_y		3.06		3.29		3.40		3.45		3.57		3.60	
$P_{ex} L_{cx}^2$, kN · m^2		1270		2790		5080		8590		13600		21000	
$P_{ey} L_{cy}^2$, kN · m^2		136		258		439		720		1070		1620	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.



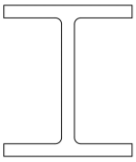
Available Strength in Axial Compression, kN
IPEA Shapes

F_y = 355 MPa

Shape		IPEA 200		IPEA 220^c		IPEA 240^c		IPEA 270^c		IPEA 300^c		IPEA 330^c	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	750	499	903	601	1060	708	1250	832	1490	989	1750	1160
	1.00	645	429	797	530	958	638	1130	754	1360	903	1600	1060
	1.50	533	355	682	454	841	559	1030	687	1260	838	1500	995
	2.00	409	272	549	365	700	466	899	598	1130	754	1360	906
	2.50	291	194	415	276	553	368	747	497	975	649	1200	799
	3.00	202	134	296	197	414	276	595	396	810	539	1020	678
	3.50	148	98.8	218	145	304	202	454	302	650	433	838	558
	4.00	114	75.6	167	111	233	155	348	231	505	336	668	444
	4.50	89.8	59.7	132	87.5	184	122	275	183	399	266	528	351
	5.00	72.7	48.4	107	70.9	149	99.2	223	148	323	215	428	284
	5.50	60.1	40.0	88.1	58.6	123	82.0	184	122	267	178	353	235
	6.00	50.5	33.6	74.0	49.2	104	68.9	155	103	225	149	297	198
	6.50	43.0	28.6	63.1	42.0	88.2	58.7	132	87.6	191	127	253	168
	7.00	37.1	24.7	54.4	36.2	76.1	50.6	114	75.5	165	110	218	145
	7.50	32.3	21.5	47.4	31.5	66.3	44.1	98.9	65.8	144	95.7	190	126
	8.00	28.4	18.9	41.6	27.7	58.2	38.8	86.9	57.8	126	84.1	167	111
	8.50	25.2	16.7	36.9	24.5	51.6	34.3	77.0	51.2	112	74.5	148	98.4
	9.00	22.4	14.9	32.9	21.9	46.0	30.6	68.7	45.7	99.8	66.4	132	87.8
	9.50	20.1	13.4	29.5	19.6	41.3	27.5	61.6	41.0	89.6	59.6	118	78.8
	10.0	18.2	12.1	26.6	17.7	37.3	24.8	55.6	37.0	80.9	53.8	107	71.1
	10.5	16.5	11.0	24.2	16.1	33.8	22.5	50.5	33.6	73.4	48.8	96.9	64.5
	11.0	15.0	10.0	22.0	14.7	30.8	20.5	46.0	30.6	66.8	44.5	88.3	58.8
	11.5	13.7	9.15	20.1	13.4	28.2	18.8	42.1	28.0	61.2	40.7	80.8	53.8
	12.0	12.6	8.40	18.5	12.3	25.9	17.2	38.6	25.7	56.2	37.4	74.2	49.4
	12.5	11.6	7.74	17.1	11.3	23.9	15.9	35.6	23.7	51.8	34.4	68.4	45.5
	13.0	10.8	7.16	15.8	10.5	22.1	14.7	32.9	21.9	47.9	31.8	63.2	42.1
	13.5	9.98	6.64	14.6	9.73	20.5	13.6	30.5	20.3	44.4	29.5	58.6	39.0
	14.0	9.28	6.17	13.6	9.04	19.0	12.7	28.4	18.9	41.3	27.5	54.5	36.3
	14.5	8.65	5.75	12.7	8.43	17.7	11.8	26.5	17.6	38.5	25.6	50.8	33.8
	15.0	8.08	5.38	11.8	7.88	16.6	11.0	24.7	16.5	35.9	23.9	47.5	31.6
Properties													
P_{wo}, kN		152	101	175	117	215	143	231	154	262	175	323	215
P_{wi}, kN/m		1600	1070	1780	1180	1850	1230	1950	1300	2170	1440	2310	1540
P_{wb}, kN		104	69.4	128	85.2	134	89.4	138	91.7	166	111	184	123
P_{fb}, kN		97.8	65.1	118	78.8	138	91.5	151	101	169	112	200	133
L_p, m		0.932		1.03		1.12		1.26		1.40		1.48	
L_r, m		2.86		3.13		3.42		3.73		4.06		4.32	
$A_g \times 10^2$, mm^2		23.47		28.26		33.31		39.15		46.53		54.74	
$I_x \times 10^4$, mm^4		1591		2317		3290		4917		7173		10230	
$I_y \times 10^4$, mm^4		117.2		171.4		240.1		358.0		519.0		685.2	
$r_y \times 10$, mm		2.23		2.46		2.68		3.02		3.34		3.54	
r_x / r_y		3.69		3.68		3.71		3.71		3.72		3.86	
$P_{ex} L_{cx}^2$, kN · m^2		31400		45700		65000		97000		142000		202000	
$P_{ey} L_{cy}^2$, kN · m^2		2300		3380		4720		7050		10200		13500	

LRFD	ASD	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.



Available Strength in Axial Compression, kN
IPEA Shapes

F_y = 355 MPa

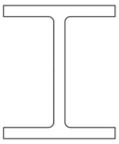
Shape		IPEA 360^c		IPEA 400^c		IPEA 450^c		IPEA 500^c		IPEA 550^c		IPEA 600^c	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2040	1360	2340	1550	2730	1820	3230	2150	3750	2490	4380	2910
	1.00	1850	1230	2100	1400	2430	1620	2860	1900	3300	2200	3850	2560
	1.50	1750	1160	2000	1330	2320	1540	2740	1820	3170	2110	3710	2470
	2.00	1620	1080	1850	1230	2170	1440	2580	1710	3000	2000	3530	2350
	2.50	1460	970	1690	1120	1990	1330	2390	1590	2790	1860	3310	2200
	3.00	1290	856	1500	1000	1790	1190	2170	1440	2560	1700	3050	2030
	3.50	1090	728	1310	873	1590	1060	1940	1290	2310	1530	2780	1850
	4.00	903	601	1100	732	1380	916	1710	1130	2050	1360	2500	1660
	4.50	726	483	900	599	1150	763	1460	971	1790	1190	2210	1470
	5.00	588	391	729	485	936	623	1210	804	1510	1000	1910	1270
	5.50	486	323	602	401	774	515	999	665	1250	832	1610	1070
	6.00	408	272	506	337	650	432	839	558	1050	699	1350	898
	6.50	348	231	431	287	554	368	715	476	896	596	1150	765
	7.00	300	200	372	247	478	318	617	410	772	514	991	659
	7.50	261	174	324	216	416	277	537	357	673	448	863	574
	8.00	230	153	285	189	366	243	472	314	591	393	759	505
	8.50	203	135	252	168	324	215	418	278	524	348	672	447
	9.00	181	121	225	150	289	192	373	248	467	311	600	399
	9.50	163	108	202	134	259	173	335	223	419	279	538	358
	10.0	147	97.8	182	121	234	156	302	201	378	252	486	323
	10.5	133	88.7	165	110	212	141	274	182	343	228	441	293
	11.0	121	80.8	151	100	193	129	250	166	313	208	401	267
	11.5	111	73.9	138	91.7	177	118	228	152	286	190	367	244
	12.0	102	67.9	127	84.2	163	108	210	140	263	175	337	224
	12.5	94.0	62.6	117	77.6	150	99.6	193	129	242	161	311	207
	13.0	86.9	57.8	108	71.7	138	92.1	179	119	224	149	287	191
	13.5	80.6	53.6	100	66.5	128	85.4	166	110	208	138	266	177
	14.0	75.0	49.9	93.0	61.9	119	79.4	154	103	193	128	248	165
	14.5	69.9	46.5	86.7	57.7	111	74.0	144	95.6	180	120	231	154
	15.0	65.3	43.5	81.0	53.9	104	69.2	134	89.4	168	112	216	144
Properties													
P_{wo}, kN		346	230	410	273	460	307	529	353	634	423	722	481
P_{wi}, kN/m		2340	1560	2490	1660	2700	1800	2980	1990	3200	2130	3480	2320
P_{wb}, kN		175	117	189	125	211	140	253	168	284	189	333	222
P_{fb}, kN		264	176	288	191	343	228	420	279	492	327	612	407
L_p, m		1.60		1.67		1.75		1.83		1.90		1.99	
L_r, m		4.62		4.80		4.98		5.21		5.43		5.70	
$A_g \times 10^2$, mm^2		63.96		73.10		85.55		101.1		117.3		137.0	
$I_x \times 10^4$, mm^4		14520		20290		29760		42930		59980		82920	
$I_y \times 10^4$, mm^4		944.3		1171		1502		1939		2432		3116	
$r_y \times 10$, mm		3.84		4.00		4.19		4.38		4.55		4.77	
r_x/r_y		3.92		4.17		4.45		4.71		4.97		5.16	
$P_{ex} L_{cx}^2$, kN · m^2		286000		400000		587000		850000		1180000		1640000	
$P_{ey} L_{cy}^2$, kN · m^2		18600		23000		29600		38300		47900		61500	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.

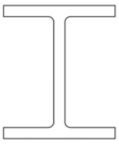


Available Strength in Axial Compression, kN
IPEO Shapes

F_y = 235 MPa

Shape		IPEO 180		IPEO 200		IPEO 220		IPEO 240		IPEO 270		IPEO 300	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	573	381	676	450	791	526	924	615	1140	758	1330	884
	1.00	511	340	615	409	732	487	865	576	1080	719	1270	848
	1.50	442	294	547	364	664	442	796	530	1010	674	1210	805
	2.00	362	241	464	309	579	385	709	472	924	615	1120	748
	2.50	279	186	375	250	486	323	611	406	822	547	1020	681
	3.00	203	135	290	193	392	261	509	338	712	474	912	607
	3.50	149	99.2	215	143	304	203	410	273	601	400	796	529
	4.00	114	76.0	165	110	233	155	320	213	494	329	680	452
	4.50	90.2	60.0	130	86.5	184	123	252	168	396	263	569	379
	5.00	73.1	48.6	105	70.1	149	99.2	205	136	320	213	466	310
	5.50	60.4	40.2	87.1	57.9	123	82.0	169	112	265	176	385	256
	6.00	50.7	33.8	73.2	48.7	104	68.9	142	94.5	222	148	324	215
	6.50	43.2	28.8	62.3	41.5	88.3	58.7	121	80.5	190	126	276	183
	7.00	37.3	24.8	53.8	35.8	76.1	50.6	104	69.4	163	109	238	158
	7.50	32.5	21.6	46.8	31.2	66.3	44.1	90.9	60.5	142	94.7	207	138
	8.00	28.5	19.0	41.2	27.4	58.3	38.8	79.9	53.2	125	83.3	182	121
	8.50	25.3	16.8	36.5	24.3	51.6	34.3	70.8	47.1	111	73.8	161	107
	9.00	22.6	15.0	32.5	21.6	46.0	30.6	63.1	42.0	98.9	65.8	144	95.7
	9.50	20.2	13.5	29.2	19.4	41.3	27.5	56.7	37.7	88.7	59.0	129	85.9
	10.0	18.3	12.2	26.3	17.5	37.3	24.8	51.1	34.0	80.1	53.3	117	77.5
	10.5	16.6	11.0	23.9	15.9	33.8	22.5	46.4	30.9	72.6	48.3	106	70.3
	11.0	15.1	10.0	21.8	14.5	30.8	20.5	42.3	28.1	66.2	44.0	96.3	64.1
	11.5	13.8	9.19	19.9	13.3	28.2	18.8	38.7	25.7	60.6	40.3	88.1	58.6
	12.0	12.7	8.44	18.3	12.2	25.9	17.2	35.5	23.6	55.6	37.0	80.9	53.8
	12.5	11.7	7.78	16.9	11.2	23.9	15.9	32.7	21.8	51.3	34.1	74.6	49.6
	13.0	10.8	7.19	15.6	10.4	22.1	14.7	30.3	20.1	47.4	31.5	68.9	45.9
	13.5	10.0	6.67	14.5	9.62	20.5	13.6	28.1	18.7	43.9	29.2	63.9	42.5
	14.0	9.32	6.20	13.4	8.94	19.0	12.7	26.1	17.4	40.9	29.2	59.4	39.6
	14.5	8.69	5.78	12.5	8.34	17.7	11.8	24.3	16.2	38.1	29.2	55.4	36.9
	15.0	8.12	5.40	11.7	7.79	16.6	11.0	22.7	15.1	35.6	29.2	51.8	34.5
Properties													
P_{wo} , kN		127	84.6	157	104	172	115	212	141	240	160	260	174
P_{wi} , kN/m		1410	940	1460	971	1550	1030	1650	1100	1760	1180	1880	1250
P_{wb} , kN		219	146	222	148	240	159	267	177	284	189	305	203
P_{fb} , kN		107	71.2	119	79.4	138	91.5	154	103	197	131	213	142
L_p , m		1.07		1.18		1.30		1.41		1.59		1.77	
L_r , m		4.37		4.72		5.04		5.45		5.93		6.32	
$A_g \times 10^2$, mm^2		27.10		31.96		37.39		43.71		53.84		62.83	
$I_x \times 10^4$, mm^4		1505		2211		3134		4369		6947		9994	
$I_y \times 10^4$, mm^4		117.3		168.9		239.8		328.5		513.5		745.7	
$r_y \times 10$, mm		2.08		2.30		2.53		2.74		3.09		3.45	
r_x / r_y		3.58		3.62		3.62		3.65		3.68		3.66	
$P_{ex} L_{cx}^2$, kN · m^2		29700		43700		61900		86300		137000		197000	
$P_{ey} L_{cy}^2$, kN · m^2		2310		3340		4720		6480		10100		14800	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.

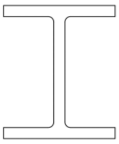


Available Strength in Axial Compression, kN
IPEO Shapes

F_y = 235 MPa

Shape		**IPEO 330**		**IPEO 360**		**IPEO 400**		**IPEO 450**		**IPEO 500**		**IPEO 550**		**IPEO 600**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1540	1020	1780	1180	2040	1360	2490	1660	2890	1920	3300	2200	4160	2770
	1.00	1480	984	1720	1140	1980	1320	2420	1610	2820	1870	3220	2140	4070	2710
	1.50	1410	939	1650	1100	1900	1270	2340	1550	2730	1810	3130	2080	3960	2640
	2.00	1320	879	1560	1040	1800	1200	2220	1480	2610	1730	3000	1990	3820	2540
	2.50	1210	808	1440	961	1680	1120	2090	1390	2460	1640	2840	1890	3630	2420
	3.00	1090	728	1320	876	1550	1030	1930	1290	2290	1520	2660	1770	3420	2280
	3.50	969	645	1180	786	1400	931	1760	1170	2100	1400	2460	1640	3190	2120
	4.00	841	560	1040	693	1250	830	1590	1060	1910	1270	2250	1490	2940	1960
	4.50	717	477	904	601	1100	729	1410	937	1710	1140	2030	1350	2680	1780
	5.00	600	399	771	513	947	630	1230	820	1510	1000	1810	1200	2420	1610
	5.50	496	330	646	430	806	536	1060	708	1320	877	1590	1060	2160	1440
	6.00	416	277	542	361	678	451	903	601	1130	755	1390	924	1900	1270
	6.50	355	236	462	308	577	384	769	512	967	643	1190	793	1660	1110
	7.00	306	204	399	265	498	331	663	441	834	555	1030	684	1440	955
	7.50	267	177	347	231	434	288	578	384	726	483	895	596	1250	832
	8.00	234	156	305	203	381	254	508	338	638	425	787	523	1100	731
	8.50	207	138	270	180	338	225	450	299	566	376	697	464	974	648
	9.00	185	123	241	160	301	200	401	267	504	336	622	414	869	578
	9.50	166	111	216	144	270	180	360	240	453	301	558	371	780	519
	10.0	150	99.7	195	130	244	162	325	216	409	272	503	335	704	468
	10.5	136	90.5	177	118	221	147	295	196	371	247	457	304	638	425
	11.0	124	82.4	161	107	202	134	269	179	338	225	416	277	581	387
	11.5	113	75.4	148	98.3	184	123	246	164	309	206	381	253	532	354
	12.0	104	69.3	136	90.2	169	113	226	150	284	189	350	233	489	325
	12.5	95.9	63.8	125	83.2	156	104	208	138	261	174	322	214	450	300
	13.0	88.7	59.0	116	76.9	144	96.0	192	128	242	161	298	198	416	277
	13.5	82.3	54.7	107	71.3	134	89.0	178	119	224	149	276	184	386	257
	14.0	76.5	50.9	99.6	66.3	124	82.8	166	110	208	139	257	171	359	239
	14.5	71.3	47.4	92.9	61.8	116	77.2	155	103	194	129	239	159	335	223
	15.0	66.6	44.3	86.8	57.8	108	72.1	144	96.1	182	121	224	149	313	208
Properties															
P_{wo} , kN		315	210	353	236	416	277	499	333	564	376	660	440	846	564
P_{wi} , kN/m		2000	1330	2160	1440	2280	1520	2590	1720	2820	1880	2980	1990	3530	2350
P_{wb} , kN		336	223	386	257	408	272	520	346	601	400	649	432	972	647
P_{fb} , kN		241	160	286	190	318	211	409	272	477	317	539	359	761	507
L_p , m		1.87		1.98		2.07		2.16		2.25		2.34		2.46	
L_r , m		6.63		6.98		7.17		7.50		7.71		7.94		8.71	
$A_g \times 10^2$, mm^2		72.62		84.13		96.39		117.7		136.7		156.1		196.8	
$I_x \times 10^4$, mm^4		13910		19050		26750		40920		57780		79160		118300	
$I_y \times 10^4$, mm^4		960.4		1251		1564		2085		2622		3224		4521	
$r_y \times 10$, mm		3.64		3.86		4.03		4.21		4.38		4.55		4.79	
r_x/ r_y		3.80		3.90		4.13		4.43		4.69		4.95		5.12	
$P_{ex} L_{cx}^2$, kN · m^2		275000		376000		528000		808000		1140000		1560000		2340000	
$P_{ey} L_{cy}^2$, kN · m^2		19000		24700		30900		41200		51800		63800		89100	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.											
$\phi_c = 0.90$		$\Omega_c = 1.67$													

Table C.1 Continued.

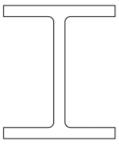


Available Strength in Axial Compression, kN
IPEO Shapes

F_y = 275 MPa

Shape		**IPEO 180**		**IPEO 200**		**IPEO 220**		**IPEO 240**		**IPEO 270**		**IPEO 300**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	671	446	791	526	925	616	1080	720	1330	887	1560	1030
	1.00	586	390	708	471	845	562	1000	666	1250	834	1480	985
	1.50	495	330	617	411	754	502	908	604	1160	773	1390	927
	2.00	391	260	509	339	643	428	793	528	1040	694	1280	851
	2.50	289	192	397	264	524	348	666	443	910	605	1140	762
	3.00	203	135	293	195	408	271	538	358	769	512	1000	666
	3.50	149	99.2	215	143	304	203	417	278	631	420	853	568
	4.00	114	76.0	165	110	233	155	320	213	501	333	710	472
	4.50	90.2	60.0	130	86.5	184	123	252	168	396	263	575	383
	5.00	73.1	48.6	105	70.1	149	99.2	205	136	320	213	466	310
	5.50	60.4	40.2	87.1	57.9	123	82.0	169	112	265	176	385	256
	6.00	50.7	33.8	73.2	48.7	104	68.9	142	94.5	222	148	324	215
	6.50	43.2	28.8	62.3	41.5	88.3	58.7	121	80.5	190	126	276	183
	7.00	37.3	24.8	53.8	35.8	76.1	50.6	104	69.4	163	109	238	158
	7.50	32.5	21.6	46.8	31.2	66.3	44.1	90.9	60.5	142	94.7	207	138
	8.00	28.5	19.0	41.2	27.4	58.3	38.8	79.9	53.2	125	83.3	182	121
	8.50	25.3	16.8	36.5	24.3	51.6	34.3	70.8	47.1	111	73.8	161	107
	9.00	22.6	15.0	32.5	21.6	46.0	30.6	63.1	42.0	98.9	65.8	144	95.7
	9.50	20.2	13.5	29.2	19.4	41.3	27.5	56.7	37.7	88.7	59.0	129	85.9
	10.0	18.3	12.2	26.3	17.5	37.3	24.8	51.1	34.0	80.1	53.3	117	77.5
	10.5	16.6	11.0	23.9	15.9	33.8	22.5	46.4	30.9	72.6	48.3	106	70.3
	11.0	15.1	10.0	21.8	14.5	30.8	20.5	42.3	28.1	66.2	44.0	96.3	64.1
	11.5	13.8	9.19	19.9	13.3	28.2	18.8	38.7	25.7	60.6	40.3	88.1	58.6
	12.0	12.7	8.44	18.3	12.2	25.9	17.2	35.5	23.6	55.6	37.0	80.9	53.8
	12.5	11.7	7.78	16.9	11.2	23.9	15.9	32.7	21.8	51.3	34.1	74.6	49.6
	13.0	10.8	7.19	15.6	10.4	22.1	14.7	30.3	20.1	47.4	31.5	68.9	45.9
	13.5	10.0	6.67	14.5	9.62	20.5	13.6	28.1	18.7	43.9	29.2	63.9	42.5
	14.0	9.32	6.20	13.4	8.94	19.0	12.7	26.1	17.4	40.9	27.2	59.4	39.6
	14.5	8.69	5.78	12.5	8.34	17.7	11.8	24.3	16.2	38.1	25.3	55.4	36.9
	15.0	8.12	5.40	11.7	7.79	16.6	11.0	22.7	15.1	35.6	23.7	51.8	34.5
Properties													
P_{wo} , **kN**		149	99	183	122	201	134	248	166	281	187	305	203
P_{wi} , **kN/m**		1650	1100	1710	1140	1820	1210	1930	1280	2060	1370	2200	1470
P_{wb} , **kN**		237	158	240	160	259	173	289	192	308	205	330	220
P_{fb} , **kN**		125	83.4	140	92.9	161	107	180	120	230	153	249	166
L_p , **m**		0.987		1.09		1.20		1.30		1.47		1.64	
L_r , **m**		3.82		4.13		4.42		4.78		5.22		5.59	
$A_g \times 10^2$, **mm²**		27.10		31.96		37.39		43.71		53.84		62.83	
$I_x \times 10^4$, **mm⁴**		1505		2211		3134		4369		6947		9994	
$I_y \times 10^4$, **mm⁴**		117.3		168.9		239.8		328.5		513.5		745.7	
$r_y \times 10$, **mm**		2.08		2.30		2.53		2.74		3.09		3.45	
r_x / r_y		3.58		3.62		3.62		3.65		3.68		3.66	
$P_{ex} L_{cx}^2$, **kN · m²**		29700		43700		61900		86300		137000		197000	
$P_{ey} L_{cy}^2$, **kN · m²**		2310		3340		4720		6480		10100		14800	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.									
$\phi_c = 0.90$		$\Omega_c = 1.67$											

Table C.1 Continued.

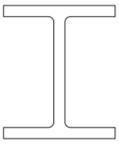


Available Strength in Axial Compression, kN
IPEO Shapes

F_y = 275 MPa

Shape		IPEO 330		IPEO 360		IPEO 400		IPEO 450		IPEO 500		IPEO 550		IPEO 600	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1800	1200	2080	1390	2390	1590	2910	1940	3380	2250	3860	2570	4870	3240
	1.00	1720	1140	2000	1330	2300	1530	2820	1880	3280	2180	3760	2500	4750	3160
	1.50	1630	1080	1910	1270	2200	1460	2710	1800	3160	2100	3630	2410	4600	3060
	2.00	1510	1000	1780	1180	2070	1370	2550	1700	3000	1990	3450	2300	4400	2930
	2.50	1370	908	1630	1080	1910	1270	2370	1580	2800	1860	3240	2160	4160	2760
	3.00	1210	805	1460	974	1730	1150	2170	1440	2570	1710	3000	1990	3870	2580
	3.50	1050	697	1290	858	1540	1020	1950	1300	2330	1550	2740	1820	3570	2370
	4.00	889	591	1110	741	1340	894	1720	1140	2080	1380	2460	1640	3240	2160
	4.50	737	490	943	627	1150	767	1500	996	1830	1220	2180	1450	2910	1940
	5.00	600	399	781	520	972	647	1280	852	1580	1050	1910	1270	2580	1720
	5.50	496	330	646	430	806	536	1070	715	1350	898	1650	1100	2260	1500
	6.00	416	277	542	361	678	451	903	601	1130	755	1400	931	1950	1300
	6.50	355	236	462	308	577	384	769	512	967	643	1190	793	1670	1110
	7.00	306	204	399	265	498	331	663	441	834	555	1030	684	1440	955
	7.50	267	177	347	231	434	288	578	384	726	483	895	596	1250	832
	8.00	234	156	305	203	381	254	508	338	638	425	787	523	1100	731
	8.50	207	138	270	180	338	225	450	299	566	376	697	464	974	648
	9.00	185	123	241	160	301	200	401	267	504	336	622	414	869	578
	9.50	166	111	216	144	270	180	360	240	453	301	558	371	780	519
	10.0	150	99.7	195	130	244	162	325	216	409	272	503	335	704	468
	10.5	136	90.5	177	118	221	147	295	196	371	247	457	304	638	425
	11.0	124	82.4	161	107	202	134	269	179	338	225	416	277	581	387
	11.5	113	75.4	148	98.3	184	123	246	164	309	206	381	253	532	354
	12.0	104	69.3	136	90.2	169	113	226	150	284	189	350	233	489	325
	12.5	95.9	63.8	125	83.2	156	104	208	138	261	174	322	214	450	300
	13.0	88.7	59.0	116	76.9	144	96.0	192	128	242	161	298	198	416	277
	13.5	82.3	54.7	107	71.3	134	89.0	178	119	224	149	276	184	386	257
	14.0	76.5	50.9	99.6	66.3	124	82.8	166	110	208	139	257	171	359	239
	14.5	71.3	47.4	92.9	61.8	116	77.2	155	103	194	129	239	159	335	223
	15.0	66.6	44.3	86.8	57.8	108	72.1	144	96.1	182	121	224	149	313	208
Properties															
P_{wo}, kN		368	245	414	276	487	325	584	389	660	440	772	515	990	660
P_{wi}, kN/m		2340	1560	2530	1690	2670	1780	3030	2020	3300	2200	3490	2330	4130	2750
P_{wb}, kN		363	242	418	278	442	294	563	374	650	432	702	467	1050	700
P_{fb}, kN		282	188	334	222	372	247	479	319	558	372	631	420	891	593
L_p, m		1.73		1.83		1.91		2.00		2.08		2.16		2.27	
L_r, m		5.87		6.18		6.36		6.66		6.86		7.07		7.73	
$A_g \times 10^2$, mm^2		72.62		84.13		96.39		117.7		136.7		156.1		196.8	
$I_x \times 10^4$, mm^4		13910		19050		26750		40920		57780		79160		118300	
$I_y \times 10^4$, mm^4		960.4		1251		1564		2085		2622		3224		4521	
$r_y \times 10$, mm		3.64		3.86		4.03		4.21		4.38		4.55		4.79	
r_x/r_y		3.80		3.90		4.13		4.43		4.69		4.95		5.12	
$P_{ex} L_{cx}^2$, kN · m^2		275000		376000		528000		808000		1140000		1560000		2340000	
$P_{ey} L_{cy}^2$, kN · m^2		19000		24700		30900		41200		51800		63800		89100	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.											
$\phi_c = 0.90$		$\Omega_c = 1.67$													

Table C.1 Continued.



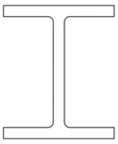
Available Strength in Axial Compression, kN
IPEO Shapes

F_y = 355 MPa

Shape		**IPEO 180**		**IPEO 200**		**IPEO 220**		**IPEO 240**		**IPEO 270**		**IPEO 300**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	866	576	1020	679	1190	795	1400	929	1720	1140	2010	1340
	1.00	728	484	886	589	1060	707	1260	841	1590	1060	1880	1250
	1.50	585	389	741	493	917	610	1110	742	1440	958	1740	1160
	2.00	432	287	578	385	746	497	935	622	1250	835	1560	1040
	2.50	292	194	420	279	573	381	746	497	1050	699	1350	900
	3.00	203	135	293	195	414	276	566	377	846	563	1140	756
	3.50	149	99.2	215	143	304	203	417	278	654	435	925	615
	4.00	114	76.0	165	110	233	155	320	213	501	333	728	485
	4.50	90.2	60.0	130	86.5	184	123	252	168	396	263	575	383
	5.00	73.1	48.6	105	70.1	149	99.2	205	136	320	213	466	310
	5.50	60.4	40.2	87.1	57.9	123	82.0	169	112	265	176	385	256
	6.00	50.7	33.8	73.2	48.7	104	68.9	142	94.5	222	148	324	215
	6.50	43.2	28.8	62.3	41.5	88.3	58.7	121	80.5	190	126	276	183
	7.00	37.3	24.8	53.8	35.8	76.1	50.6	104	69.4	163	109	238	158
	7.50	32.5	21.6	46.8	31.2	66.3	44.1	90.9	60.5	142	94.7	207	138
	8.00	28.5	19.0	41.2	27.4	58.3	38.8	79.9	53.2	125	83.3	182	121
	8.50	25.3	16.8	36.5	24.3	51.6	34.3	70.8	47.1	111	73.8	161	107
	9.00	22.6	15.0	32.5	21.6	46.0	30.6	63.1	42.0	98.9	65.8	144	95.7
	9.50	20.2	13.5	29.2	19.4	41.3	27.5	56.7	37.7	88.7	59.0	129	85.9
	10.0	18.3	12.2	26.3	17.5	37.3	24.8	51.1	34.0	80.1	53.3	117	77.5
	10.5	16.6	11.0	23.9	15.9	33.8	22.5	46.4	30.9	72.6	48.3	106	70.3
	11.0	15.1	10.0	21.8	14.5	30.8	20.5	42.3	28.1	66.2	44.0	96.3	64.1
	11.5	13.8	9.19	19.9	13.3	28.2	18.8	38.7	25.7	60.6	40.3	88.1	58.6
	12.0	12.7	8.44	18.3	12.2	25.9	17.2	35.5	23.6	55.6	37.0	80.9	53.8
	12.5	11.7	7.78	16.9	11.2	23.9	15.9	32.7	21.8	51.3	34.1	74.6	49.6
	13.0	10.8	7.19	15.6	10.4	22.1	14.7	30.3	20.1	47.4	31.5	68.9	45.9
	13.5	10.0	6.67	14.5	9.62	20.5	13.6	28.1	18.7	43.9	29.2	63.9	42.5
	14.0	9.32	6.20	13.4	8.94	19.0	12.7	26.1	17.4	40.9	27.2	59.4	39.6
	14.5	8.69	5.78	12.5	8.34	17.7	11.8	24.3	16.2	38.1	25.3	55.4	36.9
	15.0	8.12	5.40	11.7	7.79	16.6	11.0	22.7	15.1	35.6	23.7	51.8	34.5
							Properties						
P_{wo} , kN		192	128	237	158	260	173	321	214	362	241	393	262
P_{wi} , kN/m		2130	1420	2200	1470	2340	1560	2490	1660	2660	1780	2840	1890
P_{wb} , kN		269	179	273	182	295	196	328	218	350	233	375	249
P_{fb} , kN		162	108	180	120	208	138	233	155	297	198	322	214
L_p , m		0.869		0.961		1.06		1.14		1.29		1.44	
L_r , m		3.10		3.36		3.61		3.91		4.28		4.62	
$A_g \times 10^2$, mm^2		27.10		31.96		37.39		43.71		53.84		62.83	
$I_x \times 10^4$, mm^4		1505		2211		3134		4369		6947		9994	
$I_y \times 10^4$, mm^4		117.3		168.9		239.8		328.5		513.5		745.7	
$r_y \times 10$, mm		2.08		2.30		2.53		2.74		3.09		3.45	
r_x / r_y		3.58		3.62		3.62		3.65		3.68		3.66	
$P_{ex} L_{cx}^2$, kN · m^2		29700		43700		61900		86300		137000		197000	
$P_{ey} L_{cy}^2$, kN · m^2		2310		3340		4720		6480		10100		14800	

LRFD	**ASD**	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.1 Continued.



Available Strength in Axial Compression, kN
IPEO Shapes

F_y = 355 MPa

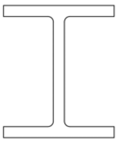
Shape		**IPEO 330**		**IPEO 360**		**IPEO 400**		**IPEO 450**		**IPEO 500**[c]		**IPEO 550**[c]		**IPEO 600**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2320	1540	2690	1790	3080	2050	3760	2500	4370	2910	4990	3320	6290	4180
	1.00	2190	1460	2560	1700	2940	1960	3600	2400	4200	2790	4780	3180	6080	4050
	1.50	2040	1360	2400	1600	2770	1850	3420	2270	4000	2660	4600	3060	5840	3890
	2.00	1850	1230	2200	1460	2560	1700	3170	2110	3730	2480	4310	2870	5510	3670
	2.50	1630	1080	1960	1300	2310	1530	2880	1920	3420	2270	3970	2640	5120	3410
	3.00	1390	926	1710	1130	2030	1350	2570	1710	3070	2040	3600	2390	4680	3110
	3.50	1160	770	1450	963	1750	1160	2240	1490	2700	1800	3190	2130	4210	2800
	4.00	935	622	1200	797	1470	976	1910	1270	2330	1550	2790	1850	3720	2470
	4.50	740	493	964	642	1200	802	1590	1060	1970	1310	2390	1590	3240	2150
	5.00	600	399	781	520	976	649	1300	865	1630	1090	2010	1340	2770	1840
	5.50	496	330	646	430	806	536	1070	715	1350	899	1660	1110	2330	1550
	6.00	416	277	542	361	678	451	903	601	1130	755	1400	931	1950	1300
	6.50	355	236	462	308	577	384	769	512	967	643	1190	793	1670	1110
	7.00	306	204	399	265	498	331	663	441	834	555	1030	684	1440	955
	7.50	267	177	347	231	434	288	578	384	726	483	895	596	1250	832
	8.00	234	156	305	203	381	254	508	338	638	425	787	523	1100	731
	8.50	207	138	270	180	338	225	450	299	566	376	697	464	974	648
	9.00	185	123	241	160	301	200	401	267	504	336	622	414	869	578
	9.50	166	111	216	144	270	180	360	240	453	301	558	371	780	519
	10.0	150	99.7	195	130	244	162	325	216	409	272	503	335	704	468
	10.5	136	90.5	177	118	221	147	295	196	371	247	457	304	638	425
	11.0	124	82.4	161	107	202	134	269	179	338	225	416	277	581	387
	11.5	113	75.4	148	98.3	184	123	246	164	309	206	381	253	532	354
	12.0	104	69.3	136	90.2	169	113	226	150	284	189	350	233	489	325
	12.5	95.9	63.8	125	83.2	156	104	208	138	261	174	322	214	450	300
	13.0	88.7	59.0	116	76.9	144	96.0	192	128	242	161	298	198	416	277
	13.5	82.3	54.7	107	71.3	134	89.0	178	119	224	149	276	184	386	257
	14.0	76.5	50.9	99.6	66.3	124	82.8	166	110	208	139	257	171	359	239
	14.5	71.3	47.4	92.9	61.8	116	77.2	155	103	194	129	239	159	335	223
	15.0	66.6	44.3	86.8	57.8	108	72.1	144	96.1	182	121	224	149	313	208
Properties															
P_{wo}, kN		475	317	534	356	628	419	754	502	852	568	996	664	1280	852
P_{wi}, kN/m		3020	2010	3270	2180	3440	2300	3910	2600	4260	2840	4510	3010	5330	3550
P_{wb}, kN		412	274	475	316	502	334	640	425	738	491	797	530	1200	795
P_{fb}, kN		364	242	432	287	480	319	619	412	721	480	815	542	1150	765
L_p, m		1.52		1.61		1.68		1.76		1.83		1.90		2.00	
L_r, m		4.85		5.12		5.29		5.54		5.73		5.92		6.43	
$A_g \times 10^2$, mm^2		72.62		84.13		96.39		117.7		136.7		156.1		196.8	
$I_x \times 10^4$, mm^4		13910		19050		26750		40920		57780		79160		118300	
$I_y \times 10^4$, mm^4		960.4		1251		1564		2085		2622		3224		4521	
$r_y \times 10$, mm		3.64		3.86		4.03		4.21		4.38		4.55		4.79	
r_x / r_y		3.80		3.90		4.13		4.43		4.69		4.95		5.12	
$P_{ex} L_{cx}^2$, kN · m^2		275000		376000		528000		808000		1140000		1560000		2340000	
$P_{ey} L_{cy}^2$, kN · m^2		19000		24700		30900		41200		51800		63800		89100	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table C.1 Continued.

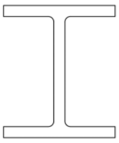


Available Strength in Axial Compression, kN
IPN Shapes

F_y = 235 MPa

Shape		IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180		IPN 200	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	0.00	160	107	224	149	300	200	387	258	482	321	590	393	706	470
	1.00	87.8	58.4	145	96.5	216	144	300	200	392	261	498	331	613	408
	1.50	43.5	28.9	84.0	55.9	143	95.2	218	145	302	201	402	268	513	341
	2.00	24.4	16.3	47.3	31.5	83.7	55.7	140	93.0	210	140	298	199	399	266
	2.50	15.6	10.4	30.3	20.1	53.6	35.6	89.4	59.5	137	90.9	203	135	290	193
	3.00	10.9	7.23	21.0	14.0	37.2	24.7	62.1	41.3	94.8	63.1	141	94.0	202	135
	3.50	7.98	5.31	15.4	10.3	27.3	18.2	45.6	30.4	69.7	46.4	104	69.0	149	98.8
	4.00	6.11	4.07	11.8	7.86	20.9	13.9	34.9	23.2	53.3	35.5	79.4	52.9	114	75.7
	4.50	4.83	3.21	9.34	6.21	16.5	11.0	27.6	18.4	42.1	28.0	62.8	41.8	89.9	59.8
	5.00	3.91	2.60	7.56	5.03	13.4	8.91	22.4	14.9	34.1	22.7	50.8	33.8	72.8	48.4
	5.50	3.23	2.15	6.25	4.16	11.1	7.36	18.5	12.3	28.2	18.8	42.0	28.0	60.2	40.0
	6.00	2.72	1.81	5.25	3.49	9.30	6.19	15.5	10.3	23.7	15.8	35.3	23.5	50.5	33.6
	6.50	2.31	1.54	4.48	2.98	7.92	5.27	13.2	8.80	20.2	13.4	30.1	20.0	43.1	28.7
	7.00	2.00	1.33	3.86	2.57	6.83	4.54	11.4	7.59	17.4	11.6	25.9	17.3	37.1	24.7
	7.50	1.74	1.16	3.36	2.24	5.95	3.96	9.93	6.61	15.2	10.1	22.6	15.0	32.4	21.5
	8.00	1.53	1.02	2.95	1.97	5.23	3.48	8.73	5.81	13.3	8.87	19.9	13.2	28.4	18.9
	8.50	1.35	0.901	2.62	1.74	4.63	3.08	7.73	5.15	11.8	7.86	17.6	11.7	25.2	16.8
	9.00	1.21	0.803	2.33	1.55	4.13	2.75	6.90	4.59	10.5	7.01	15.7	10.4	22.5	14.9
	9.50	1.08	0.721	2.10	1.39	3.71	2.47	6.19	4.12	9.46	6.29	14.1	9.37	20.2	13.4
	10.0	0.978	0.651	1.89	1.26	3.35	2.23	5.59	3.72	8.53	5.68	12.7	8.46	18.2	12.1
	10.5	0.887	0.590	1.72	1.14	3.04	2.02	5.07	3.37	7.74	5.15	11.5	7.67	16.5	11.0
	11.0	0.808	0.538	1.56	1.04	2.77	1.84	4.62	3.07	7.05	4.69	10.5	6.99	15.0	10.0
	11.5	0.739	0.492	1.43	0.951	2.53	1.68	4.23	2.81	6.45	4.29	9.61	6.39	13.8	9.15
	12.0	0.679	0.452	1.31	0.874	2.32	1.55	3.88	2.58	5.93	3.94	8.83	5.87	12.6	8.41
	12.5	0.626	0.416	1.21	0.805	2.14	1.43	3.58	2.38	5.46	3.63	8.13	5.41	11.6	7.75
	13.0	0.579	0.385	1.12	0.744	1.98	1.32	3.31	2.20	5.05	3.36	7.52	5.00	10.8	7.16
	13.5	0.537	0.357	1.04	0.690	1.84	1.22	3.07	2.04	4.68	3.12	6.97	4.64	9.98	6.64
	14.0	0.499	0.332	0.965	0.642	1.71	1.14	2.85	1.90	4.35	2.90	6.49	4.31	9.28	6.18
	14.5	0.465	0.309	0.899	0.598	1.59	1.06	2.66	1.77	4.06	2.70	6.05	4.02	8.65	5.76
	15.0	0.435	0.289	0.840	0.559	1.49	0.990	2.48	1.65	3.79	2.52	5.65	3.76	8.09	5.38
Properties															
P_{wo}, kN		48.1	32.1	64.2	42.8	82.7	55.1	103	69.0	127	84.4	152	102	180	120
P_{wi}, kN/m		917	611	1060	705	1200	799	1340	893	1480	987	1620	1080	1760	1180
P_{wb}, kN		149	99.1	178	119	213	141	251	167	294	196	342	227	393	261
P_{fb}, kN		46.0	30.6	61.1	40.7	78.4	52.1	97.8	65.0	119	79.4	143	95.1	169	112
L_p, m		0.467		0.549		0.632		0.719		0.796		0.878		0.960	
L_r, m		2.89		3.13		3.40		3.69		3.99		4.28		4.60	
$A_g \times 10^2$, mm^2		7.58		10.60		14.20		18.30		22.80		27.90		33.40	
$I_x \times 10^4$, mm^4		77.80		171.0		328.0		573.0		935.0		1450		2140	
$I_y \times 10^4$, mm^4		6.29		12.20		21.50		35.20		54.70		81.30		117.0	
$r_y \times 10$, mm		0.910		1.07		1.23		1.40		1.55		1.71		1.87	
r_x / r_y		3.52		3.75		3.91		4.01		4.13		4.21		4.28	
$P_{ex} L_{cx}^2$, kN · m^2		1530		3360		6480		11400		18400		28500		42200	
$P_{ey} L_{cy}^2$, kN · m^2		124		240		424		708		1080		1610		2310	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.											
$\phi_c = 0.90$		$\Omega_c = 1.67$													

Table C.1 Continued.

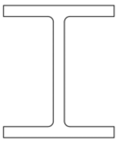


Available Strength in Axial Compression, kN
IPN Shapes

F_y = 235 MPa

Shape		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300		IPN 320		IPN 340	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	835	556	975	649	1130	750	1290	858	1460	971	1640	1090	1830	1220
	1.00	739	492	880	585	1030	684	1190	790	1350	900	1530	1020	1720	1140
	1.50	635	422	773	515	915	609	1070	712	1230	818	1400	934	1590	1060
	2.00	513	341	646	430	778	518	926	616	1080	716	1240	827	1420	946
	2.50	389	259	512	341	632	421	768	511	907	604	1060	706	1230	820
	3.00	279	186	386	257	490	326	611	407	736	490	876	583	1030	689
	3.50	205	136	284	189	365	243	466	310	575	383	698	464	842	560
	4.00	157	104	217	145	279	186	357	237	440	293	539	359	662	440
	4.50	124	82.5	172	114	221	147	282	187	348	231	426	284	523	348
	5.00	100	66.8	139	92.5	179	119	228	152	282	188	345	230	424	282
	5.50	83.0	55.2	115	76.5	148	98.3	189	125	233	155	285	190	350	233
	6.00	69.8	46.4	96.6	64.2	124	82.6	158	105	196	130	240	159	294	196
	6.50	59.4	39.5	82.3	54.7	106	70.4	135	89.8	167	111	204	136	251	167
	7.00	51.2	34.1	70.9	47.2	91.2	60.7	116	77.5	144	95.7	176	117	216	144
	7.50	44.6	29.7	61.8	41.1	79.5	52.9	101	67.5	125	83.3	153	102	188	125
	8.00	39.2	26.1	54.3	36.1	69.8	46.5	89.1	59.3	110	73.2	135	89.7	165	110
	8.50	34.8	23.1	48.1	32.0	61.9	41.2	79.0	52.5	97.5	64.9	119	79.5	147	97.5
	9.00	31.0	20.6	42.9	28.6	55.2	36.7	70.4	46.9	87.0	57.9	107	70.9	131	87.0
	9.50	27.8	18.5	38.5	25.6	49.5	33.0	63.2	42.1	78.1	51.9	95.6	63.6	117	78.1
	10.0	25.1	16.7	34.8	23.1	44.7	29.7	57.0	38.0	70.5	46.9	86.3	57.4	106	70.5
	10.5	22.8	15.2	31.5	21.0	40.5	27.0	51.7	34.4	63.9	42.5	78.3	52.1	96.1	63.9
	11.0	20.8	13.8	28.7	19.1	36.9	24.6	47.1	31.4	58.2	38.7	71.3	47.5	87.5	58.2
	11.5	19.0	12.6	26.3	17.5	33.8	22.5	43.1	28.7	53.3	35.4	65.3	43.4	80.1	53.3
	12.0	17.4	11.6	24.1	16.1	31.0	20.7	39.6	26.4	48.9	32.6	59.9	39.9	73.5	48.9
	12.5	16.1	10.7	22.2	14.8	28.6	19.0	36.5	24.3	45.1	30.0	55.2	36.7	67.8	45.1
	13.0	14.9	9.89	20.6	13.7	26.4	17.6	33.8	22.5	41.7	27.7	51.1	34.0	62.7	41.7
	13.5	13.8	9.17	19.1	12.7	24.5	16.3	31.3	20.8	38.7	25.7	47.4	31.5	58.1	38.7
	14.0	12.8	8.52	17.7	11.8	22.8	15.2	29.1	19.4	35.9	23.9	44.0	29.3	54.0	35.9
	14.5	11.9	7.95	16.5	11.0	21.3	14.1	27.1	18.1	33.5	22.3	41.0	27.3	50.4	33.5
	15.0	11.2	7.43	15.5	10.3	19.9	13.2	25.4	16.9	31.3	20.8	38.4	25.5	47.1	31.3
Properties															
P_{wo}, kN		210	140	243	162	282	188	326	217	371	247	420	280	471	314
P_{wi}, kN/m		1900	1270	2045	1363	2209	1473	2374	1582	2538	1692	2703	1802	2867	1911
P_{wb}, kN		448	298	507	337	589	392	678	451	772	514	873	581	980	652
P_{fb}, kN		197	131	227	151	263	175	305	203	347	231	396	263	443	295
L_p, m		1.04		1.13		1.19		1.26		1.31		1.37		1.44	
L_r, m		4.91		5.24		5.55		5.84		6.12		6.41		6.68	
$A_g \times 10^2$, mm^2		39.50		46.10		53.30		61.00		69.00		77.70		86.70	
$I_x \times 10^4$, mm^4		3060		4250		5740		7590		9800		12510		15700	
$I_y \times 10^4$, mm^4		162.0		221.0		288.0		364.0		451.0		555.0		674.0	
$r_y \times 10$, mm		2.02		2.20		2.32		2.45		2.56		2.67		2.80	
r_x / r_y		4.36		4.36		4.48		4.53		4.65		4.76		4.82	
$P_{ex} L_{cx}^2$, kN · m^2		60400		83700		114000		148000		193000		247000		312000	
$P_{ey} L_{cy}^2$, kN · m^2		3180		4400		5660		7230		8930		10900		13400	
LRFD	**ASD**	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.													
$\phi_c = 0.90$	$\Omega_c = 1.67$														

Table C.1 Continued.



Available Strength in Axial Compression, kN
IPN Shapes

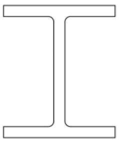
F_y = 235 MPa

Shape		**IPN 360**		**IPN 380**		**IPN 400**		**IPN 450**		**IPN 500**		**IPN 550**		**IPN 600**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2050	1360	2260	1510	2500	1660	3110	2070	3790	2520	4480	2980	5370	3570
	1.00	1930	1290	2140	1430	2370	1580	2980	1980	3650	2430	4350	2890	5230	3480
	1.50	1800	1190	2000	1330	2230	1480	2830	1880	3490	2320	4180	2780	5050	3360
	2.00	1620	1080	1820	1210	2040	1350	2620	1750	3280	2180	3960	2640	4820	3210
	2.50	1420	943	1610	1070	1820	1210	2390	1590	3020	2010	3700	2460	4540	3020
	3.00	1200	801	1380	921	1580	1050	2120	1410	2740	1820	3400	2260	4210	2800
	3.50	993	661	1160	771	1340	891	1850	1230	2440	1620	3070	2040	3860	2570
	4.00	794	529	944	628	1110	736	1580	1050	2130	1420	2740	1820	3480	2320
	4.50	628	418	751	500	889	592	1320	877	1830	1210	2400	1600	3100	2070
	5.00	508	338	608	405	720	479	1080	717	1540	1020	2070	1380	2730	1820
	5.50	420	280	503	334	595	396	891	593	1280	849	1760	1170	2370	1580
	6.00	353	235	422	281	500	333	748	498	1070	713	1480	987	2020	1350
	6.50	301	200	360	239	426	284	638	424	913	608	1260	841	1720	1150
	7.00	259	173	310	206	368	245	550	366	788	524	1090	725	1490	989
	7.50	226	150	270	180	320	213	479	319	686	456	949	631	1290	861
	8.00	199	132	238	158	281	187	421	280	603	401	834	555	1140	757
	8.50	176	117	210	140	249	166	373	248	534	355	739	492	1010	671
	9.00	157	104	188	125	222	148	333	221	476	317	659	438	899	598
	9.50	141	93.7	168	112	200	133	299	199	428	285	591	394	807	537
	10.0	127	84.6	152	101	180	120	269	179	386	257	534	355	728	485
	10.5	115	76.7	138	91.8	163	109	244	163	350	233	484	322	661	440
	11.0	105	69.9	126	83.6	149	99.0	223	148	319	212	441	294	602	400
	11.5	96.1	63.9	115	76.5	136	90.6	204	136	292	194	404	269	551	366
	12.0	88.3	58.7	106	70.3	125	83.2	187	124	268	178	371	247	506	337
	12.5	81.3	54.1	97.3	64.7	115	76.7	172	115	247	164	342	227	466	310
	13.0	75.2	50.0	90.0	59.9	107	70.9	159	106	228	152	316	210	431	287
	13.5	69.7	46.4	83.4	55.5	98.8	65.8	148	98.4	212	141	293	195	400	266
	14.0	64.8	43.1	77.6	51.6	91.9	61.1	137	91.5	197	131	272	181	372	247
	14.5	60.5	40.2	72.3	48.1	85.7	57.0	128	85.3	184	122	254	169	346	230
	15.0	56.5	37.6	67.6	45.0	80.0	53.3	120	79.7	172	114	237	158	324	215
Properties															
P_{wo} , kN		533	355	590	393	652	435	822	548	1012	675	1165	777	1450	966
P_{wi} , kN/m		3055	2037	3220	2146	3384	2256	3807	2538	4230	2820	4465	2977	5080	3380
P_{wb} , kN		1121	746	1242	826	1369	911	1732	1152	2136	1421	2279	1517	3070	2040
P_{fb} , kN		503	334	556	370	617	410	781	519	964	641	1190	792	1390	923
L_p , m		1.49		1.55		1.61		1.76		1.91		2.06		2.20	
L_r , m		7.02		7.34		7.59		8.32		9.06		9.58		10.4	
$A_g \times 10^2$, mm^2		97.00		107.0		118.0		147.0		179.0		212.0		254.0	
$I_x \times 10^4$, mm^4		19610		24010		29210		45850		68740		99180		138800	
$I_y \times 10^4$, mm^4		818.0		975.0		1160		1730		2480		3490		4674	
$r_y \times 10$, mm		2.90		3.02		3.13		3.43		3.72		4.02		4.29	
r_x / r_y		4.90		4.97		5.02		5.16		5.27		5.37		5.45	
$P_{ex} L_{cx}^2$, kN · m^2		386000		475000		574000		909000		1360000		1950000		2740000	
$P_{ey} L_{cy}^2$, kN · m^2		16100		19300		22800		34100		48900		67600		92300	

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

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.

Table C.1 Continued.

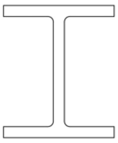


Available Strength in Axial Compression, kN
IPN Shapes

F_y = 275 MPa

Shape		IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180		IPN 200	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	188	125	262	175	351	234	453	301	564	375	691	459	827	550
	1.00	92.8	61.7	158	105	239	159	336	224	443	295	566	376	700	466
	1.50	43.5	28.9	84.0	55.9	148	98.2	232	154	327	217	441	293	568	378
	2.00	24.4	16.3	47.3	31.5	83.7	55.7	140	93.0	213	142	311	207	424	282
	2.50	15.6	10.4	30.3	20.1	53.6	35.6	89.4	59.5	137	90.9	203	135	291	194
	3.00	10.9	7.23	21.0	14.0	37.2	24.7	62.1	41.3	94.8	63.1	141	94.0	202	135
	3.50	7.98	5.31	15.4	10.3	27.3	18.2	45.6	30.4	69.7	46.4	104	69.0	149	98.8
	4.00	6.11	4.07	11.8	7.86	20.9	13.9	34.9	23.2	53.3	35.5	79.4	52.9	114	75.7
	4.50	4.83	3.21	9.34	6.21	16.5	11.0	27.6	18.4	42.1	28.0	62.8	41.8	89.9	59.8
	5.00	3.91	2.60	7.56	5.03	13.4	8.91	22.4	14.9	34.1	22.7	50.8	33.8	72.8	48.4
	5.50	3.23	2.15	6.25	4.16	11.1	7.36	18.5	12.3	28.2	18.8	42.0	28.0	60.2	40.0
	6.00	2.72	1.81	5.25	3.49	9.30	6.19	15.5	10.3	23.7	15.8	35.3	23.5	50.5	33.6
	6.50	2.31	1.54	4.48	2.98	7.92	5.27	13.2	8.80	20.2	13.4	30.1	20.0	43.1	28.7
	7.00	2.00	1.33	3.86	2.57	6.83	4.54	11.4	7.59	17.4	11.6	25.9	17.3	37.1	24.7
	7.50	1.74	1.16	3.36	2.24	5.95	3.96	9.93	6.61	15.2	10.1	22.6	15.0	32.4	21.5
	8.00	1.53	1.02	2.95	1.97	5.23	3.48	8.73	5.81	13.3	8.87	19.9	13.2	28.4	18.9
	8.50	1.35	0.901	2.62	1.74	4.63	3.08	7.73	5.15	11.8	7.86	17.6	11.7	25.2	16.8
	9.00	1.21	0.803	2.33	1.55	4.13	2.75	6.90	4.59	10.5	7.01	15.7	10.4	22.5	14.9
	9.50	1.08	0.721	2.10	1.39	3.71	2.47	6.19	4.12	9.46	6.29	14.1	9.37	20.2	13.4
	10.0	0.978	0.651	1.89	1.26	3.35	2.23	5.59	3.72	8.53	5.68	12.7	8.46	18.2	12.1
	10.5	0.887	0.590	1.72	1.14	3.04	2.02	5.07	3.37	7.74	5.15	11.5	7.67	16.5	11.0
	11.0	0.808	0.538	1.56	1.04	2.77	1.84	4.62	3.07	7.05	4.69	10.5	6.99	15.0	10.0
	11.5	0.739	0.492	1.43	0.951	2.53	1.68	4.23	2.81	6.45	4.29	9.61	6.39	13.8	9.15
	12.0	0.679	0.452	1.31	0.874	2.32	1.55	3.88	2.58	5.93	3.94	8.83	5.87	12.6	8.41
	12.5	0.626	0.416	1.21	0.805	2.14	1.43	3.58	2.38	5.46	3.63	8.13	5.41	11.6	7.75
	13.0	0.579	0.385	1.12	0.744	1.98	1.32	3.31	2.20	5.05	3.36	7.52	5.00	10.8	7.16
	13.5	0.537	0.357	1.04	0.690	1.84	1.22	3.07	2.04	4.68	3.12	6.97	4.64	9.98	6.64
	14.0	0.499	0.332	0.965	0.642	1.71	1.14	2.85	1.90	4.35	2.90	6.49	4.31	9.28	6.18
	14.5	0.465	0.309	0.899	0.598	1.59	1.06	2.66	1.77	4.06	2.70	6.05	4.02	8.65	5.76
	15.0	0.435	0.289	0.840	0.559	1.49	0.990	2.48	1.65	3.79	2.52	5.65	3.76	8.09	5.38
Properties															
P_{wo}, kN		56.3	37.5	75.2	50.1	96.8	64.5	121	80.7	148	98.8	178	119	211	141
P_{wi}, kN/m		1070	715	1240	825	1403	935	1568	1045	1733	1155	1898	1265	2063	1375
P_{wb}, kN		161	107	193	128	230	153	272	181	318	212	370	246	425	283
P_{fb}, kN		53.8	35.8	71.5	47.6	91.7	61.0	114	76.1	140	92.9	167	111	198	131
L_p, m		0.432		0.508		0.584		0.664		0.736		0.812		0.888	
L_r, m		2.48		2.69		2.93		3.18		3.45		3.71		3.99	
$A_g \times 10^2$, mm^2		7.58		10.60		14.20		18.30		22.80		27.90		33.40	
$I_x \times 10^4$, mm^4		77.80		171.0		328.0		573.0		935.0		1450		2140	
$I_y \times 10^4$, mm^4		6.29		12.20		21.50		35.20		54.70		81.30		117.0	
$r_y \times 10$, mm		0.910		1.07		1.23		1.40		1.55		1.71		1.87	
r_x/r_y		3.52		3.75		3.91		4.01		4.13		4.21		4.28	
$P_{ex} L_{cx}^2$, kN · m^2		1530		3360		6480		11400		18400		28500		42200	
$P_{ey} L_{cy}^2$, kN · m^2		124		240		424		708		1080		1610		2310	
LRFD		ASD		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.											
$\phi_c = 0.90$		$\Omega_c = 1.67$													

Table C.1 Continued.



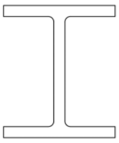
Available Strength in Axial Compression, kN
IPN Shapes

F_y = 275 MPa

Shape		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300		IPN 320		IPN 340	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	978	650	1140	759	1320	878	1510	1000	1710	1140	1920	1280	2150	1430
	1.00	847	564	1010	673	1180	788	1370	912	1560	1040	1770	1180	1990	1330
	1.50	709	472	870	579	1030	688	1210	807	1400	930	1600	1060	1820	1210
	2.00	552	367	705	469	855	569	1020	681	1200	796	1390	922	1590	1060
	2.50	400	266	537	358	670	446	823	547	979	652	1150	767	1350	897
	3.00	279	186	386	257	497	330	630	419	767	510	921	613	1100	731
	3.50	205	136	284	189	365	243	466	310	575	383	704	469	863	574
	4.00	157	104	217	145	279	186	357	237	440	293	539	359	662	440
	4.50	124	82.5	172	114	221	147	282	187	348	231	426	284	523	348
	5.00	100	66.8	139	92.5	179	119	228	152	282	188	345	230	424	282
	5.50	83.0	55.2	115	76.5	148	98.3	189	125	233	155	285	190	350	233
	6.00	69.8	46.4	96.6	64.2	124	82.6	158	105	196	130	240	159	294	196
	6.50	59.4	39.5	82.3	54.7	106	70.4	135	89.8	167	111	204	136	251	167
	7.00	51.2	34.1	70.9	47.2	91.2	60.7	116	77.5	144	95.7	176	117	216	144
	7.50	44.6	29.7	61.8	41.1	79.5	52.9	101	67.5	125	83.3	153	102	188	125
	8.00	39.2	26.1	54.3	36.1	69.8	46.5	89.1	59.3	110	73.2	135	89.7	165	110
	8.50	34.8	23.1	48.1	32.0	61.9	41.2	79.0	52.5	97.5	64.9	119	79.5	147	97.5
	9.00	31.0	20.6	42.9	28.6	55.2	36.7	70.4	46.9	87.0	57.9	107	70.9	131	87.0
	9.50	27.8	18.5	38.5	25.6	49.5	33.0	63.2	42.1	78.1	51.9	95.6	63.6	117	78.1
	10.0	25.1	16.7	34.8	23.1	44.7	29.7	57.0	38.0	70.5	46.9	86.3	57.4	106	70.5
	10.5	22.8	15.2	31.5	21.0	40.5	27.0	51.7	34.4	63.9	42.5	78.3	52.1	96.1	63.9
	11.0	20.8	13.8	28.7	19.1	36.9	24.6	47.1	31.4	58.2	38.7	71.3	47.5	87.5	58.2
	11.5	19.0	12.6	26.3	17.5	33.8	22.5	43.1	28.7	53.3	35.4	65.3	43.4	80.1	53.3
	12.0	17.4	11.6	24.1	16.1	31.0	20.7	39.6	26.4	48.9	32.6	59.9	39.9	73.5	48.9
	12.5	16.1	10.7	22.2	14.8	28.6	19.0	36.5	24.3	45.1	30.0	55.2	36.7	67.8	45.1
	13.0	14.9	9.89	20.6	13.7	26.4	17.6	33.8	22.5	41.7	27.7	51.1	34.0	62.7	41.7
	13.5	13.8	9.17	19.1	12.7	24.5	16.3	31.3	20.8	38.7	25.7	47.4	31.5	58.1	38.7
	14.0	12.8	8.52	17.7	11.8	22.8	15.2	29.1	19.4	35.9	23.9	44.0	29.3	54.0	35.9
	14.5	11.9	7.95	16.5	11.0	21.3	14.1	27.1	18.1	33.5	22.3	41.0	27.3	50.4	33.5
	15.0	11.2	7.43	15.5	10.3	19.9	13.2	25.4	16.9	31.3	20.8	38.4	25.5	47.1	31.3
Properties															
P_{wo} , kN		246	164	284	189	330	220	381	254	434	289	491	327	551	367
P_{wi} , kN/m		2228	1485	2393	1595	2585	1723	2778	1852	2970	1980	3163	2108	3355	2237
P_{wb} , kN		484	322	548	365	637	424	733	488	835	556	945	629	1060	706
P_{fb} , kN		230	153	265	177	308	205	357	238	406	270	463	308	518	345
L_p , m		0.959		1.04		1.10		1.16		1.22		1.27		1.33	
L_r , m		4.26		4.55		4.82		5.07		5.31		5.56		5.80	
$A_g \times 10^2$, mm^2		39.50		46.10		53.30		61.00		69.00		77.70		86.70	
$I_x \times 10^4$, mm^4		3060		4250		5740		7590		9800		12510		15700	
$I_y \times 10^4$, mm^4		162.0		221.0		288.0		364.0		451.0		555.0		674.0	
$r_y \times 10$, mm		2.02		2.20		2.32		2.45		2.56		2.67		2.80	
r_x / r_y		4.36		4.36		4.48		4.53		4.65		4.76		4.82	
$P_{ex} L_{cx}^2$, kN · m^2		60400		83700		114000		148000		193000		247000		312000	
$P_{ey} L_{cy}^2$, kN · m^2		3180		4400		5660		7230		8930		10900		13400	

LRFD	ASD	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.1 Continued.

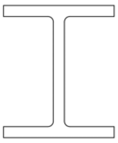


Available Strength in Axial Compression, kN
IPN Shapes

F_y = 275 MPa

Shape		**IPN 360**		**IPN 380**		**IPN 400**		**IPN 450**		**IPN 500**		**IPN 550**		**IPN 600**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	2400	1600	2650	1760	2920	1940	3640	2420	4430	2950	5250	3490	6290	4180
	1.00	2240	1490	2480	1650	2750	1830	3460	2300	4250	2830	5060	3370	6090	4050
	1.50	2050	1370	2290	1530	2550	1700	3250	2170	4030	2680	4840	3220	5850	3890
	2.00	1820	1210	2050	1360	2300	1530	2980	1990	3740	2490	4540	3020	5540	3680
	2.50	1560	1040	1780	1180	2010	1340	2670	1780	3400	2270	4190	2790	5160	3430
	3.00	1290	856	1490	991	1710	1140	2330	1550	3030	2020	3790	2520	4730	3140
	3.50	1030	683	1210	805	1410	937	1980	1320	2640	1760	3370	2240	4260	2840
	4.00	794	529	950	632	1130	749	1650	1100	2260	1500	2950	1960	3790	2520
	4.50	628	418	751	500	889	592	1330	885	1890	1260	2530	1680	3310	2200
	5.00	508	338	608	405	720	479	1080	717	1540	1030	2130	1420	2850	1890
	5.50	420	280	503	334	595	396	891	593	1280	849	1760	1170	2410	1600
	6.00	353	235	422	281	500	333	748	498	1070	713	1480	987	2020	1350
	6.50	301	200	360	239	426	284	638	424	913	608	1260	841	1720	1150
	7.00	259	173	310	206	368	245	550	366	788	524	1090	725	1490	989
	7.50	226	150	270	180	320	213	479	319	686	456	949	631	1290	861
	8.00	199	132	238	158	281	187	421	280	603	401	834	555	1140	757
	8.50	176	117	210	140	249	166	373	248	534	355	739	492	1010	671
	9.00	157	104	188	125	222	148	333	221	476	317	659	438	899	598
	9.50	141	93.7	168	112	200	133	299	199	428	285	591	394	807	537
	10.0	127	84.6	152	101	180	120	269	179	386	257	534	355	728	485
	10.5	115	76.7	138	91.8	163	109	244	163	350	233	484	322	661	440
	11.0	105	69.9	126	83.6	149	99.0	223	148	319	212	441	294	602	400
	11.5	96.1	63.9	115	76.5	136	90.6	204	136	292	194	404	269	551	366
	12.0	88.3	58.7	106	70.3	125	83.2	187	124	268	178	371	247	506	337
	12.5	81.3	54.1	97.3	64.7	115	76.7	172	115	247	164	342	227	466	310
	13.0	75.2	50.0	90.0	59.9	107	70.9	159	106	228	152	316	210	431	287
	13.5	69.7	46.4	83.4	55.5	98.8	65.8	148	98.4	212	141	293	195	400	266
	14.0	64.8	43.1	77.6	51.6	91.9	61.1	137	91.5	197	131	272	181	372	247
	14.5	60.5	40.2	72.3	48.1	85.7	57.0	128	85.3	184	122	254	169	346	230
	15.0	56.5	37.6	67.6	45.0	80.0	53.3	120	79.7	172	114	237	158	324	215
Properties															
P_{wo} , kN		624	416	690	460	763	509	962	642	1184	790	1364	909	1700	1130
P_{wi} , kN/m		3575	2383	3768	2512	3960	2640	4455	2970	4950	3300	5225	3483	5940	3960
P_{wb} , kN		1213	807	1343	894	1481	986	1873	1246	2311	1537	2466	1641	3320	2210
P_{fb} , kN		588	391	650	433	722	480	913	608	1128	750	1392	926	1620	1080
L_p , m		1.38		1.43		1.49		1.63		1.77		1.91		2.04	
L_r , m		6.09		6.37		6.59		7.22		7.87		8.33		9.01	
$A_g \times 10^2$, mm^2		97.00		107.0		118.0		147.0		179.0		212.0		254.0	
$I_x \times 10^4$, mm^4		19610		24010		29210		45850		68740		99180		138800	
$I_y \times 10^4$, mm^4		818.0		975.0		1160		1730		2480		3490		4674	
$r_y \times 10$, mm		2.90		3.02		3.13		3.43		3.72		4.02		4.02	
r_x/ r_y		4.90		4.97		5.02		5.16		5.27		5.37		5.45	
$P_{ex} L_{cx}^2$, kN · m^2		386000		475000		574000		909000		1360000		1950000		2740000	
$P_{ey} L_{cy}^2$, kN · m^2		16100		19300		22800		34100		48900		67600		92300	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.											
$\phi_c = 0.90$		$\Omega_c = 1.67$													

Table C.1 Continued.

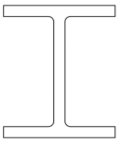


Available Strength in Axial Compression, kN
IPN Shapes

F_y = 355 MPa

Shape		**IPN 80**		**IPN 100**		**IPN 120**		**IPN 140**		**IPN 160**		**IPN 180**		**IPN 200**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	242	161	339	225	454	302	585	389	728	485	891	593	1070	710
	1.00	97.6	64.9	175	117	276	184	398	265	533	354	689	458	860	572
	1.50	43.5	28.9	84.0	55.9	149	99.0	246	164	360	239	499	332	657	437
	2.00	24.4	16.3	47.3	31.5	83.7	55.7	140	93.0	213	142	318	211	451	300
	2.50	15.6	10.4	30.3	20.1	53.6	35.6	89.4	59.5	137	90.9	203	135	291	194
	3.00	10.9	7.23	21.0	14.0	37.2	24.7	62.1	41.3	94.8	63.1	141	94.0	202	135
	3.50	7.98	5.31	15.4	10.3	27.3	18.2	45.6	30.4	69.7	46.4	104	69.0	149	98.8
	4.00	6.11	4.07	11.8	7.86	20.9	13.9	34.9	23.2	53.3	35.5	79.4	52.9	114	75.7
	4.50	4.83	3.21	9.34	6.21	16.5	11.0	27.6	18.4	42.1	28.0	62.8	41.8	89.9	59.8
	5.00	3.91	2.60	7.56	5.03	13.4	8.91	22.4	14.9	34.1	22.7	50.8	33.8	72.8	48.4
	5.50	3.23	2.15	6.25	4.16	11.1	7.36	18.5	12.3	28.2	18.8	42.0	28.0	60.2	40.0
	6.00	2.72	1.81	5.25	3.49	9.30	6.19	15.5	10.3	23.7	15.8	35.3	23.5	50.5	33.6
	6.50	2.31	1.54	4.48	2.98	7.92	5.27	13.2	8.80	20.2	13.4	30.1	20.0	43.1	28.7
	7.00	2.00	1.33	3.86	2.57	6.83	4.54	11.4	7.59	17.4	11.6	25.9	17.3	37.1	24.7
	7.50	1.74	1.16	3.36	2.24	5.95	3.96	9.93	6.61	15.2	10.1	22.6	15.0	32.4	21.5
	8.00	1.53	1.02	2.95	1.97	5.23	3.48	8.73	5.81	13.3	8.87	19.9	13.2	28.4	18.9
	8.50	1.35	0.901	2.62	1.74	4.63	3.08	7.73	5.15	11.8	7.86	17.6	11.7	25.2	16.8
	9.00	1.21	0.803	2.33	1.55	4.13	2.75	6.90	4.59	10.5	7.01	15.7	10.4	22.5	14.9
	9.50	1.08	0.721	2.10	1.39	3.71	2.47	6.19	4.12	9.46	6.29	14.1	9.37	20.2	13.4
	10.0	0.978	0.651	1.89	1.26	3.35	2.23	5.59	3.72	8.53	5.68	12.7	8.46	18.2	12.1
	10.5	0.887	0.590	1.72	1.14	3.04	2.02	5.07	3.37	7.74	5.15	11.5	7.67	16.5	11.0
	11.0	0.808	0.538	1.56	1.04	2.77	1.84	4.62	3.07	7.05	4.69	10.5	6.99	15.0	10.0
	11.5	0.739	0.492	1.43	0.951	2.53	1.68	4.23	2.81	6.45	4.29	9.61	6.39	13.8	9.15
	12.0	0.679	0.452	1.31	0.874	2.32	1.55	3.88	2.58	5.93	3.94	8.83	5.87	12.6	8.41
	12.5	0.626	0.416	1.21	0.805	2.14	1.43	3.58	2.38	5.46	3.63	8.13	5.41	11.6	7.75
	13.0	0.579	0.385	1.12	0.744	1.98	1.32	3.31	2.20	5.05	3.36	7.52	5.00	10.8	7.16
	13.5	0.537	0.357	1.04	0.690	1.84	1.22	3.07	2.04	4.68	3.12	6.97	4.64	9.98	6.64
	14.0	0.499	0.332	0.965	0.642	1.71	1.14	2.85	1.90	4.35	2.90	6.49	4.31	9.28	6.18
	14.5	0.465	0.309	0.899	0.598	1.59	1.06	2.66	1.77	4.06	2.70	6.05	4.02	8.65	5.76
	15.0	0.435	0.289	0.840	0.559	1.49	0.990	2.48	1.65	3.79	2.52	5.65	3.76	8.09	5.38
Properties															
P_{wo}, kN		72.7	48.5	97.0	64.7	125	83.3	156	104	191	127	230	154	272	181
P_{wi}, kN/m		1380	923	1600	1070	1810	1210	2020	1350	2240	1490	2450	1630	2660	1780
P_{wb}, kN		183	122	219	146	261	174	309	206	362	241	420	279	483	321
P_{fb}, kN		69.5	46.2	92.3	61.4	118	78.8	148	98.3	180	120	216	144	255	170
L_p, m		0.380		0.447		0.514		0.585		0.648		0.714		0.781	
L_r, m		1.95		2.12		2.32		2.53		2.74		2.95		3.19	
$A_g \times 10^2$, mm^2		7.58		10.60		14.20		18.30		22.80		27.90		33.40	
$I_x \times 10^4$, mm^4		77.80		171.0		328.0		573.0		935.0		1450		2140	
$I_y \times 10^4$, mm^4		6.29		12.20		21.50		35.20		54.70		81.30		117.0	
$r_y \times 10$, mm		0.910		1.07		1.23		1.40		1.55		1.71		1.87	
r_x / r_y		3.52		3.75		3.91		4.01		4.13		4.21		4.28	
$P_{ex} L_{cx}^2$, kN · m^2		1530		3360		6480		11400		18400		28500		42200	
$P_{ey} L_{cy}^2$, kN · m^2		124		240		424		708		1080		1610		2310	
LRFD	**ASD**	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.													
$\phi_c = 0.90$	$\Omega_c = 1.67$														

Table C.1 Continued.

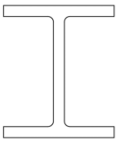


Available Strength in Axial Compression, kN
IPN Shapes

F_y = 355 MPa

Shape		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300		IPN 320		IPN 340	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	1260	840	1470	980	1700	1130	1950	1300	2200	1470	2480	1650	2770	1840
	1.00	1050	698	1260	839	1480	985	1720	1140	1970	1310	2230	1490	2520	1670
	1.50	833	554	1040	691	1240	827	1470	978	1700	1130	1960	1300	2230	1480
	2.00	603	401	791	526	973	648	1180	785	1390	926	1630	1080	1890	1260
	2.50	402	267	556	370	711	473	890	592	1080	715	1280	854	1520	1010
	3.00	279	186	386	257	497	330	634	422	783	521	959	638	1170	777
	3.50	205	136	284	189	365	243	466	310	575	383	704	469	865	575
	4.00	157	104	217	145	279	186	357	237	440	293	539	359	662	440
	4.50	124	82.5	172	114	221	147	282	187	348	231	426	284	523	348
	5.00	100	66.8	139	92.5	179	119	228	152	282	188	345	230	424	282
	5.50	83.0	55.2	115	76.5	148	98.3	189	125	233	155	285	190	350	233
	6.00	69.8	46.4	96.6	64.2	124	82.6	158	105	196	130	240	159	294	196
	6.50	59.4	39.5	82.3	54.7	106	70.4	135	89.8	167	111	204	136	251	167
	7.00	51.2	34.1	70.9	47.2	91.2	60.7	116	77.5	144	95.7	176	117	216	144
	7.50	44.6	29.7	61.8	41.1	79.5	52.9	101	67.5	125	83.3	153	102	188	125
	8.00	39.2	26.1	54.3	36.1	69.8	46.5	89.1	59.3	110	73.2	135	89.7	165	110
	8.50	34.8	23.1	48.1	32.0	61.9	41.2	79.0	52.5	97.5	64.9	119	79.5	147	97.5
	9.00	31.0	20.6	42.9	28.6	55.2	36.7	70.4	46.9	87.0	57.9	107	70.9	131	87.0
	9.50	27.8	18.5	38.5	25.6	49.5	33.0	63.2	42.1	78.1	51.9	95.6	63.6	117	78.1
	10.0	25.1	16.7	34.8	23.1	44.7	29.7	57.0	38.0	70.5	46.9	86.3	57.4	106	70.5
	10.5	22.8	15.2	31.5	21.0	40.5	27.0	51.7	34.4	63.9	42.5	78.3	52.1	96.1	63.9
	11.0	20.8	13.8	28.7	19.1	36.9	24.6	47.1	31.4	58.2	38.7	71.3	47.5	87.5	58.2
	11.5	19.0	12.6	26.3	17.5	33.8	22.5	43.1	28.7	53.3	35.4	65.3	43.4	80.1	53.3
	12.0	17.4	11.6	24.1	16.1	31.0	20.7	39.6	26.4	48.9	32.6	59.9	39.9	73.5	48.9
	12.5	16.1	10.7	22.2	14.8	28.6	19.0	36.5	24.3	45.1	30.0	55.2	36.7	67.8	45.1
	13.0	14.9	9.89	20.6	13.7	26.4	17.6	33.8	22.5	41.7	27.7	51.1	34.0	62.7	41.7
	13.5	13.8	9.17	19.1	12.7	24.5	16.3	31.3	20.8	38.7	25.7	47.4	31.5	58.1	38.7
	14.0	12.8	8.52	17.7	11.8	22.8	15.2	29.1	19.4	35.9	23.9	44.0	29.3	54.0	35.9
	14.5	11.9	7.95	16.5	11.0	21.3	14.1	27.1	18.1	33.5	22.3	41.0	27.3	50.4	33.5
	15.0	11.2	7.43	15.5	10.3	19.9	13.2	25.4	16.9	31.3	20.8	38.4	25.5	47.1	31.3
Properties															
P_{wo} , kN		318	212	367	245	426	284	492	328	560	373	634	423	711	474
P_{wi} , kN/m		2880	1920	3089	2059	3337	2225	3586	2390	3834	2556	4083	2722	4331	2887
P_{wb} , kN		550	366	623	414	724	481	833	554	949	631	1073	714	1205	802
P_{fb} , kN		297	198	343	228	397	264	461	307	524	349	598	398	669	445
L_p , m		0.844		0.919		0.969		1.02		1.07		1.12		1.17	
L_r , m		3.41		3.64		3.86		4.06		4.26		4.46		4.65	
$A_g \times 10^2$, mm^2		39.50		46.10		53.30		61.00		69.00		77.70		86.70	
$I_x \times 10^4$, mm^4		3060		4250		5740		7590		9800		12510		15700	
$I_y \times 10^4$, mm^4		162.0		221.0		288.0		364.0		451.0		555.0		674.0	
$r_y \times 10$, mm		2.02		2.20		2.32		2.45		2.56		2.67		2.80	
r_x / r_y		4.36		4.36		4.48		4.53		4.65		4.76		4.82	
$P_{ex} L_{cx}^2$, kN · m^2		60400		83700		114000		148000		193000		247000		312000	
$P_{ey} L_{cy}^2$, kN · m^2		3180		4400		5660		7230		8930		10900		13400	
LRFD		**ASD**		Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.											
$\phi_c = 0.90$		$\Omega_c = 1.67$													

Table C.1 Continued.



Available Strength in Axial Compression, kN
IPN Shapes

F_y = 355 MPa

Shape		**IPN 360**		**IPN 380**		**IPN 400**		**IPN 450**		**IPN 500**		**IPN 550**		**IPN 600**	
Design		$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Effective length, L_c (m), with respect to least radius of gyration, r_y	**0.00**	3100	2060	3420	2270	3770	2510	4700	3120	5720	3810	6770	4510	8120	5400
	1.00	2830	1890	3150	2090	3490	2320	4410	2930	5420	3600	6470	4300	7790	5180
	1.50	2530	1690	2840	1890	3170	2110	4070	2710	5060	3370	6100	4060	7400	4920
	2.00	2170	1440	2460	1640	2770	1840	3640	2420	4600	3060	5620	3740	6890	4580
	2.50	1770	1180	2040	1360	2330	1550	3150	2090	4070	2710	5060	3370	6280	4180
	3.00	1380	921	1630	1080	1890	1260	2640	1760	3510	2330	4450	2960	5620	3740
	3.50	1040	690	1240	826	1470	979	2140	1430	2940	1950	3830	2550	4920	3270
	4.00	794	529	950	632	1130	749	1680	1120	2400	1590	3210	2140	4220	2810
	4.50	628	418	751	500	889	592	1330	885	1910	1270	2640	1750	3540	2360
	5.00	508	338	608	405	720	479	1080	717	1540	1030	2140	1420	2910	1940
	5.50	420	280	503	334	595	396	891	593	1280	849	1760	1170	2410	1600
	6.00	353	235	422	281	500	333	748	498	1070	713	1480	987	2020	1350
	6.50	301	200	360	239	426	284	638	424	913	608	1260	841	1720	1150
	7.00	259	173	310	206	368	245	550	366	788	524	1090	725	1490	989
	7.50	226	150	270	180	320	213	479	319	686	456	949	631	1290	861
	8.00	199	132	238	158	281	187	421	280	603	401	834	555	1140	757
	8.50	176	117	210	140	249	166	373	248	534	355	739	492	1010	671
	9.00	157	104	188	125	222	148	333	221	476	317	659	438	899	598
	9.50	141	93.7	168	112	200	133	299	199	428	285	591	394	807	537
	10.0	127	84.6	152	101	180	120	269	179	386	257	534	355	728	485
	10.5	115	76.7	138	91.8	163	109	244	163	350	233	484	322	661	440
	11.0	105	69.9	126	83.6	149	99.0	223	148	319	212	441	294	602	400
	11.5	96.1	63.9	115	76.5	136	90.6	204	136	292	194	404	269	551	366
	12.0	88.3	58.7	106	70.3	125	83.2	187	124	268	178	371	247	506	337
	12.5	81.3	54.1	97.3	64.7	115	76.7	172	115	247	164	342	227	466	310
	13.0	75.2	50.0	90.0	59.9	107	70.9	159	106	228	152	316	210	431	287
	13.5	69.7	46.4	83.4	55.5	98.8	65.8	148	98.4	212	141	293	195	400	266
	14.0	64.8	43.1	77.6	51.6	91.9	61.1	137	91.5	197	131	272	181	372	247
	14.5	60.5	40.2	72.3	48.1	85.7	57.0	128	85.3	184	122	254	169	346	230
	15.0	56.5	37.6	67.6	45.0	80.0	53.3	120	79.7	172	114	237	158	324	215
Properties															
P_{wo}, kN		805	537	891	594	985	657	1242	828	1529	1019	1760	1174	2190	1460
P_{wi}, kN/m		4615	3077	4864	3242	5112	3408	5751	3834	6390	4260	6745	4497	7670	5110
P_{wb}, kN		1378	917	1526	1015	1683	1120	2128	1416	2625	1747	2802	1864	3780	2510
P_{fb}, kN		759	505	839	558	932	620	1179	785	1456	969	1797	1196	2100	1390
L_p, m		1.21		1.26		1.31		1.43		1.55		1.68		1.79	
L_r, m		4.88		5.10		5.28		5.79		6.30		6.69		7.23	
$A_g \times 10^2$, mm^2		97.00		107.0		118.0		147.0		179.0		212.0		254.0	
$I_x \times 10^4$, mm^4		19610		24010		29210		45850		68740		99180		138800	
$I_y \times 10^4$, mm^4		818.0		975.0		1160		1730		2480		3490		4674	
$r_y \times 10$, mm		2.90		3.02		3.13		3.43		3.72		4.02		4.02	
r_x/r_y		4.90		4.97		5.02		5.16		5.27		5.37		5.45	
$P_{ex} L_{cx}^2$, kN · m^2		386000		475000		574000		909000		1360000		1950000		2740000	
$P_{ey} L_{cy}^2$, kN · m^2		16100		19300		22800		34100		48900		67600		92300	

LRFD	**ASD**	Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200.
$\phi_c = 0.90$	$\Omega_c = 1.67$	

Table C.2 Stiffness reduction factor.

Stiffness Reduction Factor, τ_b

LRFD	ASD	F_y, MPa					
$\frac{P_u}{A}$	$\frac{P_a}{A}$	235		275		355	
MPa		LRFD	ASD	LRFD	ASD	LRFD	ASD
360		–	–	–	–	–	–
350		–	–	–	–	0.0555	–
340		–	–	–	–	0.162	–
330		–	–	–	–	0.262	–
320		–	–	–	–	0.355	–
310		–	–	–	–	0.443	–
300		–	–	–	–	0.524	–
290		–	–	–	–	0.598	–
280		–	–	–	–	0.667	–
270		–	–	0.0714	–	0.728	–
260		–	–	0.206	–	0.784	–
250		–	–	0.331	–	0.833	–
240		–	–	0.444	–	0.876	–
230		0.0833	–	0.547	–	0.913	–
220		0.239	–	0.640	–	0.943	0.0335
210		0.380	–	0.722	–	0.966	0.203
200		0.507	–	0.793	–	0.984	0.355
190		0.619	–	0.854	–	0.995	0.492
180		0.717	–	0.904	–	1.00	0.612
170		0.800	–	0.944	0.0432	↓	0.717
160		0.869	–	0.973	0.257	↓	0.804
150		0.923	–	0.992	0.444	↓	0.876
140		0.963	0.178	1.00	0.604	↓	0.931
130		0.989	0.407	↓	0.737	↓	0.970
120		1.00	0.598	↓	0.843	↓	0.993
110		↓	0.752	↓	0.922	↓	1.00
100		↓	0.869	↓	0.973	↓	↓
90.0		↓	0.949	↓	0.998	↓	↓
80.0		↓	0.992	↓	1.00	↓	↓
70.0		↓	1.00	↓	1.00	↓	↓

– Indicates the stiffness reduction parameter is not applicable because the required strength exceeds the available strength for L_c/r = 0

A = A_g for nonslender cross–sections, mm^2

= A_e for selnder cross–sections, mm^2

Table C.3 Available critical stress.

Available Critical Stress for Compression Members

$\frac{L_c}{r}$	$F_y = 235$ MPa		$F_y = 275$ MPa		$F_y = 355$ MPa	
	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c
	MPa	**MPa**	**MPa**	**MPa**	**MPa**	**MPa**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
1	211	141	247	165	319	213
2	211	141	247	165	319	213
3	211	141	247	165	319	212
4	211	141	247	165	319	212
5	211	141	247	164	319	212
6	211	140	247	164	319	212
7	211	140	247	164	318	212
8	211	140	247	164	318	212
9	211	140	246	164	318	211
10	210	140	246	164	317	211
11	210	140	246	164	317	211
12	210	140	245	163	316	210
13	210	140	245	163	315	210
14	209	139	245	163	315	209
15	209	139	244	163	314	209
16	209	139	244	162	313	209
17	208	139	243	162	313	208
18	208	138	243	162	312	207
19	208	138	242	161	311	207
20	207	138	242	161	310	206
21	207	138	241	160	309	206
22	206	137	241	160	308	205
23	206	137	240	160	307	204
24	206	137	239	159	306	204
25	205	136	239	159	305	203
26	204	136	238	158	304	202
27	204	136	237	158	302	201
28	203	135	236	157	301	200
29	203	135	236	157	300	200
30	202	135	235	156	299	199
31	202	134	234	156	297	198
32	201	134	233	155	296	197
33	200	133	232	155	294	196
34	200	133	231	154	293	195
35	199	132	230	153	291	194
36	198	132	229	153	290	193
37	198	131	229	152	288	192
38	197	131	228	151	287	191
39	196	130	226	151	285	190
40	195	130	225	150	283	188
LRFD	**ASD**					
$\phi_c = 0.90$	$\Omega_c = 1.67$					

Table C.3 Continued.

Available Critical Stress for Compression Members

$\frac{L_c}{r}$	F_y = 235 MPa		F_y = 275 MPa		F_y = 355 MPa	
	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c
	MPa	MPa	MPa	MPa	MPa	MPa
	LRFD	ASD	LRFD	ASD	LRFD	ASD
41	195	129	224	149	282	187
42	194	129	223	149	280	186
43	193	128	222	148	278	185
44	192	128	221	147	276	184
45	191	127	220	146	274	183
46	190	127	219	146	272	181
47	189	126	218	145	271	180
48	189	125	216	144	269	179
49	188	125	215	143	267	177
50	187	124	214	142	265	176
51	186	124	213	141	263	175
52	185	123	211	141	261	173
53	184	122	210	140	259	172
54	183	122	209	139	257	171
55	182	121	207	138	254	169
56	181	120	206	137	252	168
57	180	120	205	136	250	166
58	179	119	203	135	248	165
59	178	118	202	134	246	164
60	177	118	201	133	244	162
61	176	117	199	133	241	161
62	175	116	198	132	239	159
63	174	115	196	131	237	158
64	172	115	195	130	235	156
65	171	114	193	129	232	155
66	170	113	192	128	230	153
67	169	113	191	127	228	152
68	168	112	189	126	226	150
69	167	111	188	125	223	149
70	166	110	186	124	221	147
71	165	109	184	123	219	145
72	163	109	183	122	216	144
73	162	108	181	121	214	142
74	161	107	180	120	212	141
75	160	106	178	119	209	139
76	159	106	177	118	207	138
77	157	105	175	117	204	136
78	156	104	174	115	202	134
79	155	103	172	114	200	133
80	154	102	170	113	197	131

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

Table C.3 Continued.

Available Critical Stress for Compression Members

$\frac{L_c}{r}$	$F_y = 235$ MPa		$F_y = 275$ MPa		$F_y = 355$ MPa	
	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c
	MPa	MPa	MPa	MPa	MPa	MPa
	LRFD	ASD	LRFD	ASD	LRFD	ASD
81	153	101	169	112	195	130
82	151	101	167	111	193	128
83	150	99.8	166	110	190	127
84	149	99.0	164	109	188	125
85	148	98.2	162	108	185	123
86	146	97.3	161	107	183	122
87	145	96.5	159	106	181	120
88	144	95.7	158	105	178	119
89	143	94.8	156	104	176	117
90	141	94.0	154	103	174	116
91	140	93.1	153	102	171	114
92	139	92.3	151	101	169	112
93	137	91.4	149	99.4	167	111
94	136	90.6	148	98.4	164	109
95	135	89.8	146	97.3	162	108
96	134	88.9	145	96.2	160	106
97	132	88.1	143	95.1	157	105
98	131	87.2	141	94.1	155	103
99	130	86.3	140	93.0	153	102
100	129	85.5	138	91.9	151	100
101	127	84.6	137	90.8	148	98.6
102	126	83.8	135	89.8	146	97.1
103	125	82.9	133	88.7	144	95.7
104	123	82.1	132	87.6	142	94.2
105	122	81.2	130	86.6	139	92.7
106	121	80.4	129	85.5	137	91.2
107	120	79.5	127	84.5	135	89.8
108	118	78.7	125	83.4	133	88.3
109	117	77.8	124	82.4	131	86.9
110	116	77.0	122	81.3	129	85.5
111	114	76.2	121	80.3	126	84.1
112	113	75.3	119	79.2	124	82.6
113	112	74.5	118	78.2	122	81.2
114	111	73.6	116	77.2	120	79.8
115	109	72.8	114	76.2	118	78.4
116	108	72.0	113	75.1	116	77.0
117	107	71.1	111	74.1	114	75.7
118	106	70.3	110	73.1	112	74.4
119	104	69.5	108	72.1	110	73.2
120	103	68.7	107	71.1	108	72.0

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

Table C.3 Continued.

Available Critical Stress for Compression Members

$\frac{L_c}{r}$	F_y = 235 MPa		F_y = 275 MPa		F_y = 355 MPa	
	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c
	MPa	MPa	MPa	MPa	MPa	MPa
	LRFD	ASD	LRFD	ASD	LRFD	ASD
121	102	67.8	105	70.1	106	70.8
122	101	67.0	104	69.1	105	69.6
123	99.5	66.2	102	68.2	103	68.5
124	98.3	65.4	101	67.2	101	67.4
125	97.1	64.6	99.5	66.2	99.7	66.3
126	95.9	63.8	98.1	65.2	98.1	65.3
127	94.7	63.0	96.6	64.3	96.6	64.3
128	93.5	62.2	95.1	63.3	95.1	63.3
129	92.3	61.4	93.6	62.3	93.6	62.3
130	91.1	60.6	92.2	61.3	92.2	61.3
131	89.9	59.8	90.8	60.4	90.8	60.4
132	88.8	59.1	89.4	59.5	89.4	59.5
133	87.6	58.3	88.1	58.6	88.1	58.6
134	86.4	57.5	86.8	57.7	86.8	57.7
135	85.3	56.7	85.5	56.9	85.5	56.9
136	84.1	56.0	84.2	56.0	84.2	56.0
137	83.0	55.2	83.0	55.2	83.0	55.2
138	81.8	54.4	81.8	54.4	81.8	54.4
139	80.6	53.7	80.6	53.7	80.6	53.7
140	79.5	52.9	79.5	52.9	79.5	52.9
141	78.4	52.1	78.4	52.1	78.4	52.1
142	77.3	51.4	77.3	51.4	77.3	51.4
143	76.2	50.7	76.2	50.7	76.2	50.7
144	75.1	50.0	75.1	50.0	75.1	50.0
145	74.1	49.3	74.1	49.3	74.1	49.3
146	73.1	48.6	73.1	48.6	73.1	48.6
147	72.1	48.0	72.1	48.0	72.1	48.0
148	71.1	47.3	71.1	47.3	71.1	47.3
149	70.2	46.7	70.2	46.7	70.2	46.7
150	69.2	46.1	69.2	46.1	69.2	46.1
151	68.3	45.5	68.3	45.5	68.3	45.5
152	67.4	44.9	67.4	44.9	67.4	44.9
153	66.6	44.3	66.6	44.3	66.6	44.3
154	65.7	43.7	65.7	43.7	65.7	43.7
155	64.8	43.1	64.8	43.1	64.8	43.1
156	64.0	42.6	64.0	42.6	64.0	42.6
157	63.2	42.1	63.2	42.1	63.2	42.1
158	62.4	41.5	62.4	41.5	62.4	41.5
159	61.6	41.0	61.6	41.0	61.6	41.0
160	60.9	40.5	60.9	40.5	60.9	40.5
LRFD	ASD					
$\phi_c = 0.90$	$\Omega_c = 1.67$					

Table C.3 Continued.

Available Critical Stress for Compression Members

$\frac{L_c}{r}$	$F_y = 235$ MPa		$F_y = 275$ MPa		$F_y = 355$ MPa	
	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c	$\phi_c F_{cr}$	F_{cr}/Ω_c
	MPa	MPa	MPa	MPa	MPa	MPa
	LRFD	ASD	LRFD	ASD	LRFD	ASD
161	60.1	40.0	60.1	40.0	60.1	40.0
162	59.4	39.5	59.4	39.5	59.4	39.5
163	58.6	39.0	58.6	39.0	58.6	39.0
164	57.9	38.5	57.9	38.5	57.9	38.5
165	57.2	38.1	57.2	38.1	57.2	38.1
166	56.5	37.6	56.5	37.6	56.5	37.6
167	55.9	37.2	55.9	37.2	55.9	37.2
168	55.2	36.7	55.2	36.7	55.2	36.7
169	54.6	36.3	54.6	36.3	54.6	36.3
170	53.9	35.9	53.9	35.9	53.9	35.9
171	53.3	35.5	53.3	35.5	53.3	35.5
172	52.7	35.0	52.7	35.0	52.7	35.0
173	52.1	34.6	52.1	34.6	52.1	34.6
174	51.5	34.2	51.5	34.2	51.5	34.2
175	50.9	33.8	50.9	33.8	50.9	33.8
176	50.3	33.5	50.3	33.5	50.3	33.5
177	49.7	33.1	49.7	33.1	49.7	33.1
178	49.2	32.7	49.2	32.7	49.2	32.7
179	48.6	32.4	48.6	32.4	48.6	32.4
180	48.1	32.0	48.1	32.0	48.1	32.0
181	47.6	31.6	47.6	31.6	47.6	31.6
182	47.0	31.3	47.0	31.3	47.0	31.3
183	46.5	31.0	46.5	31.0	46.5	31.0
184	46.0	30.6	46.0	30.6	46.0	30.6
185	45.5	30.3	45.5	30.3	45.5	30.3
186	45.0	30.0	45.0	30.0	45.0	30.0
187	44.6	29.6	44.6	29.6	44.6	29.6
188	44.1	29.3	44.1	29.3	44.1	29.3
189	43.6	29.0	43.6	29.0	43.6	29.0
190	43.2	28.7	43.2	28.7	43.2	28.7
191	42.7	28.4	42.7	28.4	42.7	28.4
192	42.3	28.1	42.3	28.1	42.3	28.1
193	41.8	27.8	41.8	27.8	41.8	27.8
194	41.4	27.5	41.4	27.5	41.4	27.5
195	41.0	27.3	41.0	27.3	41.0	27.3
196	40.6	27.0	40.6	27.0	40.6	27.0
197	40.1	26.7	40.1	26.7	40.1	26.7
198	39.7	26.4	39.7	26.4	39.7	26.4
199	39.3	26.2	39.3	26.2	39.3	26.2
200	39.0	25.9	39.0	25.9	39.0	25.9
LRFD	ASD					
$\phi_c = 0.90$	$\Omega_c = 1.67$					

APPENDIX D

DESIGN TABLES FOR FLEXURAL MEMBERS

Table D.1 Selection by Z_x.

Z_x

I– shapes
Selection by Z_x

$F_y = 235$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
HD 400 × 1086	**27210**	**5750**	**3830**	**3100**	**2060**	**22.3**	**14.8**	**6.11**	**125**	**596000**	**6260**	**4170**
HD 400 × 990	**24280**	**5140**	**3420**	**2790**	**1860**	**21.5**	**14.3**	**6.02**	**115**	**519000**	**5580**	**3720**
HD 400 × 900	**21620**	**4570**	**3040**	**2510**	**1670**	**20.6**	**13.7**	**5.93**	**106**	**450000**	**4930**	**3290**
HD 400 × 818	**19260**	**4070**	**2710**	**2260**	**1500**	**20.0**	**13.3**	**5.85**	**96.6**	**392000**	**4380**	**2920**
HD 400 × 744	**17170**	**3630**	**2420**	**2030**	**1350**	**19.3**	**12.9**	**5.78**	**88.3**	**342000**	**3900**	**2600**
HE 1000 M	**16570**	**3500**	**2330**	**2120**	**1410**	**172**	**114**	**3.31**	**11.4**	**722000**	**2980**	**1990**
HD 400 × 677	15350	3250	2160	1840	1220	18.7	12.5	5.71	81.0	300000	3490	2320
HE 1000 B	**14860**	**3140**	**2090**	**1910**	**1270**	**166**	**110**	**3.28**	**10.7**	**645000**	**2680**	**1790**
HE 900 M	14440	3050	2030	1860	1240	136	90.2	3.39	12.2	570000	2690	1800
HD 400 × 634	14220	3010	2000	1710	1140	18.4	12.2	5.66	76.1	274000	3180	2120
HD 400 × 592	13140	2780	1850	1590	1060	18.1	12.0	5.61	71.2	250000	2950	1970
HE 1000 A	**12820**	**2710**	**1800**	**1660**	**1100**	**154**	**103**	**3.26**	**10.1**	**554000**	**2300**	**1540**
HE 900 B	12580	2660	1770	1630	1080	131	86.8	3.35	11.3	494000	2350	1570
HE 800 M	12490	2640	1760	1610	1070	104	69.0	3.49	13.4	443000	2410	1610
HD 400 x 551	12050	2550	1700	1470	979	17.7	11.8	5.57	66.5	226000	2690	1800
HD 400 x 509	11030	2330	1550	1360	903	17.4	11.6	5.53	61.6	205000	2460	1640
HE 900 A	**10810**	**2290**	**1520**	**1400**	**934**	**123**	**81.6**	**3.34**	**10.5**	**422000**	**2010**	**1340**
HE 700 M	10540	2230	1480	1360	906	75.4	50.1	3.60	15.1	329000	2120	1410
HE 800 B	10230	2160	1440	1330	884	99.5	66.2	3.43	11.8	359000	1970	1320
HD 400 × 463	9878	2090	1390	1230	816	17.0	11.3	5.47	56.2	180000	2200	1460
HE 650 M	9657	2040	1360	1250	831	63.1	42.0	3.66	16.2	282000	1980	1320
HD 400 × 421	8880	1880	1250	1110	740	16.7	11.1	5.43	51.4	160000	1970	1310
HE 600 M	8772	1860	1230	1130	755	52.1	34.6	3.71	17.6	237000	1840	1220
HE 800 A	**8699**	**1840**	**1220**	**1140**	**757**	**93.8**	**62.4**	**3.41**	**10.9**	**303000**	**1670**	**1110**
HE 700 B	8327	1760	1170	1090	723	73.0	48.6	3.53	12.8	257000	1680	1120
HD 400 × 382	7965	1680	1120	1010	669	16.4	10.9	5.39	46.7	141000	1750	1170
HE 550 M	7933	1680	1120	1020	682	42.2	28.1	3.77	19.2	198000	1690	1130
HE 650 B	7320	1550	1030	959	638	61.2	40.7	3.59	13.2	211000	1470	978
HD 400 × 347	7139	1510	1000	909	605	16.1	10.7	5.36	42.6	125000	1560	1040
HE 500 M	7094	1500	998	915	609	33.6	22.4	3.83	21.2	162000	1550	1030
HE 700 A	**7032**	**1490**	**990**	**924**	**615**	**69.6**	**46.3**	**3.51**	**11.6**	**215000**	**1410**	**940**
HE 600 B	6425	1360	904	844	562	50.7	33.7	3.64	13.8	171000	1310	874
HD 400 × 314	6374	1350	897	818	544	16.0	10.6	5.30	38.5	110000	1400	934
HE 450 M	6331	1340	891	814	542	26.4	17.6	3.90	23.8	132000	1420	944

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table D.1 Continued.

Z_x	I– shapes Selection by Z_x	$F_y = 235$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
HE 650 A	**6136**	**1300**	**863**	**810**	**539**	**58.5**	**38.9**	**3.58**	**11.9**	**175000**	**1220**	**812**
HD 400 × 287	5813	1230	818	751	500	15.8	10.5	5.28	35.5	99700	1250	835
HE 550 B	5591	1180	787	736	490	41.3	27.4	3.68	14.5	137000	1160	776
HE 400 M	5571	1180	784	714	475	20.3	13.5	3.95	26.9	104000	1280	853
HD 320 × 300	5522	1170	777	686	457	12.9	8.60	4.12	41.4	86900	1430	952
IPN 600	5452	1150	767	685	456	57.3	38.1	2.20	10.4	139000	1830	1220
HE 600 A	**5350**	**1130**	**753**	**709**	**472**	**48.6**	**32.4**	**3.62**	**12.3**	**141000**	**1080**	**721**
HD 400 × 262	5260	1110	740	684	455	15.8	10.5	5.25	32.5	89400	1150	768
HE 360 M	4989	1060	702	636	423	16.1	10.7	4.02	30.1	84900	1170	780
HE 500 B	4815	1020	678	635	422	32.9	21.9	3.73	15.4	107000	1020	682
HE 340 M	4718	998	664	600	399	14.2	9.47	4.06	32.0	76400	1120	744
HD 400 × 237	4686	991	659	614	408	15.6	10.4	5.22	29.4	78800	1010	675
HE 550 A	**4622**	**978**	**650**	**614**	**408**	**39.8**	**26.5**	**3.67**	**12.8**	**112000**	**952**	**635**
IPE O 600	**4471**	**946**	**629**	**574**	**382**	**59.5**	**39.6**	**2.46**	**8.70**	**118000**	**1290**	**860**
HD 320 × 245	4435	938	624	562	374	12.5	8.34	4.08	34.1	68100	1060	709
HE 320 M	4435	938	624	562	374	12.5	8.34	4.08	34.1	68100	1060	709
HD 400 × 216	4262	901	600	562	374	15.5	10.3	5.20	27.1	71100	915	610
IPN 550	4240	897	597	534	356	48.2	32.1	2.06	9.58	99200	1470	982
HE 300 M	4078	862	574	516	343	11.0	7.31	4.11	35.7	59200	1010	671
HE 450 B	3982	842	560	526	350	25.8	17.2	3.76	16.0	79900	888	592
HE 500 A	3949	835	556	526	350	31.9	21.2	3.72	13.4	87000	829	553
HD 360 × 196	3837	812	540	506	337	15.6	10.4	4.91	24.5	63600	860	573
HD 400 × 187	3642	770	512	484	322	15.4	10.3	5.15	23.7	60200	778	519
IPE 600	**3512**	**743**	**494**	**454**	**302**	**54.9**	**36.5**	**2.39**	**7.65**	**92100**	**1020**	**677**
HD 360 × 179	3482	736	490	462	308	15.6	10.4	4.89	22.5	57400	778	519
HD 320 × 198	3479	736	490	448	298	12.1	8.07	4.00	27.7	51900	871	580
IPE O 550	3263	690	459	421	280	48.1	32.0	2.34	7.93	79200	996	664
IPN 500	3240	685	456	407	271	38.9	25.9	1.91	9.06	68700	1270	846
HE 400 B	3232	684	455	427	284	19.6	13.1	3.80	16.9	57700	761	508
HE 450 A	3216	680	453	429	285	25.1	16.7	3.74	13.8	63700	713	476
IPE A 600	**3141**	**664**	**442**	**411**	**274**	**51.2**	**34.1**	**2.45**	**7.39**	**82900**	**825**	**550**
HD 360 × 162	3139	664	442	419	279	15.5	10.3	4.87	20.6	51500	683	455
HE 280 M	2966	627	417	378	251	9.38	6.24	3.80	30.4	39600	809	539
HD 360 × 147	2838	600	399	381	253	15.4	10.2	4.84	19.1	46300	624	416
IPE 550	**2787**	**589**	**392**	**361**	**240**	**45.3**	**30.1**	**2.28**	**7.32**	**67100**	**861**	**574**
HD 320 × 158	2718	575	382	356	237	11.9	7.91	3.94	22.4	39600	675	450
HE 360 B	2683	567	378	355	236	15.3	10.2	3.85	17.7	43200	635	423
IPE O 500	2613	553	368	338	225	39.3	26.2	2.25	7.70	57800	856	571
HD 360 × 134	2562	542	361	345	230	15.2	10.1	4.83	17.8	41500	562	375
HE 400 A	2562	542	361	342	228	19.0	12.7	3.77	14.3	45100	605	403
HD 260 × 172	2524	534	355	320	213	8.03	5.35	3.54	30.2	31300	736	491
HE 260 M	2524	534	355	320	213	8.03	5.35	3.54	30.2	31300	736	491
LRFD	**ASD**											
$\phi_b = 0.90$	$\Omega_b = 1.67$											
$\phi_v = 1.00$	$\Omega_v = 1.50$											

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 235$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN	m	m	mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD			× 10^4	LRFD	ASD
IPE A 550	**2475**	**523**	**348**	**325**	**216**	**42.3**	**28.1**	**2.34**	**7.04**	**60000**	**694**	**463**
HE 340 B	2408	509	339	319	212	13.5	8.95	3.87	18.0	36700	575	384
IPN 450	2400	508	338	302	201	31.4	20.9	1.76	8.31	45900	1030	685
IPE 500	**2194**	**464**	**309**	**285**	**190**	**36.9**	**24.6**	**2.21**	**7.05**	**48200**	**719**	**479**
HD 320 × 127	2149	455	302	285	190	11.7	7.79	3.89	18.4	30800	519	346
HE 320 B	2149	455	302	285	190	11.7	7.79	3.89	18.4	30800	519	346
HE 240 M	2117	448	298	266	177	6.82	4.53	3.28	29.9	24300	685	457
HE 360 A	2088	442	294	280	186	14.8	9.88	3.81	14.7	33100	494	329
IPE O 450	2046	433	288	266	177	31.3	20.8	2.16	7.49	40900	707	472
HD 260 × 142	2015	426	284	259	172	7.78	5.17	3.47	25.0	24300	608	405
IPE A 500	**1946**	**412**	**274**	**256**	**170**	**34.5**	**23.0**	**2.25**	**6.76**	**42900**	**589**	**392**
HE 300 B	1869	395	263	248	165	10.1	6.74	3.89	18.4	25200	465	310
HE 340 A	1850	391	260	248	165	13.0	8.64	3.83	14.8	27700	442	295
IPN 400	1714	363	241	216	144	24.5	16.3	1.61	7.59	29200	812	541
IPE 450	**1702**	**360**	**240**	**222**	**148**	**29.4**	**19.6**	**2.12**	**6.80**	**33700**	**596**	**398**
HD 320 × 97.6	1628	344	229	219	146	11.3	7.49	3.85	15.0	22900	393	262
HE 320 A	1628	344	229	219	146	11.3	7.49	3.85	15.0	22900	393	262
HD 260 × 114	1600	338	225	209	139	7.63	5.07	3.42	20.4	18900	472	315
HE 280 B	1534	324	216	204	136	8.82	5.87	3.64	17.3	19300	415	276
IPE O 400	**1502**	**318**	**211**	**196**	**130**	**23.9**	**15.9**	**2.07**	**7.16**	**26800**	**553**	**368**
IPE A 450	**1494**	**316**	**210**	**197**	**131**	**27.4**	**18.3**	**2.15**	**6.49**	**29800**	**479**	**319**
IPN 380	1482	313	209	187	124	21.9	14.6	1.55	7.33	24000	734	489
HE 220 M	1419	300	200	180	120	5.55	3.69	2.97	24.6	14600	525	350
HE 300 A	1383	293	195	187	124	9.61	6.40	3.85	14.9	18300	348	232
IPE 400	**1307**	**276**	**184**	**171**	**114**	**22.8**	**15.2**	**2.03**	**6.64**	**23100**	**485**	**323**
HD 260 × 93.0	1283	271	181	170	113	7.50	4.99	3.38	16.9	14900	367	244
HE 260 B	1283	271	181	170	113	7.50	4.99	3.38	16.9	14900	367	244
IPN 360	1276	270	180	161	107	19.6	13.1	1.49	7.02	19600	660	440
IPE O 360	**1186**	**251**	**167**	**155**	**103**	**19.2**	**12.8**	**1.98**	**6.97**	**19100**	**472**	**315**
IPE A 400	**1144**	**242**	**161**	**151**	**101**	**21.4**	**14.3**	**2.05**	**6.28**	**20300**	**392**	**261**
HD 320 × 74.2^f	1196	240	160	162	108	9.89	6.58	5.02	12.9	16500	340	226
HE 200 M	1135	240	160	143	95.3	4.56	3.04	2.71	23.9	10600	465	310
HE 280 A	1112	235	156	150	99.8	8.38	5.57	3.59	13.8	13700	305	203
IPN 340	1080	228	152	137	90.9	17.5	11.6	1.44	6.68	15700	585	390
HE 240 B	1053	223	148	139	92.4	6.31	4.20	3.12	16.4	11300	338	226

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 235$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
IPE 360	**1019**	**216**	**143**	**134**	**89.0**	**18.4**	**12.2**	**1.95**	**6.39**	**16300**	**406**	**271**
IPE O 330	**942.8**	**199**	**133**	**123**	**82.1**	**16.0**	**10.6**	**1.87**	**6.62**	**13900**	**400**	**267**
HD 260 × 68.2	919.8	195	129	124	82.4	7.11	4.73	3.34	13.3	10500	264	176
HE 260 A	919.8	195	129	124	82.4	7.11	4.73	3.34	13.3	10500	264	176
IPN 320	914.0	193	129	116	77.0	15.4	10.3	1.37	6.40	12500	519	346
IPE A 360	**906.8**	**192**	**128**	**120**	**80.0**	**17.4**	**11.6**	**1.97**	**6.08**	**14500**	**333**	**222**
HE 180 M	883.4	187	124	111	73.7	3.70	2.46	2.45	23.0	7480	409	273
HE 220 B	827.0	175	116	109	72.4	5.29	3.52	2.87	15.3	8090	295	196
IPE 330	**804.3**	**170**	**113**	**106**	**70.2**	**15.3**	**10.2**	**1.82**	**6.05**	**11800**	**349**	**233**
IPN 300	762.0	161	107	96.7	64.3	13.4	8.93	1.31	6.12	9800	457	305
HE 240 A	744.6	157	105	99.9	66.5	6.02	4.01	3.08	12.6	7760	243	162
IPE O 300	743.8	157	105	97.3	64.8	13.2	8.78	1.77	6.31	9990	343	229
IPE A 330	**701.9**	**148**	**98.8**	**92.6**	**61.6**	**14.4**	**9.57**	**1.82**	**5.70**	**10200**	**300**	**200**
HD 260 × 54.1[f]	714.5	143	95.4	96.8	64.4	6.43	4.28	4.48	11.7	7980	224	149
HE 160 M	674.6	143	94.9	83.9	55.8	2.91	1.94	2.19	22.4	5100	355	237
HE 200 B	642.5	136	90.4	84.3	56.1	4.30	2.86	2.60	14.6	5700	254	169
IPN 280	632.0	134	88.9	80.2	53.4	11.7	7.76	1.26	5.84	7590	399	266
IPE 300	**628.4**	**133**	**88.4**	**82.5**	**54.9**	**12.6**	**8.39**	**1.72**	**5.72**	**8360**	**300**	**200**
IPE O 270	574.6	122	80.9	75.1	50.0	10.7	7.13	1.59	5.92	6950	290	193
HE 220 A	568.5	120	80.0	76.3	50.7	5.05	3.36	2.83	11.5	5410	207	138
IPE A 300	**541.8**	**115**	**76.2**	**71.5**	**47.6**	**11.8**	**7.87**	**1.71**	**5.35**	**7170**	**255**	**170**
IPN 260	514.0	109	72.3	65.4	43.5	9.94	6.61	1.19	5.54	5740	345	230
HE 140 M	493.8	104	69.5	60.9	40.5	2.24	1.49	1.94	21.4	3290	293	196
IPE 270	**484.0**	**102**	**68.1**	**63.5**	**42.2**	**10.3**	**6.82**	**1.55**	**5.34**	**5790**	**251**	**168**
HE 180 B	481.4	102	67.7	63.0	41.9	3.46	2.30	2.35	13.6	3830	216	144
HE 200 A	429.5	90.8	60.4	57.5	38.3	4.05	2.70	2.56	10.8	3690	174	116
IPE A 270	**412.5**	**87.2**	**58.0**	**54.5**	**36.3**	**9.64**	**6.41**	**1.55**	**4.95**	**4920**	**207**	**138**
IPN 240	412.0	87.1	58.0	52.4	34.9	8.46	5.63	1.13	5.23	4250	294	196
IPE O 240	410.3	86.8	57.7	53.5	35.6	8.25	5.49	1.41	5.44	4370	239	159
IPE 240	366.6	77.5	51.6	48.0	31.9	8.10	5.39	1.38	5.02	3890	210	140
HE 160 B	354.0	74.9	49.8	46.1	30.7	2.67	1.78	2.08	12.8	2492	180	120
HE 120 M	350.6	74.2	49.3	42.7	28.4	1.64	1.09	1.67	20.9	2020	247	165
HE 180 A	324.9	68.7	45.7	43.5	28.9	3.32	2.21	2.32	9.93	2510	145	96.4
IPN 220	324.0	68.5	45.6	41.2	27.4	7.07	4.70	1.04	4.91	3060	251	168

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 235$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	$\times 10^3$	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	$\times 10^4$	LRFD	ASD
IPE O 220	**321.1**	**67.9**	**45.2**	**41.8**	**27.8**	**7.00**	**4.66**	**1.30**	**5.03**	**3130**	**207**	**138**
IPE A 240	**311.6**	**65.9**	**43.8**	**41.1**	**27.4**	**7.68**	**5.11**	**1.38**	**4.60**	**3290**	**174**	**116**
IPE 220	**285.4**	**60.4**	**40.2**	**37.3**	**24.8**	**6.89**	**4.58**	**1.27**	**4.62**	**2770**	**183**	**122**
IPN 200	**250.0**	**52.9**	**35.2**	**31.7**	**21.1**	**5.82**	**3.87**	**0.960**	**4.60**	**2140**	**212**	**141**
IPE O 200	**249.4**	**52.7**	**35.1**	**32.4**	**21.6**	**5.75**	**3.83**	**1.18**	**4.72**	**2210**	**177**	**118**
HE 140 B	245.4	51.9	34.5	31.9	21.2	2.03	1.35	1.84	11.7	1510	138	92.1
HE 160 A	245.1	51.8	34.5	32.6	21.7	2.53	1.68	2.04	9.65	1670	129	85.7
IPE A 220	**240.2**	**50.8**	**33.8**	**31.6**	**21.0**	**6.52**	**4.34**	**1.26**	**4.21**	**2320**	**153**	**102**
HE 100 M	235.8	49.9	33.2	28.2	18.8	1.13	0.753	1.41	20.6	1140	203	135
IPE 200	220.6	46.7	31.0	28.8	19.1	5.66	3.77	1.15	4.31	1940	158	105
IPE O 180	**189.1**	**40.0**	**26.6**	**24.5**	**16.3**	**4.70**	**3.12**	**1.07**	**4.37**	**1510**	**154**	**103**
IPN 180	187.0	39.6	26.3	23.8	15.9	4.62	3.07	0.878	4.28	1450	175	117
IPE A 200	**181.7**	**38.4**	**25.6**	**23.9**	**15.9**	**5.34**	**3.55**	**1.14**	**3.86**	**1590**	**125**	**83.3**
HE 140 A	173.5	36.7	24.4	23.0	15.3	1.95	1.30	1.81	8.84	1030	103	68.8
IPE 180	166.4	35.2	23.4	21.7	14.4	4.62	3.07	1.05	3.98	1320	135	89.7
HE 120 B	165.2	34.9	23.2	21.3	14.2	1.45	0.962	1.57	11.0	864	110	73.3
IPN 160	**136.0**	**28.8**	**19.1**	**17.3**	**11.5**	**3.59**	**2.39**	**0.796**	**3.98**	**935**	**142**	**94.8**
IPE A 180	**135.3**	**28.6**	**19.0**	**17.8**	**11.8**	**4.37**	**2.91**	**1.05**	**3.53**	**1060**	**107**	**71.5**
IPE 160	123.9	26.2	17.4	16.1	10.7	3.61	2.40	0.945	3.75	869	113	75.2
HE 120 A	119.5	25.3	16.8	15.7	10.5	1.38	0.919	1.55	8.45	606	80.4	53.6
HE 100 B	104.2	22.0	14.7	13.3	8.86	0.957	0.637	1.30	10.4	450	84.6	56.4
IPE A 160	**99.09**	**21.0**	**13.9**	**13.0**	**8.65**	**3.41**	**2.27**	**0.940**	**3.27**	**689**	**88.5**	**59.0**
IPN 140	95.40	20.2	13.4	12.1	8.07	2.71	1.81	0.719	3.69	573	113	75.0
IPE 140	88.34	18.7	12.4	11.4	7.62	2.75	1.83	0.847	3.48	541	92.8	61.9
HE 100 A	83.01	17.6	11.7	10.8	7.17	0.916	0.609	1.29	8.70	349	67.7	45.1
IPE A 140	**71.60**	**15.1**	**10.1**	**9.37**	**6.24**	**2.64**	**1.76**	**0.847**	**3.03**	**435**	**73.6**	**49.1**
IPN 120	63.60	13.5	8.95	8.10	5.39	1.93	1.29	0.632	3.40	328	86.3	57.5
IPE 120	**60.73**	**12.8**	**8.55**	**7.84**	**5.22**	**1.97**	**1.31**	**0.744**	**3.29**	**318**	**74.4**	**49.6**
IPE A 120	**49.87**	**10.5**	**7.02**	**6.48**	**4.31**	**1.90**	**1.26**	**0.729**	**2.87**	**257**	**63.0**	**42.0**
IPN 100	**39.80**	**8.42**	**5.60**	**5.06**	**3.37**	**1.30**	**0.866**	**0.549**	**3.13**	**171**	**63.5**	**42.3**
IPE 100	**39.41**	**8.34**	**5.55**	**5.06**	**3.37**	**1.31**	**0.869**	**0.637**	**3.14**	**171**	**57.8**	**38.5**
IPE A 100	**32.98**	**6.98**	**4.64**	**4.27**	**2.84**	**1.26**	**0.841**	**0.626**	**2.77**	**141**	**49.7**	**33.2**
IPE 80	**23.22**	**4.91**	**3.27**	**2.97**	**1.97**	**0.823**	**0.548**	**0.539**	**2.90**	**80.1**	**42.9**	**28.6**
IPN 80	**22.80**	**4.82**	**3.21**	**2.89**	**1.92**	**0.800**	**0.532**	**0.467**	**2.89**	**77.8**	**44.0**	**29.3**
IPE A 80	**18.98**	**4.01**	**2.67**	**2.44**	**1.63**	**0.783**	**0.521**	**0.534**	**2.54**	**64.4**	**36.3**	**24.2**

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table D.1 Continued.

Z_x	I– shapes Selection by Z_x	$F_y = 275$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
HD 400 × 1086	**27210**	**6730**	**4480**	**3630**	**2410**	**30.7**	**20.4**	**5.65**	**107**	**596000**	**7320**	**4880**
HD 400 × 990	**24280**	**6010**	**4000**	**3270**	**2180**	**29.6**	**19.7**	**5.56**	**98.2**	**519000**	**6520**	**4350**
HD 400 × 900	**21620**	**5350**	**3560**	**2940**	**1950**	**28.4**	**18.9**	**5.48**	**90.4**	**450000**	**5770**	**3850**
HD 400 × 818	**19260**	**4770**	**3170**	**2640**	**1760**	**27.5**	**18.3**	**5.41**	**82.5**	**392000**	**5130**	**3420**
HD 400 × 744	**17170**	**4250**	**2830**	**2380**	**1580**	**26.6**	**17.7**	**5.34**	**75.5**	**342000**	**4570**	**3050**
HE 1000 M	**16570**	**4100**	**2730**	**2480**	**1650**	**229**	**153**	**3.06**	**10.1**	**722000**	**3490**	**2330**
HD 400 × 677	15350	3800	2530	2150	1430	25.8	17.2	5.28	69.3	300000	4080	2720
HE 1000 B	**14860**	**3680**	**2450**	**2230**	**1490**	**220**	**146**	**3.03**	**9.60**	**645000**	**3140**	**2090**
HE 900 M	14440	3570	2380	2170	1450	182	121	3.13	10.8	570000	3150	2100
HD 400 × 634	14220	3520	2340	2000	1330	25.3	16.9	5.24	65.0	274000	3720	2480
HD 400 × 592	13140	3250	2160	1860	1240	24.9	16.6	5.19	60.9	250000	3450	2300
HE 1000 A	**12820**	**3170**	**2110**	**1940**	**1290**	**203**	**135**	**3.01**	**9.11**	**554000**	**2700**	**1800**
HE 900 B	12580	3110	2070	1900	1270	174	116	3.10	10.1	494000	2750	1830
HE 800 M	12490	3090	2060	1880	1250	141	93.6	3.22	11.8	443000	2820	1880
HD 400 × 551	12050	2980	1980	1720	1150	24.4	16.2	5.15	56.9	226000	3150	2100
HD 400 × 509	11030	2730	1820	1590	1060	24.0	16.0	5.12	52.7	205000	2880	1920
HE 900 A	**10810**	**2680**	**1780**	**1640**	**1090**	**162**	**108**	**3.09**	**9.46**	**422000**	**2350**	**1570**
HE 700 M	10540	2610	1740	1590	1060	103	68.6	3.33	13.2	329000	2480	1650
HE 800 B	10230	2530	1680	1560	1030	133	88.7	3.17	10.5	359000	2310	1540
HD 400 × 463	9878	2440	1630	1440	955	23.5	15.6	5.06	48.1	180000	2570	1710
HE 650 M	9657	2390	1590	1460	972	86.6	57.6	3.38	14.1	282000	2310	1540
HD 400 × 421	8880	2200	1460	1300	866	23.0	15.3	5.02	44.0	160000	2300	1530
HE 600 M	8772	2170	1440	1330	883	71.7	47.7	3.43	15.2	237000	2150	1430
HE 800 A	**8699**	**2150**	**1430**	**1330**	**886**	**124**	**82.8**	**3.16**	**9.77**	**303000**	**1960**	**1300**
HE 700 B	8327	2060	1370	1270	846	98.6	65.6	3.26	11.3	257000	1960	1310
HD 400 × 382	7965	1970	1310	1180	783	22.7	15.1	4.98	40.0	141000	2050	1360
HE 550 M	7933	1960	1310	1200	798	58.3	38.8	3.49	16.6	198000	1980	1320
HE 650 B	7320	1810	1210	1120	747	82.9	55.1	3.32	11.6	211000	1720	1140
HD 400 × 347	7139	1770	1180	1060	708	22.3	14.8	4.95	36.5	125000	1830	1220
HE 500 M	7094	1760	1170	1070	712	46.5	30.9	3.54	18.3	162000	1820	1210
HE 700 A	**7032**	**1740**	**1160**	**1080**	**719**	**93.0**	**61.9**	**3.25**	**10.3**	**215000**	**1650**	**1100**
HE 600 B	6425	1590	1060	988	657	68.9	45.8	3.36	12.1	171000	1530	1020
HD 400 × 314	6374	1580	1050	957	637	22.1	14.7	4.90	33.0	110000	1640	1090
HE 450 M	6331	1570	1040	953	634	36.6	24.3	3.60	20.4	132000	1660	1100
LRFD	ASD											
$\phi_b = 0.90$	$\Omega_b = 1.67$											
$\phi_v = 1.00$	$\Omega_v = 1.50$											

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 275$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
HE 650 A	**6136**	**1520**	**1010**	**948**	**631**	**78.3**	**52.1**	**3.31**	**10.6**	**175000**	**1430**	**950**
HD 400 × 287	5813	1440	957	879	585	21.9	14.6	4.88	30.4	99700	1470	977
HE 550 B	5591	1380	921	861	573	56.3	37.5	3.40	12.7	137000	1360	908
HE 400 M	5571	1380	917	835	556	28.1	18.7	3.65	23.0	104000	1500	998
HD 320 × 300	5522	1370	909	803	534	17.9	11.9	3.81	35.4	86900	1670	1110
IPN 600	5452	1350	898	802	533	78.6	52.3	2.04	9.00	139000	2140	1430
HE 600 A	**5350**	**1320**	**881**	**829**	**552**	**65.4**	**43.5**	**3.35**	**10.9**	**141000**	**1270**	**844**
HD 400 × 262	5260	1300	866	800	533	21.8	14.5	4.86	27.9	89400	1350	898
HE 360 M	4989	1230	822	744	495	22.2	14.8	3.72	25.8	84900	1370	912
HE 500 B	4815	1190	793	743	494	45.1	30.0	3.45	13.4	107000	1200	798
HE 340 M	4718	1170	777	702	467	19.7	13.1	3.75	27.4	76400	1310	871
HD 400 × 237	4686	1160	772	718	478	21.6	14.3	4.82	25.3	78800	1190	790
HE 550 A	**4622**	**1140**	**761**	**718**	**478**	**53.8**	**35.8**	**3.39**	**11.3**	**112000**	**1110**	**743**
IPE O 600	**4471**	**1110**	**736**	**672**	**447**	**79.8**	**53.1**	**2.27**	**7.72**	**118000**	**1510**	**1010**
HD 320 × 245	4435	1100	730	658	438	17.3	11.5	3.77	29.2	68100	1240	829
HE 320 M	4435	1100	730	658	438	17.3	11.5	3.77	29.2	68100	1240	829
HD 400 × 216	4262	1050	702	657	437	21.4	14.3	4.81	23.4	71100	1070	714
IPN 550	4240	1050	698	625	416	66.1	44.0	1.91	8.32	99200	1720	1150
HE 300 M	4078	1010	672	603	401	15.2	10.1	3.80	30.5	59200	1180	785
HE 450 B	3982	986	656	615	409	35.4	23.6	3.48	13.9	79900	1040	693
HE 500 A	3949	977	650	615	409	43.3	28.8	3.44	11.8	87000	970	647
HD 360 × 196	3837	950	632	593	394	21.5	14.3	4.54	21.1	63600	1010	671
HD 400 × 187	3642	901	600	567	377	21.3	14.2	4.76	20.5	60200	911	607
IPE 600	**3512**	**869**	**578**	**532**	**354**	**72.5**	**48.3**	**2.21**	**6.86**	**92100**	**1190**	**792**
HD 360 × 179	3482	862	573	541	360	21.5	14.3	4.52	19.5	57400	911	607
HD 320 × 198	3479	861	573	524	349	16.8	11.2	3.70	23.8	51900	1020	679
IPE O 550	3263	808	537	493	328	64.2	42.7	2.16	7.06	79200	1170	777
IPN 500	3240	802	534	476	317	53.4	35.5	1.77	7.86	68700	1490	990
HE 400 B	3232	800	532	500	332	27.0	18.0	3.51	14.6	57700	891	594
HE 450 A	3216	796	530	502	334	34.1	22.7	3.46	12.1	63700	835	557
IPE A 600	**3141**	**777**	**517**	**481**	**320**	**67.3**	**44.8**	**2.26**	**6.67**	**82900**	**965**	**644**
HD 360 × 162	3139	777	517	491	326	21.3	14.2	4.50	17.9	51500	799	533
HE 280 M	2966	734	488	442	294	13.0	8.63	3.51	26.0	39600	946	631
HD 360 × 147	2838	702	467	446	296	21.1	14.0	4.48	16.7	46300	731	487

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 275$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
IPE 550	**2787**	**690**	**459**	**423**	**281**	**59.9**	**39.9**	**2.11**	**6.57**	**67100**	**1010**	**672**
HD 320 × 158	2718	673	448	416	277	16.4	10.9	3.64	19.2	39600	790	526
HE 360 B	2683	664	442	416	277	21.1	14.1	3.56	15.3	43200	743	495
IPE O 500	2613	647	430	396	263	52.6	35.0	2.08	6.85	57800	1000	472
HD 360 × 134^f	2562	634	422	404	269	20.7	13.7	4.46	15.6	41500	658	574
HE 400 A	2562	634	422	400	266	26.0	17.3	3.48	12.5	45100	708	574
HD 260 × 172	2524	625	416	374	249	11.1	7.39	3.27	25.8	31300	861	542
HE 260 M	2524	625	416	374	249	11.1	7.39	3.27	25.8	31300	861	449
IPE A 550	**2475**	**613**	**408**	**380**	**253**	**55.5**	**36.9**	**2.16**	**6.35**	**60000**	**812**	**802**
HE 340 B	2408	596	397	374	249	18.6	12.3	3.57	15.6	36700	673	561
IPN 450	2400	594	395	353	235	43.1	28.6	1.63	7.22	45900	1200	405
IPE 500	**2194**	**543**	**361**	**334**	**222**	**48.9**	**32.5**	**2.05**	**6.32**	**48200**	**842**	**405**
HD 320 × 127	2149	532	354	334	222	16.2	10.8	3.59	15.9	30800	607	535
HE 320 B	2149	532	354	334	222	16.2	10.8	3.59	15.9	30800	607	385
HE 240 M	2117	524	349	312	207	9.42	6.27	3.03	25.6	24300	802	552
HE 360 A	2088	517	344	328	218	20.3	13.5	3.53	12.8	33100	578	474
IPE O 450	2046	506	337	311	207	42.0	28.0	2.00	6.65	40900	828	459
HD 260 × 142	2015	499	332	303	202	10.8	7.16	3.21	21.4	24300	711	363
IPE A 500	**1946**	**482**	**320**	**299**	**199**	**45.3**	**30.1**	**2.08**	**6.10**	**42900**	**689**	**345**
HE 300 B	1869	463	308	291	193	14.0	9.31	3.60	15.9	25200	545	634
HE 340 A	1850	458	305	291	193	17.8	11.8	3.54	13.0	27700	517	465
IPN 400	1714	424	282	253	168	33.6	22.3	1.49	6.59	29200	950	307
IPE 450	**1702**	**421**	**280**	**260**	**173**	**39.0**	**26.0**	**1.96**	**6.09**	**33700**	**698**	**307**
HD 320 × 97.6	1628	403	268	256	170	15.4	10.3	3.56	13.1	22900	460	369
HE 320 A	1628	403	268	256	170	15.4	10.3	3.56	13.1	22900	460	323
HD 260 × 114	1600	396	263	244	163	10.6	7.02	3.16	17.5	18900	553	431
HE 280 B	1534	380	253	238	159	12.2	8.11	3.37	15.0	19300	485	374
IPE O 400	**1502**	**372**	**247**	**229**	**153**	**32.1**	**21.3**	**1.91**	**6.35**	**26800**	**647**	**573**
IPE A 450	**1494**	**370**	**246**	**231**	**153**	**36.1**	**24.0**	**1.99**	**5.84**	**29800**	**561**	**409**
IPN 380	1482	367	244	218	145	30.1	20.0	1.43	6.37	24000	859	271
HE 220 M	1419	351	234	211	140	7.67	5.11	2.75	21.0	14600	614	378
HE 300 A^f	1383	339	225	218	145	13.2	8.75	3.82	13.0	18300	407	286
IPE 400	**1307**	**323**	**215**	**200**	**133**	**30.4**	**20.2**	**1.87**	**5.92**	**23100**	**568**	**286**
HD 260 × 93.0	1283	318	211	199	132	10.4	6.89	3.12	14.6	14900	429	515
HE 260 B	1283	318	211	199	132	10.4	6.89	3.12	14.6	14900	429	265
IPN 360	1276	316	210	189	126	26.9	17.9	1.38	6.09	19600	772	368
IPE O 360	**1186**	**294**	**195**	**181**	**121**	**25.9**	**17.2**	**1.83**	**6.17**	**19100**	**553**	**368**
IPE A 400	**1144**	**283**	**188**	**177**	**118**	**28.3**	**18.8**	**1.90**	**5.65**	**20300**	**459**	**306**
HE 200 M	1196	281	187	168	112	6.31	4.20	2.50	20.5	10600	545	456
HD 320 × 74.2^f	1135	274	183	189	126	13.4	8.91	5.05	11.4	16500	397	265
HE 280 A^f	1112	272	181	176	117	11.5	7.62	3.59	12.0	13700	356	264
IPN 340	1080	267	178	160	106	24.0	16.0	1.33	5.80	15700	684	317
HE 240 B	1053	261	173	163	108	8.73	5.81	2.89	14.1	11300	396	312

LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 275$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
IPE 360	**1019**	**252**	**168**	**157**	**104**	**24.5**	**16.3**	**1.80**	**5.70**	**16300**	**475**	**206**
IPE O 330	**942.8**	**233**	**155**	**144**	**96.0**	**21.6**	**14.3**	**1.73**	**5.86**	**13900**	**468**	**206**
HD 260 × 68.2[f]	919.8	227	151	145	96.4	9.75	6.49	3.16	11.6	10500	309	206
HE 260 A[f]	919.8	227	151	145	96.4	9.75	6.49	3.16	11.6	10500	309	206
IPN 320	914.0	226	151	135	90.1	21.1	14.1	1.27	5.56	12500	607	319
IPE A 360	**906.8**	**224**	**149**	**141**	**93.6**	**23.1**	**15.3**	**1.82**	**5.46**	**14500**	**389**	**230**
HE 180 M	883.4	219	145	130	86.3	5.11	3.40	2.26	19.7	7480	479	272
HE 220 B	827.0	205	136	127	84.8	7.32	4.87	2.65	13.2	8090	345	356
IPE 330	**804.3**	**199**	**132**	**124**	**82.2**	**20.4**	**13.6**	**1.68**	**5.39**	**11800**	**408**	**190**
IPN 300	762.0	189	125	113	75.3	18.4	12.3	1.22	5.31	9800	535	268
HE 240 A	744.6	184	123	117	77.8	8.27	5.50	2.85	11.0	7760	285	174
IPE O 300	743.8	184	122	114	75.8	17.8	11.8	1.64	5.58	9990	401	234
IPE A 330	**701.9**	**174**	**116**	**108**	**72.1**	**19.1**	**12.7**	**1.68**	**5.11**	**10200**	**351**	**198**
HE 160 M	714.5	167	111	98.1	65.3	4.02	2.67	2.02	19.2	5100	416	311
HD 260 × 54.1[f]	674.6	164	109	113	75.4	8.75	5.82	4.51	10.3	7980	262	277
HE 200 B	642.5	159	106	98.7	65.7	5.95	3.96	2.41	12.5	5700	297	234
IPN 280	632.0	156	104	93.9	62.5	16.0	10.7	1.16	5.07	7590	467	226
IPE 300	**628.4**	**156**	**103**	**96.5**	**64.2**	**16.8**	**11.2**	**1.59**	**5.09**	**8360**	**351**	**162**
IPE O 270	574.6	142	94.6	87.9	58.5	14.5	9.66	1.47	5.21	6950	339	**199**
HE 220 A	568.5	141	93.6	89.3	59.4	6.93	4.61	2.62	10.0	5410	243	269
IPE A 300	**541.8**	**134**	**89.2**	**83.7**	**55.7**	**15.7**	**10.4**	**1.59**	**4.80**	**7170**	**299**	**229**
IPN 260	514.0	127	84.6	76.6	50.9	13.6	9.08	1.10	4.81	5740	403	196
HE 140 M	493.8	122	81.3	71.3	47.4	3.09	2.06	1.79	18.3	3290	343	168
IPE 270	**484.0**	**120**	**79.7**	**74.3**	**49.4**	**13.8**	**9.16**	**1.43**	**4.74**	**5790**	**294**	**136**
HE 180 B	481.4	119	79.3	73.8	49.1	4.79	3.19	2.17	11.6	3830	252	162
HE 200 A	429.5	106	70.7	67.3	44.8	5.57	3.71	2.36	9.36	3690	204	230
IPE A 270	**412.5**	**102**	**67.9**	**63.8**	**42.5**	**12.8**	**8.52**	**1.43**	**4.42**	**4920**	**242**	**186**
IPN 240	412.0	102	67.8	61.3	40.8	11.6	7.73	1.04	4.54	4250	345	164
IPE O 240	410.3	102	67.6	62.6	41.6	11.2	7.46	1.30	4.78	4370	280	141
IPE 240	366.6	90.7	60.4	56.2	37.4	11.0	7.29	1.28	4.43	3890	246	193
HE 160 B	354.0	87.6	58.3	54.0	35.9	3.70	2.46	1.92	11.0	2490	211	141
HE 120 M	350.6	86.8	57.7	49.9	33.2	2.26	1.50	1.54	17.9	2020	289	193
HE 180 A	324.9	80.4	53.5	50.9	33.8	4.57	3.04	2.15	8.62	2510	169	113
IPN 220	324.0	80.2	53.4	48.2	32.0	9.71	6.46	0.959	4.26	3060	294	196

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 275$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
IPE O 220	**321.1**	**79.5**	**52.9**	**48.9**	**32.5**	**9.51**	**6.33**	**1.20**	**4.41**	**3130**	**242**	**161**
IPE A 240	**311.6**	**77.1**	**51.3**	**48.1**	**32.0**	**10.3**	**6.84**	**1.27**	**4.09**	**3290**	**203**	**136**
IPE 220	**285.4**	**70.6**	**47.0**	**43.7**	**29.0**	**9.31**	**6.19**	**1.18**	**4.08**	**2770**	**214**	**143**
IPN 200	**250.0**	**61.9**	**41.2**	**37.1**	**24.7**	**8.00**	**5.32**	**0.888**	**3.99**	**2140**	**248**	**165**
IPE O 200	**249.4**	**61.7**	**41.1**	**37.9**	**25.2**	**7.84**	**5.22**	**1.09**	**4.13**	**2210**	**207**	**138**
HE 140 B	245.4	60.7	40.4	37.4	24.9	2.81	1.87	1.70	10.0	1510	162	108
HE 160 A	245.1	60.7	40.4	38.1	25.4	3.49	2.32	1.89	8.34	1670	150	100
IPE A 220	**240.2**	**59.4**	**39.6**	**37.0**	**24.6**	**8.72**	**5.80**	**1.17**	**3.74**	**2320**	**179**	**119**
HE 100 M	235.8	58.4	38.8	33.0	21.9	1.56	1.04	1.30	17.6	1140	238	158
IPE 200	220.6	54.6	36.3	33.7	22.4	7.67	5.11	1.06	3.79	1940	185	123
IPE O 180	**189.1**	**46.8**	**31.1**	**28.7**	**19.1**	**6.41**	**4.26**	**0.987**	**3.82**	**1510**	**180**	**120**
IPN 180	187.0	46.3	30.8	27.9	18.6	6.36	4.23	0.812	3.70	1450	205	137
IPE A 200	**181.7**	**45.0**	**29.9**	**28.0**	**18.6**	**7.15**	**4.76**	**1.06**	**3.43**	**1590**	**146**	**97.5**
HE 140 A	173.5	42.9	28.6	26.9	17.9	2.69	1.79	1.67	7.63	1030	121	80.5
IPE 180	166.4	41.2	27.4	25.3	16.9	6.27	4.17	0.973	3.50	1320	157	105
HE 120 B	165.2	40.9	27.2	25.0	16.6	2.00	1.33	1.45	9.41	864	129	85.8
IPN 160	**136.0**	**33.7**	**22.4**	**20.3**	**13.5**	**4.94**	**3.29**	**0.736**	**3.44**	**935**	**166**	**111**
IPE A 180	**135.3**	**33.5**	**22.3**	**20.8**	**13.8**	**5.85**	**3.89**	**0.973**	**3.14**	**1060**	**126**	**83.7**
IPE 160	123.9	30.7	20.4	18.8	12.5	4.91	3.27	0.873	3.28	869	132	88.0
HE 120 A	119.5	29.6	19.7	18.4	12.3	1.91	1.27	1.43	7.27	606	94.1	62.7
HE 100 B	104.2	25.8	17.2	15.6	10.4	1.32	0.881	1.20	8.92	450	99.0	66.0
IPE A 160	**99.09**	**24.5**	**16.3**	**15.2**	**10.1**	**4.59**	**3.05**	**0.869**	**2.90**	**689**	**104**	**69.1**
IPN 140	95.40	23.6	15.7	14.2	9.44	3.74	2.49	0.664	3.18	573	132	87.8
IPE 140	88.34	21.9	14.5	13.4	8.91	3.75	2.50	0.783	3.04	541	109	72.4
HE 100 A	83.01	20.5	13.7	12.6	8.39	1.27	0.843	1.19	7.46	349	79.2	52.8
IPE A 140	**71.60**	**17.7**	**11.8**	**11.0**	**7.30**	**3.57**	**2.37**	**0.783**	**2.68**	**435**	**86.1**	**57.4**
IPN 120	63.60	15.7	10.5	9.48	6.31	2.67	1.78	0.584	2.93	328	101	67.3
IPE 120	**60.73**	**15.0**	**10.0**	**9.18**	**6.10**	**2.70**	**1.80**	**0.688**	**2.86**	**318**	**87.1**	**58.1**
IPE A 120	**49.87**	**12.3**	**8.21**	**7.58**	**5.05**	**2.58**	**1.72**	**0.674**	**2.52**	**257**	**73.7**	**49.2**
IPN 100	**39.80**	**9.85**	**6.55**	**5.93**	**3.94**	**1.80**	**1.20**	**0.508**	**2.69**	**171**	**74.3**	**49.5**
IPE 100	**39.41**	**9.75**	**6.49**	**5.93**	**3.94**	**1.80**	**1.20**	**0.589**	**2.72**	**171**	**67.6**	**45.1**
IPE A 100	**32.98**	**8.16**	**5.43**	**4.99**	**3.32**	**1.73**	**1.15**	**0.579**	**2.41**	**141**	**58.2**	**38.8**
IPE 80	**23.22**	**5.75**	**3.82**	**3.47**	**2.31**	**1.14**	**0.756**	**0.498**	**2.50**	**80.1**	**50.2**	**33.4**
IPN 80	**22.80**	**5.64**	**3.75**	**3.38**	**2.25**	**1.11**	**0.736**	**0.432**	**2.48**	**77.8**	**51.5**	**34.3**
IPE A 80	**18.98**	**4.70**	**3.13**	**2.86**	**1.90**	**1.08**	**0.717**	**0.494**	**2.20**	**64.4**	**42.5**	**28.3**
LRFD	ASD											
$\phi_b = 0.90$ $\phi_v = 1.00$	$\Omega_b = 1.67$ $\Omega_v = 1.50$											

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 355$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	$\times 10^3$	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	$\times 10^4$	LRFD	ASD
HD 400 × 1086	**27210**	**8690**	**5780**	**4680**	**3120**	**51.5**	**34.2**	**4.97**	**82.9**	**596000**	**9450**	**6300**
HD 400 × 990	**24280**	**7760**	**5160**	**4220**	**2810**	**49.7**	**33.1**	**4.90**	**76.1**	**519000**	**8420**	**5620**
HD 400 × 900	**21620**	**6910**	**4600**	**3790**	**2520**	**47.7**	**31.8**	**4.82**	**70.1**	**450000**	**7450**	**4970**
HD 400 × 818	**19260**	**6150**	**4090**	**3410**	**2270**	**46.3**	**30.8**	**4.76**	**64.0**	**392000**	**6620**	**4420**
HD 400 × 744	**17170**	**5490**	**3650**	**3070**	**2040**	**44.8**	**29.8**	**4.70**	**58.5**	**342000**	**5900**	**3930**
HE 1000 M	**16570**	**5290**	**3520**	**3200**	**2130**	**362**	**241**	**2.69**	**8.46**	**722000**	**4510**	**3010**
HD 400 × 677	15350	4900	3260	2770	1850	43.5	28.9	4.65	53.7	300000	5270	3510
HE 1000 B	**14860**	**4750**	**3160**	**2880**	**1920**	**343**	**228**	**2.67**	**8.10**	**645000**	**4050**	**2700**
HE 900 M	14440	4610	3070	2800	1870	292	194	2.76	8.96	570000	4070	2710
HD 400 × 634	14220	4540	3020	2590	1720	42.7	28.4	4.61	50.4	274000	4810	3200
HD 400 × 592	13140	4200	2790	2410	1600	42.1	28.0	4.57	47.2	250000	4460	2970
HE 1000 A	**12820**	**4100**	**2730**	**2500**	**1670**	**313**	**208**	**2.65**	**7.75**	**554000**	**3480**	**2320**
HE 900 B	12580	4020	2670	2460	1630	275	183	2.73	8.42	494000	3550	2360
HE 800 M	12490	3990	2660	2430	1620	228	152	2.84	9.66	443000	3640	2430
HD 400 × 551	12050	3850	2560	2220	1480	41.1	27.4	4.53	44.1	226000	4070	2710
HD 400 × 509	11030	3520	2340	2050	1360	40.5	27.0	4.50	40.8	205000	3710	2480
HE 900 A	**10810**	**3450**	**2300**	**2120**	**1410**	**252**	**168**	**2.72**	**8.01**	**422000**	**3030**	**2020**
HE 700 M	10540	3370	2240	2060	1370	170	113	2.93	10.6	329000	3200	2140
HE 800 B	10230	3270	2170	2010	1340	212	141	2.79	8.73	359000	2980	1990
HD 400 × 463	9878	3160	2100	1850	1230	39.7	26.4	4.45	37.3	180000	3320	2210
HE 650 M	9657	3090	2050	1890	1250	144	95.7	2.98	11.3	282000	2990	1990
HD 400 × 421	8880	2840	1890	1680	1120	38.9	25.9	4.42	34.1	160000	2970	1980
HE 600 M	8772	2800	1860	1710	1140	120	79.7	3.02	12.1	237000	2770	1850
HE 800 A	**8699**	**2780**	**1850**	**1720**	**1140**	**195**	**130**	**2.78**	**8.23**	**303000**	**2520**	**1680**
HE 700 B	8327	2660	1770	1640	1090	159	106	2.87	9.28	257000	2530	1690
HD 400 × 382	7965	2540	1690	1520	1010	38.4	25.6	4.38	31.1	141000	2640	1760
HE 550 M	7933	2530	1690	1550	1030	98.0	65.2	3.07	13.1	198000	2560	1710
HE 650 B	7320	2340	1560	1450	964	134	89.3	2.92	9.55	211000	2220	1480
HD 400 × 347	7139	2280	1520	1370	914	37.8	25.2	4.36	28.4	125000	2360	1570
HE 500 M	7094	2270	1510	1380	920	78.5	52.2	3.12	14.4	162000	2340	1560
HE 700 A	**7032**	**2250**	**1490**	**1400**	**929**	**147**	**97.9**	**2.86**	**8.64**	**215000**	**2130**	**1420**
HE 600 B	6425	2050	1370	1280	848	112	74.7	2.96	9.88	171000	1980	1320
HD 400 × 314	6374	2040	1350	1240	822	37.4	24.9	4.32	25.7	110000	2120	1410
HE 450 M	6331	2020	1350	1230	819	61.9	41.2	3.17	16.0	132000	2140	1430

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 355$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	$\times 10^3$	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	$\times 10^4$	LRFD	ASD
HE 650 A	**6136**	**1960**	**1300**	**1220**	**815**	**125**	**82.9**	**2.91**	**8.82**	**175000**	**1840**	**1230**
HD 400 × 287	5813	1860	1240	1130	755	37.2	24.7	4.30	23.7	99700	1890	1260
HE 550 B	5591	1790	1190	1110	740	92.4	61.5	3.00	10.3	137000	1760	1170
HE 400 M	5571	1780	1180	1080	717	47.6	31.7	3.22	18.0	104000	1930	1290
HD 320 × 300	5522	1760	1170	1040	690	30.2	20.1	3.35	27.5	86900	2160	1440
IPN 600	5452	1740	1160	1030	689	130	86.6	1.79	7.22	139000	2760	1840
HE 600 A	**5350**	**1710**	**1140**	**1070**	**712**	**105**	**69.6**	**2.95**	**9.05**	**141000**	**1630**	**1090**
HD 400 × 262	5260	1680	1120	1030	687	37.0	24.6	4.27	21.8	89400	1740	1160
HE 360 M	4989	1590	1060	961	639	37.7	25.1	3.27	20.1	84900	1770	1180
HE 500 B	4815	1540	1020	959	638	74.6	49.6	3.04	10.8	107000	1540	1030
HE 340 M	4718	1510	1000	906	603	33.4	22.2	3.30	21.3	76400	1690	1120
HD 400 × 237	4686	1500	996	927	617	36.5	24.3	4.24	19.9	78800	1530	1020
HE 550 A	**4622**	**1480**	**983**	**927**	**617**	**86.6**	**57.6**	**2.99**	**9.33**	**112000**	**1440**	**959**
IPE O 600	**4471**	**1430**	**950**	**868**	**577**	**127**	**84.5**	**2.00**	**6.42**	**118000**	**1950**	**1300**
HD 320 × 245	4435	1420	943	849	565	29.4	19.5	3.32	22.7	68100	1610	1070
HE 320 M	4435	1420	943	849	565	29.4	19.5	3.32	22.7	68100	1610	1070
HD 400 × 216	4262	1360	906	849	565	36.2	24.1	4.23	18.4	71100	1380	921
IPN 550	4240	1350	901	807	537	109	72.7	1.68	6.69	99200	2230	1480
HE 300 M	4078	1300	867	779	518	25.7	17.1	3.34	23.7	59200	1520	1010
HE 450 B	3982	1270	846	794	528	58.8	39.1	3.06	11.2	79900	1340	895
HE 500 A	3949	1260	839	794	528	70.3	46.8	3.02	9.68	87000	1250	835
HD 360 × 196	3837	1230	816	765	509	36.3	24.1	3.99	16.7	63600	1300	866
HD 400 × 187	3642	1160	774	732	487	35.7	23.7	4.19	16.3	60200	1180	784
IPE 600	**3512**	**1120**	**747**	**686**	**457**	**113**	**75.1**	**1.95**	**5.81**	**92100**	**1530**	**1020**
HD 360 × 179	3482	1110	740	698	465	36.0	24.0	3.98	15.5	57400	1180	784
HD 320 × 198	3479	1110	740	677	450	28.5	19.0	3.25	18.5	51900	1320	877
IPE O 550	3263	1040	694	637	424	101	67.4	1.90	5.90	79200	1500	1000
IPN 500	3240	1040	689	615	409	88.6	58.9	1.55	6.30	68700	1920	1280
HE 400 B	3232	1030	687	645	429	45.1	30.0	3.09	11.7	57700	1150	767
HE 450 A	3216	1030	684	648	431	55.5	36.9	3.05	9.89	63700	1080	719
IPE A 600	**3141**	**1000**	**668**	**621**	**413**	**104**	**69.0**	**1.99**	**5.68**	**82900**	**1250**	**831**
HD 360 × 162	3139	1000	667	633	421	35.5	23.6	3.96	14.4	51500	1030	687
HE 280 M	2966	948	630	571	380	22.0	14.6	3.09	20.2	39600	1220	814
HD 360 × 147[f]	2838	899	598	575	383	34.8	23.1	4.15	13.5	46300	943	629
IPE 550	**2787**	**890**	**592**	**546**	**363**	**93.4**	**62.1**	**1.86**	**5.55**	**67100**	**1300**	**867**
HD 320 × 158	2718	868	578	537	358	27.8	18.5	3.20	15.1	39600	1020	679
HE 360 B	2683	857	570	537	357	35.4	23.6	3.13	12.2	43200	959	639
IPE O 500	2613	835	555	511	340	83.3	55.4	1.83	5.72	57800	1290	862
HE 400 A	2562	819	545	517	344	42.5	28.3	3.07	10.2	45100	914	609
HD 260 × 172	2524	806	537	483	321	18.8	12.5	2.88	20.1	31300	1110	741
HE 260 M	2524	806	537	483	321	18.8	12.5	2.88	20.1	31300	1110	741
HD 360 × 134[f]	2562	794	528	522	347	33.8	22.5	4.66	12.7	41500	849	566

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table D.1 Continuegd.

Z_x

I– shapes
Selection by Z_x

$F_y = 355$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
IPE A 550	**2475**	**791**	**526**	**490**	**326**	**85.5**	**56.9**	**1.90**	**5.41**	**60000**	**1050**	**699**
HE 340 B	2408	769	512	482	321	31.1	20.7	3.15	12.4	36700	869	579
IPN 450	2400	767	510	456	304	71.4	47.5	1.43	5.78	45900	1550	1040
IPE 500	**2194**	**701**	**466**	**431**	**287**	**76.2**	**50.7**	**1.80**	**5.34**	**48200**	**1090**	**724**
HD 320 × 127	2149	687	457	431	287	27.1	18.1	3.16	12.6	30800	784	523
HE 320 B	2149	687	457	431	287	27.1	18.1	3.16	12.6	30800	784	523
HE 240 M	2117	676	450	402	268	15.9	10.6	2.67	19.9	24300	1040	690
HE 360 A	2088	667	444	423	281	33.4	22.2	3.10	10.4	33100	746	497
IPE O 450	2046	654	435	401	267	66.8	44.5	1.76	5.53	40900	1070	712
HD 260 × 142	2015	644	428	391	260	18.3	12.1	2.82	16.7	24300	918	612
IPE A 500	**1946**	**622**	**414**	**386**	**257**	**69.9**	**46.5**	**1.83**	**5.20**	**42900**	**889**	**593**
HE 300 B	1869	597	397	375	250	23.5	15.6	3.17	12.6	25200	703	469
HE 340 A[f]	1850	590	393	375	250	29.3	19.5	3.15	10.5	27700	668	445
IPN 400	1714	548	364	327	217	55.7	37.1	1.31	5.28	29200	1230	818
IPE 450	**1702**	**544**	**362**	**335**	**223**	**61.1**	**40.7**	**1.72**	**5.13**	**33700**	**901**	**601**
HD 320 × 97.6[f]	1628	512	340	331	220	25.4	16.9	3.46	10.6	22900	594	396
HE 320 A[f]	1628	512	340	331	220	25.4	16.9	3.46	10.6	22900	594	396
HD 260 × 114	1600	511	340	316	210	17.9	11.9	2.78	13.7	18900	714	476
HE 280 B	1534	490	326	308	205	20.5	13.6	2.96	11.9	19300	626	417
IPE O 400	**1502**	**480**	**319**	**296**	**197**	**51.1**	**34.0**	**1.68**	**5.28**	**26800**	**835**	**556**
IPE A 450	**1494**	**477**	**318**	**298**	**198**	**55.8**	**37.1**	**1.75**	**4.97**	**29800**	**724**	**482**
IPN 380	1482	473	315	282	187	50.0	33.3	1.26	5.10	24000	1110	739
HE 220 M	1419	453	302	272	181	13.0	8.65	2.42	16.4	14600	792	528
HE 300 A[f]	1383	423	282	282	187	21.7	14.4	3.98	10.5	18300	525	350
IPE 400	**1307**	**418**	**278**	**259**	**172**	**47.9**	**31.9**	**1.65**	**4.97**	**23100**	**733**	**488**
HD 260 × 93.0	1283	410	273	257	171	17.5	11.6	2.75	11.5	14900	554	369
HE 260 B	1283	410	273	257	171	17.5	11.6	2.75	11.5	14900	554	369
IPN 360	1276	408	271	244	162	44.7	29.7	1.21	4.88	19600	997	665
IPE O 360	**1186**	**379**	**252**	**234**	**156**	**41.4**	**27.6**	**1.61**	**5.11**	**19100**	**713**	**476**
IPE A 400	**1144**	**366**	**243**	**229**	**152**	**44.0**	**29.3**	**1.67**	**4.78**	**20300**	**592**	**395**
HE 200 M	1196	363	241	216	144	10.7	7.11	2.20	15.9	10600	703	469
IPN 340	1135	345	230	206	137	39.9	26.5	1.17	4.65	15700	884	589
HE 280 A[f]	1112	340	226	227	151	18.9	12.6	3.74	9.75	13700	460	307
HD 320 × 74.2[f]	1080	339	226	244	163	21.7	14.4	5.02	9.37	16500	513	342
HE 240 B	1053	336	224	210	140	14.8	9.81	2.54	11.1	11300	511	341

LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 355$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
IPE 360	**1019**	**326**	**217**	**202**	**134**	**38.7**	**25.8**	**1.58**	**4.77**	**16300**	**613**	**409**
IPE O 330	**942.8**	**301**	**200**	**186**	**124**	**34.6**	**23.0**	**1.52**	**4.84**	**13900**	**605**	**403**
HD 260 × 68.2[f]	919.8	284	189	187	124	16.1	10.7	3.34	9.33	10500	399	266
HE 260 A[f]	919.8	284	189	187	124	16.1	10.7	3.34	9.33	10500	399	266
IPN 320	914.0	292	194	175	116	35.1	23.3	1.12	4.45	12500	784	523
IPE A 360	**906.8**	**290**	**193**	**182**	**121**	**36.0**	**23.9**	**1.60**	**4.61**	**14500**	**503**	**335**
HE 180 M	883.4	282	188	167	111	8.65	5.76	1.99	15.3	7480	618	412
HE 220 B	827.0	264	176	164	109	12.4	8.23	2.34	10.4	8090	445	297
IPE 330	**804.3**	**257**	**171**	**159**	**106**	**32.3**	**21.5**	**1.48**	**4.50**	**11800**	**527**	**351**
IPN 300	762.0	243	162	146	97.2	30.6	20.3	1.07	4.26	9800	690	460
IPE O 300	744.6	238	158	147	97.8	28.6	19.0	1.44	4.61	9990	518	345
HE 240 A[f]	743.8	232	154	151	100	13.7	9.13	2.93	8.84	7760	367	245
IPE A 330	**701.9**	**224**	**149**	**140**	**93.1**	**29.8**	**19.8**	**1.48**	**4.31**	**10200**	**453**	**302**
HE 160 M	714.5	216	143	127	84.3	6.79	4.52	1.78	14.9	5100	537	358
HE 200 B	674.6	205	137	127	84.8	10.1	6.71	2.12	9.85	5700	383	256
HD 260 × 54.1[f]	642.5	202	135	146	97.3	14.3	9.48	4.48	8.41	7980	338	225
IPN 280	632.0	202	134	121	80.7	26.6	17.7	1.02	4.06	7590	602	402
IPE 300	**628.4**	**201**	**134**	**125**	**82.9**	**26.7**	**17.7**	**1.40**	**4.26**	**8360**	**454**	**302**
IPE O 270	574.6	184	122	113	75.5	23.5	15.7	1.29	4.27	6950	438	292
HE 220 A[f]	568.5	177	118	115	76.7	11.5	7.65	2.69	8.08	5410	313	209
IPE A 300	**541.8**	**173**	**115**	**108**	**71.9**	**24.5**	**16.3**	**1.40**	**4.05**	**7170**	**386**	**257**
IPN 260	514.0	164	109	98.9	65.8	22.7	15.1	0.969	3.86	5740	521	347
HE 140 M	493.8	158	105	92.0	61.2	5.22	3.47	1.57	14.2	3290	443	295
IPE 270	**484.0**	**155**	**103**	**95.9**	**63.8**	**22.0**	**14.6**	**1.26**	**3.94**	**5790**	**380**	**253**
HE 180 B	481.4	154	102	95.2	63.3	8.11	5.40	1.91	9.13	3830	326	217
HE 200 A[f]	429.5	134	89.1	86.9	57.8	9.27	6.17	2.44	7.51	3690	263	175
IPE A 270	**412.5**	**132**	**87.7**	**82.4**	**54.8**	**20.1**	**13.4**	**1.26**	**3.72**	**4920**	**313**	**209**
IPN 240	412.0	132	87.6	79.2	52.7	19.3	12.8	0.919	3.64	4250	445	296
IPE O 240	410.3	131	87.2	80.8	53.7	18.3	12.2	1.14	3.90	4370	361	241
IPE 240	366.6	117	77.9	72.5	48.3	17.7	11.8	1.12	3.65	3890	317	211
HE 160 B	354.0	113	75.3	69.7	46.4	6.27	4.17	1.69	8.62	2490	273	182
HE 120 M	350.6	112	74.5	64.5	42.9	3.81	2.53	1.36	13.8	2020	373	249
HE 180 A[f]	324.9	103	68.3	65.7	43.7	7.61	5.07	2.04	6.90	2510	219	146
IPN 220	324.0	104	68.9	62.2	41.4	16.2	10.7	0.844	3.40	3060	380	253

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table D.1 Continued.

Z_x

I– shapes
Selection by Z_x

$F_y = 355$ MPa

Shape	Z_x	$\phi_b M_{px}$	M_{px}/Ω_b	$\phi_b M_{rx}$	M_{rx}/Ω_b	$\phi_b BF$	BF/Ω_b	L_p	L_r	I_x	$\phi_v V_{nx}$	V_{nx}/Ω_v
	mm^3	kN·m	kN·m	kN·m	kN·m	kN	kN			mm^4	kN	kN
	× 10^3	LRFD	ASD	LRFD	ASD	LRFD	ASD	m	m	× 10^4	LRFD	ASD
IPE O 220	321.1	103	68.3	63.1	42.0	15.5	10.3	1.06	3.60	3130	312	208
IPE A 240	311.6	99.6	66.2	62.1	41.3	16.3	10.9	1.12	3.41	3290	263	175
IPE 220	285.4	91.2	60.7	56.4	37.5	15.0	9.98	1.04	3.36	2770	276	184
IPN 200	250.0	79.9	53.1	47.9	31.8	13.3	8.87	0.781	3.18	2140	320	213
IPE O 200	249.4	79.7	53.0	49.0	32.6	12.8	8.53	0.961	3.36	2210	267	178
HE 140 B	245.4	78.4	52.2	48.2	32.1	4.77	3.18	1.50	7.82	1510	209	139
HE 160 A	245.1	78.3	52.1	49.2	32.8	5.86	3.90	1.66	6.62	1670	194	130
IPE A 220	240.2	76.7	51.1	47.7	31.8	13.8	9.19	1.03	3.13	2320	231	154
HE 100 M	235.8	75.3	50.1	42.6	28.3	2.63	1.75	1.14	13.6	1140	307	204
IPE 200	220.6	70.5	46.9	43.5	28.9	12.4	8.27	0.936	3.11	1940	239	159
IPE O 180	189.1	60.4	40.2	37.0	24.6	10.5	7.00	0.869	3.10	1510	233	155
IPN 180	187.0	59.7	39.8	36.0	24.0	10.6	7.06	0.714	2.95	1450	265	176
IPE A 200	181.7	58.1	38.6	36.1	24.0	11.4	7.56	0.932	2.86	1590	189	126
HE 140 A	173.5	55.4	36.9	34.8	23.1	4.53	3.01	1.47	6.04	1030	156	104
IPE 180	166.4	53.2	35.4	32.7	21.8	10.2	6.76	0.856	2.87	1320	203	135
HE 120 B	165.2	52.8	35.1	32.2	21.4	3.39	2.26	1.28	7.33	864	166	111
IPN 160	136.0	43.5	28.9	26.2	17.4	8.27	5.50	0.648	2.74	935	215	143
IPE A 180	135.3	43.2	28.8	26.9	17.9	9.29	6.18	0.856	2.62	1060	162	108
IPE 160	123.9	39.6	26.3	24.3	16.2	8.03	5.34	0.769	2.67	869	170	114
HE 120 A	119.5	38.2	25.4	23.8	15.8	3.23	2.15	1.26	5.72	606	121	80.9
HE 100 B	104.2	33.3	22.2	20.1	13.4	2.24	1.49	1.06	6.93	450	128	85.2
IPE A 160	99.09	31.7	21.1	19.6	13.1	7.33	4.88	0.764	2.40	689	134	89.2
IPN 140	95.40	30.5	20.3	18.3	12.2	6.28	4.18	0.585	2.52	573	170	113
IPE 140	88.34	28.2	18.8	17.3	11.5	6.16	4.10	0.689	2.46	541	140	93.4
HE 100 A	83.01	26.5	17.6	16.3	10.8	2.15	1.43	1.05	5.82	349	102	68.2
IPE A 140	71.60	22.9	15.2	14.2	9.42	5.73	3.82	0.689	2.21	435	111	74.1
IPN 120	63.60	20.3	13.5	12.2	8.14	4.49	2.99	0.514	2.32	328	130	86.9
IPE 120	60.73	19.4	12.9	11.8	7.88	4.47	2.97	0.606	2.30	318	112	75.0
IPE A 120	49.87	15.9	10.6	9.79	6.51	4.21	2.80	0.593	2.05	257	95.2	63.5
IPN 100	39.80	12.7	8.46	7.65	5.09	3.03	2.02	0.447	2.12	171	95.9	63.9
IPE 100	39.41	12.6	8.38	7.65	5.09	3.01	2.00	0.518	2.16	171	87.3	58.2
IPE A 100	32.98	10.5	7.01	6.44	4.29	2.87	1.91	0.510	1.94	141	75.1	50.1
IPE 80	23.22	7.42	4.94	4.48	2.98	1.91	1.27	0.439	1.98	80.1	64.8	43.2
IPN 80	22.80	7.28	4.85	4.36	2.90	1.87	1.24	0.380	1.94	77.8	66.5	44.3
IPE A 80	18.98	6.06	4.03	3.69	2.46	1.80	1.20	0.434	1.75	64.4	54.8	36.6

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table D.2 Selection by Z_y.

Z_y

I– shapes
Selection by Z_y

$F_y = 235$ MPa

Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b	Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b
	mm^3	kN·m	kN·m		mm^3	kN·m	kN·m
	× 10^3	LRFD	ASD		× 10^3	LRFD	ASD
HD 400 × 1086	13380	2830	1880	HD 360 × 162	1516	321	213
HD 400 × 990	11960	2530	1680	HE 700 B	1495	316	210
HD 400 × 900	10710	2270	1510	HE 1000 A	1470	311	207
HD 400 × 818	9561	2020	1350	HE 650 B	1441	305	203
HD 400 × 744	8549	1810	1200	HE 900 A	1414	299	199
HD 400 × 677	7680	1620	1080	HE 280 M	1397	295	197
HD 400 × 634	7117	1510	1000	HE 600 B	1391	294	196
HD 400 × 592	6574	1390	925				
HD 400 × 551	6051	1280	851	HD 360 × 147	1369	290	193
HD 400 × 509	5552	1170	781	HE 550 B	1341	284	189
HD 400 × 463	4978	1050	700	HE 800 A	1312	277	185
HD 400 × 421	4489	949	632	HE 500 B	1292	273	182
HD 400 × 382	4031	853	567	HE 700 A	1257	266	177
HD 400 × 347	3629	768	511				
HD 400 × 314	3236	684	455	HD 360 × 134	1237	262	174
HD 400 × 287	2957	625	416	HE 650 A	1205	255	170
HD 400 × 262	2676	566	377	HE 450 B	1198	253	169
HD 320 × 300	2414	511	340	HD 320 × 158	1194	253	168
				HD 260 × 172	1192	252	168
HD 400 × 237	2387	505	336	HE 260 M	1192	252	168
HD 400 × 216	2176	460	306	HE 600 A	1156	244	163
HE 340 M	1953	413	275	HE 550 A	1107	234	156
HD 320 × 245	1951	413	275	HE 400 B	1104	233	155
HE 320 M	1951	413	275	HE 500 A	1059	224	149
HE 360 M	1942	411	273	HE 360 B	1032	218	145
HE 1000 M	1940	410	273	HE 240 M	1006	213	142
HE 450 M	1939	410	273	HE 340 B	985.7	208	139
HE 550 M	1937	410	273	HE 450 A	965.5	204	136
HE 650 M	1936	409	272	HD 260 × 142	950.5	201	134
HE 400 M	1934	409	272				
HE 500 M	1932	409	272	HD 320 × 127	939.1	199	132
HE 600 M	1930	408	272	HE 320 B	939.1	199	132
HE 800 M	1930	408	272				
HE 700 M	1929	408	271				
HE 900 M	1929	408	271	HE 400 A	872.9	185	123
HE 300 M	1913	405	269	HE 300 B	870.1	184	122
				HE 360 A	802.3	170	113
HD 360 × 196	1856	393	261	HE 340 A	755.9	160	106
HD 400 × 187	1855	392	261	HD 260 × 114	752.5	159	106
HE 1000 B	1716	363	241	IPN 600	752.0	159	106
HD 360 × 179	1683	356	237	HE 280 B	717.6	152	101
HE 900 B	1658	351	233	HD 320 × 97.6	709.7	150	99.9
HE 800 B	1553	328	219	HE 320 A	709.7	150	99.9
HD 320 × 198	1530	324	215	HE 220 M	678.6	144	95.5

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table D.2 Continued.

Z_y

I– shapes
Selection by Z_y

$F_y = 235$ MPa

Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b	Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b
	mm^3	kN·m	kN·m		mm^3	kN·m	kN·m
	× 10^3	LRFD	ASD		× 10^3	LRFD	ASD
HE 300 A	**641.2**	**136**	**90.2**	**HE 180 A**	**156.5**	**33.1**	**22.0**
IPE O 600	640.1	135	90.1	IPE 330	153.7	32.5	21.6
HD 260 × 93.0	602.2	127	84.7	IPE O 300	152.6	32.3	21.5
HE 260 B	602.2	127	84.7	IPN 320	143.0	30.2	20.1
IPN 550	592.0	125	83.3	IPE A 330	133.3	28.2	18.8
HE 200 M	543.2	115	76.4	IPE 300	125.2	26.5	17.6
				IPN 300	121.0	25.6	17.0
HE 280 A	**518.1**	**110**	**72.9**				
				HE 140 B	**119.8**	**25.3**	**16.9**
HD 320 × 74.2^f	**505.7**	**98.8**	**65.7**	IPE O 270	117.7	24.9	16.6
HE 240 B	498.4	105	70.1				
IPE 600	485.6	103	68.3	**HE 160 A**	**117.6**	**24.9**	**16.5**
IPE O 550	480.5	102	67.6	HE 100 M	116.3	24.6	16.4
IPN 500	456.0	96.4	64.2	IPE A 300	107.3	22.7	15.1
IPE A 600	442.1	93.5	62.2	IPN 280	103.0	21.8	14.5
				IPE 270	96.95	20.5	13.6
HD 260 × 68.2	**430.2**	**91.0**	**60.5**	IPN 260	85.90	18.2	12.1
HE 260 A	**430.2**	**91.0**	**60.5**				
HE 180 M	425.2	89.9	59.8	**HE 140 A**	**84.85**	**17.9**	**11.9**
IPE O 500	408.5	86.4	57.5	IPE O 240	84.40	17.9	11.9
IPE 550	400.5	84.7	56.4	IPE A 270	82.34	17.4	11.6
HE 220 B	393.9	83.3	55.4	HE 120 B	80.97	17.1	11.4
IPE A 550	361.5	76.5	50.9	IPE 240	73.92	15.6	10.4
				IPN 240	70.00	14.8	9.85
HE 240 A	**351.7**	**74.4**	**49.5**	IPE O 220	66.91	14.2	9.42
IPN 450	345.0	73.0	48.5	IPE A 240	62.4	13.2	8.78
IPE O 450	341.0	72.1	48.0				
IPE 500	335.9	71.0	47.3	**HE 120 A**	**58.85**	**12.5**	**8.28**
HE 160 M	325.5	68.8	45.8	IPE 220	58.11	12.3	8.18
HE 200 B	305.8	64.7	43.0	IPN 220	55.70	11.8	7.84
				IPE O 200	51.89	10.9	7.30
HD 260 × 54.1^f	**327.7**	**63.9**	**42.5**	HE 100 B	51.42	10.9	7.24
IPE A 500	301.6	63.8	42.4	IPE A 220	48.49	10.3	6.82
IPE 450	276.4	58.5	38.9	IPE 200	44.61	9.4	6.28
				IPN 200	43.50	9.2	6.12
HE 220 A	**270.6**	**57.2**	**38.1**				
IPE O 400	269.1	56.9	37.9	**HE 100 A**	**41.14**	**8.72**	**5.79**
IPN 400	253.0	53.5	35.6	IPE O 180	39.91	8.44	5.61
IPE A 450	245.7	52.0	34.6	IPE A 200	36.54	7.73	5.14
HE 140 M	240.5	50.8	33.8	IPE 180	34.60	7.31	4.87
HE 180 B	231.0	48.9	32.5	IPN 180	33.20	7.02	4.67
IPE 400	229.0	48.4	32.2				
IPE O 360	226.9	48.0	31.9	**IPE A 180**	**27.96**	**5.91**	**3.93**
IPN 380	221.0	46.7	31.1	IPE 160	26.10	5.52	3.67
				IPN 160	24.90	5.26	3.50
HE 200 A	**203.8**	**43.1**	**28.7**				
IPE A 400	202.1	42.7	28.4	**IPE A 160**	**20.70**	**4.38**	**2.91**
IPN 360	194.0	41.0	27.3	IPE 140	19.25	4.07	2.71
IPE 360	191.1	40.4	26.9	IPN 140	17.90	3.79	2.52
IPE O 330	185.0	39.1	26.0				
IPE A 360	171.9	36.4	24.2	**IPE A 140**	**15.52**	**3.28**	**2.19**
HE 120 M	171.6	36.3	24.1				
HE 160 B	170.0	36.0	23.9				
IPN 340	166.0	35.1	23.4				
LRFD	**ASD**						
$\phi_b = 0.90$ $\phi_v = 1.00$	$\Omega_b = 1.67$ $\Omega_v = 1.50$						

Table D.2 Continued.

Z_y

I– shapes
Selection by Z_y

$F_y = 235$ MPa

Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b	Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b
	mm^3	kN·m	kN·m		mm^3	kN·m	kN·m
	× 10^3	LRFD	ASD		× 10^3	LRFD	ASD
IPE 120	**13.58**	**2.87**	**1.91**				
IPN 120	12.40	2.62	1.74				
IPE A 120	**10.98**	**2.32**	**1.55**				
IPE 100	**9.15**	**1.93**	**1.29**				
IPN 100	8.10	1.71	1.14				
IPE A 100	**7.54**	**1.60**	**1.06**				
IPE 80	**5.82**	**1.23**	**0.819**				
IPN 80	**5.00**	**1.06**	**0.703**				
IPE A 80	**4.69**	**0.991**	**0.660**				

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table D.2 Continued.

Z_y

I– shapes
Selection by Z_y

$F_y = 275$ MPa

Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b	Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b
	mm^3	kN·m	kN·m		mm^3	kN·m	kN·m
	× 10^3	LRFD	ASD		× 10^3	LRFD	ASD
HD 400 × 1086	**13380**	**3310**	**2200**	**HD 360 × 162**	**1516**	**375**	**250**
HD 400 × 990	**11960**	**2960**	**1970**	HE 700 B	1495	370	246
HD 400 × 900	**10710**	**2650**	**1760**	HE 1000 A	1470	364	242
HD 400 × 818	**9561**	**2370**	**1570**	HE 650 B	1441	357	237
HD 400 × 744	**8549**	**2120**	**1410**	HE 900 A	1414	350	233
HD 400 × 677	**7680**	**1900**	**1260**	HE 280 M	1397	346	230
HD 400 × 634	**7117**	**1760**	**1170**	HE 600 B	1391	344	229
HD 400 × 592	**6574**	**1630**	**1080**				
HD 400 × 551	**6051**	**1500**	**996**	**HD 360 × 147**	**1369**	**339**	**225**
HD 400 × 509	**5552**	**1370**	**914**	HE 550 B	1341	332	221
HD 400 × 463	**4978**	**1230**	**820**	HE 800 A	1312	325	216
HD 400 × 421	**4489**	**1110**	**739**	HE 500 B	1292	320	213
HD 400 × 382	**4031**	**998**	**664**	HE 700 A	1257	311	207
HD 400 × 347	**3629**	**898**	**598**				
HD 400 × 314	**3236**	**801**	**533**	**HD 360 × 134**^{f}	**1237**	**306**	**204**
HD 400 × 287	**2957**	**732**	**487**	HE 650 A	1205	298	198
HD 400 × 262	**2676**	**662**	**441**	HE 450 B	1198	297	197
HD 320 × 300	2414	597	398	HD 320 × 158	1194	296	197
				HD 260 × 172	1192	295	196
HD 400 × 237	**2387**	**591**	**393**	HE 260 M	1192	295	196
HD 400 × 216	**2176**	**539**	**358**	HE 600 A	1156	286	190
HE 340 M	1953	483	322	HE 550 A	1107	274	182
HD 320 × 245	1951	483	321	HE 400 B	1104	273	182
HE 320 M	1951	483	321	HE 500 A	1059	262	174
HE 360 M	1942	481	320	HE 360 B	1032	255	170
HE 1000 M	1940	480	319	HE 240 M	1006	249	166
HE 450 M	1939	480	319	HE 340 B	985.7	244	162
HE 550 M	1937	479	319	HE 450 A	965.5	239	159
HE 650 M	1936	479	319	HD 260 × 142	950.5	235	157
HE 400 M	1934	479	318				
HE 500 M	1932	478	318	**HD 320 × 127**	**939.1**	**232**	**155**
HE 600 M	1930	478	318	**HE 320 B**	**939.1**	**232**	**155**
HE 800 M	1930	478	318				
HE 700 M	1929	477	318				
HE 900 M	1929	477	318	**HE 400 A**	**872.9**	**216**	**144**
HE 300 M	1913	473	315	**HE 300 B**	**870.1**	**215**	**143**
				HE 360 A	**802.3**	**199**	**132**
HD 360 × 196	**1856**	**459**	**306**	**HE 340 A**	**755.9**	**187**	**124**
HD 400 × 187	**1855**	**459**	**305**	HD 260 × 114	752.5	186	124
HE 1000 B	1716	425	283	IPN 600	752.0	186	124
HD 360 × 179	**1683**	**417**	**277**	**HE 280 B**	**717.6**	**178**	**118**
HE 900 B	1658	410	273	**HD 320 × 97.6**	**709.7**	**176**	**117**
HE 800 B	1553	384	256	**HE 320 A**	**709.7**	**176**	**117**
HD 320 × 198	1530	379	252	HE 220 M	678.6	168	112
				IPE O 600	640.1	158	105

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table D.2 Continued.

Z_y

I– shapes
Selection by Z_y

$F_y = 275$ MPa

Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b	Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b
	mm^3	kN·m	kN·m		mm^3	kN·m	kN·m
	× 10^3	LRFD	ASD		× 10^3	LRFD	ASD
HE 300 A^{f}	**641.2**	**156**	**104**	**HE 180 A**	**156.5**	**38.7**	**25.8**
HD 260 × 93.0	602.2	149	99.2	IPE 330	153.7	38.0	25.3
HE 260 B	602.2	149	99.2	IPE O 300	152.6	37.8	25.1
IPN 550	592.0	147	97.5	IPN 320	143.00	35.4	23.5
HE 200 M	543.2	134	89.4	IPE A 330	133.3	33.0	22.0
				IPE 300	125.2	31.0	20.6
HE 280 A^{f}	**518.1**	**128**	**85.3**	IPN 300	121.0	29.9	19.9
HE 240 B	498.4	123	82.1				
IPE 600	485.6	120	80.0	**HE 140 B**	**119.8**	**29.7**	**19.7**
IPE O 550	480.5	119	79.1	IPE O 270	117.7	29.1	19.4
IPN 500	456.0	113	75.1				
				HE 160 A	**117.6**	**29.1**	**19.4**
HD 320 × 74.2^{f}	**505.7**	111	74.1	HE 100 M	116.3	28.8	19.2
IPE A 600	442.1	109	72.8	IPE A 300	107.3	26.6	17.7
				IPN 280	103.00	25.5	17.0
HD 260 × 68.2^{f}	**430.2**	**106**	**70.5**	IPE 270	96.95	24.0	16.0
HE 260 A^{f}	**430.2**	**106**	**70.8**	IPN 260	85.90	21.3	14.1
HE 180 M	425.2	105	70.0				
IPE O 500	408.5	101	67.3	**HE 140 A**	**84.85**	**21.0**	**14.0**
IPE 550	400.5	99.1	66.0	IPE O 240	84.40	20.9	13.9
HE 220 B	393.9	97.5	64.9	IPE A 270	82.34	20.4	13.6
IPE A 550	361.5	89.5	59.5	HE 120 B	80.97	20.0	13.3
				IPE 240	73.92	18.3	12.2
HE 240 A	**351.7**	**87**	**57.9**	IPN 240	70.00	17.3	11.5
IPN 450	345.0	85.4	56.8	IPE O 220	66.91	16.6	11.0
IPE O 450	341.0	84.4	56.2	IPE A 240	62.40	15.4	10.3
IPE 500	335.9	83.1	55.3				
HE 160 M	325.5	80.6	53.6	**HE 120 A**	**58.85**	**14.6**	**9.69**
HE 200 B	305.8	75.7	50.4	IPE 220	58.11	14.4	9.57
IPE A 500	301.6	74.6	49.7	IPN 220	55.70	13.8	9.17
				IPE O 200	51.89	12.8	8.54
HD 260 × 54.1^{f}	327.7	72.1	48.0	HE 100 B	51.42	12.7	8.47
IPE 450	276.4	68.4	45.5	IPE A 220	48.49	12.0	7.98
				IPE 200	44.61	11.0	7.35
HE 220 A	**270.6**	**67.0**	**44.6**	IPN 200	43.50	10.8	7.16
IPE O 400	269.1	66.6	44.3				
IPN 400	253.0	62.6	41.7	**HE 100 A**	**41.14**	**10.2**	**6.77**
IPE A 450	245.7	60.8	40.5	IPE O 180	39.91	9.88	6.57
HE 140 M	240.5	59.5	39.6	IPE A 200	36.54	9.04	6.02
HE 180 B	231.0	57.2	38.0	IPE 180	34.60	8.56	5.70
IPE 400	229.0	56.7	37.7	IPN 180	33.20	8.22	5.47
IPE O 360	226.9	56.2	37.4				
IPN 380	221.0	54.7	36.4	**IPE A 180**	**27.96**	**6.92**	**4.60**
				IPE 160	26.10	6.46	4.30
HE 200 A	**203.8**	**50.4**	**33.6**	IPN 160	24.90	6.16	4.10
IPE A 400	202.1	50.0	33.3				
IPN 360	194.0	48.0	31.9	**IPE A 160**	**20.70**	**5.12**	**3.41**
IPE 360	191.1	47.3	31.5	IPE 140	19.25	4.76	3.17
IPE O 330	185.00	45.8	30.5	IPN 140	17.90	4.43	2.95
IPE A 360	171.9	42.5	28.3				
HE 120 M	171.6	42.5	28.3	**IPE A 140**	**15.52**	**3.84**	**2.56**
HE 160 B	170.00	42.1	28.0				
IPN 340	166.00	41.1	27.3				

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table D.2 Continued.

Z_y	**I– shapes** **Selection by Z_y** $F_y = 275$ MPa						
Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b	**Shape**	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b
	mm^3	**kN·m**	**kN·m**		**mm^3**	**kN·m**	**kN·m**
	$\times 10^3$	**LRFD**	**ASD**		$\times 10^3$	**LRFD**	**ASD**
IPE 120	**13.58**	**3.36**	**2.24**				
IPN 120	12.40	3.07	2.04				
IPE A 120	**10.98**	**2.72**	**1.81**				
IPE 100	**9.15**	**2.26**	**1.51**				
IPN 100	8.10	2.00	1.33				
IPE A 100	**7.54**	**1.87**	**1.24**				
IPE 80	**5.82**	**1.44**	**0.958**				
IPN 80	**5.00**	**1.24**	**0.823**				
IPE A 80	**4.69**	**1.16**	**0.772**				

LRFD	**ASD**
$\phi_b = 0.90$ $\phi_v = 1.00$	$\Omega_b = 1.67$ $\Omega_v = 1.50$

Table D.2 Continued.

Z_y

I– shapes
Selection by Z_y

$F_y = 355$ MPa

Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b	Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b
	mm^3	kN·m	kN·m		mm^3	kN·m	kN·m
	× 10^3	LRFD	ASD		× 10^3	LRFD	ASD
HD 400 × 1086	**13380**	**4270**	**2840**	**HD 360 × 162**	**1516**	**484**	**322**
HD 400 × 990	**11960**	**3820**	**2540**	HE 700 B	1495	478	318
HD 400 × 900	**10710**	**3420**	**2280**	HE 1000 A	1470	470	312
HD 400 × 818	**9561**	**3050**	**2030**	HE 650 B	1441	460	306
HD 400 × 744	**8549**	**2730**	**1820**	HE 900 A	1414	452	301
HD 400 × 677	**7680**	**2450**	**1630**	HE 280 M	1397	446	297
HD 400 × 634	**7117**	**2270**	**1510**	HE 600 B	1391	444	296
HD 400 × 592	**6574**	**2100**	**1400**				
HD 400 × 551	**6051**	**1930**	**1290**	**HD 360 × 147^f**	**1369**	**432**	**288**
HD 400 × 509	**5552**	**1770**	**1180**	HE 550 B	1341	428	285
HD 400 × 463	**4978**	**1590**	**1060**	HE 800 A	1312	419	279
HD 400 × 421	**4489**	**1430**	**954**	HE 500 B	1292	413	275
HD 400 × 382	**4031**	**1290**	**857**	HE 700 A	1257	402	267
HD 400 × 347	**3629**	**1160**	**771**	HE 650 A	1205	385	256
HD 400 × 314	**3236**	**1030**	**688**	HE 450 B	1198	383	255
HD 400 × 287	**2957**	**945**	**629**	HD 320 × 158	1194	381	254
HD 400 × 262	**2676**	**855**	**569**	HD 260 × 172	1192	381	253
HD 320 × 300	2414	771	513	HE 260 M	1192	381	253
HD 400 × 237	**2387**	**763**	**507**	**HD 360 × 134^f**	**1237**	**377**	**251**
HD 400 × 216	**2176**	**695**	**463**	HE 600 A	1156	369	246
HE 340 M	1953	624	415	HE 550 A	1107	354	235
HD 320 × 245	1951	623	415	HE 400 B	1104	353	235
HE 320 M	1951	623	415	HE 500 A	1059	338	225
HE 360 M	1942	620	413	HE 360 B	1032	330	219
HE 1000 M	1940	620	412	HE 240 M	1006	321	214
HE 450 M	1939	620	412	HE 340 B	985.7	315	210
HE 550 M	1937	619	412	HE 450 A	965.5	308	205
HE 650 M	1936	619	412	HD 260 × 142	950.5	304	202
HE 400 M	1934	618	411				
HE 500 M	1932	617	411	**HD 320 × 127**	**939.1**	**300**	**200**
HE 600 M	1930	617	410	**HE 320 B**	**939.1**	**300**	**200**
HE 800 M	1930	617	410				
HE 700 M	1929	616	410				
HE 900 M	1929	616	410	**HE 400 A**	**872.9**	**279**	**186**
HE 300 M	1913	611	407	**HE 300 B**	**870.1**	**278**	**185**
				HE 360 A	**802.3**	**256**	**171**
HD 360 × 196	**1856**	**593**	**395**	**HE 340 A^f**	**755.9**	**241**	**160**
HD 400 × 187	**1855**	**593**	**394**	HD 260 × 114	752.5	240	160
HE 1000 B	1716	548	365	IPN 600	752.0	240	160
HD 360 × 179	**1683**	**538**	**358**	**HE 280 B**	**717.6**	**229**	**153**
HE 900 B	1658	530	352	**HD 320 × 97.6^f**	**709.7**	**221**	**147**
HE 800 B	1553	496	330	**HE 320 A^f**	**709.7**	**221**	**147**
HD 320 × 198	1530	489	325	HE 220 M	678.6	217	144

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table D.2 Continued.

Z_y

I– shapes
Selection by Z_y

$F_y = 355$ MPa

Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b	Shape	Z_y	$\phi_b M_{py}$	M_{py}/Ω_b
	mm^3	kN·m	kN·m		mm^3	kN·m	kN·m
	$\times 10^3$	LRFD	ASD		$\times 10^3$	LRFD	ASD
IPE O 600	640.1	205	136	**HE 180 A$^{\text{f}}$**	**156.5**	**49.2**	**32.7**
HE 300 A$^{\text{f}}$	**641.2**	192	128	IPE 330	153.7	49.1	32.7
HD 260 × 93.0	602.2	192	128	IPE O 300	152.6	48.8	32.4
HE 260 B	602.2	192	128	IPN 320	143.0	45.7	30.4
IPN 550	592.0	189	126	IPE A 330	133.3	42.6	28.3
HE 200 M	543.2	174	115	IPE 300	125.2	40.0	26.6
				IPN 300	121.0	38.7	25.7
HE 280 A$^{\text{f}}$	**518.1**	**155**	**103**				
HE 240 B	498.4	159	106	**HE 140 B**	**119.8**	**38.3**	**25.5**
IPE 600	485.6	155	103	IPE O 270	117.7	37.6	25.0
IPE O 550	480.5	154	102				
IPN 500	456.0	146	96.9	**HE 160 A**	**117.6**	**37.6**	**25.0**
IPE A 600	442.1	141	94.0	HE 100 M	116.3	37.2	24.7
HE 180 M	425.2	136	90.4	IPE A 300	107.3	34.3	22.8
				IPN 280	103.0	32.9	21.9
HD 320 × 74.2$^{\text{f}}$	**505.7**	**134**	**89.2**	IPE 270	96.95	31.0	20.6
IPE O 500	408.5	131	86.8	IPN 260	85.90	27.4	18.3
HD 260 × 68.2$^{\text{f}}$	**430.2**	**130**	**86.8**	**HE 140 A**	**84.85**	**27.1**	**18.0**
HE 260 A$^{\text{f}}$	**430.2**	**130**	**86.8**	IPE O 240	84.40	27.0	17.9
IPE 550	400.5	128	85.1	IPE A 270	82.34	26.3	17.5
HE 220 B	393.9	126	83.7	HE 120 B	80.97	25.9	17.2
IPE A 550	361.5	115	76.8	IPE 240	73.92	23.6	15.7
				IPN 240	70.00	22.4	14.9
HE 240 A$^{\text{f}}$	**351.7**	**108**	**72.1**	IPE O 220	66.91	21.4	14.2
IPN 450	345.0	110	73.3	IPE A 240	62.40	19.9	13.3
IPE O 450	341.0	109	72.5				
IPE 500	335.9	107	71.4	**HE 120 A**	**58.85**	**18.8**	**12.5**
				IPE 220	58.11	18.6	12.4
HD 260 × 54.1$^{\text{f}}$	327.7	**86.7**	**57.7**	IPN 220	55.70	17.8	11.8
HE 160 M	325.5	104	69.2	IPE O 200	51.89	16.6	11.0
HE 200 B	305.8	97.7	65.0	HE 100 B	51.42	16.4	10.9
IPE A 500	301.6	96.4	64.1	IPE A 220	48.49	15.5	10.3
IPE 450	276.4	88.3	58.8	IPE 200	44.61	14.3	9.48
IPE O 400	269.1	86.0	57.2	IPN 200	43.50	13.9	9.25
HE 220 A$^{\text{f}}$	**270.6**	**83.3**	**55.5**	**HE 100 A**	**41.14**	**13.1**	**8.75**
IPN 400	253.0	80.8	53.8	IPE O 180	39.91	12.8	8.48
IPE A 450	245.7	78.5	52.2	IPE A 200	36.54	11.7	7.77
HE 140 M	240.5	76.8	51.1	IPE 180	34.60	11.1	7.36
HE 180 B	231.0	73.8	49.1	IPN 180	33.20	10.6	7.06
IPE 400	229.0	73.2	48.7				
IPE O 360	226.9	72.5	48.2	**IPE A 180**	**27.96**	**8.93**	**5.94**
IPN 380	221.0	70.6	47.0	IPE 160	26.10	8.34	5.55
IPE A 400	202.1	64.6	43.0	IPN 160	24.90	7.96	5.29
HE 200 A$^{\text{f}}$	**203.8**	**62.8**	**41.8**	**IPE A 160**	**20.70**	**6.61**	**4.40**
IPN 360	194.0	62.0	41.2	IPE 140	19.25	6.15	4.09
IPE 360	191.1	61.1	40.6	IPN 140	17.90	5.72	3.81
IPE O 330	185.0	59.1	39.3				
IPE A 360	171.9	54.9	36.5	**IPE A 140**	**15.52**	**4.96**	**3.30**
HE 120 M	171.6	54.8	36.5				
HE 160 B	170.0	54.3	36.1				
IPN 340	166.0	53.0	35.3				

LRFD	ASD
$\phi_b = 0.90$ $\phi_v = 1.00$	$\Omega_b = 1.67$ $\Omega_v = 1.50$

Table D.2 Continued.

Z_y

I– shapes

Selection by Z_y $F_y = 355$ MPa

Shape	Z_y mm^3 $\times 10^3$	$\phi_b M_{py}$ kN·m LRFD	M_{py}/Ω_b kN·m ASD	Shape	Z_y mm^3 $\times 10^3$	$\phi_b M_{py}$ kN·m LRFD	M_{py}/Ω_b kN·m ASD
IPE 120	**13.58**	**4.34**	**2.89**				
IPN 120	12.40	3.96	2.64				
IPE A 120	**10.98**	**3.51**	**2.33**				
IPE 100	**9.15**	**2.92**	**1.95**				
IPN 100	8.10	2.59	1.72				
IPE A 100	**7.54**	**2.41**	**1.60**				
IPE 80	**5.82**	**1.86**	**1.24**				
IPN 80	**5.00**	**1.60**	**1.06**				
IPE A 80	**4.69**	**1.50**	**0.997**				

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Table D.3 Selection by I_x.

I_x

I-shapes
Selection by I_x

Shape	**I_x**	**Shape**	**I_x**	**Shape**	**I_x**
	mm^4		**mm^4**		**mm^4**
HE 1000 M	**722300**	**HE 600 A**	**141200**	**IPE A 550**	**59980**
		IPN 600	138800	HE 300 M	59200
HE 1000 B	**644700**	HE 550 B	136700	IPE O 500	57780
HD 400 × 1086	595700	HE 450 M	131500	HE 400 B	57680
HE 900 M	570400	HD 400 × 347	124900	HD 360 × 179	57440
				HD 320 × 198	51900
HE 1000 A	**553800**	**IPE O 600**	**118300**	HD 360 × 162	51540
HD 400 × 990	518900	HE 550 A	111900		
HE 900 B	494100	HD 400 × 314	110200	**IPE 500**	**48200**
HD 400 × 900	450200	HE 500 B	107200	HD 360 × 147	46290
HE 800 M	442600	HE 400 M	104100	IPN 450	45850
HE 900 A	422100	HD 400 × 287	99710	HE 400 A	45070
HD 400 × 818	392200	IPN 550	99180	HE 360 B	43190
HE 800 B	**359100**	**IPE 600**	**92080**	**IPE A 500**	**42930**
HD 400 × 744	342100	HD 400 × 262	89410	HD 360 × 134	41510
HE 700 M	329300	HE 500 A	86970	IPE O 450	40920
		HD 320 × 300	86900	HD 320 × 158	39640
HE 800 A	**303400**	HE 360 M	84870	HE 280 M	39550
HD 400 × 677	299500			HE 340 B	36660
HE 650 M	281700	**IPE A 600**	**82920**		
HD 400 × 634	274200	HE 450 B	79890	**IPE 450**	**33740**
HE 700 B	256900	IPE O 550	79160	HE 360 A	33090
HD 400 × 592	250200	HD 400 × 237	78780	HD 260 × 172	31310
HE 600 M	237400	HE 340 M	76370	HE 260 M	31310
HD 400 × 551	226100	HD 400 × 216	71140	HD 320 × 127	30820
		IPN 500	68740	HE 320 B	30820
HE 700 A	**215300**	HD 320 × 245	68130		
HE 650 B	210600	HE 320 M	68130	**IPE A 450**	**29760**
HD 400 × 509	204500			IPN 400	29210
HE 550 M	198000	**IPE 550**	**67120**	HE 340 A	27690
HD 400 × 463	180200	HE 450 A	63720	IPE O 400	26750
		HD 360 × 196	63630	HE 300 B	25170
HE 650 A	**175200**	HD 400 × 187	60180	HD 260 × 142	24330
HE 600 B	171000			HE 240 M	24290
HE 500 M	161900			IPN 380	24010
HD 400 × 421	159600				
HD 400 × 382	141300				

Table D.3 Continued.

I_x

I-shapes
Selection by I_x

Shape	I_x	Shape	I_x	Shape	I_x
	mm^4		mm^4		mm^4
IPE 400	**23130**	**IPE A 300**	**7173**	**IPE A 180**	**1063**
HD 320 × 97.6	22930	IPE O 270	6947	HE 140 A	1033
HE 320 A	22930			IPN 160	935.0
		IPE 270	**5790**	IPE 160	869.3
IPE A 400	**20290**	IPN 260	5740	HE 120 B	864.4
IPN 360	19610	HE 200 B	5696		
HE 280 B	19270	HE 220 A	5410	**IPE A 160**	**689.3**
IPE O 360	19050	HE 160 M	5098	HE 120 A	606.2
HD 260 × 114	18910			IPN 140	573.0
HE 300 A	18260	**IPE A 270**	**4917**	IPE 140	541.2
HD 320 × 74.2	16450	IPE O 240	4369	HE 100 B	449.5
		IPN 240	4250		
IPE 360	**16270**	IPE 240	3892	**IPE A 140**	**434.9**
IPN 340	15700	HE 180 B	3831	HE 100 A	349.2
HD 260 × 93.0	14920	HE 200 A	3692	IPN 120	328.0
HE 260 B	14920	HE 140 M	3291		
HE 220 M	14600			**IPE 120**	**317.8**
		IPE A 240	**3290**		
IPE A 360	**14520**	IPE O 220	3134	**IPE A 120**	**257.4**
IPE O 330	13910	IPN 220	3060		
HE 280 A	13670	IPE 220	2772	**IPE 100**	**171.0**
IPN 320	12510	HE 180 A	2510		
		HE 160 B	2492	**IPN 100**	**171.0**
IPE 330	**11770**				
HE 240 B	11260	**IPE A 220**	**2317**	**IPE A 100**	**141.1**
HE 200 M	10640	IPE O 200	2211		
HD 260 × 68.2	10450	IPN 200	2140	**IPE 80**	**80.14**
HE 260 A	10450	HE 120 M	2018		
		IPE 200	1943	**IPN 80**	**77.80**
IPE A 330	**10230**	HE 160 A	1673		
IPE O 300	9994			**IPE A 80**	**64.38**
IPN 300	9800	**IPE A 200**	**1591**		
		HE 140 B	1509		
IPE 300	**8356**	IPE O 180	1505		
HE 220 B	8091	IPN 180	1450		
HD 260 × 54.1	7981	IPE 180	1317		
HE 240 A	7763	HE 100 M	1143		
IPN 280	7590				
HE 180 M	7483				

Table D.4 Selection by I_y.

I_y

I-shapes
Selection by I_y

Shape	I_y	**Shape**	I_y	**Shape**	I_y
	mm^4		**mm^4**		**mm^4**
HD 400 × 1086	**196200**	**HD 360 × 162**	**18560**	**HE 300 B**	**8563**
HD 400 × 990	**173400**	HE 1000 M	18460	HD 260 × 142	8236
HD 400 × 900	**153300**	HE 900 M	18450	HE 240 M	8153
HD 400 × 818	**135500**				
HD 400 × 744	**119900**	**HD 360 × 147**	**16720**	**HE 360 A**	**7887**
HD 400 × 677	**106900**	HE 1000 B	16280	**HE 340 A**	**7436**
HD 400 × 634	**98250**	HE 900 B	15820	**HD 320 × 97.6**	**6985**
HD 400 × 592	**90170**	HD 320 × 198	15310	HE 320 A	6985
HD 400 × 551	**82490**			HE 280 B	6595
HD 400 × 509	**75400**	**HD 360 × 134**	**15080**	HD 260 × 114	6456
HD 400 × 463	**67040**	HE 800 B	14900		
HD 400 × 421	**60080**	HE 700 B	14440	**HE 300 A**	**6310**
HD 400 × 382	**53620**	HE 1000 A	14000	HD 260 × 93.0	5135
HD 400 × 347	**48090**	HE 650 B	13980	HE 260 B	5135
HD 400 × 314	**42600**	HE 900 A	13550	HE 220 M	5012
HD 400 × 287	**38780**	HE 600 B	13530		
HD 400 × 262	**35020**	HE 280 M	13160	**HD 320 × 74.2**	**4959**
HD 400 × 237	**31040**	HE 550 B	13080	HE 280 A	4763
HD 400 × 216	**28250**	HE 800 A	12640	IPN 600	4674
HD 320 × 300	24600	HE 500 B	12620	IPE O 600	4521
		HE 700 A	12180	HE 240 B	3923
HD 400 × 187	**23920**	HD 320 × 158	11840		
HD 360 × 196	22860	HE 650 A	11720	**HD 260 × 68.2**	**3668**
		HE 450 B	11720	HE 260 A	3668
HD 360 × 179	**20680**	HE 600 A	11270	HE 200 M	3651
HD 320 × 245	19710	HE 550 A	10820	IPN 550	3490
HE 320 M	19710	HE 400 B	10820	IPE 600	3387
HE 340 M	19710	HD 260 × 172	10450	IPE O 550	3224
HE 360 M	19520	HE 260 M	10450	IPE A 600	3116
HE 300 M	19400	HE 500 A	10370	HE 220 B	2843
HE 400 M	19340	HE 360 B	10140		
HE 450 M	19340	HE 340 B	9690	**HD 260 × 54.1**	**2788**
HE 550 M	19160	HE 450 A	9465	HE 240 A	2769
HE 500 M	19150			IPE 550	2668
HE 600 M	18980	**HD 320 × 127**	**9239**	IPE O 500	2622
HE 650 M	18980	HE 320 B	9239	HE 180 M	2580
HE 700 M	18800	HE 400 A	8564	IPN 500	2480
HE 800 M	18630			IPE A 550	2432
				IPE 500	2142
				IPE O 450	2085
				HE 200 B	2003

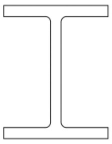
Table D.4 Continued.

I_y

I-shapes
Selection by I_y

Shape	I_y	Shape	I_y	Shape	I_y
	mm^4		mm^4		mm^4
HE 220 A	**1955**	**HE 140 A**	**389.3**	**IPE A 120**	**22.39**
IPE A 500	1939	IPN 280	364.0	IPN 120	21.50
HE 160 M	1759	IPE A 270	358.0		
IPN 450	1730	IPE O 240	328.5	**IPE 100**	**15.92**
IPE 450	1676	HE 120 B	317.5		
IPE O 400	1564	IPN 260	288.0	**IPE A 100**	**13.12**
IPE A 450	1502	IPE 240	283.6	IPN 100	12.20
HE 180 B	1363	IPE A 240	240.1		
		IPE O 220	239.8	**IPE 80**	**8.49**
HE 200 A	**1336**				
IPE 400	1318	**HE 120 A**	**230.9**	**IPE A 80**	**6.85**
IPE O 360	1251	IPN 240	221.0		
IPE A 400	1171	IPE 220	204.9	**IPN 80**	**6.29**
IPN 400	1160	IPE A 220	171.4		
HE 140 M	1144	IPE O 200	168.9		
IPE 360	1043	HE 100 B	167.3		
IPN 380	975.0	IPN 220	162.0		
IPE O 330	960.4	IPE 200	142.4		
IPE A 360	944.3				
		HE 100 A	**133.8**		
HE 180 A	**924.6**	IPE O 180	117.3		
HE 160 B	889.2	IPE A 200	117.2		
IPN 360	818.0	IPN 200	117.0		
IPE 330	788.1	IPE 180	100.9		
IPE O 300	745.7				
HE 120 M	702.8	**IPE A 180**	**81.89**		
IPE A 330	685.2	IPN 180	81.30		
IPN 340	674.0	IPE 160	68.31		
HE 160 A	615.6	IPN 160	54.70		
IPE 300	603.8				
IPN 320	555.0	**IPE A 160**	**54.43**		
		IPE 140	44.92		
HE 140 B	**549.7**				
IPE A 300	519.0	**IPE A 140**	**36.42**		
IPE O 270	513.5	IPN 140	35.20		
IPN 300	451.0				
IPE 270	419.9	**IPE 120**	**27.67**		
HE 100 M	399.2				

Table D.5 Maximum total uniform load.



Maximum Total Uniform Load, kN
HD Shapes

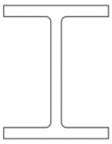
F_y = 235 MPa

Shape		HD 260×54.1^f		HD 260×68.2		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**447**	**298**	**529**	**353**	**733**	**489**	**945**	**630**	**1220**	**810**	**1470**	**981**
	1.50	**447**	**298**	**529**	**353**	**733**	**489**	**945**	**630**	**1220**	**810**	**1470**	**981**
	2.00	**447**	**298**	**529**	**353**	**733**	**489**	**945**	**630**	**1220**	**810**	**1470**	**981**
	2.50	**447**	**298**	**529**	**353**	**733**	**489**	**945**	**630**	**1220**	**810**	**1470**	**981**
	3.00	382	254	519	345	724	481	902	600	1140	756	1420	947
	3.50	328	218	445	296	620	413	773	515	974	648	1220	812
	4.00	287	191	389	259	543	361	677	450	852	567	1070	710
	4.50	255	170	346	230	482	321	602	400	758	504	949	631
	5.00	229	153	311	207	434	289	541	360	682	454	854	568
	5.50	208	139	283	188	395	263	492	327	620	412	776	517
	6.00	191	127	259	173	362	241	451	300	568	378	712	474
	6.50	176	117	239	159	334	222	416	277	525	349	657	437
	7.00	164	109	222	148	310	206	387	257	487	324	610	406
	7.50	153	102	208	138	289	193	361	240	455	302	569	379
	8.00	143	95.4	195	129	271	181	338	225	426	284	534	355
	8.50	135	89.7	183	122	255	170	318	212	401	267	502	334
	9.00	127	84.8	173	115	241	160	301	200	379	252	475	316
	9.50	121	80.3	164	109	229	152	285	190	359	239	450	299
	10.0	115	76.3	156	104	217	144	271	180	341	227	427	284
	10.5	109	72.7	148	98.6	207	138	258	172	325	216	407	271
	11.0	104	69.3	141	94.1	197	131	246	164	310	206	388	258
	11.5	100	66.3	135	90.0	189	126	235	157	296	197	371	247
	12.0	95.5	63.6	130	86.3	181	120	226	150	284	189	356	237
	12.5	91.7	61.0	125	82.8	174	116	217	144	273	181	342	227
	13.0	88.2	58.7	120	79.7	167	111	208	139	262	174	329	219
	13.5	84.9	56.5	115	76.7	161	107	201	133	253	168	316	210
	14.0	81.9	54.5	111	74.0	155	103	193	129	244	162	305	203
	14.5	79.1	52.6	107	71.4	150	99.6	187	124	235	156	295	196
	15.0	76.4	50.9	104	69.0	145	96.3	180	120	227	151	285	189
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	1150	763	1560	1040	2170	1440	2710	1800	3410	2270	4270	2840
$\phi_b M_p$	M_p/Ω_b , kN·m	143	95.4	195	129	271	181	338	225	426	284	534	355
$\phi_b M_r$	M_r/Ω_b , kN·m	96.8	64.4	124	82.4	170	113	209	139	259	172	320	213
$\phi_b BF$	BF/Ω_b , kN	6.43	4.28	7.11	4.73	7.49	4.98	7.62	5.07	7.78	5.17	8.03	5.35
$\phi_v V_n$	V_n/Ω_v , kN	224	149	264	176	367	244	472	315	608	405	736	491
	$Z_x \times 10^3$, mm^3	714.5		919.8		1283		1600		2015		2524	
	L_p , m	4.48		3.34		3.38		3.42		3.47		3.54	
	L_r , m	11.7		13.3		16.9		20.4		25.0		30.2	
LRFD	ASD												
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

F_y = 235 MPa

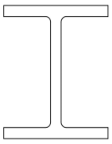
Shape		**HD 320 × 74.2**^{f}		**HD 320 × 97.6**		**HD 320 × 127**		**HD 320 × 158**		**HD 320 × 198**		**HD 320 × 245**	
Design		LRFD	**ASD**	LRFD	**ASD**	LRFD	**ASD**	LRFD	**ASD**	LRFD	**ASD**	LRFD	**ASD**
Span Length (m)	**1.00**	**679**	**453**	**787**	**525**	**1040**	**692**	**1350**	**900**	**1740**	**1160**	**2130**	**1420**
	1.50	**679**	**453**	**787**	**525**	**1040**	**692**	**1350**	**900**	**1740**	**1160**	**2130**	**1420**
	2.00	**679**	**453**	**787**	**525**	**1040**	**692**	**1350**	**900**	**1740**	**1160**	**2130**	**1420**
	2.50	**679**	**453**	**787**	**525**	**1040**	**692**	**1350**	**900**	**1740**	**1160**	**2130**	**1420**
	3.00	640	426	**787**	**525**	**1040**	**692**	**1350**	**900**	**1740**	**1160**	**2130**	**1420**
	3.50	549	365	**787**	**525**	**1040**	**692**	1310	874	1680	1120	**2130**	**1420**
	4.00	480	319	689	458	909	605	1150	765	1470	979	1880	1250
	4.50	427	284	612	407	808	538	1020	680	1310	870	1670	1110
	5.00	384	256	551	367	727	484	920	612	1180	783	1500	999
	5.50	349	232	501	333	661	440	836	556	1070	712	1360	908
	6.00	320	213	459	305	606	403	766	510	981	653	1250	832
	6.50	296	197	424	282	559	372	708	471	906	603	1150	768
	7.00	274	183	394	262	519	346	657	437	841	559	1070	713
	7.50	256	170	367	244	485	323	613	408	785	522	1000	666
	8.00	240	160	344	229	455	302	575	382	736	490	938	624
	8.50	226	150	324	216	428	285	541	360	693	461	883	587
	9.00	213	142	306	204	404	269	511	340	654	435	834	555
	9.50	202	135	290	193	383	255	484	322	620	412	790	526
	10.0	192	128	275	183	364	242	460	306	589	392	750	499
	10.5	183	122	262	175	346	230	438	291	561	373	715	475
	11.0	175	116	250	167	331	220	418	278	535	356	682	454
	11.5	167	111	240	159	316	210	400	266	512	341	653	434
	12.0	160	106	230	153	303	202	383	255	491	326	625	416
	12.5	154	102	220	147	291	194	368	245	471	313	600	399
	13.0	148	98.3	212	141	280	186	354	235	453	301	577	384
	13.5	142	94.7	204	136	269	179	341	227	436	290	556	370
	14.0	137	91.3	197	131	260	173	328	219	420	280	536	357
	14.5	132	88.1	190	126	251	167	317	211	406	270	518	344
	15.0	128	85.2	184	122	242	161	307	204	392	261	500	333
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	1920	1280	2750	1830	3640	2420	4600	3060	5890	3920	7500	4990
$\phi_b M_p$	M_p/Ω_b, kN·m	240	160	344	229	455	302	575	382	736	490	938	624
$\phi_b M_r$	M_r/Ω_b, kN·m	162	108	219	146	285	190	356	237	448	298	562	374
$\phi_b BF$	BF/Ω_b, kN	9.89	6.58	11.2	7.48	11.7	7.78	11.9	7.90	12.1	8.07	12.5	8.34
$\phi_v V_n$	V_n/Ω_v, kN	340	226	393	262	519	346	675	450	871	580	1060	709
	$Z_x \times 10^3$, mm^3	1196		1628		2149		2718		3479		4435	
	L_p, m	5.02		3.85		3.89		3.94		4		4.08	
	L_r, m	12.9		15		18.4		22.4		27.7		34.1	

LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

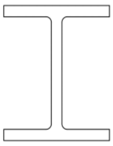
F_y = 235 MPa

Shape		**HD 320 × 300**		**HD 360 × 134**		**HD 360 × 147**		**HD 360 × 162**		**HD 360 × 179**		**HD 360 × 196**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**2860**	**1900**	**1120**	**750**	**1250**	**832**	**1370**	**910**	**1560**	**1040**	**1720**	**1150**
	1.50	**2860**	**1900**	**1120**	**750**	**1250**	**832**	**1370**	**910**	**1560**	**1040**	**1720**	**1150**
	2.00	**2860**	**1900**	**1120**	**750**	**1250**	**832**	**1370**	**910**	**1560**	**1040**	**1720**	**1150**
	2.50	**2860**	**1900**	**1120**	**750**	**1250**	**832**	**1370**	**910**	**1560**	**1040**	**1720**	**1150**
	3.00	**2860**	**1900**	**1120**	**750**	**1250**	**832**	**1370**	**910**	**1560**	**1040**	**1720**	**1150**
	3.50	2670	1780	**1120**	**750**	**1250**	**832**	**1370**	**910**	**1560**	**1040**	**1720**	**1150**
	4.00	2340	1550	1080	721	1200	799	1330	883	1470	980	1620	1080
	4.50	2080	1380	963	641	1070	710	1180	785	1310	871	1440	960
	5.00	1870	1240	867	577	960	639	1060	707	1180	784	1300	864
	5.50	1700	1130	788	524	873	581	966	642	1070	713	1180	785
	6.00	1560	1040	722	481	800	532	885	589	982	653	1080	720
	6.50	1440	956	667	444	739	492	817	544	906	603	999	665
	7.00	1330	888	619	412	686	456	759	505	842	560	927	617
	7.50	1250	829	578	385	640	426	708	471	786	523	866	576
	8.00	1170	777	542	361	600	399	664	442	736	490	812	540
	8.50	1100	731	510	339	565	376	625	416	693	461	764	508
	9.00	1040	691	482	320	534	355	590	393	655	436	721	480
	9.50	983	654	456	304	505	336	559	372	620	413	683	455
	10.0	934	622	433	288	480	319	531	353	589	392	649	432
	10.5	890	592	413	275	457	304	506	337	561	373	618	411
	11.0	849	565	394	262	437	290	483	321	536	356	590	393
	11.5	812	541	377	251	418	278	462	307	512	341	565	376
	12.0	779	518	361	240	400	266	443	294	491	327	541	360
	12.5	747	497	347	231	384	256	425	283	471	314	519	346
	13.0	719	478	333	222	369	246	409	272	453	302	499	332
	13.5	692	460	321	214	356	237	393	262	436	290	481	320
	14.0	667	444	310	206	343	228	379	252	421	280	464	309
	14.5	644	429	299	199	331	220	366	244	406	270	448	298
	15.0	623	414	289	192	320	213	354	236	393	261	433	288
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	9340	6220	4330	2880	4800	3190	5310	3530	5890	3920	6490	4320
$\phi_b M_p$	M_p/Ω_b , kN·m	1170	777	542	361	600	399	664	442	736	490	812	540
$\phi_b M_r$	M_r/Ω_b , kN·m	686	457	345	230	381	253	419	279	462	308	506	337
$\phi_b BF$	BF/Ω_b , kN	12.9	8.60	15.1	10.1	15.4	10.2	15.5	10.3	15.6	10.4	15.6	10.4
$\phi_v V_n$	V_n/Ω_v , kN	1430	952	562	375	624	416	683	455	778	519	860	573
	$Z_x \times 10^3$, mm^3	5522		2562		2838		3139		3482		3837	
	L_p , m	4.12		4.83		4.84		4.87		4.89		4.91	
	L_r , m	41.4		17.8		19.1		20.7		22.5		24.5	

LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

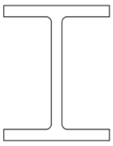


Maximum Total Uniform Load, kN
HD Shapes

F_y = 235 MPa

Shape		HD 400 × 187		HD 400 × 216		HD 400×237		HD 400×262		HD 400×287	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**1560**	**1040**	**1830**	**1220**	**2030**	**1350**	**2300**	**1540**	**2500**	**1670**
	1.50	**1560**	**1040**	**1830**	**1220**	**2030**	**1350**	**2300**	**1540**	**2500**	**1670**
	2.00	**1560**	**1040**	**1830**	**1220**	**2030**	**1350**	**2300**	**1540**	**2500**	**1670**
	2.50	**1560**	**1040**	**1830**	**1220**	**2030**	**1350**	**2300**	**1540**	**2500**	**1670**
	3.00	**1560**	**1040**	**1830**	**1220**	**2030**	**1350**	**2300**	**1540**	**2500**	**1670**
	3.50	**1560**	**1040**	**1830**	**1220**	**2030**	**1350**	**2300**	**1540**	**2500**	**1670**
	4.00	1540	1020	1800	1200	1980	1320	2220	1480	2460	1640
	4.50	1370	911	1600	1070	1760	1170	1980	1320	2190	1450
	5.00	1230	820	1440	960	1590	1060	1780	1180	1970	1310
	5.50	1120	745	1310	872	1440	959	1620	1080	1790	1190
	6.00	1030	683	1200	800	1320	879	1480	987	1640	1090
	6.50	948	631	1110	738	1220	812	1370	911	1510	1010
	7.00	880	586	1030	685	1130	754	1270	846	1410	935
	7.50	822	547	962	640	1060	703	1190	790	1310	873
	8.00	770	512	901	600	991	659	1110	740	1230	818
	8.50	725	482	848	564	933	621	1050	697	1160	770
	9.00	685	456	801	533	881	586	989	658	1090	727
	9.50	649	432	759	505	835	555	937	623	1040	689
	10.0	616	410	721	480	793	528	890	592	984	654
	10.5	587	390	687	457	755	502	848	564	937	623
	11.0	560	373	656	436	721	480	809	538	894	595
	11.5	536	357	627	417	689	459	774	515	855	569
	12.0	514	342	601	400	661	440	742	493	820	545
	12.5	493	328	577	384	634	422	712	474	787	524
	13.0	474	315	555	369	610	406	685	455	757	503
	13.5	456	304	534	355	587	391	659	439	729	485
	14.0	440	293	515	343	566	377	636	423	703	467
	14.5	425	283	497	331	547	364	614	408	678	451
	15.0	411	273	481	320	529	352	593	395	656	436
Beam Properties											
$\phi_b W_c$	W_c/Ω_b , kN·m	6160	4100	7210	4800	7930	5280	8900	5920	9840	6540
$\phi_b M_p$	M_p/Ω_b , kN·m	770	512	901	600	991	659	1110	740	1230	818
$\phi_b M_r$	M_r/Ω_b , kN·m	484	322	562	374	614	408	684	455	751	500
$\phi_b BF$	BF/Ω_b , kN	15.4	10.3	15.5	10.3	15.6	10.4	15.7	10.5	15.8	10.5
$\phi_v V_n$	V_n/Ω_v , kN	778	519	915	610	1010	675	1150	768	1250	835
	$Z_x \times 10^3$, mm^3	3642		4262		4686		5260		5813	
	L_p , m	5.15		5.20		5.22		5.25		5.28	
	L_r , m	23.7		27.1		29.4		32.5		35.5	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										
$\phi_v = 1.00$	$\Omega_v = 1.50$										

Table D.5 Continued.

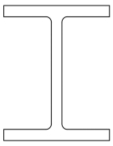


Maximum Total Uniform Load, kN
HD Shapes

F_y = 235 MPa

Shape		HD 400×314		HD 400×347		HD 400×382		HD 400×421		HD 400×463	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**2800**	**1870**	**3120**	**2080**	**3500**	**2330**	**3930**	**2620**	**4390**	**2930**
	1.50	**2800**	**1870**	**3120**	**2080**	**3500**	**2330**	**3930**	**2620**	**4390**	**2930**
	2.00	**2800**	**1870**	**3120**	**2080**	**3500**	**2330**	**3930**	**2620**	**4390**	**2930**
	2.50	**2800**	**1870**	**3120**	**2080**	**3500**	**2330**	**3930**	**2620**	**4390**	**2930**
	3.00	**2800**	**1870**	**3120**	**2080**	**3500**	**2330**	**3930**	**2620**	**4390**	**2930**
	3.50	**2800**	**1870**	**3120**	**2080**	**3500**	**2330**	**3930**	**2620**	**4390**	**2930**
	4.00	2700	1790	3020	2010	3370	2240	3760	2500	4180	2780
	4.50	2400	1590	2680	1790	2990	1990	3340	2220	3710	2470
	5.00	2160	1440	2420	1610	2700	1790	3000	2000	3340	2220
	5.50	1960	1300	2200	1460	2450	1630	2730	1820	3040	2020
	6.00	1800	1200	2010	1340	2250	1490	2500	1670	2790	1850
	6.50	1660	1100	1860	1240	2070	1380	2310	1540	2570	1710
	7.00	1540	1030	1730	1150	1930	1280	2150	1430	2390	1590
	7.50	1440	957	1610	1070	1800	1200	2000	1330	2230	1480
	8.00	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
	8.50	1270	844	1420	945	1590	1050	1770	1180	1970	1310
	9.00	1200	797	1340	893	1500	996	1670	1110	1860	1240
	9.50	1140	755	1270	846	1420	944	1580	1050	1760	1170
	10.0	1080	718	1210	804	1350	897	1500	1000	1670	1110
	10.5	1030	683	1150	765	1280	854	1430	952	1590	1060
	11.0	980	652	1100	731	1230	815	1370	909	1520	1010
	11.5	938	624	1050	699	1170	780	1310	869	1450	967
	12.0	899	598	1010	670	1120	747	1250	833	1390	927
	12.5	863	574	966	643	1080	717	1200	800	1340	890
	13.0	830	552	929	618	1040	690	1160	769	1290	855
	13.5	799	532	895	595	998	664	1110	740	1240	824
	14.0	770	513	863	574	963	640	1070	714	1190	794
	14.5	744	495	833	554	929	618	1040	689	1150	767
	15.0	719	478	805	536	898	598	1000	666	1110	741
Beam Properties											
$\phi_b W_c$	W_c/Ω_b, kN·m	10800	7180	12100	8040	13500	8970	15000	10000	16700	11100
$\phi_b M_p$	M_p/Ω_b, kN·m	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
$\phi_b M_r$	M_r/Ω_b, kN·m	818	544	909	605	1010	669	1110	740	1230	816
$\phi_b BF$	BF/Ω_b, kN	15.9	10.6	16.1	10.7	16.4	10.9	16.7	11.1	17.0	11.3
$\phi_v V_n$	V_n/Ω_v, kN	1400	934	1560	1040	1750	1170	1970	1310	2200	1460
	$Z_x \times 10^3$, mm^3	6374		7139		7965		8880		9878	
	L_p, m	5.30		5.36		5.39		5.43		5.47	
	L_r, m	38.5		42.6		46.8		51.4		56.2	
LRFD	ASD	Notes: For beams laterally unsppported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										
$\phi_v = 1.00$	$\Omega_v = 1.50$										

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

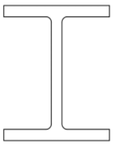
F_y = 235 MPa

Shape		HD 400×509		HD 400×551		HD 400×592		HD 400×634		HD 400×677	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**4920**	**3280**	**5390**	**3590**	**5900**	**3930**	**6360**	**4240**	**6970**	**4650**
	1.50	**4920**	**3280**	**5390**	**3590**	**5900**	**3930**	**6360**	**4240**	**6970**	**4650**
	2.00	**4920**	**3280**	**5390**	**3590**	**5900**	**3930**	**6360**	**4240**	**6970**	**4650**
	2.50	**4920**	**3280**	**5390**	**3590**	**5900**	**3930**	**6360**	**4240**	**6970**	**4650**
	3.00	**4920**	**3280**	**5390**	**3590**	**5900**	**3930**	**6360**	**4240**	**6970**	**4650**
	3.50	**4920**	**3280**	**5390**	**3590**	**5900**	**3930**	**6360**	**4240**	**6970**	**4650**
	4.00	4670	3100	5100	3390	5560	3700	6020	4000	6490	4320
	4.50	4150	2760	4530	3010	4940	3290	5350	3560	5770	3840
	5.00	3730	2480	4080	2710	4450	2960	4810	3200	5190	3460
	5.50	3390	2260	3710	2470	4040	2690	4370	2910	4720	3140
	6.00	3110	2070	3400	2260	3710	2470	4010	2670	4330	2880
	6.50	2870	1910	3140	2090	3420	2280	3700	2460	4000	2660
	7.00	2670	1770	2910	1940	3180	2110	3440	2290	3710	2470
	7.50	2490	1660	2720	1810	2960	1970	3210	2130	3460	2300
	8.00	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	8.50	2200	1460	2400	1600	2620	1740	2830	1880	3060	2030
	9.00	2070	1380	2270	1510	2470	1640	2670	1780	2890	1920
	9.50	1960	1310	2150	1430	2340	1560	2530	1690	2730	1820
	10.0	1870	1240	2040	1360	2220	1480	2410	1600	2600	1730
	10.5	1780	1180	1940	1290	2120	1410	2290	1520	2470	1650
	11.0	1700	1130	1850	1230	2020	1340	2190	1460	2360	1570
	11.5	1620	1080	1770	1180	1930	1290	2090	1390	2260	1500
	12.0	1560	1030	1700	1130	1850	1230	2010	1330	2160	1440
	12.5	1490	993	1630	1090	1780	1180	1920	1280	2080	1380
	13.0	1440	955	1570	1040	1710	1140	1850	1230	2000	1330
	13.5	1380	920	1510	1000	1650	1100	1780	1190	1920	1280
	14.0	1330	887	1460	969	1590	1060	1720	1140	1860	1230
	14.5	1290	856	1410	936	1530	1020	1660	1100	1790	1190
	15.0	1240	828	1360	904	1480	986	1600	1070	1730	1150
Beam Properties											
$\phi_b W_c$	W_c/Ω_b , kN·m	18700	12400	20400	13600	22200	14800	24100	16000	26000	17300
$\phi_b M_p$	M_p/Ω_b , kN·m	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
$\phi_b M_r$	M_r/Ω_b , kN·m	1360	903	1470	979	1590	1060	1710	1140	1840	1220
$\phi_b BF$	BF/Ω_b , kN	17.4	11.6	17.7	11.8	18.1	12.0	18.4	12.2	18.7	12.5
$\phi_v V_n$	V_n/Ω_v , kN	2460	1640	2690	1800	2950	1970	3180	2120	3490	2320
	$Z_x \times 10^3$, mm^3	11030		12050		13140		14220		15350	
	L_p , m	5.53		5.57		5.61		5.66		5.71	
	L_r , m	61.6		66.5		71.2		76.1		81.0	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

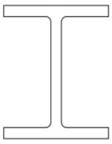


Maximum Total Uniform Load, kN
HD Shapes

F_y = 235 MPa

Shape		HD 400×744		HD 400×818		HD 400×900		HD 400×990		HD 400×1086	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**7810**	**5210**	**8770**	**5850**	**9870**	**6580**	**11200**	**7430**	**12500**	**8340**
	1.50	**7810**	**5210**	**8770**	**5850**	**9870**	**6580**	**11200**	**7430**	**12500**	**8340**
	2.00	**7810**	**5210**	**8770**	**5850**	**9870**	**6580**	**11200**	**7430**	**12500**	**8340**
	2.50	**7810**	**5210**	**8770**	**5850**	**9870**	**6580**	**11200**	**7430**	**12500**	**8340**
	3.00	**7810**	**5210**	**8770**	**5850**	**9870**	**6580**	**11200**	**7430**	**12500**	**8340**
	3.50	**7810**	**5210**	**8770**	**5850**	**9870**	**6580**	**11200**	**7430**	**12500**	**8340**
	4.00	7260	4830	8150	5420	9150	6080	10300	6830	11500	7660
	4.50	6460	4300	7240	4820	8130	5410	9130	6070	10200	6810
	5.00	5810	3870	6520	4340	7320	4870	8220	5470	9210	6130
	5.50	5280	3510	5930	3940	6650	4430	7470	4970	8370	5570
	6.00	4840	3220	5430	3610	6100	4060	6850	4560	7670	5110
	6.50	4470	2970	5010	3340	5630	3740	6320	4210	7080	4710
	7.00	4150	2760	4660	3100	5230	3480	5870	3900	6580	4380
	7.50	3870	2580	4350	2890	4880	3250	5480	3640	6140	4080
	8.00	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	8.50	3420	2270	3830	2550	4300	2860	4830	3220	5420	3600
	9.00	3230	2150	3620	2410	4060	2700	4560	3040	5120	3400
	9.50	3060	2030	3430	2280	3850	2560	4320	2880	4850	3220
	10.0	2910	1930	3260	2170	3660	2430	4110	2730	4600	3060
	10.5	2770	1840	3100	2060	3480	2320	3910	2600	4380	2920
	11.0	2640	1760	2960	1970	3330	2210	3730	2480	4190	2780
	11.5	2530	1680	2830	1890	3180	2120	3570	2380	4000	2660
	12.0	2420	1610	2720	1810	3050	2030	3420	2280	3840	2550
	12.5	2320	1550	2610	1730	2930	1950	3290	2190	3680	2450
	13.0	2230	1490	2510	1670	2810	1870	3160	2100	3540	2360
	13.5	2150	1430	2410	1610	2710	1800	3040	2020	3410	2270
	14.0	2080	1380	2330	1550	2610	1740	2930	1950	3290	2190
	14.5	2000	1330	2250	1500	2520	1680	2830	1890	3180	2110
	15.0	1940	1290	2170	1450	2440	1620	2740	1820	3070	2040
Beam Properties											
$\phi_b W_c$	W_c/Ω_b , kN·m	29100	19300	32600	21700	36600	24300	41100	27300	46000	30600
$\phi_b M_p$	M_p/Ω_b , kN·m	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
$\phi_b M_r$	M_r/Ω_b , kN·m	2030	1350	2260	1500	2510	1670	2790	1860	3100	2060
$\phi_b BF$	BF/Ω_b , kN	19.3	12.9	20.0	13.3	20.6	13.7	21.5	14.3	22.3	14.8
$\phi_v V_n$	V_n/Ω_v , kN	3900	2600	4380	2920	4930	3290	5580	3720	6260	4170
	$Z_x \times 10^3$, mm^3	17170		19260		21620		24280		27210	
	L_p , m	5.78		5.85		5.93		6.02		6.11	
	L_r , m	88.3		96.6		106		115		125	
LRFD	ASD	Notes: For beams laterally unsppported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										
$\phi_v = 1.00$	$\Omega_v = 1.50$										

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

F_y = 275 MPa

Shape		**HD 260×54.1[f]**		**HD 260×68.2[f]**		**HD 260×93.0**		**HD 260×114**		**HD 260×142**		**HD 260×172**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**523**	**349**	**619**	**413**	**858**	**572**	**1110**	**737**	**1420**	**948**	**1720**	**1150**
	1.50	**523**	**349**	**619**	**413**	**858**	**572**	**1110**	**737**	**1420**	**948**	**1720**	**1150**
	2.00	**523**	**349**	**619**	**413**	**858**	**572**	**1110**	**737**	**1420**	**948**	**1720**	**1150**
	2.50	**523**	**349**	**619**	**413**	**858**	**572**	**1110**	**737**	**1420**	**948**	**1720**	**1150**
	3.00	437	291	605	403	847	563	1060	703	1330	885	1670	1110
	3.50	374	249	519	345	726	483	905	602	1140	758	1430	950
	4.00	328	218	454	302	635	423	792	527	997	664	1250	831
	4.50	291	194	403	268	565	376	704	468	887	590	1110	739
	5.00	262	174	363	242	508	338	634	422	798	531	1000	665
	5.50	238	159	330	220	462	307	576	383	725	483	909	605
	6.00	218	145	303	201	423	282	528	351	665	442	833	554
	6.50	202	134	279	186	391	260	487	324	614	408	769	512
	7.00	187	125	259	173	363	241	453	301	570	379	714	475
	7.50	175	116	242	161	339	225	422	281	532	354	666	443
	8.00	164	109	227	151	318	211	396	263	499	332	625	416
	8.50	154	103	214	142	299	199	373	248	469	312	588	391
	9.00	146	96.9	202	134	282	188	352	234	443	295	555	369
	9.50	138	91.8	191	127	267	178	333	222	420	279	526	350
	10.0	131	87.2	182	121	254	169	317	211	399	265	500	333
	10.5	125	83.0	173	115	242	161	302	201	380	253	476	317
	11.0	119	79.3	165	110	231	154	288	192	363	241	454	302
	11.5	114	75.8	158	105	221	147	275	183	347	231	435	289
	12.0	109	72.6	151	101	212	141	264	176	332	221	416	277
	12.5	105	69.7	145	96.6	203	135	253	169	319	212	400	266
	13.0	101	67.1	140	92.9	195	130	244	162	307	204	384	256
	13.5	97.1	64.6	134	89.5	188	125	235	156	296	197	370	246
	14.0	93.6	62.3	130	86.3	181	121	226	151	285	190	357	238
	14.5	90.4	60.1	125	83.3	175	117	218	145	275	183	345	229
	15.0	87.4	58.1	121	80.5	169	113	211	141	266	177	333	222
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	1310	872	1820	1210	2540	1690	3170	2110	3990	2650	5000	3330
$\phi_b M_p$	M_p/Ω_b , kN·m	164	109	227	151	318	211	396	263	499	332	625	416
$\phi_b M_r$	M_r/Ω_b , kN·m	113	75.4	145	96.4	199	132	244	163	303	202	374	249
$\phi_b BF$	BF/Ω_b , kN	8.75	5.82	9.75	6.49	10.4	6.89	10.6	7.02	10.8	7.16	11.1	7.39
$\phi_v V_n$	V_n/Ω_v , kN	262	174	309	206	429	286	553	369	711	474	861	574
	$Z_x \times 10^3$, mm^3	714.5		919.8		1283		1600		2015		2524	
	L_p , m	4.51		3.16		3.12		3.16		3.21		3.27	
	L_r , m	10.3		11.6		14.6		17.5		21.4		25.8	

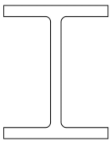
LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Notes: For beams laterally unspported, see Table D.6.

Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

F_y = 275 MPa

Shape		HD 320 × 74.2[f]		HD 320 × 97.6		HD 320 × 127		HD 320 × 158		HD 320 × 198		HD 320 × 245	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**795**	**530**	**921**	**614**	**1210**	**810**	**1580**	**1050**	**2040**	**1360**	**2490**	**1660**
	1.50	**795**	**530**	**921**	**614**	**1210**	**810**	**1580**	**1050**	**2040**	**1360**	**2490**	**1660**
	2.00	**795**	**530**	**921**	**614**	**1210**	**810**	**1580**	**1050**	**2040**	**1360**	**2490**	**1660**
	2.50	**795**	**530**	**921**	**614**	**1210**	**810**	**1580**	**1050**	**2040**	**1360**	**2490**	**1660**
	3.00	732	487	**921**	**614**	**1210**	**810**	**1580**	**1050**	**2040**	**1360**	**2490**	**1660**
	3.50	627	417	**921**	**614**	**1210**	**810**	1540	1020	1970	1310	**2490**	**1660**
	4.00	549	365	806	536	1060	708	1350	895	1720	1150	2200	1460
	4.50	488	325	716	477	946	629	1200	796	1530	1020	1950	1300
	5.00	439	292	645	429	851	566	1080	716	1380	917	1760	1170
	5.50	399	266	586	390	774	515	978	651	1250	833	1600	1060
	6.00	366	243	537	357	709	472	897	597	1150	764	1460	974
	6.50	338	225	496	330	655	436	828	551	1060	705	1350	899
	7.00	314	209	460	306	608	404	769	512	984	655	1250	835
	7.50	293	195	430	286	567	377	718	477	918	611	1170	779
	8.00	274	183	403	268	532	354	673	448	861	573	1100	730
	8.50	258	172	379	252	501	333	633	421	810	539	1030	687
	9.00	244	162	358	238	473	315	598	398	765	509	976	649
	9.50	231	154	339	226	448	298	566	377	725	482	924	615
	10.0	220	146	322	214	426	283	538	358	689	458	878	584
	10.5	209	139	307	204	405	270	513	341	656	436	836	556
	11.0	200	133	293	195	387	257	489	326	626	417	798	531
	11.5	191	127	280	186	370	246	468	311	599	399	764	508
	12.0	183	122	269	179	355	236	448	298	574	382	732	487
	12.5	176	117	258	172	340	226	431	286	551	367	703	467
	13.0	169	112	248	165	327	218	414	275	530	353	675	449
	13.5	163	108	239	159	315	210	399	265	510	339	650	433
	14.0	157	104	230	153	304	202	384	256	492	327	627	417
	14.5	151	101	222	148	293	195	371	247	475	316	606	403
	15.0	146	97.4	215	143	284	189	359	239	459	306	585	390
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	2200	1460	3220	2140	4260	2830	5380	3580	6890	4580	8780	5840
$\phi_b M_p$	M_p/Ω_b, kN·m	274	183	403	268	532	354	673	448	861	573	1100	730
$\phi_b M_r$	M_r/Ω_b, kN·m	189	126	256	170	334	222	416	277	524	349	658	438
$\phi_b BF$	BF/Ω_b, kN	13.4	8.91	15.4	10.2	16.1	10.7	16.4	10.9	16.8	11.2	17.3	11.5
$\phi_v V_n$	V_n/Ω_v, kN	397	265	460	307	607	405	790	526	1020	679	1240	829
	$Z_x \times 10^3$, mm^3	1196		1628		2149		2718		3479		4435	
	L_p, m	5.04		3.56		3.59		3.64		3.70		3.77	
	L_r, m	11.4		13.1		15.9		19.2		23.8		29.2	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Notes: For beams laterally unsupported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

Maximum Total Uniform Load, kN
HD Shapes

F_y = 275 MPa

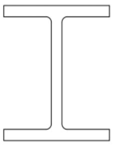
Shape		**HD 320 × 300**		**HD 360 × 134^f**		**HD 360 × 147**		**HD 360 × 162**		**HD 360 × 179**		**HD 360 × 196**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**3340**	**2230**	**1320**	**877**	**1460**	**974**	**1600**	**1070**	**1820**	**1210**	**2010**	**1340**
	1.50	**3340**	**2230**	**1320**	**877**	**1460**	**974**	**1600**	**1070**	**1820**	**1210**	**2010**	**1340**
	2.00	**3340**	**2230**	**1320**	**877**	**1460**	**974**	**1600**	**1070**	**1820**	**1210**	**2010**	**1340**
	2.50	**3340**	**2230**	**1320**	**877**	**1460**	**974**	**1600**	**1070**	**1820**	**1210**	**2010**	**1340**
	3.00	**3340**	**2230**	**1320**	**877**	**1460**	**974**	**1600**	**1070**	**1820**	**1210**	**2010**	**1340**
	3.50	3120	2080	**1320**	**877**	**1460**	**974**	**1600**	**1070**	**1820**	**1210**	**2010**	**1340**
	4.00	2730	1820	1270	844	1400	935	1550	1030	1720	1150	1900	1260
	4.50	2430	1620	1130	750	1250	831	1380	919	1530	1020	1690	1120
	5.00	2190	1450	1010	675	1120	748	1240	827	1380	917	1520	1010
	5.50	1990	1320	922	614	1020	680	1130	752	1250	834	1380	919
	6.00	1820	1210	845	562	937	623	1040	689	1150	765	1270	842
	6.50	1680	1120	780	519	864	575	956	636	1060	706	1170	778
	7.00	1560	1040	725	482	803	534	888	591	985	655	1090	722
	7.50	1460	970	676	450	749	498	829	551	919	612	1010	674
	8.00	1370	909	634	422	702	467	777	517	862	573	950	632
	8.50	1290	856	597	397	661	440	731	486	811	540	894	595
	9.00	1210	808	564	375	624	415	691	459	766	510	844	562
	9.50	1150	766	534	355	591	394	654	435	726	483	800	532
	10.0	1090	727	507	337	562	374	622	414	689	459	760	505
	10.5	1040	693	483	321	535	356	592	394	657	437	724	481
	11.0	994	661	461	307	511	340	565	376	627	417	691	460
	11.5	951	633	441	293	489	325	540	360	600	399	661	440
	12.0	911	606	423	281	468	312	518	345	575	382	633	421
	12.5	875	582	406	270	450	299	497	331	552	367	608	404
	13.0	841	560	390	260	432	288	478	318	530	353	584	389
	13.5	810	539	376	250	416	277	460	306	511	340	563	374
	14.0	781	520	362	241	401	267	444	295	492	328	543	361
	14.5	754	502	350	233	388	258	429	285	475	316	524	349
	15.0	729	485	338	225	375	249	414	276	460	306	506	337
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	10900	7270	5070	3370	5620	3740	6220	4140	6890	4590	7600	5050
$\phi_b M_p$	M_p/Ω_b , kN·m	1370	909	634	422	702	467	777	517	862	573	950	632
$\phi_b M_r$	M_r/Ω_b , kN·m	803	534	404	269	446	296	491	326	541	360	593	394
$\phi_b BF$	BF/Ω_b , kN	17.9	11.9	20.7	13.7	21	14	21.3	14.2	21.5	14.3	21.5	14.3
$\phi_v V_n$	V_n/Ω_v , kN	1670	1110	658	439	731	487	799	533	911	607	1010	671
	$Z_x \times 10^3$, mm^3	5522		2562		2838		3139		3482		3837	
	L_p , m	3.81		4.46		4.48		4.50		4.52		4.54	
	L_r , m	35.4		15.6		16.7		17.9		19.5		21.1	
LRFD	**ASD**												
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Notes: For beams laterally unspported, see Table D.6.

Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

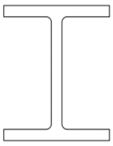
F_y = 275 MPa

Shape		HD 400 × 187		HD 400 × 216		HD 400×237		HD 400×262		HD 400×287	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**1820**	**1210**	**2140**	**1430**	**2370**	**1580**	**2690**	**1800**	**2930**	**1950**
	1.50	**1820**	**1210**	**2140**	**1430**	**2370**	**1580**	**2690**	**1800**	**2930**	**1950**
	2.00	**1820**	**1210**	**2140**	**1430**	**2370**	**1580**	**2690**	**1800**	**2930**	**1950**
	2.50	**1820**	**1210**	**2140**	**1430**	**2370**	**1580**	**2690**	**1800**	**2930**	**1950**
	3.00	**1820**	**1210**	**2140**	**1430**	**2370**	**1580**	**2690**	**1800**	**2930**	**1950**
	3.50	**1820**	**1210**	**2140**	**1430**	**2370**	**1580**	**2690**	**1800**	**2930**	**1950**
	4.00	1800	1200	2110	1400	2320	1540	2600	1730	2880	1910
	4.50	1600	1070	1880	1250	2060	1370	2310	1540	2560	1700
	5.00	1440	960	1690	1120	1860	1230	2080	1390	2300	1530
	5.50	1310	872	1530	1020	1690	1120	1890	1260	2090	1390
	6.00	1200	800	1410	936	1550	1030	1740	1150	1920	1280
	6.50	1110	738	1300	864	1430	950	1600	1070	1770	1180
	7.00	1030	685	1210	802	1330	882	1490	990	1640	1090
	7.50	961	640	1130	749	1240	823	1390	924	1530	1020
	8.00	901	600	1050	702	1160	772	1300	866	1440	957
	8.50	848	564	993	661	1090	726	1230	815	1350	901
	9.00	801	533	938	624	1030	686	1160	770	1280	851
	9.50	759	505	888	591	977	650	1100	729	1210	806
	10.0	721	480	844	561	928	617	1040	693	1150	766
	10.5	687	457	804	535	884	588	992	660	1100	729
	11.0	656	436	767	510	843	561	947	630	1050	696
	11.5	627	417	734	488	807	537	906	603	1000	666
	12.0	601	400	703	468	773	514	868	577	959	638
	12.5	577	384	675	449	742	494	833	554	921	613
	13.0	555	369	649	432	714	475	801	533	885	589
	13.5	534	355	625	416	687	457	771	513	853	567
	14.0	515	343	603	401	663	441	744	495	822	547
	14.5	497	331	582	387	640	426	718	478	794	528
	15.0	481	320	563	374	619	412	694	462	767	511
Beam Properties											
$\phi_b W_c$	W_c/Ω_b, kN·m	7210	4800	8440	5610	9280	6170	10400	6930	11500	7660
$\phi_b M_p$	M_p/Ω_b, kN·m	901	600	1050	702	1160	772	1300	866	1440	957
$\phi_b M_r$	M_r/Ω_b, kN·m	567	377	657	437	718	478	800	533	879	585
$\phi_b BF$	BF/Ω_b, kN	21.3	14.1	21.4	14.3	21.6	14.3	21.8	14.5	21.9	14.6
$\phi_v V_n$	V_n/Ω_v, kN	911	607	1070	714	1190	790	1350	898	1470	977
	$Z_x \times 10^3$, mm^3	3642		4262		4686		5260		5813	
	L_p, m	4.76		4.81		4.82		4.86		4.88	
	L_r, m	20.5		23.4		25.3		27.9		30.4	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

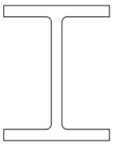
F_y = 275 MPa

Shape		HD 400×314		HD 400×347		HD 400×382		HD 400×421		HD 400×463	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**3280**	**2190**	**3650**	**2440**	**4090**	**2730**	**4600**	**3070**	**5140**	**3430**
	1.50	**3280**	**2190**	**3650**	**2440**	**4090**	**2730**	**4600**	**3070**	**5140**	**3430**
	2.00	**3280**	**2190**	**3650**	**2440**	**4090**	**2730**	**4600**	**3070**	**5140**	**3430**
	2.50	**3280**	**2190**	**3650**	**2440**	**4090**	**2730**	**4600**	**3070**	**5140**	**3430**
	3.00	**3280**	**2190**	**3650**	**2440**	**4090**	**2730**	**4600**	**3070**	**5140**	**3430**
	3.50	**3280**	**2190**	**3650**	**2440**	**4090**	**2730**	**4600**	**3070**	**5140**	**3430**
	4.00	3160	2100	3530	2350	3940	2620	4400	2920	4890	3250
	4.50	2800	1870	3140	2090	3500	2330	3910	2600	4350	2890
	5.00	2520	1680	2830	1880	3150	2100	3520	2340	3910	2600
	5.50	2290	1530	2570	1710	2870	1910	3200	2130	3560	2370
	6.00	2100	1400	2360	1570	2630	1750	2930	1950	3260	2170
	6.50	1940	1290	2170	1450	2430	1610	2700	1800	3010	2000
	7.00	1800	1200	2020	1340	2250	1500	2510	1670	2790	1860
	7.50	1680	1120	1880	1250	2100	1400	2340	1560	2610	1740
	8.00	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
	8.50	1480	988	1660	1110	1860	1230	2070	1380	2300	1530
	9.00	1400	933	1570	1040	1750	1170	1950	1300	2170	1450
	9.50	1330	884	1490	990	1660	1100	1850	1230	2060	1370
	10.0	1260	840	1410	940	1580	1050	1760	1170	1960	1300
	10.5	1200	800	1350	896	1500	999	1670	1110	1860	1240
	11.0	1150	763	1290	855	1430	954	1600	1060	1780	1180
	11.5	1100	730	1230	818	1370	912	1530	1020	1700	1130
	12.0	1050	700	1180	784	1310	874	1470	975	1630	1080
	12.5	1010	672	1130	752	1260	839	1410	936	1560	1040
	13.0	971	646	1090	723	1210	807	1350	900	1500	1000
	13.5	935	622	1050	697	1170	777	1300	867	1450	964
	14.0	901	600	1010	672	1130	749	1260	836	1400	929
	14.5	870	579	975	649	1090	724	1210	807	1350	897
	15.0	841	560	942	627	1050	700	1170	780	1300	868
Beam Properties											
$\phi_b W_c$	W_c/Ω_b , kN·m	12600	8400	14100	9400	15800	10500	17600	11700	19600	13000
$\phi_b M_p$	M_p/Ω_b , kN·m	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
$\phi_b M_r$	M_r/Ω_b , kN·m	957	637	1060	708	1180	783	1300	866	1440	955
$\phi_b BF$	BF/Ω_b , kN	22.1	14.7	22.3	14.8	22.7	15.1	23.0	15.3	23.5	15.6
$\phi_v V_n$	V_n/Ω_v , kN	1640	1090	1830	1220	2050	1360	2300	1530	2570	1710
	$Z_x \times 10^3$, mm^3	6374		7139		7965		8880		9878	
	L_p , m	4.90		4.95		4.98		5.02		5.06	
	L_r , m	33.0		36.5		40.0		44.0		48.1	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

F_y = 275 MPa

Shape		HD 400×509		HD 400×551		HD 400×592		HD 400×634		HD 400×677	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**5750**	**3840**	**6310**	**4200**	**6910**	**4600**	**7450**	**4960**	**8160**	**5440**
	1.50	**5750**	**3840**	**6310**	**4200**	**6910**	**4600**	**7450**	**4960**	**8160**	**5440**
	2.00	**5750**	**3840**	**6310**	**4200**	**6910**	**4600**	**7450**	**4960**	**8160**	**5440**
	2.50	**5750**	**3840**	**6310**	**4200**	**6910**	**4600**	**7450**	**4960**	**8160**	**5440**
	3.00	**5750**	**3840**	**6310**	**4200**	**6910**	**4600**	**7450**	**4960**	**8160**	**5440**
	3.50	**5750**	**3840**	**6310**	**4200**	**6910**	**4600**	**7450**	**4960**	**8160**	**5440**
	4.00	5460	3630	5960	3970	6500	4330	7040	4680	7600	5060
	4.50	4850	3230	5300	3530	5780	3850	6260	4160	6750	4490
	5.00	4370	2910	4770	3170	5200	3460	5630	3750	6080	4040
	5.50	3970	2640	4340	2890	4730	3150	5120	3410	5530	3680
	6.00	3640	2420	3980	2650	4340	2890	4690	3120	5070	3370
	6.50	3360	2240	3670	2440	4000	2660	4330	2880	4680	3110
	7.00	3120	2080	3410	2270	3720	2470	4020	2680	4340	2890
	7.50	2910	1940	3180	2120	3470	2310	3750	2500	4050	2700
	8.00	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	8.50	2570	1710	2810	1870	3060	2040	3310	2200	3580	2380
	9.00	2430	1610	2650	1760	2890	1920	3130	2080	3380	2250
	9.50	2300	1530	2510	1670	2740	1820	2960	1970	3200	2130
	10.0	2180	1450	2390	1590	2600	1730	2820	1870	3040	2020
	10.5	2080	1380	2270	1510	2480	1650	2680	1780	2890	1930
	11.0	1990	1320	2170	1440	2370	1570	2560	1700	2760	1840
	11.5	1900	1260	2070	1380	2260	1510	2450	1630	2640	1760
	12.0	1820	1210	1990	1320	2170	1440	2350	1560	2530	1690
	12.5	1750	1160	1910	1270	2080	1380	2250	1500	2430	1620
	13.0	1680	1120	1840	1220	2000	1330	2170	1440	2340	1560
	13.5	1620	1080	1770	1180	1930	1280	2090	1390	2250	1500
	14.0	1560	1040	1700	1130	1860	1240	2010	1340	2170	1440
	14.5	1510	1000	1650	1090	1790	1190	1940	1290	2100	1390
	15.0	1460	969	1590	1060	1730	1150	1880	1250	2030	1350
Beam Properties											
$\phi_b W_c$	W_c/Ω_b , kN·m	21800	14500	23900	15900	26000	17300	28200	18700	30400	20200
$\phi_b M_p$	M_p/Ω_b , kN·m	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
$\phi_b M_r$	M_r/Ω_b , kN·m	1590	1060	1720	1150	1860	1240	2000	1330	2150	1430
$\phi_b BF$	BF/Ω_b , kN	24.0	16.0	24.4	16.2	24.9	16.6	25.3	16.9	25.8	17.2
$\phi_v V_n$	V_n/Ω_v , kN	2880	1920	3150	2100	3450	2300	3720	2480	4080	2720
	$Z_x \times 10^3$, mm^3	11030		12050		13140		14220		15350	
	L_p , m	5.12		5.15		5.19		5.24		5.28	
	L_r , m	52.7		56.9		60.9		65.0		69.3	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

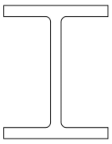
Table D.5 Continued.

Maximum Total Uniform Load, kN
HD Shapes

F_y = 275 MPa

Shape		HD 400×744		HD 400×818		HD 400×900		HD 400×990		HD 400×1086	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**9140**	**6090**	**10300**	**6840**	**11500**	**7700**	**13000**	**8700**	**14600**	**9760**
	1.50	**9140**	**6090**	**10300**	**6840**	**11500**	**7700**	**13000**	**8700**	**14600**	**9760**
	2.00	**9140**	**6090**	**10300**	**6840**	**11500**	**7700**	**13000**	**8700**	**14600**	**9760**
	2.50	**9140**	**6090**	**10300**	**6840**	**11500**	**7700**	**13000**	**8700**	**14600**	**9760**
	3.00	**9140**	**6090**	**10300**	**6840**	**11500**	**7700**	**13000**	**8700**	**14600**	**9760**
	3.50	**9140**	**6090**	**10300**	**6840**	**11500**	**7700**	**13000**	**8700**	**14600**	**9760**
	4.00	8500	5650	9530	6340	10700	7120	12000	8000	13500	8960
	4.50	7550	5030	8470	5640	9510	6330	10700	7110	12000	7970
	5.00	6800	4520	7630	5070	8560	5700	9610	6400	10800	7170
	5.50	6180	4110	6930	4610	7780	5180	8740	5820	9800	6520
	6.00	5670	3770	6360	4230	7130	4750	8010	5330	8980	5970
	6.50	5230	3480	5870	3900	6590	4380	7400	4920	8290	5510
	7.00	4860	3230	5450	3620	6120	4070	6870	4570	7700	5120
	7.50	4530	3020	5080	3380	5710	3800	6410	4260	7180	4780
	8.00	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	8.50	4000	2660	4490	2980	5040	3350	5660	3760	6340	4220
	9.00	3780	2510	4240	2820	4760	3160	5340	3550	5990	3980
	9.50	3580	2380	4010	2670	4510	3000	5060	3370	5670	3770
	10.0	3400	2260	3810	2540	4280	2850	4810	3200	5390	3580
	10.5	3240	2150	3630	2420	4080	2710	4580	3050	5130	3410
	11.0	3090	2060	3470	2310	3890	2590	4370	2910	4900	3260
	11.5	2960	1970	3320	2210	3720	2480	4180	2780	4680	3120
	12.0	2830	1880	3180	2110	3570	2370	4010	2670	4490	2990
	12.5	2720	1810	3050	2030	3420	2280	3850	2560	4310	2870
	13.0	2620	1740	2930	1950	3290	2190	3700	2460	4140	2760
	13.5	2520	1680	2820	1880	3170	2110	3560	2370	3990	2660
	14.0	2430	1620	2720	1810	3060	2030	3430	2280	3850	2560
	14.5	2340	1560	2630	1750	2950	1960	3320	2210	3720	2470
	15.0	2270	1510	2540	1690	2850	1900	3200	2130	3590	2390
Beam Properties											
$\phi_b W_c$	W_c/Ω_b, kN·m	34000	22600	38100	25400	42800	28500	48100	32000	53900	35800
$\phi_b M_p$	M_p/Ω_b, kN·m	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
$\phi_b M_r$	M_r/Ω_b, kN·m	2380	1580	2640	1760	2940	1950	3270	2180	3630	2410
$\phi_b BF$	BF/Ω_b, kN	26.6	17.7	27.5	18.3	28.4	18.9	29.6	19.7	30.7	20.4
$\phi_v V_n$	V_n/Ω_v, kN	4570	3050	5130	3420	5770	3850	6520	4350	7320	4880
	$Z_x \times 10^3$, mm^3	17170		19260		21620		24280		27210	
	L_p, m	5.34		5.41		5.48		5.56		5.65	
	L_r, m	75.5		82.5		90.4		98.2		107	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										
$\phi_v = 1.00$	$\Omega_v = 1.50$										

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

F_y = 355 MPa

Shape		**HD 260×54.1[f]**		**HD 260×68.2[f]**		**HD 260×93.0**		**HD 260×114**		**HD 260×142**		**HD 260×172**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**676**	**450**	**799**	**533**	**1110**	**738**	**1430**	**951**	**1840**	**1220**	**2220**	**1480**
	1.50	**676**	**450**	**799**	**533**	**1110**	**738**	**1430**	**951**	**1840**	**1220**	**2220**	**1480**
	2.00	**676**	**450**	**799**	**533**	**1110**	**738**	**1430**	**951**	**1840**	**1220**	**2220**	**1480**
	2.50	647	431	**799**	**533**	**1110**	**738**	**1430**	**951**	**1840**	**1220**	**2220**	**1480**
	3.00	539	359	757	504	1090	727	1360	907	1720	1140	2150	1430
	3.50	462	308	649	432	937	623	1170	777	1470	979	1840	1230
	4.00	405	269	568	378	820	545	1020	680	1290	857	1610	1070
	4.50	360	239	505	336	729	485	909	605	1140	761	1430	954
	5.00	324	215	454	302	656	436	818	544	1030	685	1290	858
	5.50	294	196	413	275	596	397	744	495	936	623	1170	780
	6.00	270	179	378	252	547	364	682	453	858	571	1080	715
	6.50	249	166	349	232	505	336	629	419	792	527	993	660
	7.00	231	154	324	216	468	312	584	389	736	490	922	613
	7.50	216	144	303	201	437	291	545	363	687	457	860	572
	8.00	202	135	284	189	410	273	511	340	644	428	806	537
	8.50	190	127	267	178	386	257	481	320	606	403	759	505
	9.00	180	120	252	168	364	242	454	302	572	381	717	477
	9.50	170	113	239	159	345	230	430	286	542	361	679	452
	10.0	162	108	227	151	328	218	409	272	515	343	645	429
	10.5	154	103	216	144	312	208	389	259	491	326	614	409
	11.0	147	97.9	206	137	298	198	372	247	468	312	586	390
	11.5	141	93.6	197	131	285	190	356	237	448	298	561	373
	12.0	135	89.7	189	126	273	182	341	227	429	286	538	358
	12.5	129	86.1	182	121	262	175	327	218	412	274	516	343
	13.0	124	82.8	175	116	252	168	315	209	396	264	496	330
	13.5	120	79.8	168	112	243	162	303	202	382	254	478	318
	14.0	116	76.9	162	108	234	156	292	194	368	245	461	307
	14.5	112	74.3	157	104	226	150	282	188	355	236	445	296
	15.0	108	71.8	151	101	219	145	273	181	343	228	430	286
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	1620	1080	2270	1510	3280	2180	4090	2720	5150	3430	6450	4290
$\phi_b M_p$	M_p/Ω_b, kN·m	202	135	284	189	410	273	511	340	644	428	806	537
$\phi_b M_r$	M_r/Ω_b, kN·m	146	97.3	187	124	257	171	316	210	391	260	483	321
$\phi_b BF$	BF/Ω_b, kN	14.3	9.48	16.1	10.7	17.5	11.6	17.9	11.9	18.2	12.1	18.8	12.5
$\phi_v V_n$	V_n/Ω_v, kN	338	225	399	266	554	369	714	476	918	612	1110	741
	$Z_x \times 10^3$, mm^3	714.5		919.8		1283		1600		2015		2524	
	L_p, m	4.48		3.34		2.75		2.78		2.82		2.88	
	L_r, m	8.41		9.33		11.5		13.7		16.7		20.1	

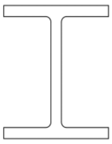
LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Notes: For beams laterally unsupported, see Table D.6.

Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

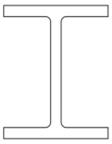


Maximum Total Uniform Load, kN
HD Shapes

F_y = 355 MPa

Shape		HD 320 × 74.2^f		HD 320 × 97.6^f		HD 320 × 127		HD 320 × 158		HD 320 × 198		HD 320 × 245	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**1030**	**684**	**1190**	**792**	**1570**	**1050**	**2040**	**1360**	**2630**	**1750**	**3210**	**2140**
	1.50	**1030**	**684**	**1190**	**792**	**1570**	**1050**	**2040**	**1360**	**2630**	**1750**	**3210**	**2140**
	2.00	**1030**	**684**	**1190**	**792**	**1570**	**1050**	**2040**	**1360**	**2630**	**1750**	**3210**	**2140**
	2.50	**1030**	**684**	**1190**	**792**	**1570**	**1050**	**2040**	**1360**	**2630**	**1750**	**3210**	**2140**
	3.00	904	601	**1190**	**792**	**1570**	**1050**	**2040**	**1360**	**2630**	**1750**	**3210**	**2140**
	3.50	775	515	1170	778	**1570**	**1050**	1980	1320	2540	1690	**3210**	**2140**
	4.00	678	451	1020	681	1370	914	1740	1160	2220	1480	2830	1890
	4.50	603	401	910	605	1220	812	1540	1030	1980	1310	2520	1680
	5.00	542	361	819	545	1100	731	1390	924	1780	1180	2270	1510
	5.50	493	328	744	495	999	664	1260	840	1620	1080	2060	1370
	6.00	452	301	682	454	915	609	1160	770	1480	986	1890	1260
	6.50	417	278	630	419	845	562	1070	711	1370	910	1740	1160
	7.00	387	258	585	389	785	522	992	660	1270	845	1620	1080
	7.50	362	241	546	363	732	487	926	616	1190	789	1510	1010
	8.00	339	226	512	340	687	457	868	578	1110	740	1420	943
	8.50	319	212	482	320	646	430	817	544	1050	696	1330	887
	9.00	301	200	455	303	610	406	772	514	988	657	1260	838
	9.50	285	190	431	287	578	385	731	487	936	623	1190	794
	10.0	271	180	409	272	549	365	695	462	889	592	1130	754
	10.5	258	172	390	259	523	348	662	440	847	563	1080	718
	11.0	246	164	372	248	499	332	632	420	808	538	1030	686
	11.5	236	157	356	237	478	318	604	402	773	514	986	656
	12.0	226	150	341	227	458	305	579	385	741	493	945	629
	12.5	217	144	327	218	439	292	556	370	711	473	907	603
	13.0	209	139	315	210	423	281	534	356	684	455	872	580
	13.5	201	134	303	202	407	271	515	342	659	438	840	559
	14.0	194	129	292	195	392	261	496	330	635	423	810	539
	14.5	187	124	282	188	379	252	479	319	613	408	782	520
	15.0	181	120	273	182	366	244	463	308	593	394	756	503
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	2710	1800	4090	2720	5490	3650	6950	4620	8890	5920	11300	7540
$\phi_b M_p$	M_p/Ω_b , kN·m	339	226	512	340	687	457	868	578	1110	740	1420	943
$\phi_b M_r$	M_r/Ω_b , kN·m	244	163	331	220	431	287	537	358	677	450	849	565
$\phi_b BF$	BF/Ω_b , kN	21.7	14.4	25.4	16.9	27.1	18.0	27.8	18.5	28.5	18.9	29.3	19.5
$\phi_v V_n$	V_n/Ω_v , kN	513	342	594	396	784	523	1020	679	1320	877	1610	1070
	$Z_x \times 10^3$, mm^3	1196		1628		2149		2718		3479		4435	
	L_p , m	5.02		3.46		3.16		3.2		3.25		3.32	
	L_r , m	9.37		10.6		12.6		15.1		18.5		22.7	
LRFD	**ASD**	[f] Shape exceeds compact limit for fle×ure; tabulated values have been adjusted accordingly. Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

F_y = 355 MPa

Shape		HD 320 × 300		HD 360 × 134^f		HD 360 × 147^f		HD 360 × 162		HD 360 × 179		HD 360 × 196	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**4310**	**2880**	**1700**	**1130**	**1890**	**1260**	**2060**	**1370**	**2350**	**1570**	**2600**	**1730**
	1.50	**4310**	**2880**	**1700**	**1130**	**1890**	**1260**	**2060**	**1370**	**2350**	**1570**	**2600**	**1730**
	2.00	**4310**	**2880**	**1700**	**1130**	**1890**	**1260**	**2060**	**1370**	**2350**	**1570**	**2600**	**1730**
	2.50	**4310**	**2880**	**1700**	**1130**	**1890**	**1260**	**2060**	**1370**	**2350**	**1570**	**2600**	**1730**
	3.00	**4310**	**2880**	**1700**	**1130**	**1890**	**1260**	**2060**	**1370**	**2350**	**1570**	**2600**	**1730**
	3.50	4030	2680	**1700**	**1130**	**1890**	**1260**	**2060**	**1370**	**2350**	**1570**	**2600**	**1730**
	4.00	3530	2350	1590	1060	1800	1200	2010	1330	2220	1480	2450	1630
	4.50	3140	2090	1410	939	1600	1060	1780	1190	1980	1320	2180	1450
	5.00	2820	1880	1270	845	1440	957	1600	1070	1780	1180	1960	1310
	5.50	2570	1710	1150	768	1310	870	1460	971	1620	1080	1780	1190
	6.00	2350	1570	1060	704	1200	798	1340	890	1480	987	1630	1090
	6.50	2170	1440	977	650	1110	737	1230	821	1370	911	1510	1000
	7.00	2020	1340	907	604	1030	684	1150	763	1270	846	1400	932
	7.50	1880	1250	847	563	959	638	1070	712	1190	790	1310	870
	8.00	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
	8.50	1660	1100	747	497	847	563	944	628	1050	697	1150	768
	9.00	1570	1040	706	469	800	532	891	593	989	658	1090	725
	9.50	1490	988	668	445	757	504	845	562	937	623	1030	687
	10.0	1410	939	635	422	720	479	802	534	890	592	981	653
	10.5	1340	894	605	402	685	456	764	508	848	564	934	621
	11.0	1280	854	577	384	654	435	729	485	809	538	892	593
	11.5	1230	817	552	367	626	416	698	464	774	515	853	567
	12.0	1180	783	529	352	600	399	669	445	742	493	817	544
	12.5	1130	751	508	338	576	383	642	427	712	474	785	522
	13.0	1090	722	488	325	554	368	617	411	685	455	754	502
	13.5	1050	696	470	313	533	355	594	395	659	439	726	483
	14.0	1010	671	454	302	514	342	573	381	636	423	701	466
	14.5	973	648	438	291	496	330	553	368	614	408	676	450
	15.0	941	626	423	282	480	319	535	356	593	395	654	435
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	14100	9390	6350	4220	7200	4790	8020	5340	8900	5920	9810	6530
$\phi_b M_p$	M_p/Ω_b , kN·m	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
$\phi_b M_r$	M_r/Ω_b , kN·m	1040	690	522	347	575	383	633	421	698	465	765	509
$\phi_b BF$	BF/Ω_b , kN	30.2	20.1	33.8	22.5	34.8	23.1	35.5	23.6	36.0	23.9	36.3	24.1
$\phi_v V_n$	V_n/Ω_v , kN	2160	1440	849	566	943	629	1030	687	1180	784	1300	866
	$Z_x \times 10^3$, mm^3	5522		2562		2838		3139		3482		3837	
	L_p , m	3.35		4.15		3.94		3.96		3.98		3.99	
	L_r , m	27.5		12.7		13.5		14.4		15.5		16.7	

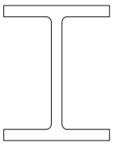
LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

^{f} Shape exceeds compact limit for fle×ure; tabulated values have been adjusted accordingly.

Notes: For beams laterally unsupported, see Table D.6.

Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HD Shapes

F_y = 355 MPa

Shape		HD 400 × 187		HD 400 × 216		HD 400×237		HD 400×262		HD 400×287	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**2350**	**1570**	**2760**	**1840**	**3060**	**2040**	**3480**	**2320**	**3780**	**2520**
	1.50	**2350**	**1570**	**2760**	**1840**	**3060**	**2040**	**3480**	**2320**	**3780**	**2520**
	2.00	**2350**	**1570**	**2760**	**1840**	**3060**	**2040**	**3480**	**2320**	**3780**	**2520**
	2.50	**2350**	**1570**	**2760**	**1840**	**3060**	**2040**	**3480**	**2320**	**3780**	**2520**
	3.00	**2350**	**1570**	**2760**	**1840**	**3060**	**2040**	**3480**	**2320**	**3780**	**2520**
	3.50	**2350**	**1570**	**2760**	**1840**	**3060**	**2040**	**3480**	**2320**	**3780**	**2520**
	4.00	2330	1550	2720	1810	2990	1990	3360	2240	3710	2470
	4.50	2070	1380	2420	1610	2660	1770	2990	1990	3300	2200
	5.00	1860	1240	2180	1450	2400	1590	2690	1790	2970	1980
	5.50	1690	1130	1980	1320	2180	1450	2440	1630	2700	1800
	6.00	1550	1030	1820	1210	2000	1330	2240	1490	2480	1650
	6.50	1430	953	1680	1120	1840	1230	2070	1380	2290	1520
	7.00	1330	885	1560	1040	1710	1140	1920	1280	2120	1410
	7.50	1240	826	1450	966	1600	1060	1790	1190	1980	1320
	8.00	1160	774	1360	906	1500	996	1680	1120	1860	1240
	8.50	1100	729	1280	853	1410	938	1580	1050	1750	1160
	9.00	1030	688	1210	805	1330	885	1490	994	1650	1100
	9.50	980	652	1150	763	1260	839	1420	942	1560	1040
	10.0	931	619	1090	725	1200	797	1340	895	1490	989
	10.5	887	590	1040	690	1140	759	1280	852	1420	941
	11.0	846	563	990	659	1090	724	1220	813	1350	899
	11.5	809	539	947	630	1040	693	1170	778	1290	860
	12.0	776	516	908	604	998	664	1120	745	1240	824
	12.5	745	495	871	580	958	638	1080	716	1190	791
	13.0	716	476	838	558	921	613	1030	688	1140	760
	13.5	690	459	807	537	887	590	996	663	1100	732
	14.0	665	442	778	518	856	569	960	639	1060	706
	14.5	642	427	751	500	826	550	927	617	1020	682
	15.0	621	413	726	483	798	531	896	596	991	659
Beam Properties											
$\phi_b W_c$	W_c/Ω_b , kN·m	9310	6190	10900	7250	12000	7970	13400	8950	14900	9890
$\phi_b M_p$	M_p/Ω_b , kN·m	1160	774	1360	906	1500	996	1680	1120	1860	1240
$\phi_b M_r$	M_r/Ω_b , kN·m	732	487	849	565	927	617	1030	687	1130	755
$\phi_b BF$	BF/Ω_b , kN	35.7	23.7	36.2	24.1	36.5	24.3	36.9	24.6	37.1	24.7
$\phi_v V_n$	V_n/Ω_v , kN	1180	784	1380	921	1530	1020	1740	1160	1890	1260
	$Z_x \times 10^3$, mm^3	3642		4262		4686		5260		5813	
	L_p , m	4.19		4.23		4.24		4.27		4.30	
	L_r , m	16.3		18.4		19.9		21.8		23.7	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										
$\phi_v = 1.00$	$\Omega_v = 1.50$										

Table D.5 Continued.

Maximum Total Uniform Load, kN
HD Shapes

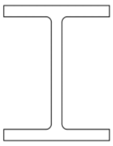
F_y = 355 MPa

Shape		**HD 400×314**		**HD 400×347**		**HD 400×382**		**HD 400×421**		**HD 400×463**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**4230**	**2820**	**4720**	**3140**	**5280**	**3520**	**5940**	**3960**	**6630**	**4420**
	1.50	**4230**	**2820**	**4720**	**3140**	**5280**	**3520**	**5940**	**3960**	**6630**	**4420**
	2.00	**4230**	**2820**	**4720**	**3140**	**5280**	**3520**	**5940**	**3960**	**6630**	**4420**
	2.50	**4230**	**2820**	**4720**	**3140**	**5280**	**3520**	**5940**	**3960**	**6630**	**4420**
	3.00	**4230**	**2820**	**4720**	**3140**	**5280**	**3520**	**5940**	**3960**	**6630**	**4420**
	3.50	**4230**	**2820**	**4720**	**3140**	**5280**	**3520**	**5940**	**3960**	**6630**	**4420**
	4.00	4070	2710	4560	3040	5090	3390	5670	3780	6310	4200
	4.50	3620	2410	4050	2700	4520	3010	5040	3360	5610	3730
	5.00	3260	2170	3650	2430	4070	2710	4540	3020	5050	3360
	5.50	2960	1970	3320	2210	3700	2460	4130	2750	4590	3050
	6.00	2720	1810	3040	2020	3390	2260	3780	2520	4210	2800
	6.50	2510	1670	2810	1870	3130	2080	3490	2320	3880	2580
	7.00	2330	1550	2610	1730	2910	1940	3240	2160	3610	2400
	7.50	2170	1450	2430	1620	2710	1810	3030	2010	3370	2240
	8.00	2040	1350	2280	1520	2540	1690	2840	1890	3160	2100
	8.50	1920	1280	2150	1430	2400	1590	2670	1780	2970	1980
	9.00	1810	1200	2030	1350	2260	1510	2520	1680	2810	1870
	9.50	1710	1140	1920	1280	2140	1430	2390	1590	2660	1770
	10.0	1630	1080	1820	1210	2040	1350	2270	1510	2520	1680
	10.5	1550	1030	1740	1160	1940	1290	2160	1440	2400	1600
	11.0	1480	985	1660	1100	1850	1230	2060	1370	2300	1530
	11.5	1420	943	1590	1060	1770	1180	1970	1310	2200	1460
	12.0	1360	903	1520	1010	1700	1130	1890	1260	2100	1400
	12.5	1300	867	1460	971	1630	1080	1820	1210	2020	1340
	13.0	1250	834	1400	934	1570	1040	1750	1160	1940	1290
	13.5	1210	803	1350	899	1510	1000	1680	1120	1870	1240
	14.0	1160	774	1300	867	1450	968	1620	1080	1800	1200
	14.5	1120	748	1260	837	1400	934	1570	1040	1740	1160
	15.0	1090	723	1220	809	1360	903	1510	1010	1680	1120
Beam Properties											
$\phi_b W_c$	W_c/Ω_b , kN·m	16300	10800	18200	12100	20400	13500	22700	15100	25200	16800
$\phi_b M_p$	M_p/Ω_b , kN·m	2040	1350	2280	1520	2540	1690	2840	1890	3160	2100
$\phi_b M_r$	M_r/Ω_b , kN·m	1240	822	1370	914	1520	1010	1680	1120	1850	1230
$\phi_b BF$	BF/Ω_b , kN	37.4	24.9	37.8	25.2	38.4	25.6	38.9	25.9	39.7	26.4
$\phi_v V_n$	V_n/Ω_v , kN	2120	1410	2360	1570	2640	1760	2970	1980	3320	2210
	$Z_x \times 10^3$, mm^3	6374		7139		7965		8880		9878	
	L_p , m	4.32		4.36		4.38		4.42		4.45	
	L_r , m	25.7		28.4		31.1		34.1		37.3	

LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

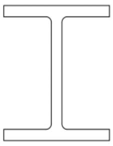


Maximum Total Uniform Load, kN
HD Shapes

F_y = 355 MPa

Shape		**HD 400×509**		**HD 400×551**		**HD 400×592**		**HD 400×634**		**HD 400×677**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**7430**	**4950**	**8140**	**5430**	**8910**	**5940**	**9610**	**6410**	**10500**	**7020**
	1.50	**7430**	**4950**	**8140**	**5430**	**8910**	**5940**	**9610**	**6410**	**10500**	**7020**
	2.00	**7430**	**4950**	**8140**	**5430**	**8910**	**5940**	**9610**	**6410**	**10500**	**7020**
	2.50	**7430**	**4950**	**8140**	**5430**	**8910**	**5940**	**9610**	**6410**	**10500**	**7020**
	3.00	**7430**	**4950**	**8140**	**5430**	**8910**	**5940**	**9610**	**6410**	**10500**	**7020**
	3.50	**7430**	**4950**	**8140**	**5430**	**8910**	**5940**	**9610**	**6410**	**10500**	**7020**
	4.00	7050	4690	7700	5120	8400	5590	9090	6050	9810	6530
	4.50	6270	4170	6840	4550	7460	4970	8080	5370	8720	5800
	5.00	5640	3750	6160	4100	6720	4470	7270	4840	7850	5220
	5.50	5130	3410	5600	3730	6110	4060	6610	4400	7130	4750
	6.00	4700	3130	5130	3420	5600	3720	6060	4030	6540	4350
	6.50	4340	2890	4740	3150	5170	3440	5590	3720	6040	4020
	7.00	4030	2680	4400	2930	4800	3190	5190	3450	5600	3730
	7.50	3760	2500	4110	2730	4480	2980	4850	3220	5230	3480
	8.00	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
	8.50	3320	2210	3620	2410	3950	2630	4280	2850	4620	3070
	9.00	3130	2080	3420	2280	3730	2480	4040	2690	4360	2900
	9.50	2970	1970	3240	2160	3540	2350	3830	2550	4130	2750
	10.0	2820	1880	3080	2050	3360	2230	3630	2420	3920	2610
	10.5	2690	1790	2930	1950	3200	2130	3460	2300	3740	2490
	11.0	2560	1710	2800	1860	3050	2030	3300	2200	3570	2370
	11.5	2450	1630	2680	1780	2920	1940	3160	2100	3410	2270
	12.0	2350	1560	2570	1710	2800	1860	3030	2020	3270	2180
	12.5	2260	1500	2460	1640	2690	1790	2910	1930	3140	2090
	13.0	2170	1440	2370	1580	2580	1720	2800	1860	3020	2010
	13.5	2090	1390	2280	1520	2490	1660	2690	1790	2910	1930
	14.0	2010	1340	2200	1460	2400	1600	2600	1730	2800	1860
	14.5	1940	1290	2120	1410	2320	1540	2510	1670	2710	1800
	15.0	1880	1250	2050	1370	2240	1490	2420	1610	2620	1740
Beam Properties											
$\phi_b W_c$	W_c/Ω_b , kN·m	28200	18800	30800	20500	33600	22300	36300	24200	39200	26100
$\phi_b M_p$	M_p/Ω_b , kN·m	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
$\phi_b M_r$	M_r/Ω_b , kN·m	2050	1360	2220	1480	2410	1600	2590	1720	2770	1850
$\phi_b BF$	BF/Ω_b , kN	40.5	27.0	41.1	27.4	42.1	28.0	42.7	28.4	43.5	28.9
$\phi_v V_n$	V_n/Ω_v , kN	3710	2480	4070	2710	4460	2970	4810	3200	5270	3510
	$Z_x \times 10^3$, mm^3	11030		12050		13140		14220		15350	
	L_p , m	4.50		4.53		4.57		4.61		4.65	
	L_r , m	40.8		44.1		47.2		50.4		53.7	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										
$\phi_v = 1.00$	$\Omega_v = 1.50$										

Table D.5 Continued.

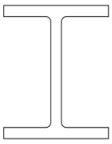


Maximum Total Uniform Load, kN
HD Shapes

F_y = 355 MPa

Shape		HD 400×744		HD 400×818		HD 400×900		HD 400×990		HD 400×1086	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**11800**	**7860**	**13200**	**8830**	**14900**	**9940**	**16800**	**11200**	**18900**	**12600**
	1.50	**11800**	**7860**	**13200**	**8830**	**14900**	**9940**	**16800**	**11200**	**18900**	**12600**
	2.00	**11800**	**7860**	**13200**	**8830**	**14900**	**9940**	**16800**	**11200**	**18900**	**12600**
	2.50	**11800**	**7860**	**13200**	**8830**	**14900**	**9940**	**16800**	**11200**	**18900**	**12600**
	3.00	**11800**	**7860**	**13200**	**8830**	**14900**	**9940**	**16800**	**11200**	**18900**	**12600**
	3.50	**11800**	**7860**	**13200**	**8830**	**14900**	**9940**	**16800**	**11200**	**18900**	**12600**
	4.00	11000	7300	12300	8190	13800	9190	15500	10300	17400	11600
	4.50	9750	6490	10900	7280	12300	8170	13800	9180	15500	10300
	5.00	8780	5840	9850	6550	11100	7350	12400	8260	13900	9250
	5.50	7980	5310	8950	5960	10000	6680	11300	7510	12600	8410
	6.00	7310	4870	8200	5460	9210	6130	10300	6880	11600	7710
	6.50	6750	4490	7570	5040	8500	5660	9550	6350	10700	7120
	7.00	6270	4170	7030	4680	7890	5250	8870	5900	9940	6610
	7.50	5850	3890	6560	4370	7370	4900	8270	5510	9270	6170
	8.00	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
	8.50	5160	3440	5790	3850	6500	4330	7300	4860	8180	5440
	9.00	4880	3240	5470	3640	6140	4090	6900	4590	7730	5140
	9.50	4620	3070	5180	3450	5820	3870	6530	4350	7320	4870
	10.0	4390	2920	4920	3280	5530	3680	6210	4130	6950	4630
	10.5	4180	2780	4690	3120	5260	3500	5910	3930	6620	4410
	11.0	3990	2650	4480	2980	5020	3340	5640	3750	6320	4210
	11.5	3820	2540	4280	2850	4810	3200	5400	3590	6050	4020
	12.0	3660	2430	4100	2730	4610	3060	5170	3440	5800	3860
	12.5	3510	2340	3940	2620	4420	2940	4960	3300	5560	3700
	13.0	3380	2250	3790	2520	4250	2830	4770	3180	5350	3560
	13.5	3250	2160	3650	2430	4090	2720	4600	3060	5150	3430
	14.0	3130	2090	3520	2340	3950	2630	4430	2950	4970	3310
	14.5	3030	2010	3400	2260	3810	2540	4280	2850	4800	3190
	15.0	2930	1950	3280	2180	3680	2450	4140	2750	4640	3080
Beam Properties											
$\phi_b W_c$	W_c/Ω_b , kN·m	43900	29200	49200	32800	55300	36800	62100	41300	69500	46300
$\phi_b M_p$	M_p/Ω_b , kN·m	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
$\phi_b M_r$	M_r/Ω_b , kN·m	3070	2040	3410	2270	3790	2520	4220	2810	4680	3120
$\phi_b BF$	BF/Ω_b , kN	44.8	29.8	46.3	30.8	47.7	31.8	49.7	33.1	51.5	34.2
$\phi_v V_n$	V_n/Ω_v , kN	5900	3930	6620	4420	7450	4970	8420	5620	9450	6300
	$Z_x \times 10^3$, mm^3	17170		19260		21620		24280		27210	
	L_p , m	4.70		4.76		4.82		4.90		4.97	
	L_r , m	58.5		64.0		70.1		76.1		82.9	
LRFD	ASD	Notes: For beams laterally unsppported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										
$\phi_v = 1.00$	$\Omega_v = 1.50$										

Table D.5 Continued.

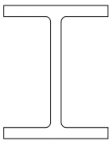


Maximum Total Uniform Load, kN
HEA Shapes

F_y = 235 MPa

Shape		HEA 100		HEA 120		HEA 140		HEA 160		HEA 180		HEA 200	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**135**	**90.2**	**161**	**107**	**206**	**138**	**257**	**171**	**289**	**193**	**348**	**232**
	1.50	93.6	62.3	135	89.7	196	130	**257**	**171**	**289**	**193**	**348**	**232**
	2.00	70.2	46.7	101	67.3	147	97.7	207	138	275	183	**348**	**232**
	2.50	56.2	37.4	80.9	53.8	117	78.1	166	110	220	146	291	193
	3.00	46.8	31.1	67.4	44.8	97.9	65.1	138	92.0	183	122	242	161
	3.50	40.1	26.7	57.8	38.4	83.9	55.8	118	78.8	157	105	208	138
	4.00	35.1	23.4	50.5	33.6	73.4	48.8	104	69.0	137	91.4	182	121
	4.50	31.2	20.8	44.9	29.9	65.2	43.4	92.2	61.3	122	81.3	161	107
	5.00	28.1	18.7	40.4	26.9	58.7	39.1	82.9	55.2	110	73.2	145	96.7
	5.50	25.5	17.0	36.8	24.5	53.4	35.5	75.4	50.2	100	66.5	132	87.9
	6.00	23.4	15.6	33.7	22.4	48.9	32.6	69.1	46.0	91.6	61.0	121	80.6
	6.50	21.6	14.4	31.1	20.7	45.2	30.0	63.8	42.4	84.6	56.3	112	74.4
	7.00	20.1	13.3	28.9	19.2	41.9	27.9	59.2	39.4	78.5	52.3	104	69.1
	7.50	18.7	12.5	27.0	17.9	39.1	26.0	55.3	36.8	73.3	48.8	96.9	64.5
	8.00	17.6	11.7	25.3	16.8	36.7	24.4	51.8	34.5	68.7	45.7	90.8	60.4
	8.50	16.5	11.0	23.8	15.8	34.5	23.0	48.8	32.5	64.7	43.0	85.5	56.9
	9.00	15.6	10.4	22.5	14.9	32.6	21.7	46.1	30.7	61.1	40.6	80.7	53.7
	9.50	14.8	9.84	21.3	14.2	30.9	20.6	43.7	29.0	57.9	38.5	76.5	50.9
	10.0	14.0	9.34	20.2	13.5	29.4	19.5	41.5	27.6	55.0	36.6	72.7	48.4
	10.5	13.4	8.90	19.3	12.8	28.0	18.6	39.5	26.3	52.4	34.8	69.2	46.0
	11.0	12.8	8.50	18.4	12.2	26.7	17.8	37.7	25.1	50.0	33.3	66.1	44.0
	11.5	12.2	8.13	17.6	11.7	25.5	17.0	36.1	24.0	47.8	31.8	63.2	42.0
	12.0	11.7	7.79	16.8	11.2	24.5	16.3	34.6	23.0	45.8	30.5	60.6	40.3
	12.5	11.2	7.48	16.2	10.8	23.5	15.6	33.2	22.1	44.0	29.3	58.1	38.7
	13.0	10.8	7.19	15.6	10.3	22.6	15.0	31.9	21.2	42.3	28.1	55.9	37.2
	13.5	10.4	6.92	15.0	9.96	21.7	14.5	30.7	20.4	40.7	27.1	53.8	35.8
	14.0	10.0	6.67	14.4	9.61	21.0	14.0	29.6	19.7	39.3	26.1	51.9	34.5
	14.5	9.69	6.44	13.9	9.28	20.2	13.5	28.6	19.0	37.9	25.2	50.1	33.3
	15.0	9.36	6.23	13.5	8.97	19.6	13.0	27.6	18.4	36.6	24.4	48.4	32.2
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	140	93.4	202	135	294	195	415	276	550	366	727	484
$\phi_b M_p$	M_p/Ω_b , kN·m	17.6	11.7	25.3	16.8	36.7	24.4	51.8	34.5	68.7	45.7	90.8	60.4
$\phi_b M_r$	M_r/Ω_b , kN·m	10.8	7.17	15.7	10.5	23.0	15.3	32.6	21.7	43.5	28.9	57.5	38.3
$\phi_b BF$	BF/Ω_b , kN	0.915	0.609	1.38	0.919	1.95	1.29	2.53	1.68	3.32	2.21	4.05	2.69
$\phi_v V_n$	V_n/Ω_v , kN	67.7	45.1	80.4	53.6	103	68.8	129	85.7	145	96.4	174	116
	$Z_x \times 10^3$, mm^3	83.01		119.5		173.5		245.1		324.9		429.5	
	L_p , m	1.29		1.55		1.81		2.04		2.32		2.56	
	L_r , m	8.70		8.45		8.84		9.66		9.93		10.8	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEA Shapes

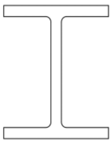
F_y = 235 MPa

Shape		HEA 220		HEA 240		HEA 260		HEA 280		HEA 300		HEA 320	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**415**	**276**	**486**	**324**	**529**	**353**	**609**	**406**	**695**	**463**	**787**	**525**
	1.50	**415**	**276**	**486**	**324**	**529**	**353**	**609**	**406**	**695**	**463**	**787**	**525**
	2.00	**415**	**276**	**486**	**324**	**529**	**353**	**609**	**406**	**695**	**463**	**787**	**525**
	2.50	385	256	**486**	**324**	**529**	**353**	**609**	**406**	**695**	**463**	**787**	**525**
	3.00	321	213	420	279	519	**345**	**609**	**406**	**695**	**463**	**787**	**525**
	3.50	275	183	360	239	445	296	538	358	669	445	**787**	**525**
	4.00	240	160	315	210	389	259	470	313	585	389	689	458
	4.50	214	142	280	186	346	230	418	278	520	346	612	407
	5.00	192	128	252	168	311	207	376	250	468	311	551	367
	5.50	175	116	229	152	283	188	342	228	425	283	501	333
	6.00	160	107	210	140	259	173	314	209	390	259	459	305
	6.50	148	98.5	194	129	239	159	289	193	360	240	424	282
	7.00	137	91.4	180	120	222	148	269	179	334	222	394	262
	7.50	128	85.3	168	112	208	138	251	167	312	208	367	244
	8.00	120	80.0	157	105	195	129	235	156	293	195	344	229
	8.50	113	75.3	148	98.6	183	122	221	147	275	183	324	216
	9.00	107	71.1	140	93.1	173	115	209	139	260	173	306	204
	9.50	101	67.4	133	88.2	164	109	198	132	246	164	290	193
	10.0	96.2	64.0	126	83.8	156	104	188	125	234	156	275	183
	10.5	91.6	61.0	120	79.8	148	98.6	179	119	223	148	262	175
	11.0	87.4	58.2	115	76.2	141	94.1	171	114	213	142	250	167
	11.5	83.6	55.7	110	72.9	135	90.0	164	109	203	135	240	159
	12.0	80.2	53.3	105	69.9	130	86.3	157	104	195	130	230	153
	12.5	77.0	51.2	101	67.1	125	82.8	151	100	187	125	220	147
	13.0	74.0	49.2	96.9	64.5	120	79.7	145	96.3	180	120	212	141
	13.5	71.3	47.4	93.3	62.1	115	76.7	139	92.7	173	115	204	136
	14.0	68.7	45.7	90.0	59.9	111	74.0	134	89.4	167	111	197	131
	14.5	66.3	44.1	86.9	57.8	107	71.4	130	86.3	161	107	190	126
	15.0	64.1	42.7	84.0	55.9	104	69.0	125	83.5	156	104	184	122
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	962	640	1260	838	1560	1040	1880	1250	2340	1560	2750	1830
$\phi_b M_p$	M_p/Ω_b , kN·m	120	80.0	157	105	195	129	235	156	293	195	344	229
$\phi_b M_r$	M_r/Ω_b , kN·m	76.3	50.7	99.9	66.5	124	82.4	150	99.8	187	124	219	146
$\phi_b BF$	BF/Ω_b , kN	5.04	3.36	6.01	4.00	7.11	4.73	8.37	5.57	9.60	6.39	11.2	7.48
$\phi_v V_n$	V_n/Ω_v , kN	207	138	243	162	264	176	305	203	348	232	393	262
	$Z_x \times 10^3$, mm^3	568.5		744.6		919.8		1112		1383		1628	
	L_p , m	2.83		3.08		3.34		3.59		3.85		3.85	
	L_r , m	11.5		12.6		13.3		13.8		14.9		15.0	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

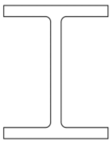


Maximum Total Uniform Load, kN
HEA Shapes

F_y = 235 MPa

Shape		**HEA 340**		**HEA 360**		**HEA 400**		**HEA 450**		**HEA 500**		**HEA 550**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**884**	**589**	**987**	**658**	**1210**	**807**	**1430**	**951**	**1660**	**1110**	**1900**	**1270**
	1.50	**884**	**589**	**987**	**658**	**1210**	**807**	**1430**	**951**	**1660**	**1110**	**1900**	**1270**
	2.00	**884**	**589**	**987**	**658**	**1210**	**807**	**1430**	**951**	**1660**	**1110**	**1900**	**1270**
	2.50	**884**	**589**	**987**	**658**	**1210**	**807**	**1430**	**951**	**1660**	**1110**	**1900**	**1270**
	3.00	**884**	**589**	**987**	**658**	**1210**	**807**	**1430**	**951**	**1660**	**1110**	**1900**	**1270**
	3.50	**884**	**589**	**987**	**658**	**1210**	**807**	**1430**	**951**	**1660**	**1110**	**1900**	**1270**
	4.00	783	521	883	588	1080	721	1360	905	**1660**	**1110**	**1900**	**1270**
	4.50	696	463	785	522	963	641	1210	805	1480	988	1740	1160
	5.00	626	417	707	470	867	577	1090	724	1340	889	1560	1040
	5.50	569	379	642	427	788	524	989	658	1210	808	1420	946
	6.00	522	347	589	392	722	481	907	603	1110	741	1300	867
	6.50	482	320	544	362	667	444	837	557	1030	684	1200	800
	7.00	447	298	505	336	619	412	777	517	955	635	1120	743
	7.50	417	278	471	313	578	385	726	483	891	593	1040	694
	8.00	391	260	442	294	542	361	680	453	835	556	978	650
	8.50	368	245	416	277	510	339	640	426	786	523	920	612
	9.00	348	231	393	261	482	320	605	402	742	494	869	578
	9.50	329	219	372	247	456	304	573	381	703	468	823	548
	10.0	313	208	353	235	433	288	544	362	668	445	782	520
	10.5	298	198	336	224	413	275	518	345	636	423	745	496
	11.0	285	189	321	214	394	262	495	329	607	404	711	473
	11.5	272	181	307	204	377	251	473	315	581	387	680	452
	12.0	261	174	294	196	361	240	453	302	557	370	652	434
	12.5	250	167	283	188	347	231	435	290	535	356	626	416
	13.0	241	160	272	181	333	222	419	278	514	342	602	400
	13.5	232	154	262	174	321	214	403	268	495	329	579	385
	14.0	224	149	252	168	310	206	389	259	477	318	559	372
	14.5	216	144	244	162	299	199	375	250	461	307	539	359
	15.0	209	139	236	157	289	192	363	241	445	296	521	347
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	3130	2080	3530	2350	4330	2880	5440	3620	6680	4450	7820	5200
$\phi_b M_p$	M_p/Ω_b , kN·m	391	260	442	294	542	361	680	453	835	556	978	650
$\phi_b M_r$	M_r/Ω_b , kN·m	248	165	280	186	342	228	429	285	526	350	614	408
$\phi_b BF$	BF/Ω_b , kN	13.0	8.63	14.8	9.87	19.0	12.6	25.0	16.6	31.9	21.2	39.8	26.5
$\phi_v V_n$	V_n/Ω_v , kN	442	295	494	329	605	403	713	476	829	553	952	635
	$Z_x \times 10^3$, mm^3	1850		2088		2562		3216		3949		4622	
	L_p , m	3.83		3.81		3.77		3.74		3.72		3.67	
	L_r , m	14.8		14.7		14.3		13.8		13.4		12.8	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.

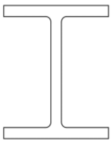


Maximum Total Uniform Load, kN
HEA Shapes

F_y = 235 MPa

Shape		HEA 600		HEA 650		HEA 700		HEA 800		HEA 900		HEA 1000	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**2160**	**1440**	**2440**	**1620**	**2820**	**1880**	**3340**	**2230**	**4020**	**2680**	**4610**	**3070**
	1.50	**2160**	**1440**	**2440**	**1620**	**2820**	**1880**	**3340**	**2230**	**4020**	**2680**	**4610**	**3070**
	2.00	**2160**	**1440**	**2440**	**1620**	**2820**	**1880**	**3340**	**2230**	**4020**	**2680**	**4610**	**3070**
	2.50	**2160**	**1440**	**2440**	**1620**	**2820**	**1880**	**3340**	**2230**	**4020**	**2680**	**4610**	**3070**
	3.00	**2160**	**1440**	**2440**	**1620**	**2820**	**1880**	**3340**	**2230**	**4020**	**2680**	**4610**	**3070**
	3.50	**2160**	**1440**	**2440**	**1620**	**2820**	**1880**	**3340**	**2230**	**4020**	**2680**	**4610**	**3070**
	4.00	**2160**	**1440**	**2440**	**1620**	**2820**	**1880**	**3340**	**2230**	**4020**	**2680**	**4610**	**3070**
	4.50	2010	1340	2310	1540	2640	1760	3270	2180	**4020**	**2680**	**4610**	**3070**
	5.00	1810	1200	2080	1380	2380	1580	2940	1960	3660	2430	4340	2890
	5.50	1650	1100	1890	1260	2160	1440	2680	1780	3330	2210	3940	2620
	6.00	1510	1000	1730	1150	1980	1320	2450	1630	3050	2030	3620	2410
	6.50	1390	927	1600	1060	1830	1220	2260	1510	2810	1870	3340	2220
	7.00	1290	860	1480	987	1700	1130	2100	1400	2610	1740	3100	2060
	7.50	1210	803	1380	921	1590	1060	1960	1310	2440	1620	2890	1920
	8.00	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
	8.50	1060	709	1220	813	1400	931	1730	1150	2150	1430	2550	1700
	9.00	1010	669	1150	768	1320	880	1640	1090	2030	1350	2410	1600
	9.50	953	634	1090	727	1250	833	1550	1030	1930	1280	2280	1520
	10.0	905	602	1040	691	1190	792	1470	979	1830	1220	2170	1440
	10.5	862	574	989	658	1130	754	1400	933	1740	1160	2070	1370
	11.0	823	548	944	628	1080	720	1340	890	1660	1110	1970	1310
	11.5	787	524	903	601	1030	688	1280	852	1590	1060	1890	1250
	12.0	754	502	865	576	992	660	1230	816	1520	1010	1810	1200
	12.5	724	482	831	553	952	633	1180	783	1460	974	1740	1150
	13.0	696	463	799	531	915	609	1130	753	1410	936	1670	1110
	13.5	671	446	769	512	881	586	1090	725	1350	901	1610	1070
	14.0	647	430	742	493	850	565	1050	699	1310	869	1550	1030
	14.5	624	415	716	476	821	546	1020	675	1260	839	1500	995
	15.0	603	402	692	461	793	528	981	653	1220	811	1450	962
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	9050	6020	10400	6910	11900	7920	14700	9790	18300	12200	21700	14400
$\phi_b M_p$	M_p/Ω_b , kN·m	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
$\phi_b M_r$	M_r/Ω_b , kN·m	709	472	810	539	924	615	1140	757	1400	934	1660	1100
$\phi_b BF$	BF/Ω_b , kN	48.5	32.3	58.3	38.8	69.4	46.2	93.5	62.2	122	81.3	154	102
$\phi_v V_n$	V_n/Ω_v , kN	1080	721	1220	812	1410	940	1670	1110	2010	1340	2300	1540
	$Z_x \times 10^3$, mm^3	5350		6136		7032		8699		10810		12820	
	L_p , m	3.62		3.58		3.51		3.41		3.34		3.26	
	L_r , m	12.3		11.9		11.6		10.9		10.6		10.1	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEA Shapes

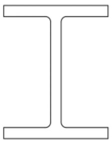
F_y = 275 MPa

Shape		HEA 100		HEA 120		HEA 140		HEA 160		HEA 180		HEA 200	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**158**	**106**	**188**	**125**	**241**	**161**	**301**	**201**	**339**	**226**	**408**	**272**
	1.50	110	72.9	158	105	229	152	**301**	**201**	**339**	**226**	**408**	**272**
	2.00	82.2	54.7	118	78.7	172	114	243	161	322	214	**408**	**272**
	2.50	65.7	43.7	94.6	63.0	137	91.4	194	129	257	171	340	226
	3.00	54.8	36.5	78.9	52.5	115	76.2	162	108	214	143	283	189
	3.50	47.0	31.2	67.6	45.0	98.2	65.3	139	92.3	184	122	243	162
	4.00	41.1	27.3	59.2	39.4	85.9	57.1	121	80.7	161	107	213	141
	4.50	36.5	24.3	52.6	35.0	76.3	50.8	108	71.8	143	95.1	189	126
	5.00	32.9	21.9	47.3	31.5	68.7	45.7	97.1	64.6	129	85.6	170	113
	5.50	29.9	19.9	43.0	28.6	62.5	41.6	88.2	58.7	117	77.8	155	103
	6.00	27.4	18.2	39.4	26.2	57.3	38.1	80.9	53.8	107	71.3	142	94.3
	6.50	25.3	16.8	36.4	24.2	52.9	35.2	74.7	49.7	99.0	65.8	131	87.0
	7.00	23.5	15.6	33.8	22.5	49.1	32.7	69.3	46.1	91.9	61.1	121	80.8
	7.50	21.9	14.6	31.5	21.0	45.8	30.5	64.7	43.1	85.8	57.1	113	75.4
	8.00	20.5	13.7	29.6	19.7	42.9	28.6	60.7	40.4	80.4	53.5	106	70.7
	8.50	19.3	12.9	27.8	18.5	40.4	26.9	57.1	38.0	75.7	50.4	100	66.6
	9.00	18.3	12.2	26.3	17.5	38.2	25.4	53.9	35.9	71.5	47.6	94.5	62.9
	9.50	17.3	11.5	24.9	16.6	36.2	24.1	51.1	34.0	67.7	45.1	89.5	59.6
	10.0	16.4	10.9	23.7	15.7	34.4	22.9	48.5	32.3	64.3	42.8	85.0	56.6
	10.5	15.7	10.4	22.5	15.0	32.7	21.8	46.2	30.8	61.3	40.8	81.0	53.9
	11.0	14.9	9.94	21.5	14.3	31.2	20.8	44.1	29.4	58.5	38.9	77.3	51.4
	11.5	14.3	9.51	20.6	13.7	29.9	19.9	42.2	28.1	55.9	37.2	73.9	49.2
	12.0	13.7	9.11	19.7	13.1	28.6	19.0	40.4	26.9	53.6	35.7	70.9	47.2
	12.5	13.1	8.75	18.9	12.6	27.5	18.3	38.8	25.8	51.5	34.2	68.0	45.3
	13.0	12.6	8.41	18.2	12.1	26.4	17.6	37.3	24.8	49.5	32.9	65.4	43.5
	13.5	12.2	8.10	17.5	11.7	25.4	16.9	35.9	23.9	47.7	31.7	63.0	41.9
	14.0	11.7	7.81	16.9	11.2	24.5	16.3	34.7	23.1	46.0	30.6	60.7	40.4
	14.5	11.3	7.54	16.3	10.9	23.7	15.8	33.5	22.3	44.4	29.5	58.6	39.0
	15.0	11.0	7.29	15.8	10.5	22.9	15.2	32.4	21.5	42.9	28.5	56.7	37.7
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	164	109	237	157	344	229	485	323	643	428	850	566
$\phi_b M_p$	M_p/Ω_b, kN·m	20.5	13.7	29.6	19.7	42.9	28.6	60.7	40.4	80.4	53.5	106	70.7
$\phi_b M_r$	M_r/Ω_b, kN·m	12.6	8.39	18.4	12.3	26.9	17.9	38.1	25.4	50.9	33.8	67.3	44.8
$\phi_b BF$	BF/Ω_b, kN	1.27	0.843	1.91	1.27	2.69	1.79	3.49	2.32	4.56	3.04	5.57	3.70
$\phi_v V_n$	V_n/Ω_v, kN	79.2	52.8	94.1	62.7	121	80.5	150	100	169	113	204	136
	$Z_x \times 10^3$, mm^3	83.01		119.5		173.5		245.1		324.9		429.5	
	L_p, m	1.19		1.43		1.67		1.89		2.15		2.36	
	L_r, m	7.46		7.27		7.63		8.35		8.62		9.37	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

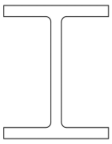


Maximum Total Uniform Load, kN
HEA Shapes

F_y = 275 MPa

Shape		HEA 220		HEA 240		HEA 260^{f}		HEA 280^{f}		HEA 300^{f}		HEA 320	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**485**	**323**	**569**	**380**	**619**	**413**	**713**	**475**	**813**	**542**	**921**	**614**
	1.50	**485**	**323**	**569**	**380**	**619**	**413**	**713**	**475**	**813**	**542**	**921**	**614**
	2.00	**485**	**323**	**569**	**380**	**619**	**413**	**713**	**475**	**813**	**542**	**921**	**614**
	2.50	450	300	**569**	**380**	**619**	**413**	**713**	**475**	**813**	**542**	**921**	**614**
	3.00	375	250	491	327	605	403	**713**	**475**	**813**	**542**	**921**	**614**
	3.50	322	214	421	280	519	345	622	414	774	515	**921**	**614**
	4.00	281	187	369	245	454	302	544	362	678	451	806	536
	4.50	250	166	328	218	403	268	484	322	602	401	716	477
	5.00	225	150	295	196	363	242	435	290	542	361	645	429
	5.50	205	136	268	178	330	220	396	263	493	328	586	390
	6.00	188	125	246	163	303	201	363	241	452	301	537	357
	6.50	173	115	227	151	279	186	335	223	417	277	496	330
	7.00	161	107	211	140	259	173	311	207	387	258	460	306
	7.50	150	99.9	197	131	242	161	290	193	361	240	430	286
	8.00	141	93.6	184	123	227	151	272	181	339	225	403	268
	8.50	132	88.1	173	115	214	142	256	170	319	212	379	252
	9.00	125	83.2	164	109	202	134	242	161	301	200	358	238
	9.50	118	78.8	155	103	191	127	229	152	285	190	339	226
	10.0	113	74.9	147	98.1	182	121	218	145	271	180	322	214
	10.5	107	71.3	140	93.4	173	115	207	138	258	172	307	204
	11.0	102	68.1	134	89.2	165	110	198	132	246	164	293	195
	11.5	97.9	65.1	128	85.3	158	105	189	126	236	157	280	186
	12.0	93.8	62.4	123	81.7	151	101	181	121	226	150	269	179
	12.5	90.1	59.9	118	78.5	145	97	174	116	217	144	258	172
	13.0	86.6	57.6	113	75.5	140	93	167	111	209	139	248	165
	13.5	83.4	55.5	109	72.7	134	90	161	107	201	134	239	159
	14.0	80.4	53.5	105	70.1	130	86	155	103	194	129	230	153
	14.5	77.6	51.6	102	67.6	125	83	150	100	187	124	222	148
	15.0	75.0	49.9	98.3	65.4	121	81	145	97	181	120	215	143
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	1130	749	1470	981	1820	1210	2180	1450	2710	1800	3220	2140
$\phi_b M_p$	M_p/Ω_b, kN·m	141	93.6	184	123	227	151	272	181	339	225	403	268
$\phi_b M_r$	M_r/Ω_b, kN·m	89.3	59.4	117	77.8	145	96.4	176	117	218	145	256	170
$\phi_b BF$	BF/Ω_b, kN	6.92	4.61	8.26	5.49	9.75	6.49	11.5	7.62	13.2	8.75	15.4	10.2
$\phi_v V_n$	V_n/Ω_v, kN	243	162	285	190	309	206	356	238	407	271	460	307
	$Z_x \times 10^3$, mm^3	568.5		744.6		919.8		1112		1383		1628	
	L_p, m	2.62		2.85		3.16		3.59		3.82		3.56	
	L_r, m	10.0		11.0		11.6		12.0		13.0		13.1	
LRFD	ASD	f Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.											
$\phi_b = 0.90$	$\Omega_b = 1.67$	Notes: For beams laterally unspported, see Table D.6.											
$\phi_v = 1.00$	$\Omega_v = 1.50$	Available strength tabulated in bold is limited by available shear strength.											

Table D.5 Continued.

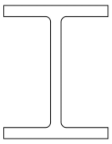


Maximum Total Uniform Load, kN
HEA Shapes

F_y = 275 MPa

Shape		**HEA 340**		**HEA 360**		**HEA 400**		**HEA 450**		**HEA 500**		**HEA 550**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**1030**	**690**	**1160**	**770**	**1420**	**944**	**1670**	**1110**	**1940**	**1290**	**2230**	**1490**
	1.50	**1030**	**690**	**1160**	**770**	**1420**	**944**	**1670**	**1110**	**1940**	**1290**	**2230**	**1490**
	2.00	**1030**	**690**	**1160**	**770**	**1420**	**944**	**1670**	**1110**	**1940**	**1290**	**2230**	**1490**
	2.50	**1030**	**690**	**1160**	**770**	**1420**	**944**	**1670**	**1110**	**1940**	**1290**	**2230**	**1490**
	3.00	**1030**	**690**	**1160**	**770**	**1420**	**944**	**1670**	**1110**	**1940**	**1290**	**2230**	**1490**
	3.50	**1030**	**690**	**1160**	**770**	**1420**	**944**	**1670**	**1110**	**1940**	**1290**	**2230**	**1490**
	4.00	916	609	1030	688	1270	844	1590	1060	**1940**	**1290**	**2230**	**1490**
	4.50	814	542	919	611	1130	750	1420	941	1740	1160	2030	1350
	5.00	733	487	827	550	1010	675	1270	847	1560	1040	1830	1220
	5.50	666	443	752	500	922	614	1160	770	1420	946	1660	1110
	6.00	611	406	689	458	845	563	1060	706	1300	867	1530	1010
	6.50	564	375	636	423	780	519	980	652	1200	800	1410	937
	7.00	523	348	591	393	725	482	910	605	1120	743	1310	870
	7.50	488	325	551	367	676	450	849	565	1040	694	1220	812
	8.00	458	305	517	344	634	422	796	530	977	650	1140	761
	8.50	431	287	486	324	597	397	749	498	920	612	1080	716
	9.00	407	271	459	306	564	375	708	471	869	578	1020	677
	9.50	386	257	435	290	534	355	670	446	823	548	963	641
	10.0	366	244	413	275	507	338	637	424	782	520	915	609
	10.5	349	232	394	262	483	321	606	403	745	495	872	580
	11.0	333	222	376	250	461	307	579	385	711	473	832	554
	11.5	319	212	359	239	441	293	554	368	680	452	796	529
	12.0	305	203	345	229	423	281	531	353	652	434	763	507
	12.5	293	195	331	220	406	270	509	339	626	416	732	487
	13.0	282	187	318	212	390	260	490	326	601	400	704	468
	13.5	271	181	306	204	376	250	472	314	579	385	678	451
	14.0	262	174	295	196	362	241	455	303	559	372	654	435
	14.5	253	168	285	190	350	233	439	292	539	359	631	420
	15.0	244	162	276	183	338	225	425	282	521	347	610	406
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	3660	2440	4130	2750	5070	3380	6370	4240	7820	5200	9150	6090
$\phi_b M_p$	M_p/Ω_b , kN·m	458	305	517	344	634	422	796	530	977	650	1140	761
$\phi_b M_r$	M_r/Ω_b , kN·m	291	193	328	218	400	266	502	334	615	409	718	478
$\phi_b BF$	BF/Ω_b , kN	17.7	11.8	20.3	13.5	25.9	17.2	34.0	22.6	43.2	28.8	53.7	35.7
$\phi_v V_n$	V_n/Ω_v , kN	517	345	578	385	708	472	835	557	970	647	1110	743
	$Z_x \times 10^3$, mm^3	1850		2088		2562		3216		3949		4622	
	L_p , m	3.54		3.53		3.48		3.46		3.44		3.39	
	L_r , m	13.0		12.9		12.5		12.1		11.8		11.3	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.

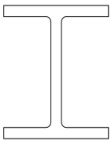


Maximum Total Uniform Load, kN
HEA Shapes

F_y = 275 MPa

Shape		HEA 600		HEA 650		HEA 700		HEA 800		HEA 900		HEA 1000	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**2530**	**1690**	**2850**	**1900**	**3300**	**2200**	**3910**	**2610**	**4700**	**3130**	**5390**	**3590**
	1.50	**2530**	**1690**	**2850**	**1900**	**3300**	**2200**	**3910**	**2610**	**4700**	**3130**	**5390**	**3590**
	2.00	**2530**	**1690**	**2850**	**1900**	**3300**	**2200**	**3910**	**2610**	**4700**	**3130**	**5390**	**3590**
	2.50	**2530**	**1690**	**2850**	**1900**	**3300**	**2200**	**3910**	**2610**	**4700**	**3130**	**5390**	**3590**
	3.00	**2530**	**1690**	**2850**	**1900**	**3300**	**2200**	**3910**	**2610**	**4700**	**3130**	**5390**	**3590**
	3.50	**2530**	**1690**	**2850**	**1900**	**3300**	**2200**	**3910**	**2610**	**4700**	**3130**	**5390**	**3590**
	4.00	**2530**	**1690**	**2850**	**1900**	**3300**	**2200**	**3910**	**2610**	**4700**	**3130**	**5390**	**3590**
	4.50	2350	1570	2700	1800	3090	2060	3830	2550	**4700**	**3130**	**5390**	**3590**
	5.00	2120	1410	2430	1620	2780	1850	3440	2290	4280	2850	5080	3380
	5.50	1930	1280	2210	1470	2530	1680	3130	2080	3890	2590	4620	3070
	6.00	1770	1170	2020	1350	2320	1540	2870	1910	3570	2370	4230	2810
	6.50	1630	1080	1870	1240	2140	1430	2650	1760	3290	2190	3910	2600
	7.00	1510	1010	1740	1150	1990	1320	2460	1640	3060	2030	3630	2410
	7.50	1410	940	1620	1080	1860	1240	2300	1530	2850	1900	3380	2250
	8.00	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
	8.50	1250	829	1430	951	1640	1090	2030	1350	2520	1680	2990	1990
	9.00	1180	783	1350	898	1550	1030	1910	1270	2380	1580	2820	1880
	9.50	1120	742	1280	851	1470	975	1810	1210	2250	1500	2670	1780
	10.0	1060	705	1210	808	1390	926	1720	1150	2140	1420	2540	1690
	10.5	1010	671	1160	770	1330	882	1640	1090	2040	1360	2420	1610
	11.0	963	641	1100	735	1270	842	1570	1040	1950	1290	2310	1540
	11.5	921	613	1060	703	1210	806	1500	997	1860	1240	2210	1470
	12.0	883	587	1010	674	1160	772	1440	955	1780	1190	2120	1410
	12.5	847	564	972	647	1110	741	1380	917	1710	1140	2030	1350
	13.0	815	542	935	622	1070	713	1320	882	1650	1100	1950	1300
	13.5	785	522	900	599	1030	686	1280	849	1590	1050	1880	1250
	14.0	757	503	868	577	995	662	1230	819	1530	1020	1810	1210
	14.5	731	486	838	557	960	639	1190	790	1480	982	1750	1160
	15.0	706	470	810	539	928	618	1150	764	1430	949	1690	1130
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	10600	7050	12100	8080	13900	9260	17200	11500	21400	14200	25400	16900
$\phi_b M_p$	M_p/Ω_b , kN·m	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
$\phi_b M_r$	M_r/Ω_b , kN·m	829	552	948	631	1080	719	1330	886	1640	1090	1940	1290
$\phi_b BF$	BF/Ω_b , kN	65.3	43.4	78.1	52.0	92.8	61.7	124	82.5	161	107	202	134
$\phi_v V_n$	V_n/Ω_v , kN	1270	844	1430	950	1650	1100	1960	1300	2350	1570	2700	1800
	$Z_x \times 10^3$, mm^3	5350		6136		7032		8699		10810		12820	
	L_p , m	3.35		3.31		3.25		3.16		3.09		3.01	
	L_r , m	10.9		10.6		10.4		9.79		9.48		9.13	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEA Shapes

F_y = 355 MPa

Shape		**HEA 100**		**HEA 120**		**HEA 140**		**HEA 160**		**HEA 180^f**		**HEA 200^f**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**204**	**136**	**243**	**162**	**312**	**208**	**389**	**259**	**437**	**291**	**526**	**351**
	1.50	141	94.1	204	135	296	197	**389**	**259**	**437**	**291**	**526**	**351**
	2.00	106	70.6	153	102	222	148	313	208	411	273	**526**	**351**
	2.50	84.9	56.5	122	81.3	177	118	251	167	328	219	428	285
	3.00	70.7	47.1	102	67.7	148	98.4	209	139	274	182	357	238
	3.50	60.6	40.3	87.3	58.1	127	84.3	179	119	235	156	306	204
	4.00	53.0	35.3	76.4	50.8	111	73.8	157	104	205	137	268	178
	4.50	47.1	31.4	67.9	45.2	98.5	65.6	139	92.6	182	121	238	158
	5.00	42.4	28.2	61.1	40.6	88.7	59.0	125	83.4	164	109	214	143
	5.50	38.6	25.7	55.5	36.9	80.6	53.6	114	75.8	149	99.3	195	130
	6.00	35.4	23.5	50.9	33.9	73.9	49.2	104	69.5	137	91.0	178	119
	6.50	32.6	21.7	47.0	31.3	68.2	45.4	96.4	64.1	126	84.0	165	110
	7.00	30.3	20.2	43.6	29.0	63.4	42.2	89.5	59.5	117	78.0	153	102
	7.50	28.3	18.8	40.7	27.1	59.1	39.3	83.5	55.6	109	72.8	143	95.0
	8.00	26.5	17.6	38.2	25.4	55.4	36.9	78.3	52.1	103	68.3	134	89.1
	8.50	25.0	16.6	35.9	23.9	52.2	34.7	73.7	49.0	96.6	64.3	126	83.8
	9.00	23.6	15.7	33.9	22.6	49.3	32.8	69.6	46.3	91.2	60.7	119	79.2
	9.50	22.3	14.9	32.2	21.4	46.7	31.1	65.9	43.9	86.4	57.5	113	75.0
	10.0	21.2	14.1	30.5	20.3	44.3	29.5	62.6	41.7	82.1	54.6	107	71.3
	10.5	20.2	13.4	29.1	19.4	42.2	28.1	59.7	39.7	78.2	52.0	102	67.9
	11.0	19.3	12.8	27.8	18.5	40.3	26.8	57.0	37.9	74.6	49.7	97.4	64.8
	11.5	18.4	12.3	26.6	17.7	38.6	25.7	54.5	36.2	71.4	47.5	93.1	62.0
	12.0	17.7	11.8	25.5	16.9	37.0	24.6	52.2	34.7	68.4	45.5	89.2	59.4
	12.5	17.0	11.3	24.4	16.3	35.5	23.6	50.1	33.3	65.7	43.7	85.7	57.0
	13.0	16.3	10.9	23.5	15.6	34.1	22.7	48.2	32.1	63.2	42.0	82.4	54.8
	13.5	15.7	10.5	22.6	15.1	32.8	21.9	46.4	30.9	60.8	40.5	79.3	52.8
	14.0	15.2	10.1	21.8	14.5	31.7	21.1	44.7	29.8	58.6	39.0	76.5	50.9
	14.5	14.6	9.74	21.1	14.0	30.6	20.3	43.2	28.7	56.6	37.7	73.9	49.1
	15.0	14.1	9.41	20.4	13.5	29.6	19.7	41.8	27.8	54.7	36.4	71.4	47.5
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	212	141	305	203	443	295	626	417	821	546	1070	713
$\phi_b M_p$	M_p/Ω_b , kN·m	26.5	17.6	38.2	25.4	55.4	36.9	78.3	52.1	103	68.3	134	89.1
$\phi_b M_r$	M_r/Ω_b , kN·m	16.3	10.8	23.8	15.8	34.8	23.1	49.2	32.8	65.7	43.7	86.9	57.8
$\phi_b BF$	BF/Ω_b , kN	2.15	1.43	3.23	2.15	4.52	3.01	5.86	3.90	7.61	5.07	9.27	6.17
$\phi_v V_n$	V_n/Ω_v , kN	102	68.2	121	80.9	156	104	194	130	219	146	263	175
$Z_x \times 10^3$, mm^3		83.01		119.5		173.5		245.1		324.9		429.5	
L_p , m		1.05		1.26		1.47		1.66		2.04		2.44	
L_r , m		5.82		5.72		6.04		6.63		6.90		7.51	

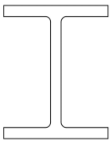
LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

f Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Notes: For beams laterally unspported, see Table D.6.

Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



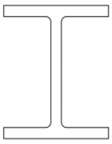
Maximum Total Uniform Load, kN
HEA Shapes

F_y = 355 MPa

Shape		HEA 220^{f}		HEA 240^{f}		HEA 260^{f}		HEA 280^{f}		HEA 300^{f}		HEA 320^{f}	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**626**	**417**	**735**	**490**	**799**	**533**	**920**	**613**	**1050**	**700**	**1190**	**792**
	1.50	**626**	**417**	**735**	**490**	**799**	**533**	**920**	**613**	**1050**	**700**	**1190**	**792**
	2.00	**626**	**417**	**735**	**490**	**799**	**533**	**920**	**613**	**1050**	**700**	**1190**	**792**
	2.50	567	377	**735**	**490**	**799**	**533**	**920**	**613**	**1050**	**700**	**1190**	**792**
	3.00	473	314	619	412	757	504	**907**	**603**	**1050**	**700**	**1190**	**792**
	3.50	405	269	531	353	649	432	777	517	968	644	1170	778
	4.00	354	236	464	309	568	378	680	452	847	563	1020	681
	4.50	315	210	413	275	505	336	604	402	753	501	910	605
	5.00	284	189	371	247	454	302	544	362	677	451	819	545
	5.50	258	171	338	225	413	275	495	329	616	410	744	495
	6.00	236	157	309	206	378	252	453	302	565	376	682	454
	6.50	218	145	286	190	349	232	418	278	521	347	630	419
	7.00	203	135	265	176	324	216	389	259	484	322	585	389
	7.50	189	126	248	165	303	201	363	241	452	301	546	363
	8.00	177	118	232	154	284	189	340	226	423	282	512	340
	8.50	167	111	218	145	267	178	320	213	399	265	482	320
	9.00	158	105	206	137	252	168	302	201	376	250	455	303
	9.50	149	99.3	195	130	239	159	286	190	357	237	431	287
	10.0	142	94.3	186	124	227	151	272	181	339	225	409	272
	10.5	135	89.8	177	118	216	144	259	172	323	215	390	259
	11.0	129	85.7	169	112	206	137	247	165	308	205	372	248
	11.5	123	82.0	161	107	197	131	237	157	295	196	356	237
	12.0	118	78.6	155	103	189	126	227	151	282	188	341	227
	12.5	113	75.5	149	98.8	182	121	218	145	271	180	327	218
	13.0	109	72.6	143	95.0	175	116	209	139	261	173	315	210
	13.5	105	69.9	138	91.5	168	112	201	134	251	167	303	202
	14.0	101	67.4	133	88.2	162	108	194	129	242	161	292	195
	14.5	97.8	65.1	128	85.2	157	104	188	125	234	155	282	188
	15.0	94.5	62.9	124	82.4	151	101	181	121	226	150	273	182
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	1420	943	1860	1240	2270	1510	2720	1810	3390	2250	4090	2720
$\phi_b M_p$	M_p/Ω_b , kN·m	177	118	232	154	284	189	340	226	423	282	512	340
$\phi_b M_r$	M_r/Ω_b , kN·m	115	76.7	151	100	187	124	227	151	282	187	331	220
$\phi_b BF$	BF/Ω_b , kN	11.5	7.65	13.7	9.13	16.1	10.7	18.9	12.6	21.7	14.4	25.4	16.9
$\phi_v V_n$	V_n/Ω_v , kN	313	209	367	245	399	266	460	307	525	350	594	396
	$Z_x \times 10^3$, mm^3	568.5		744.6		919.8		1112		1383		1628	
	L_p , m	2.69		2.93		3.34		3.74		3.13		3.46	
	L_r , m	8.08		8.84		9.33		9.75		10.5		10.6	
LRFD	ASD												
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

f Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.
Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

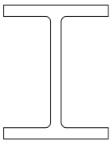


Maximum Total Uniform Load, kN
HEA Shapes

F_y = 355 MPa

Shape		HEA 340^f		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**1340**	**890**	**1490**	**994**	**1830**	**1220**	**2160**	**1440**	**2500**	**1670**	**2880**	**1920**
	1.50	**1340**	**890**	**1490**	**994**	**1830**	**1220**	**2160**	**1440**	**2500**	**1670**	**2880**	**1920**
	2.00	**1340**	**890**	**1490**	**994**	**1830**	**1220**	**2160**	**1440**	**2500**	**1670**	**2880**	**1920**
	2.50	**1340**	**890**	**1490**	**994**	**1830**	**1220**	**2160**	**1440**	**2500**	**1670**	**2880**	**1920**
	3.00	**1340**	**890**	**1490**	**994**	**1830**	**1220**	**2160**	**1440**	**2500**	**1670**	**2880**	**1920**
	3.50	**1340**	**890**	**1490**	**994**	**1830**	**1220**	**2160**	**1440**	**2500**	**1670**	**2880**	**1920**
	4.00	1180	785	1330	888	1640	1090	2060	1370	**2500**	**1670**	**2880**	**1920**
	4.50	1050	698	1190	789	1460	968	1830	1220	2240	1490	2630	1750
	5.00	944	628	1070	710	1310	871	1640	1090	2020	1340	2360	1570
	5.50	858	571	970	646	1190	792	1490	994	1840	1220	2150	1430
	6.00	787	523	889	592	1090	726	1370	912	1680	1120	1970	1310
	6.50	726	483	821	546	1010	670	1260	841	1550	1030	1820	1210
	7.00	674	449	762	507	935	622	1170	781	1440	959	1690	1120
	7.50	629	419	712	473	873	581	1100	729	1350	895	1580	1050
	8.00	590	393	667	444	819	545	1030	684	1260	839	1480	983
	8.50	555	369	628	418	770	513	967	643	1190	790	1390	925
	9.00	524	349	593	395	728	484	913	608	1120	746	1310	873
	9.50	497	331	562	374	689	459	865	576	1060	707	1240	827
	10.0	472	314	534	355	655	436	822	547	1010	672	1180	786
	10.5	450	299	508	338	624	415	783	521	961	640	1130	749
	11.0	429	286	485	323	595	396	747	497	918	611	1070	715
	11.5	410	273	464	309	569	379	715	476	878	584	1030	683
	12.0	393	262	445	296	546	363	685	456	841	560	984	655
	12.5	378	251	427	284	524	349	658	438	807	537	945	629
	13.0	363	242	411	273	504	335	632	421	776	517	909	605
	13.5	350	233	395	263	485	323	609	405	748	497	875	582
	14.0	337	224	381	254	468	311	587	391	721	480	844	561
	14.5	326	217	368	245	452	300	567	377	696	463	815	542
	15.0	315	209	356	237	437	290	548	365	673	448	788	524
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	4720	3140	5340	3550	6550	4360	8220	5470	10100	6720	11800	7860
$\phi_b M_p$	M_p/Ω_b, kN·m	590	393	667	444	819	545	1030	684	1260	839	1480	983
$\phi_b M_r$	M_r/Ω_b, kN·m	375	250	423	281	517	344	648	431	794	528	927	617
$\phi_b BF$	BF/Ω_b, kN	29.3	19.5	33.3	22.2	42.4	28.2	55.4	36.9	70.1	46.6	86.4	57.5
$\phi_v V_n$	V_n/Ω_v, kN	668	445	746	497	914	609	1080	719	1250	835	1440	959
	$Z_x \times 10^3$, mm^3	1850		2088		2562		3216		3949		4622	
	L_p, m	3.15		3.10		3.07		3.05		3.02		2.99	
	L_r, m	10.5		10.4		10.2		9.90		9.70		9.35	
LRFD	**ASD**	f Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly. Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.

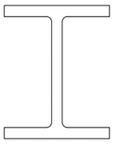


Maximum Total Uniform Load, kN
HEA Shapes

F_y = 355 MPa

Shape		HEA 600		HEA 650		HEA 700		HEA 800		HEA 900		HEA 1000	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**3270**	**2180**	**3680**	**2450**	**4260**	**2840**	**5050**	**3370**	**6070**	**4040**	**6960**	**4640**
	1.50	**3270**	**2180**	**3680**	**2450**	**4260**	**2840**	**5050**	**3370**	**6070**	**4040**	**6960**	**4640**
	2.00	**3270**	**2180**	**3680**	**2450**	**4260**	**2840**	**5050**	**3370**	**6070**	**4040**	**6960**	**4640**
	2.50	**3270**	**2180**	**3680**	**2450**	**4260**	**2840**	**5050**	**3370**	**6070**	**4040**	**6960**	**4640**
	3.00	**3270**	**2180**	**3680**	**2450**	**4260**	**2840**	**5050**	**3370**	**6070**	**4040**	**6960**	**4640**
	3.50	**3270**	**2180**	**3680**	**2450**	**4260**	**2840**	**5050**	**3370**	**6070**	**4040**	**6960**	**4640**
	4.00	**3270**	**2180**	**3680**	**2450**	**4260**	**2840**	**5050**	**3370**	**6070**	**4040**	**6960**	**4640**
	4.50	3040	2020	3490	2320	3990	2660	4940	3290	**6070**	**4040**	**6960**	**4640**
	5.00	2730	1820	3140	2090	3590	2390	4450	2960	5530	3680	6550	4360
	5.50	2490	1650	2850	1900	3270	2170	4040	2690	5020	3340	5960	3960
	6.00	2280	1520	2610	1740	3000	1990	3710	2470	4610	3060	5460	3630
	6.50	2100	1400	2410	1610	2770	1840	3420	2280	4250	2830	5040	3350
	7.00	1950	1300	2240	1490	2570	1710	3180	2110	3950	2630	4680	3110
	7.50	1820	1210	2090	1390	2400	1590	2960	1970	3680	2450	4370	2910
	8.00	1710	1140	1960	1300	2250	1490	2780	1850	3450	2300	4100	2730
	8.50	1610	1070	1850	1230	2110	1410	2620	1740	3250	2160	3860	2560
	9.00	1520	1010	1740	1160	2000	1330	2470	1640	3070	2040	3640	2420
	9.50	1440	958	1650	1100	1890	1260	2340	1560	2910	1940	3450	2290
	10.0	1370	910	1570	1040	1800	1200	2220	1480	2760	1840	3280	2180
	10.5	1300	866	1490	994	1710	1140	2120	1410	2630	1750	3120	2080
	11.0	1240	827	1430	949	1630	1090	2020	1340	2510	1670	2980	1980
	11.5	1190	791	1360	907	1560	1040	1930	1290	2400	1600	2850	1900
	12.0	1140	758	1310	870	1500	997	1850	1230	2300	1530	2730	1820
	12.5	1090	728	1250	835	1440	957	1780	1180	2210	1470	2620	1740
	13.0	1050	700	1210	803	1380	920	1710	1140	2130	1410	2520	1680
	13.5	1010	674	1160	773	1330	886	1650	1100	2050	1360	2430	1610
	14.0	977	650	1120	745	1280	854	1590	1060	1970	1310	2340	1560
	14.5	943	627	1080	720	1240	825	1530	1020	1910	1270	2260	1500
	15.0	912	607	1050	696	1200	797	1480	986	1840	1230	2180	1450
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	13700	9100	15700	10400	18000	12000	22200	14800	27600	18400	32800	21800
$\phi_b M_p$	M_p/Ω_b, kN·m	1710	1140	1960	1300	2250	1490	2780	1850	3450	2300	4100	2730
$\phi_b M_r$	M_r/Ω_b, kN·m	1070	712	1220	815	1400	929	1720	1140	2120	1410	2500	1670
$\phi_b BF$	BF/Ω_b, kN	104	69.4	124	82.6	147	97.6	194	129	251	167	311	207
$\phi_v V_n$	V_n/Ω_v, kN	1630	1090	1840	1230	2130	1420	2520	1680	3030	2020	3480	2320
$Z_x \times 10^3$, mm^3		5350		6136		7032		8699		10810		12820	
L_p, m		2.95		2.91		2.86		2.78		2.72		2.65	
L_r, m		9.07		8.84		8.66		8.25		8.03		7.77	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEB Shapes

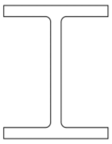
F_y = 235 MPa

Shape		HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**169**	**113**	**220**	**147**	**276**	**184**	**361**	**241**	**431**	**288**	**508**	**338**
	1.50	118	78.2	186	124	**276**	**184**	**361**	**241**	**431**	**288**	**508**	**338**
	2.00	88.2	58.7	140	93.0	208	138	299	199	407	271	**508**	**338**
	2.50	70.5	46.9	112	74.4	166	111	240	159	326	217	435	289
	3.00	58.8	39.1	93.2	62.0	138	92.1	200	133	272	181	362	241
	3.50	50.4	33.5	79.9	53.1	119	78.9	171	114	233	155	311	207
	4.00	44.1	29.3	69.9	46.5	104	69.1	150	99.6	204	135	272	181
	4.50	39.2	26.1	62.1	41.3	92.3	61.4	133	88.6	181	120	242	161
	5.00	35.3	23.5	55.9	37.2	83.0	55.3	120	79.7	163	108	217	145
	5.50	32.1	21.3	50.8	33.8	75.5	50.2	109	72.5	148	98.5	198	132
	6.00	29.4	19.6	46.6	31.0	69.2	46.0	99.8	66.4	136	90.3	181	121
	6.50	27.1	18.0	43.0	28.6	63.9	42.5	92.1	61.3	125	83.4	167	111
	7.00	25.2	16.8	39.9	26.6	59.3	39.5	85.6	56.9	116	77.4	155	103
	7.50	23.5	15.6	37.3	24.8	55.4	36.8	79.9	53.1	109	72.3	145	96.4
	8.00	22.0	14.7	34.9	23.2	51.9	34.5	74.9	49.8	102	67.7	136	90.4
	8.50	20.7	13.8	32.9	21.9	48.8	32.5	70.5	46.9	95.8	63.8	128	85.1
	9.00	19.6	13.0	31.1	20.7	46.1	30.7	66.6	44.3	90.5	60.2	121	80.4
	9.50	18.6	12.3	29.4	19.6	43.7	29.1	63.0	41.9	85.7	57.0	114	76.1
	10.0	17.6	11.7	28.0	18.6	41.5	27.6	59.9	39.9	81.5	54.2	109	72.3
	10.5	16.8	11.2	26.6	17.7	39.5	26.3	57.0	38.0	77.6	51.6	104	68.9
	11.0	16.0	10.7	25.4	16.9	37.7	25.1	54.5	36.2	74.0	49.3	98.8	65.8
	11.5	15.3	10.2	24.3	16.2	36.1	24.0	52.1	34.7	70.8	47.1	94.5	62.9
	12.0	14.7	9.78	23.3	15.5	34.6	23.0	49.9	33.2	67.9	45.2	90.6	60.3
	12.5	14.1	9.38	22.4	14.9	33.2	22.1	47.9	31.9	65.2	43.4	87.0	57.9
	13.0	13.6	9.02	21.5	14.3	31.9	21.3	46.1	30.7	62.7	41.7	83.6	55.6
	13.5	13.1	8.69	20.7	13.8	30.8	20.5	44.4	29.5	60.3	40.1	80.5	53.6
	14.0	12.6	8.38	20.0	13.3	29.7	19.7	42.8	28.5	58.2	38.7	77.7	51.7
	14.5	12.2	8.09	19.3	12.8	28.6	19.1	41.3	27.5	56.2	37.4	75.0	49.9
	15.0	11.8	7.82	18.6	12.4	27.7	18.4	39.9	26.6	54.3	36.1	72.5	48.2
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	176	117	280	186	415	276	599	399	815	542	1090	723
$\phi_b M_p$	M_p/Ω_b , kN·m	22.0	14.7	34.9	23.2	51.9	34.5	74.9	49.8	102	67.7	136	90.4
$\phi_b M_r$	M_r/Ω_b , kN·m	13.3	8.86	21.3	14.2	31.9	21.2	46.1	30.7	63.0	41.9	84.3	56.1
$\phi_b BF$	BF/Ω_b , kN	0.957	0.637	1.45	0.962	2.03	1.35	2.67	1.78	3.46	2.30	4.30	2.86
$\phi_v V_n$	V_n/Ω_v , kN	84.6	56.4	110	73.3	138	92.1	180	120	216	144	254	169
	$Z_x \times 10^3$, mm^3	104.2		165.2		245.4		345.0		481.4		642.5	
	L_p , m	1.30		1.57		1.84		2.08		2.35		2.60	
	L_r , m	10.4		11.0		11.7		12.8		13.6		14.6	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

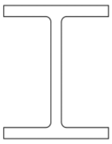


Maximum Total Uniform Load, kN
HEB Shapes

***F_y* = 235 MPa**

Shape		HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**589**	**393**	**677**	**451**	**733**	**489**	**829**	**553**	**931**	**620**	**1040**	**692**
	1.50	**589**	**393**	**677**	**451**	**733**	**489**	**829**	**553**	**931**	**620**	**1040**	**692**
	2.00	**589**	**393**	**677**	**451**	**733**	**489**	**829**	**553**	**931**	**620**	**1040**	**692**
	2.50	560	372	**677**	**451**	**733**	**489**	**829**	**553**	**931**	**620**	**1040**	**692**
	3.00	466	310	594	395	724	481	**829**	**553**	**931**	**620**	**1040**	**692**
	3.50	400	266	509	339	620	413	742	493	904	601	**1040**	**692**
	4.00	350	233	445	296	543	361	649	432	791	526	909	605
	4.50	311	207	396	263	482	321	577	384	703	468	808	538
	5.00	280	186	356	237	434	289	519	345	632	421	727	484
	5.50	254	169	324	216	395	263	472	314	575	383	661	440
	6.00	233	155	297	198	362	241	433	288	527	351	606	403
	6.50	215	143	274	182	334	222	399	266	487	324	559	372
	7.00	200	133	255	169	310	206	371	247	452	301	519	346
	7.50	187	124	238	158	289	193	346	230	422	281	485	323
	8.00	175	116	223	148	271	181	324	216	395	263	455	302
	8.50	165	110	210	139	255	170	305	203	372	248	428	285
	9.00	155	103	198	132	241	160	288	192	351	234	404	269
	9.50	147	98.0	188	125	229	152	273	182	333	221	383	255
	10.0	140	93.1	178	119	217	144	260	173	316	210	364	242
	10.5	133	88.7	170	113	207	138	247	164	301	200	346	230
	11.0	127	84.6	162	108	197	131	236	157	287	191	331	220
	11.5	122	81.0	155	103	189	126	226	150	275	183	316	210
	12.0	117	77.6	148	98.8	181	120	216	144	264	175	303	202
	12.5	112	74.5	143	94.8	174	116	208	138	253	168	291	194
	13.0	108	71.6	137	91.2	167	111	200	133	243	162	280	186
	13.5	104	69.0	132	87.8	161	107	192	128	234	156	269	179
	14.0	99.9	66.5	127	84.7	155	103	185	123	226	150	260	173
	14.5	96.5	64.2	123	81.8	150	99.6	179	119	218	145	251	167
	15.0	93.3	62.1	119	79.0	145	96.3	173	115	211	140	242	161
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	1400	931	1780	1190	2170	1440	2600	1730	3160	2100	3640	2420
$\phi_b M_p$	M_p/Ω_b, kN·m	175	116	223	148	271	181	324	216	395	263	455	302
$\phi_b M_r$	M_r/Ω_b, kN·m	109	72.4	139	92.4	170	113	204	136	248	165	285	190
$\phi_b BF$	BF/Ω_b, kN	5.29	3.52	6.31	4.20	7.49	4.98	8.82	5.87	10.1	6.74	11.7	7.78
$\phi_v V_n$	V_n/Ω_v, kN	295	196	338	226	367	244	415	276	465	310	519	346
	$Z_x \times 10^3$, mm^3	827.0		1053		1283		1534		1869		2149	
	L_p, m	2.87		3.12		3.38		3.64		3.89		3.89	
	L_r, m	15.4		16.4		16.9		17.3		18.4		18.4	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEB Shapes

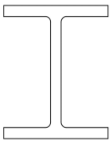
F_y = 235 MPa

Shape		HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**1150**	**767**	**1270**	**846**	**1520**	**1020**	**1780**	**1180**	**2040**	**1360**	**2330**	**1550**
	1.50	**1150**	**767**	**1270**	**846**	**1520**	**1020**	**1780**	**1180**	**2040**	**1360**	**2330**	**1550**
	2.00	**1150**	**767**	**1270**	**846**	**1520**	**1020**	**1780**	**1180**	**2040**	**1360**	**2330**	**1550**
	2.50	**1150**	**767**	**1270**	**846**	**1520**	**1020**	**1780**	**1180**	**2040**	**1360**	**2330**	**1550**
	3.00	**1150**	**767**	**1270**	**846**	**1520**	**1020**	**1780**	**1180**	**2040**	**1360**	**2330**	**1550**
	3.50	**1150**	**767**	**1270**	**846**	**1520**	**1020**	**1780**	**1180**	**2040**	**1360**	**2330**	**1550**
	4.00	1020	678	1130	755	1370	910	1680	1120	**2040**	**1360**	**2330**	**1550**
	4.50	905	602	1010	671	1220	809	1500	996	1810	1200	2100	1400
	5.00	815	542	908	604	1090	728	1350	897	1630	1080	1890	1260
	5.50	741	493	825	549	994	662	1230	815	1480	986	1720	1140
	6.00	679	452	757	503	911	606	1120	747	1360	903	1580	1050
	6.50	627	417	698	465	841	560	1040	690	1250	834	1460	968
	7.00	582	387	649	431	781	520	963	640	1160	774	1350	899
	7.50	543	361	605	403	729	485	898	598	1090	723	1260	839
	8.00	509	339	567	378	684	455	842	560	1020	678	1180	787
	8.50	479	319	534	355	643	428	793	527	958	638	1110	740
	9.00	453	301	504	336	608	404	749	498	905	602	1050	699
	9.50	429	285	478	318	576	383	709	472	858	571	996	663
	10.0	407	271	454	302	547	364	674	448	815	542	946	629
	10.5	388	258	432	288	521	347	642	427	776	516	901	599
	11.0	370	246	413	275	497	331	613	408	741	493	860	572
	11.5	354	236	395	263	476	316	586	390	708	471	823	547
	12.0	340	226	378	252	456	303	561	374	679	452	788	525
	12.5	326	217	363	242	437	291	539	359	652	434	757	504
	13.0	313	209	349	232	421	280	518	345	627	417	728	484
	13.5	302	201	336	224	405	270	499	332	603	402	701	466
	14.0	291	194	324	216	391	260	481	320	582	387	676	450
	14.5	281	187	313	208	377	251	465	309	562	374	652	434
	15.0	272	181	303	201	365	243	449	299	543	361	631	420
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	4070	2710	4540	3020	5470	3640	6740	4480	8150	5420	9460	6290
$\phi_b M_p$	M_p/Ω_b, kN·m	509	339	567	378	684	455	842	560	1020	678	1180	787
$\phi_b M_r$	M_r/Ω_b, kN·m	319	212	355	236	427	284	526	350	635	422	736	490
$\phi_b BF$	BF/Ω_b, kN	13.4	8.95	15.3	10.2	19.6	13.0	25.8	17.1	32.9	21.9	41.2	27.4
$\phi_v V_n$	V_n/Ω_v, kN	575	384	635	423	761	508	888	592	1020	682	1160	776
	$Z_x \times 10^3$, mm^3	2408		2683		3232		3982		4815		5591	
	L_p, m	3.87		3.85		3.80		3.76		3.73		3.68	
	L_r, m	18.0		17.7		16.9		16.0		15.4		14.5	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEB Shapes

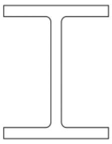
F_y = 235 MPa

Shape		HEB 600		HEB 650		HEB 700		HEB 800		HEB 900		HEB 1000	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**2620**	**1750**	**2930**	**1960**	**3360**	**2240**	**3950**	**2630**	**4700**	**3130**	**5360**	**3570**
	1.50	**2620**	**1750**	**2930**	**1960**	**3360**	**2240**	**3950**	**2630**	**4700**	**3130**	**5360**	**3570**
	2.00	**2620**	**1750**	**2930**	**1960**	**3360**	**2240**	**3950**	**2630**	**4700**	**3130**	**5360**	**3570**
	2.50	**2620**	**1750**	**2930**	**1960**	**3360**	**2240**	**3950**	**2630**	**4700**	**3130**	**5360**	**3570**
	3.00	**2620**	**1750**	**2930**	**1960**	**3360**	**2240**	**3950**	**2630**	**4700**	**3130**	**5360**	**3570**
	3.50	**2620**	**1750**	**2930**	**1960**	**3360**	**2240**	**3950**	**2630**	**4700**	**3130**	**5360**	**3570**
	4.00	**2620**	**1750**	**2930**	**1960**	**3360**	**2240**	**3950**	**2630**	**4700**	**3130**	**5360**	**3570**
	4.50	2420	1610	2750	1830	3130	2080	3850	2560	**4700**	**3130**	**5360**	**3570**
	5.00	2170	1450	2480	1650	2820	1870	3460	2300	4260	2830	5030	3350
	5.50	1980	1320	2250	1500	2560	1700	3150	2090	3870	2570	4570	3040
	6.00	1810	1210	2060	1370	2350	1560	2880	1920	3550	2360	4190	2790
	6.50	1670	1110	1910	1270	2170	1440	2660	1770	3270	2180	3870	2570
	7.00	1550	1030	1770	1180	2010	1340	2470	1650	3040	2020	3590	2390
	7.50	1450	964	1650	1100	1880	1250	2310	1540	2840	1890	3350	2230
	8.00	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
	8.50	1280	851	1460	969	1660	1100	2040	1350	2500	1670	2960	1970
	9.00	1210	804	1380	916	1570	1040	1920	1280	2370	1570	2790	1860
	9.50	1140	761	1300	867	1480	987	1820	1210	2240	1490	2650	1760
	10.0	1090	723	1240	824	1410	937	1730	1150	2130	1420	2510	1670
	10.5	1040	689	1180	785	1340	893	1650	1100	2030	1350	2390	1590
	11.0	988	658	1130	749	1280	852	1570	1050	1940	1290	2290	1520
	11.5	945	629	1080	717	1230	815	1510	1000	1850	1230	2190	1450
	12.0	906	603	1030	687	1170	781	1440	960	1770	1180	2100	1390
	12.5	870	579	991	659	1130	750	1380	921	1700	1130	2010	1340
	13.0	836	556	953	634	1080	721	1330	886	1640	1090	1930	1290
	13.5	805	536	917	610	1040	694	1280	853	1580	1050	1860	1240
	14.0	777	517	885	589	1010	670	1240	823	1520	1010	1800	1190
	14.5	750	499	854	568	972	646	1190	794	1470	977	1730	1150
	15.0	725	482	826	549	939	625	1150	768	1420	944	1680	1120
		Beam Properties											
$\phi_b W_c$	W_c/Ω_b, kN·m	10900	7230	12400	8240	14100	9370	17300	11500	21300	14200	25100	16700
$\phi_b M_p$	M_p/Ω_b, kN·m	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
$\phi_b M_r$	M_r/Ω_b, kN·m	844	562	959	638	1090	723	1330	884	1630	1080	1910	1270
$\phi_b BF$	BF/Ω_b, kN	50.6	33.7	61.1	40.6	72.9	48.5	99.3	66.1	130	86.6	165	110
$\phi_v V_n$	V_n/Ω_v, kN	1310	874	1470	978	1680	1120	1970	1320	2350	1570	2680	1790
	$Z_x \times 10^3$, mm^3	6425		7320		8327		10230		12580		14860	
	L_p, m	3.64		3.59		3.53		3.43		3.35		3.28	
	L_r, m	13.8		13.2		12.8		11.8		11.3		10.7	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

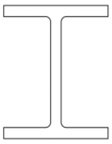


Maximum Total Uniform Load, kN
HEB Shapes

F_y = 275 MPa

Shape		**HEB 100**		**HEB 120**		**HEB 140**		**HEB 160**		**HEB 180**		**HEB 200**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**198**	**132**	**257**	**172**	**323**	**216**	**422**	**282**	**505**	**337**	**594**	**396**
	1.50	138	91.5	218	145	**323**	**216**	**422**	**282**	**505**	**337**	**594**	**396**
	2.00	103	68.6	164	109	243	162	350	233	477	317	**594**	**396**
	2.50	82.5	54.9	131	87.1	194	129	280	187	381	254	509	339
	3.00	68.8	45.8	109	72.5	162	108	234	155	318	211	424	282
	3.50	58.9	39.2	93.5	62.2	139	92.4	200	133	272	181	363	242
	4.00	51.6	34.3	81.8	54.4	121	80.8	175	117	238	159	318	212
	4.50	45.8	30.5	72.7	48.4	108	71.8	156	104	212	141	283	188
	5.00	41.3	27.5	65.4	43.5	97.2	64.7	140	93.3	191	127	254	169
	5.50	37.5	25.0	59.5	39.6	88.3	58.8	127	84.8	173	115	231	154
	6.00	34.4	22.9	54.5	36.3	81.0	53.9	117	77.7	159	106	212	141
	6.50	31.7	21.1	50.3	33.5	74.8	49.7	108	71.7	147	97.6	196	130
	7.00	29.5	19.6	46.7	31.1	69.4	46.2	100	66.6	136	90.6	182	121
	7.50	27.5	18.3	43.6	29.0	64.8	43.1	93.5	62.2	127	84.6	170	113
	8.00	25.8	17.2	40.9	27.2	60.7	40.4	87.6	58.3	119	79.3	159	106
	8.50	24.3	16.1	38.5	25.6	57.2	38.0	82.5	54.9	112	74.6	150	99.6
	9.00	22.9	15.3	36.3	24.2	54.0	35.9	77.9	51.8	106	70.5	141	94.0
	9.50	21.7	14.4	34.4	22.9	51.1	34.0	73.8	49.1	100	66.8	134	89.1
	10.0	20.6	13.7	32.7	21.8	48.6	32.3	70.1	46.6	95.3	63.4	127	84.6
	10.5	19.6	13.1	31.2	20.7	46.3	30.8	66.8	44.4	90.8	60.4	121	80.6
	11.0	18.8	12.5	29.7	19.8	44.2	29.4	63.7	42.4	86.7	57.7	116	76.9
	11.5	17.9	11.9	28.4	18.9	42.3	28.1	60.9	40.6	82.9	55.1	111	73.6
	12.0	17.2	11.4	27.3	18.1	40.5	26.9	58.4	38.9	79.4	52.8	106	70.5
	12.5	16.5	11.0	26.2	17.4	38.9	25.9	56.1	37.3	76.3	50.7	102	67.7
	13.0	15.9	10.6	25.2	16.7	37.4	24.9	53.9	35.9	73.3	48.8	97.9	65.1
	13.5	15.3	10.2	24.2	16.1	36.0	23.9	51.9	34.5	70.6	47.0	94.2	62.7
	14.0	14.7	9.80	23.4	15.5	34.7	23.1	50.1	33.3	68.1	45.3	90.9	60.5
	14.5	14.2	9.47	22.6	15.0	33.5	22.3	48.3	32.2	65.7	43.7	87.7	58.4
	15.0	13.8	9.15	21.8	14.5	32.4	21.6	46.7	31.1	63.5	42.3	84.8	56.4
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	206	137	327	218	486	323	701	466	953	634	1270	846
$\phi_b M_p$	M_p/Ω_b , kN·m	25.8	17.2	40.9	27.2	60.7	40.4	87.6	58.3	119	79.3	159	106
$\phi_b M_r$	M_r/Ω_b , kN·m	15.6	10.4	25.0	16.6	37.4	24.9	54.0	35.9	73.8	49.1	98.7	65.7
$\phi_b BF$	BF/Ω_b , kN	1.32	0.881	2.00	1.33	2.81	1.87	3.70	2.46	4.79	3.19	5.95	3.96
$\phi_v V_n$	V_n/Ω_v , kN	99.0	66.0	129	85.8	162	108	211	141	252	168	297	198
$Z_x \times 10^3$, mm^3		104.2		165.2		245.4		345.0		481.4		642.5	
L_p , m		1.20		1.45		1.70		1.92		2.17		2.41	
L_r , m		8.92		9.41		10.0		11.0		11.6		12.5	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



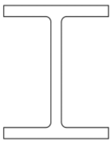
Maximum Total Uniform Load, kN
HEB Shapes

F_y = 275 MPa

Shape		**HEB 220**		**HEB 240**		**HEB 260**		**HEB 280**		**HEB 300**		**HEB 320**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**690**	**460**	**792**	**528**	**858**	**572**	**970**	**647**	**1090**	**726**	**1210**	**810**
	1.50	**690**	**460**	**792**	**528**	**858**	**572**	**970**	**647**	**1090**	**726**	**1210**	**810**
	2.00	**690**	**460**	**792**	**528**	**858**	**572**	**970**	**647**	**1090**	**726**	**1210**	**810**
	2.50	655	436	**792**	**528**	**858**	**572**	**970**	**647**	**1090**	**726**	**1210**	**810**
	3.00	546	363	695	462	847	563	**970**	**647**	**1090**	**726**	**1210**	**810**
	3.50	468	311	596	396	726	483	868	577	1060	703	**1210**	**810**
	4.00	409	272	521	347	635	423	759	505	925	616	1060	708
	4.50	364	242	463	308	565	376	675	449	822	547	946	629
	5.00	327	218	417	277	508	338	607	404	740	492	851	566
	5.50	298	198	379	252	462	307	552	367	673	448	774	515
	6.00	273	182	347	231	423	282	506	337	617	410	709	472
	6.50	252	168	321	213	391	260	467	311	569	379	655	436
	7.00	234	156	298	198	363	241	434	289	529	352	608	404
	7.50	218	145	278	185	339	225	405	269	493	328	567	377
	8.00	205	136	261	173	318	211	380	253	463	308	532	354
	8.50	193	128	245	163	299	199	357	238	435	290	501	333
	9.00	182	121	232	154	282	188	337	225	411	274	473	315
	9.50	172	115	219	146	267	178	320	213	390	259	448	298
	10.0	164	109	208	139	254	169	304	202	370	246	426	283
	10.5	156	104	199	132	242	161	289	192	352	234	405	270
	11.0	149	99.0	190	126	231	154	276	184	336	224	387	257
	11.5	142	94.7	181	121	221	147	264	176	322	214	370	246
	12.0	136	90.8	174	116	212	141	253	168	308	205	355	236
	12.5	131	87.2	167	111	203	135	243	162	296	197	340	226
	13.0	126	83.8	160	107	195	130	234	155	285	189	327	218
	13.5	121	80.7	154	103	188	125	225	150	274	182	315	210
	14.0	117	77.8	149	99.1	181	121	217	144	264	176	304	202
	14.5	113	75.1	144	95.7	175	117	209	139	255	170	293	195
	15.0	109	72.6	139	92.5	169	113	202	135	247	164	284	189
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	1640	1090	2080	1390	2540	1690	3040	2020	3700	2460	4260	2830
$\phi_b M_p$	M_p/Ω_b , kN·m	205	136	261	173	318	211	380	253	463	308	532	354
$\phi_b M_r$	M_r/Ω_b , kN·m	127	84.8	163	108	199	132	238	159	291	193	334	222
$\phi_b BF$	BF/Ω_b , kN	7.32	4.87	8.73	5.81	10.4	6.89	12.2	8.10	14.0	9.30	16.1	10.7
$\phi_v V_n$	V_n/Ω_v , kN	345	230	396	264	429	286	485	323	545	363	607	405
	$Z_x \times 10^3$, mm^3	827.0		1053		1283		1534		1869		2149	
	L_p , m	2.65		2.89		3.12		3.37		3.60		3.59	
	L_r , m	13.2		14.1		14.6		15.0		15.9		15.9	
LRFD	**ASD**												
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

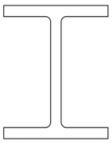


Maximum Total Uniform Load, kN
HEB Shapes

F_y = 275 MPa

Shape		HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**1350**	**898**	**1490**	**990**	**1780**	**1190**	**2080**	**1390**	**2390**	**1600**	**2720**	**1820**
	1.50	**1350**	**898**	**1490**	**990**	**1780**	**1190**	**2080**	**1390**	**2390**	**1600**	**2720**	**1820**
	2.00	**1350**	**898**	**1490**	**990**	**1780**	**1190**	**2080**	**1390**	**2390**	**1600**	**2720**	**1820**
	2.50	**1350**	**898**	**1490**	**990**	**1780**	**1190**	**2080**	**1390**	**2390**	**1600**	**2720**	**1820**
	3.00	**1350**	**898**	**1490**	**990**	**1780**	**1190**	**2080**	**1390**	**2390**	**1600**	**2720**	**1820**
	3.50	**1350**	**898**	**1490**	**990**	**1780**	**1190**	**2080**	**1390**	**2390**	**1600**	**2720**	**1820**
	4.00	1190	793	1330	884	1600	1060	1970	1310	2380	1590	**2720**	**1820**
	4.50	1060	705	1180	785	1420	946	1750	1170	2120	1410	2460	1640
	5.00	954	634	1060	707	1280	852	1580	1050	1910	1270	2210	1470
	5.50	867	577	966	643	1160	774	1430	954	1730	1150	2010	1340
	6.00	795	529	885	589	1070	710	1310	874	1590	1060	1850	1230
	6.50	734	488	817	544	985	655	1210	807	1470	976	1700	1130
	7.00	681	453	759	505	914	608	1130	749	1360	906	1580	1050
	7.50	636	423	708	471	853	568	1050	699	1270	846	1480	982
	8.00	596	397	664	442	800	532	986	656	1190	793	1380	921
	8.50	561	373	625	416	753	501	928	617	1120	746	1300	867
	9.00	530	352	590	393	711	473	876	583	1060	705	1230	818
	9.50	502	334	559	372	674	448	830	552	1000	668	1170	775
	10.0	477	317	531	353	640	426	788	525	953	634	1110	737
	10.5	454	302	506	337	609	405	751	500	908	604	1050	701
	11.0	433	288	483	321	582	387	717	477	867	577	1010	670
	11.5	415	276	462	307	556	370	686	456	829	552	963	640
	12.0	397	264	443	295	533	355	657	437	794	529	923	614
	12.5	381	254	425	283	512	341	631	420	763	507	886	589
	13.0	367	244	409	272	492	328	606	404	733	488	852	567
	13.5	353	235	394	262	474	315	584	389	706	470	820	546
	14.0	341	227	379	252	457	304	563	375	681	453	791	526
	14.5	329	219	366	244	441	294	544	362	657	437	763	508
	15.0	318	211	354	236	427	284	526	350	636	423	738	491
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	4770	3170	5310	3530	6400	4260	7880	5250	9530	6340	11100	7370
$\phi_b M_p$	M_p/Ω_b , kN·m	596	397	664	442	800	532	986	656	1190	793	1380	921
$\phi_b M_r$	M_r/Ω_b , kN·m	374	249	416	277	500	332	615	409	743	494	861	573
$\phi_b BF$	BF/Ω_b , kN	18.5	12.3	21.1	14.1	27.0	17.9	35.4	23.5	45.0	30.0	56.2	37.4
$\phi_v V_n$	V_n/Ω_v , kN	673	449	743	495	891	594	1040	693	1200	798	1360	908
	$Z_x \times 10^3$, mm^3	2408		2683		3232		3982		4815		5591	
	L_p , m	3.57		3.56		3.51		3.48		3.45		3.40	
	L_r , m	15.6		15.3		14.6		13.9		13.4		12.7	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



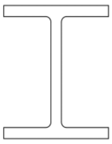
Maximum Total Uniform Load, kN
HEB Shapes

F_y = 275 MPa

Shape		HEB 600		HEB 650		HEB 700		HEB 800		HEB 900		HEB 1000	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**3070**	**2050**	**3430**	**2290**	**3930**	**2620**	**4620**	**3080**	**5490**	**3660**	**6270**	**4180**
	1.50	**3070**	**2050**	**3430**	**2290**	**3930**	**2620**	**4620**	**3080**	**5490**	**3660**	**6270**	**4180**
	2.00	**3070**	**2050**	**3430**	**2290**	**3930**	**2620**	**4620**	**3080**	**5490**	**3660**	**6270**	**4180**
	2.50	**3070**	**2050**	**3430**	**2290**	**3930**	**2620**	**4620**	**3080**	**5490**	**3660**	**6270**	**4180**
	3.00	**3070**	**2050**	**3430**	**2290**	**3930**	**2620**	**4620**	**3080**	**5490**	**3660**	**6270**	**4180**
	3.50	**3070**	**2050**	**3430**	**2290**	**3930**	**2620**	**4620**	**3080**	**5490**	**3660**	**6270**	**4180**
	4.00	**3070**	**2050**	**3430**	**2290**	**3930**	**2620**	**4620**	**3080**	**5490**	**3660**	**6270**	**4180**
	4.50	2830	1880	3220	2140	3660	2440	4500	2990	**5490**	**3660**	**6270**	**4180**
	5.00	2540	1690	2900	1930	3300	2190	4050	2700	4980	3310	5880	3920
	5.50	2310	1540	2640	1750	3000	1990	3680	2450	4530	3010	5350	3560
	6.00	2120	1410	2420	1610	2750	1830	3380	2250	4150	2760	4900	3260
	6.50	1960	1300	2230	1480	2540	1690	3120	2070	3830	2550	4530	3010
	7.00	1820	1210	2070	1380	2360	1570	2890	1930	3560	2370	4200	2800
	7.50	1700	1130	1930	1290	2200	1460	2700	1800	3320	2210	3920	2610
	8.00	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
	8.50	1500	996	1710	1130	1940	1290	2380	1590	2930	1950	3460	2300
	9.00	1410	940	1610	1070	1830	1220	2250	1500	2770	1840	3270	2180
	9.50	1340	891	1530	1020	1740	1150	2130	1420	2620	1740	3100	2060
	10.0	1270	846	1450	964	1650	1100	2030	1350	2490	1660	2940	1960
	10.5	1210	806	1380	918	1570	1040	1930	1280	2370	1580	2800	1860
	11.0	1160	769	1320	877	1500	997	1840	1230	2260	1510	2670	1780
	11.5	1110	736	1260	839	1430	954	1760	1170	2170	1440	2560	1700
	12.0	1060	705	1210	804	1370	914	1690	1120	2080	1380	2450	1630
	12.5	1020	677	1160	771	1320	878	1620	1080	1990	1330	2350	1570
	13.0	979	651	1110	742	1270	844	1560	1040	1920	1270	2260	1510
	13.5	942	627	1070	714	1220	813	1500	998	1850	1230	2180	1450
	14.0	909	605	1040	689	1180	784	1450	963	1780	1180	2100	1400
	14.5	877	584	1000	665	1140	757	1400	929	1720	1140	2030	1350
	15.0	848	564	966	643	1100	731	1350	898	1660	1100	1960	1310
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	12700	8460	14500	9640	16500	11000	20300	13500	24900	16600	29400	19600
$\phi_b M_p$	M_p/Ω_b, kN·m	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
$\phi_b M_r$	M_r/Ω_b, kN·m	988	657	1120	747	1270	846	1560	1030	1900	1270	2230	1490
$\phi_b BF$	BF/Ω_b, kN	68.8	45.8	82.7	55.0	98.4	65.5	133	88.5	174	115	219	146
$\phi_v V_n$	V_n/Ω_v, kN	1530	1020	1720	1140	1960	1310	2310	1540	2750	1830	3140	2090
	$Z_x \times 10^3$, mm^3	6425		7320		8327		10230		12580		14860	
	L_p, m	3.36		3.32		3.26		3.17		3.10		3.03	
	L_r, m	12.1		11.6		11.3		10.5		10.1		9.62	
LRFD	ASD												
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

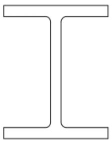


Maximum Total Uniform Load, kN
HEB Shapes

F_y = 355 MPa

Shape		**HEB 100**		**HEB 120**		**HEB 140**		**HEB 160**		**HEB 180**		**HEB 200**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**256**	**170**	**332**	**222**	**417**	**278**	**545**	**364**	**652**	**435**	**767**	**511**
	1.50	178	118	282	187	**417**	**278**	**545**	**364**	**652**	**435**	**767**	**511**
	2.00	133	88.6	211	140	314	209	452	301	615	409	**767**	**511**
	2.50	107	70.9	169	112	251	167	362	241	492	327	657	437
	3.00	88.8	59.1	141	93.6	209	139	302	201	410	273	547	364
	3.50	76.1	50.6	121	80.3	179	119	259	172	352	234	469	312
	4.00	66.6	44.3	106	70.2	157	104	226	151	308	205	411	273
	4.50	59.2	39.4	93.8	62.4	139	92.7	201	134	273	182	365	243
	5.00	53.3	35.4	84.5	56.2	125	83.5	181	120	246	164	328	219
	5.50	48.4	32.2	76.8	51.1	114	75.9	165	109	224	149	299	199
	6.00	44.4	29.5	70.4	46.8	105	69.6	151	100	205	136	274	182
	6.50	41.0	27.3	65.0	43.2	96.5	64.2	139	92.6	189	126	253	168
	7.00	38.0	25.3	60.3	40.1	89.6	59.6	129	86.0	176	117	235	156
	7.50	35.5	23.6	56.3	37.5	83.6	55.6	121	80.3	164	109	219	146
	8.00	33.3	22.2	52.8	35.1	78.4	52.2	113	75.3	154	102	205	137
	8.50	31.3	20.8	49.7	33.1	73.8	49.1	106	70.8	145	96.3	193	129
	9.00	29.6	19.7	46.9	31.2	69.7	46.4	101	66.9	137	91.0	182	121
	9.50	28.0	18.7	44.4	29.6	66.0	43.9	95.2	63.4	130	86.2	173	115
	10.0	26.6	17.7	42.2	28.1	62.7	41.7	90.5	60.2	123	81.9	164	109
	10.5	25.4	16.9	40.2	26.8	59.7	39.7	86.2	57.3	117	78.0	156	104
	11.0	24.2	16.1	38.4	25.5	57.0	37.9	82.3	54.7	112	74.4	149	99.3
	11.5	23.2	15.4	36.7	24.4	54.5	36.3	78.7	52.3	107	71.2	143	95.0
	12.0	22.2	14.8	35.2	23.4	52.3	34.8	75.4	50.2	103	68.2	137	91.1
	12.5	21.3	14.2	33.8	22.5	50.2	33.4	72.4	48.2	98.4	65.5	131	87.4
	13.0	20.5	13.6	32.5	21.6	48.2	32.1	69.6	46.3	94.7	63.0	126	84.0
	13.5	19.7	13.1	31.3	20.8	46.5	30.9	67.0	44.6	91.1	60.6	122	80.9
	14.0	19.0	12.7	30.2	20.1	44.8	29.8	64.6	43.0	87.9	58.5	117	78.0
	14.5	18.4	12.2	29.1	19.4	43.3	28.8	62.4	41.5	84.9	56.5	113	75.4
	15.0	17.8	11.8	28.2	18.7	41.8	27.8	60.3	40.1	82.0	54.6	109	72.8
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	266	177	422	281	627	417	905	602	1230	819	1640	1090
$\phi_b M_p$	M_p/Ω_b, kN·m	33.3	22.2	52.8	35.1	78.4	52.2	113	75.3	154	102	205	137
$\phi_b M_r$	M_r/Ω_b, kN·m	20.1	13.4	32.2	21.4	48.2	32.1	69.7	46.4	95.2	63.3	127	84.8
$\phi_b BF$	BF/Ω_b, kN	2.24	1.49	3.39	2.26	4.77	3.17	6.27	4.17	8.11	5.40	10.1	6.70
$\phi_v V_n$	V_n/Ω_v, kN	128	85.2	166	111	209	139	273	182	326	217	383	256
	$Z_x \times 10^3$, mm^3	104.2		165.2		245.4		345.0		481.4		642.5	
	L_p, m	1.06		1.28		1.50		1.69		1.91		2.12	
	L_r, m	6.93		7.34		7.82		8.62		9.14		9.85	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEB Shapes

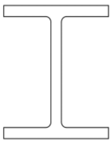
F_y = 355 MPa

Shape		HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**890**	**594**	**1020**	**682**	**1110**	**738**	**1250**	**835**	**1410**	**937**	**1570**	**1050**
	1.50	**890**	**594**	**1020**	**682**	**1110**	**738**	**1250**	**835**	**1410**	**937**	**1570**	**1050**
	2.00	**890**	**594**	**1020**	**682**	**1110**	**738**	**1250**	**835**	**1410**	**937**	**1570**	**1050**
	2.50	846	563	**1020**	**682**	**1110**	**738**	**1250**	**835**	**1410**	**937**	**1570**	**1050**
	3.00	705	469	897	597	1090	727	**1250**	**835**	**1410**	**937**	**1570**	**1050**
	3.50	604	402	769	512	937	623	1120	745	1360	908	**1570**	**1050**
	4.00	528	352	673	448	820	545	980	652	1190	795	1370	914
	4.50	470	313	598	398	729	485	871	580	1060	706	1220	812
	5.00	423	281	538	358	656	436	784	522	955	636	1100	731
	5.50	384	256	489	326	596	397	713	474	869	578	999	664
	6.00	352	234	449	298	547	364	653	435	796	530	915	609
	6.50	325	216	414	275	505	336	603	401	735	489	845	562
	7.00	302	201	384	256	468	312	560	373	682	454	785	522
	7.50	282	188	359	239	437	291	523	348	637	424	732	487
	8.00	264	176	336	224	410	273	490	326	597	397	687	457
	8.50	249	165	317	211	386	257	461	307	562	374	646	430
	9.00	235	156	299	199	364	242	436	290	531	353	610	406
	9.50	223	148	283	188	345	230	413	275	503	335	578	385
	10.0	211	141	269	179	328	218	392	261	478	318	549	365
	10.5	201	134	256	171	312	208	373	248	455	303	523	348
	11.0	192	128	245	163	298	198	356	237	434	289	499	332
	11.5	184	122	234	156	285	190	341	227	415	276	478	318
	12.0	176	117	224	149	273	182	327	217	398	265	458	305
	12.5	169	113	215	143	262	175	314	209	382	254	439	292
	13.0	163	108	207	138	252	168	302	201	367	244	423	281
	13.5	157	104	199	133	243	162	290	193	354	235	407	271
	14.0	151	100	192	128	234	156	280	186	341	227	392	261
	14.5	146	97.0	186	123	226	150	270	180	329	219	379	252
	15.0	141	93.8	179	119	219	145	261	174	318	212	366	244
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	2110	1410	2690	1790	3280	2180	3920	2610	4780	3180	5490	3650
$\phi_b M_p$	M_p/Ω_b , kN·m	264	176	336	224	410	273	490	326	597	397	687	457
$\phi_b M_r$	M_r/Ω_b , kN·m	164	109	210	140	257	171	308	205	375	250	431	287
$\phi_b BF$	BF/Ω_b , kN	12.4	8.23	14.7	9.81	17.5	11.6	20.5	13.6	23.5	15.6	27.1	18.0
$\phi_v V_n$	V_n/Ω_v , kN	445	297	511	341	554	369	626	417	703	469	784	523
	$Z_x \times 10^3$, mm^3	827.0		1053		1283		1534		1869		2149	
	L_p , m	2.34		2.54		2.75		2.96		3.17		3.16	
	L_r , m	10.4		11.1		11.5		11.9		12.6		12.6	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

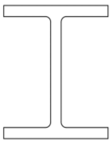


Maximum Total Uniform Load, kN
HEB Shapes

F_y = 355 MPa

Shape		**HEB 340**		**HEB 360**		**HEB 400**		**HEB 450**		**HEB 500**		**HEB 550**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**1740**	**1160**	**1920**	**1280**	**2300**	**1530**	**2680**	**1790**	**3090**	**2060**	**3510**	**2340**
	1.50	**1740**	**1160**	**1920**	**1280**	**2300**	**1530**	**2680**	**1790**	**3090**	**2060**	**3510**	**2340**
	2.00	**1740**	**1160**	**1920**	**1280**	**2300**	**1530**	**2680**	**1790**	**3090**	**2060**	**3510**	**2340**
	2.50	**1740**	**1160**	**1920**	**1280**	**2300**	**1530**	**2680**	**1790**	**3090**	**2060**	**3510**	**2340**
	3.00	**1740**	**1160**	**1920**	**1280**	**2300**	**1530**	**2680**	**1790**	**3090**	**2060**	**3510**	**2340**
	3.50	**1740**	**1160**	**1920**	**1280**	**2300**	**1530**	**2680**	**1790**	**3090**	**2060**	**3510**	**2340**
	4.00	1540	1020	1710	1140	2070	1370	2540	1690	3080	2050	**3510**	**2340**
	4.50	1370	910	1520	1010	1840	1220	2260	1500	2730	1820	3180	2110
	5.00	1230	819	1370	913	1650	1100	2040	1350	2460	1640	2860	1900
	5.50	1120	745	1250	830	1500	999	1850	1230	2240	1490	2600	1730
	6.00	1030	683	1140	760	1380	916	1700	1130	2050	1360	2380	1580
	6.50	947	630	1060	702	1270	846	1570	1040	1890	1260	2200	1460
	7.00	879	585	980	652	1180	785	1450	967	1760	1170	2040	1360
	7.50	821	546	914	608	1100	733	1360	903	1640	1090	1910	1270
	8.00	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
	8.50	724	482	807	537	972	647	1200	797	1450	963	1680	1120
	9.00	684	455	762	507	918	611	1130	752	1370	910	1590	1060
	9.50	648	431	722	480	870	579	1070	713	1300	862	1500	1000
	10.0	615	410	686	456	826	550	1020	677	1230	819	1430	951
	10.5	586	390	653	435	787	523	969	645	1170	780	1360	906
	11.0	560	372	623	415	751	500	925	616	1120	744	1300	864
	11.5	535	356	596	397	718	478	885	589	1070	712	1240	827
	12.0	513	341	571	380	688	458	848	564	1030	682	1190	792
	12.5	492	328	549	365	661	440	814	542	985	655	1140	761
	13.0	473	315	528	351	635	423	783	521	947	630	1100	731
	13.5	456	303	508	338	612	407	754	502	912	607	1060	704
	14.0	440	293	490	326	590	393	727	484	879	585	1020	679
	14.5	424	282	473	315	570	379	702	467	849	565	986	656
	15.0	410	273	457	304	551	366	679	451	820	546	953	634
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	6150	4100	6860	4560	8260	5500	10200	6770	12300	8190	14300	9510
$\phi_b M_p$	M_p/Ω_b , kN·m	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
$\phi_b M_r$	M_r/Ω_b , kN·m	482	321	537	357	645	429	794	528	959	638	1110	740
$\phi_b BF$	BF/Ω_b , kN	31.1	20.7	35.4	23.5	45.0	29.9	58.7	39.1	74.4	49.5	92.2	61.4
$\phi_v V_n$	V_n/Ω_v , kN	869	579	959	639	1150	767	1340	895	1540	1030	1760	1170
	$Z_x \times 10^3$, mm^3	2408		2683		3232		3982		4815		5591	
	L_p , m	3.15		3.13		3.09		3.06		3.04		3.00	
	L_r , m	12.4		12.2		11.7		11.2		10.8		10.3	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEB Shapes

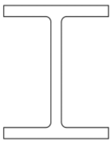
F_y = 355 MPa

Shape		HEB 600		HEB 650		HEB 700		HEB 800		HEB 900		HEB 1000	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**3960**	**2640**	**4430**	**2950**	**5070**	**3380**	**5960**	**3980**	**7090**	**4730**	**8090**	**5400**
	1.50	**3960**	**2640**	**4430**	**2950**	**5070**	**3380**	**5960**	**3980**	**7090**	**4730**	**8090**	**5400**
	2.00	**3960**	**2640**	**4430**	**2950**	**5070**	**3380**	**5960**	**3980**	**7090**	**4730**	**8090**	**5400**
	2.50	**3960**	**2640**	**4430**	**2950**	**5070**	**3380**	**5960**	**3980**	**7090**	**4730**	**8090**	**5400**
	3.00	**3960**	**2640**	**4430**	**2950**	**5070**	**3380**	**5960**	**3980**	**7090**	**4730**	**8090**	**5400**
	3.50	**3960**	**2640**	**4430**	**2950**	**5070**	**3380**	**5960**	**3980**	**7090**	**4730**	**8090**	**5400**
	4.00	**3960**	**2640**	**4430**	**2950**	**5070**	**3380**	**5960**	**3980**	**7090**	**4730**	**8090**	**5400**
	4.50	3650	2430	4160	2770	4730	3150	5810	3870	**7090**	**4730**	**8090**	**5400**
	5.00	3280	2190	3740	2490	4260	2830	5230	3480	6430	4280	7600	5050
	5.50	2990	1990	3400	2260	3870	2570	4750	3160	5850	3890	6910	4590
	6.00	2740	1820	3120	2070	3550	2360	4360	2900	5360	3570	6330	4210
	6.50	2530	1680	2880	1920	3270	2180	4020	2680	4950	3290	5840	3890
	7.00	2350	1560	2670	1780	3040	2020	3740	2490	4590	3060	5430	3610
	7.50	2190	1460	2490	1660	2840	1890	3490	2320	4290	2850	5060	3370
	8.00	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
	8.50	1930	1290	2200	1460	2500	1670	3080	2050	3780	2520	4470	2970
	9.00	1820	1210	2080	1380	2360	1570	2910	1930	3570	2380	4220	2810
	9.50	1730	1150	1970	1310	2240	1490	2750	1830	3380	2250	4000	2660
	10.0	1640	1090	1870	1240	2130	1420	2610	1740	3220	2140	3800	2530
	10.5	1560	1040	1780	1190	2030	1350	2490	1660	3060	2040	3620	2410
	11.0	1490	993	1700	1130	1930	1290	2380	1580	2920	1940	3450	2300
	11.5	1430	950	1630	1080	1850	1230	2270	1510	2800	1860	3300	2200
	12.0	1370	911	1560	1040	1770	1180	2180	1450	2680	1780	3170	2110
	12.5	1310	874	1500	996	1700	1130	2090	1390	2570	1710	3040	2020
	13.0	1260	840	1440	958	1640	1090	2010	1340	2470	1650	2920	1940
	13.5	1220	809	1390	922	1580	1050	1940	1290	2380	1580	2810	1870
	14.0	1170	780	1340	889	1520	1010	1870	1240	2300	1530	2710	1810
	14.5	1130	754	1290	859	1470	977	1800	1200	2220	1480	2620	1740
	15.0	1090	728	1250	830	1420	944	1740	1160	2140	1430	2530	1680
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	16400	10900	18700	12400	21300	14200	26100	17400	32200	21400	38000	25300
$\phi_b M_p$	M_p/Ω_b, kN·m	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
$\phi_b M_r$	M_r/Ω_b, kN·m	1280	848	1450	964	1640	1090	2010	1340	2460	1630	2880	1920
$\phi_b BF$	BF/Ω_b, kN	112	74.6	134	89.1	158	105	212	141	274	182	342	228
$\phi_v V_n$	V_n/Ω_v, kN	1980	1320	2220	1480	2530	1690	2980	1990	3550	2360	4050	2700
	$Z_x \times 10^3$, mm^3	6425		7320		8327		10230		12580		14860	
	L_p, m	2.96		2.92		2.87		2.79		2.73		2.67	
	L_r, m	9.90		9.56		9.30		8.75		8.44		8.12	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEM Shapes

F_y = 235 MPa

Shape		HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	399	265	**494**	**329**	**587**	**391**	**711**	**474**	**818**	**545**	**931**	**620**
	1.50	266	177	395	263	557	371	**711**	**474**	**818**	**545**	**931**	**620**
	2.00	199	133	297	197	418	278	571	380	747	497	**931**	**620**
	2.50	160	106	237	158	334	222	457	304	598	398	768	511
	3.00	133	88.5	198	132	279	185	380	253	498	331	640	426
	3.50	114	75.8	169	113	239	159	326	217	427	284	549	365
	4.00	99.7	66.4	148	98.7	209	139	285	190	374	249	480	319
	4.50	88.7	59.0	132	87.7	186	124	254	169	332	221	427	284
	5.00	79.8	53.1	119	78.9	167	111	228	152	299	199	384	256
	5.50	72.5	48.3	108	71.8	152	101	208	138	272	181	349	232
	6.00	66.5	44.2	98.9	65.8	139	92.6	190	127	249	166	320	213
	6.50	61.4	40.8	91.3	60.7	129	85.5	176	117	230	153	295	197
	7.00	57.0	37.9	84.7	56.4	119	79.4	163	108	214	142	274	183
	7.50	53.2	35.4	79.1	52.6	111	74.1	152	101	199	133	256	170
	8.00	49.9	33.2	74.2	49.3	104	69.5	143	94.9	187	124	240	160
	8.50	46.9	31.2	69.8	46.4	98.3	65.4	134	89.3	176	117	226	150
	9.00	44.3	29.5	65.9	43.9	92.8	61.8	127	84.4	166	110	213	142
	9.50	42.0	27.9	62.4	41.5	87.9	58.5	120	79.9	157	105	202	134
	10.0	39.9	26.5	59.3	39.5	83.6	55.6	114	75.9	149	99.4	192	128
	10.5	38.0	25.3	56.5	37.6	79.6	52.9	109	72.3	142	94.7	183	122
	11.0	36.3	24.1	53.9	35.9	76.0	50.5	104	69.0	136	90.4	175	116
	11.5	34.7	23.1	51.6	34.3	72.7	48.3	99.3	66.0	130	86.5	167	111
	12.0	33.2	22.1	49.4	32.9	69.6	46.3	95.1	63.3	125	82.9	160	106
	12.5	31.9	21.2	47.5	31.6	66.8	44.5	91.3	60.8	120	79.6	154	102
	13.0	30.7	20.4	45.6	30.4	64.3	42.8	87.8	58.4	115	76.5	148	98.3
	13.5	29.6	19.7	43.9	29.2	61.9	41.2	84.5	56.3	111	73.7	142	94.6
	14.0	28.5	19.0	42.4	28.2	59.7	39.7	81.5	54.2	107	71.0	137	91.3
	14.5	27.5	18.3	40.9	27.2	57.6	38.3	78.7	52.4	103	68.6	132	88.1
	15.0	26.6	17.7	39.5	26.3	55.7	37.1	76.1	50.6	99.6	66.3	128	85.2
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	399	265	593	395	836	556	1140	759	1490	994	1920	1280
$\phi_b M_p$	M_p/Ω_b , kN·m	49.9	33.2	74.2	49.3	104	69.5	143	94.9	187	124	240	160
$\phi_b M_r$	M_r/Ω_b , kN·m	28.2	18.8	42.7	28.4	60.9	40.5	83.9	55.8	111	73.7	143	95.3
$\phi_b BF$	BF/Ω_b , kN	1.13	0.753	1.64	1.09	2.24	1.49	2.91	1.94	3.70	2.46	4.56	3.04
$\phi_v V_n$	V_n/Ω_v , kN	203	135	247	165	293	196	355	237	409	273	465	310
	$Z_x \times 10^3$, mm^3	235.8		350.6		493.8		674.6		883.4		1135	
	L_p , m	1.41		1.67		1.94		2.19		2.45		2.71	
	L_r , m	20.6		20.9		21.4		22.4		23.0		23.9	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

Maximum Total Uniform Load, kN
HEM Shapes

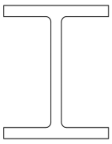
F_y = 235 MPa

Shape		HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**1050**	**699**	**1370**	**914**	**1470**	**981**	**1620**	**1080**	**2010**	**1340**	**2130**	**1420**
	1.50	**1050**	**699**	**1370**	**914**	**1470**	**981**	**1620**	**1080**	**2010**	**1340**	**2130**	**1420**
	2.00	**1050**	**699**	**1370**	**914**	**1470**	**981**	**1620**	**1080**	**2010**	**1340**	**2130**	**1420**
	2.50	960	639	**1370**	**914**	**1470**	**981**	**1620**	**1080**	**2010**	**1340**	**2130**	**1420**
	3.00	800	532	1190	794	1420	947	**1620**	**1080**	**2010**	**1340**	**2130**	**1420**
	3.50	686	456	1020	681	1220	812	1430	954	**1970**	**1310**	**2130**	**1420**
	4.00	600	399	895	596	1070	710	1250	835	1720	1150	1880	1250
	4.50	534	355	796	530	949	631	1120	742	1530	1020	1670	1110
	5.00	480	319	716	477	854	568	1000	668	1380	918	1500	999
	5.50	437	290	651	433	776	517	912	607	1250	835	1360	908
	6.00	400	266	597	397	712	474	836	556	1150	765	1250	832
	6.50	369	246	551	367	657	437	772	514	1060	706	1150	768
	7.00	343	228	512	340	610	406	717	477	986	656	1070	713
	7.50	320	213	478	318	569	379	669	445	920	612	1000	666
	8.00	300	200	448	298	534	355	627	417	862	574	938	624
	8.50	282	188	421	280	502	334	590	393	812	540	883	587
	9.00	267	177	398	265	475	316	558	371	767	510	834	555
	9.50	253	168	377	251	450	299	528	351	726	483	790	526
	10.0	240	160	358	238	427	284	502	334	690	459	750	499
	10.5	229	152	341	227	407	271	478	318	657	437	715	475
	11.0	218	145	326	217	388	258	456	304	627	417	682	454
	11.5	209	139	311	207	371	247	436	290	600	399	653	434
	12.0	200	133	298	199	356	237	418	278	575	383	625	416
	12.5	192	128	287	191	342	227	401	267	552	367	600	399
	13.0	185	123	276	183	329	219	386	257	531	353	577	384
	13.5	178	118	265	177	316	210	372	247	511	340	556	370
	14.0	171	114	256	170	305	203	358	238	493	328	536	357
	14.5	166	110	247	164	295	196	346	230	476	317	518	344
	15.0	160	106	239	159	285	189	335	223	460	306	500	333
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	2400	1600	3580	2380	4270	2840	5020	3340	6900	4590	7500	4990
$\phi_b M_p$	M_p/Ω_b , kN·m	300	200	448	298	534	355	627	417	862	574	938	624
$\phi_b M_r$	M_r/Ω_b , kN·m	180	120	266	177	320	213	378	251	516	343	562	374
$\phi_b BF$	BF/Ω_b , kN	5.55	3.69	6.82	4.53	8.03	5.35	9.38	6.24	11.0	7.31	12.5	8.34
$\phi_v V_n$	V_n/Ω_v , kN	525	350	685	457	736	491	809	539	1010	671	1060	709
	$Z_x \times 10^3$, mm^3	1419		2117		2524		2966		4078		4435	
	L_p , m	2.97		3.28		3.54		3.80		4.11		4.08	
	L_r , m	24.6		29.9		30.2		30.4		35.7		34.1	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

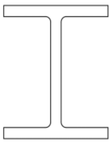


Maximum Total Uniform Load, kN
HEM Shapes

F_y = 235 MPa

Shape		HEM 340		HEM 360		HEM 400		HEM 450		HEM 500		HEM 550	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**2230**	**1490**	**2340**	**1560**	**2560**	**1710**	**2830**	**1890**	**3100**	**2070**	**3390**	**2260**
	1.50	**2230**	**1490**	**2340**	**1560**	**2560**	**1710**	**2830**	**1890**	**3100**	**2070**	**3390**	**2260**
	2.00	**2230**	**1490**	**2340**	**1560**	**2560**	**1710**	**2830**	**1890**	**3100**	**2070**	**3390**	**2260**
	2.50	**2230**	**1490**	**2340**	**1560**	**2560**	**1710**	**2830**	**1890**	**3100**	**2070**	**3390**	**2260**
	3.00	**2230**	**1490**	**2340**	**1560**	**2560**	**1710**	**2830**	**1890**	**3100**	**2070**	**3390**	**2260**
	3.50	**2230**	**1490**	**2340**	**1560**	**2560**	**1710**	**2830**	**1890**	**3100**	**2070**	**3390**	**2260**
	4.00	2000	1330	2110	1400	2360	1570	2680	1780	3000	2000	3360	2230
	4.50	1770	1180	1880	1250	2090	1390	2380	1580	2670	1770	2980	1980
	5.00	1600	1060	1690	1120	1890	1250	2140	1430	2400	1600	2680	1790
	5.50	1450	966	1530	1020	1710	1140	1950	1300	2180	1450	2440	1620
	6.00	1330	885	1410	936	1570	1050	1790	1190	2000	1330	2240	1490
	6.50	1230	817	1300	864	1450	965	1650	1100	1850	1230	2070	1370
	7.00	1140	759	1210	802	1350	896	1530	1020	1710	1140	1920	1280
	7.50	1060	708	1130	749	1260	836	1430	950	1600	1060	1790	1190
	8.00	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
	8.50	939	625	993	661	1110	738	1260	838	1410	940	1580	1050
	9.00	887	590	938	624	1050	697	1190	792	1330	887	1490	992
	9.50	840	559	889	591	992	660	1130	750	1260	841	1410	940
	10.0	798	531	844	562	943	627	1070	713	1200	799	1340	893
	10.5	760	506	804	535	898	597	1020	679	1140	761	1280	851
	11.0	726	483	767	511	857	570	974	648	1090	726	1220	812
	11.5	694	462	734	488	820	545	931	620	1040	694	1170	777
	12.0	665	443	703	468	786	523	893	594	1000	666	1120	744
	12.5	639	425	675	449	754	502	857	570	960	639	1070	714
	13.0	614	409	649	432	725	482	824	548	923	614	1030	687
	13.5	591	393	625	416	698	465	793	528	889	592	994	662
	14.0	570	379	603	401	673	448	765	509	857	570	959	638
	14.5	551	366	582	387	650	433	739	492	828	551	926	616
	15.0	532	354	563	374	628	418	714	475	800	532	895	595
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	7980	5310	8440	5620	9430	6270	10700	7130	12000	7990	13400	8930
$\phi_b M_p$	M_p/Ω_b , kN·m	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
$\phi_b M_r$	M_r/Ω_b , kN·m	600	399	636	423	714	475	814	542	915	609	1020	682
$\phi_b BF$	BF/Ω_b , kN	14.2	9.47	16.1	10.7	20.3	13.5	26.4	17.6	33.6	22.4	42.2	28.1
$\phi_v V_n$	V_n/Ω_v , kN	1120	744	1170	780	1280	853	1420	944	1550	1030	1690	1130
	$Z_x \times 10^3$, mm^3	4718		4989		5571		6331		7094		7933	
	L_p , m	4.06		4.02		3.95		3.90		3.83		3.77	
	L_r , m	32.0		30.1		26.9		23.8		21.3		19.2	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEM Shapes

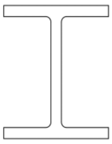
F_y = 235 MPa

Shape		HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**3670**	**2450**	**3960**	**2640**	**4240**	**2830**	**4820**	**3210**	**5390**	**3590**	**5970**	**3980**
	1.50	**3670**	**2450**	**3960**	**2640**	**4240**	**2830**	**4820**	**3210**	**5390**	**3590**	**5970**	**3980**
	2.00	**3670**	**2450**	**3960**	**2640**	**4240**	**2830**	**4820**	**3210**	**5390**	**3590**	**5970**	**3980**
	2.50	**3670**	**2450**	**3960**	**2640**	**4240**	**2830**	**4820**	**3210**	**5390**	**3590**	**5970**	**3980**
	3.00	**3670**	**2450**	**3960**	**2640**	**4240**	**2830**	**4820**	**3210**	**5390**	**3590**	**5970**	**3980**
	3.50	**3670**	**2450**	**3960**	**2640**	**4240**	**2830**	**4820**	**3210**	**5390**	**3590**	**5970**	**3980**
	4.00	**3670**	**2450**	**3960**	**2640**	**4240**	**2830**	**4820**	**3210**	**5390**	**3590**	**5970**	**3980**
	4.50	3300	2190	3630	2420	3960	2640	4700	3120	**5390**	**3590**	**5970**	**3980**
	5.00	2970	1980	3270	2170	3570	2370	4230	2810	4890	3250	5610	3730
	5.50	2700	1800	2970	1980	3240	2160	3840	2560	4440	2960	5100	3390
	6.00	2470	1650	2720	1810	2970	1980	3520	2340	4070	2710	4670	3110
	6.50	2280	1520	2510	1670	2740	1830	3250	2160	3760	2500	4310	2870
	7.00	2120	1410	2330	1550	2550	1700	3020	2010	3490	2320	4010	2660
	7.50	1980	1320	2180	1450	2380	1580	2820	1870	3260	2170	3740	2490
	8.00	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
	8.50	1750	1160	1920	1280	2100	1400	2490	1650	2870	1910	3300	2190
	9.00	1650	1100	1820	1210	1980	1320	2350	1560	2710	1810	3120	2070
	9.50	1560	1040	1720	1140	1880	1250	2220	1480	2570	1710	2950	1960
	10.0	1480	988	1630	1090	1780	1190	2110	1410	2440	1630	2800	1870
	10.5	1410	940	1560	1040	1700	1130	2010	1340	2330	1550	2670	1780
	11.0	1350	898	1490	988	1620	1080	1920	1280	2220	1480	2550	1700
	11.5	1290	859	1420	945	1550	1030	1840	1220	2120	1410	2440	1620
	12.0	1240	823	1360	906	1490	989	1760	1170	2040	1350	2340	1550
	12.5	1190	790	1310	870	1430	949	1690	1120	1950	1300	2240	1490
	13.0	1140	760	1260	836	1370	913	1630	1080	1880	1250	2160	1430
	13.5	1100	731	1210	805	1320	879	1570	1040	1810	1200	2080	1380
	14.0	1060	705	1170	777	1270	848	1510	1000	1750	1160	2000	1330
	14.5	1020	681	1130	750	1230	818	1460	970	1680	1120	1930	1290
	15.0	989	658	1090	725	1190	791	1410	937	1630	1080	1870	1240
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	14800	9880	16300	10900	17800	11900	21100	14100	24400	16300	28000	18700
$\phi_b M_p$	M_p/Ω_b , kN·m	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
$\phi_b M_r$	M_r/Ω_b , kN·m	1130	755	1250	831	1360	906	1610	1070	1860	1240	2120	1410
$\phi_b BF$	BF/Ω_b , kN	52.0	34.6	63.0	41.9	75.3	50.1	104	68.9	135	90.1	172	114
$\phi_v V_n$	V_n/Ω_v , kN	1840	1220	1980	1320	2120	1410	2410	1610	2690	1800	2980	1990
	$Z_x \times 10^3$, mm^3	8772		9657		10540		12490		14440		16570	
	L_p , m	3.71		3.66		3.60		3.49		3.39		3.31	
	L_r , m	17.6		16.3		15.1		13.5		12.2		11.4	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

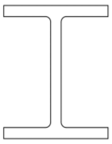


Maximum Total Uniform Load, kN
HEM Shapes

F_y = 275 MPa

Shape		**HEM 100**		**HEM 120**		**HEM 140**		**HEM 160**		**HEM 180**		**HEM 200**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	467	311	**578**	**385**	**686**	**458**	**832**	**554**	**957**	**638**	**1090**	**726**
	1.50	311	207	463	308	652	434	**832**	**554**	**957**	**638**	**1090**	**726**
	2.00	233	155	347	231	489	325	668	444	875	582	**1090**	**726**
	2.50	187	124	278	185	391	260	534	355	700	466	899	598
	3.00	156	104	231	154	326	217	445	296	583	388	749	498
	3.50	133	88.8	198	132	279	186	382	254	500	333	642	427
	4.00	117	77.7	174	115	244	163	334	222	437	291	562	374
	4.50	104	69.0	154	103	217	145	297	197	389	259	499	332
	5.00	93.4	62.1	139	92.4	196	130	267	178	350	233	449	299
	5.50	84.9	56.5	126	84.0	178	118	243	162	318	212	409	272
	6.00	77.8	51.8	116	77.0	163	108	223	148	292	194	375	249
	6.50	71.8	47.8	107	71.1	150	100	205	137	269	179	346	230
	7.00	66.7	44.4	99.2	66.0	140	92.9	191	127	250	166	321	214
	7.50	62.3	41.4	92.6	61.6	130	86.7	178	118	233	155	300	199
	8.00	58.4	38.8	86.8	57.7	122	81.3	167	111	219	145	281	187
	8.50	54.9	36.5	81.7	54.3	115	76.5	157	105	206	137	264	176
	9.00	51.9	34.5	77.1	51.3	109	72.3	148	98.7	194	129	250	166
	9.50	49.1	32.7	73.1	48.6	103	68.5	141	93.5	184	123	237	157
	10.0	46.7	31.1	69.4	46.2	97.8	65.1	134	88.9	175	116	225	150
	10.5	44.5	29.6	66.1	44.0	93.1	62.0	127	84.6	167	111	214	142
	11.0	42.4	28.2	63.1	42.0	88.9	59.1	121	80.8	159	106	204	136
	11.5	40.6	27.0	60.4	40.2	85.0	56.6	116	77.3	152	101	195	130
	12.0	38.9	25.9	57.8	38.5	81.5	54.2	111	74.1	146	97.0	187	125
	12.5	37.4	24.9	55.5	36.9	78.2	52.0	107	71.1	140	93.1	180	120
	13.0	35.9	23.9	53.4	35.5	75.2	50.0	103	68.4	135	89.5	173	115
	13.5	34.6	23.0	51.4	34.2	72.4	48.2	98.9	65.8	130	86.2	166	111
	14.0	33.3	22.2	49.6	33.0	69.8	46.5	95.4	63.5	125	83.1	161	107
	14.5	32.2	21.4	47.9	31.9	67.4	44.9	92.1	61.3	121	80.3	155	103
	15.0	31.1	20.7	46.3	30.8	65.2	43.4	89.0	59.2	117	77.6	150	99.7
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	467	311	694	462	978	651	1340	889	1750	1160	2250	1500
$\phi_b M_p$	M_p/Ω_b, kN·m	58.4	38.8	86.8	57.7	122	81.3	167	111	219	145	281	187
$\phi_b M_r$	M_r/Ω_b, kN·m	33.0	21.9	49.9	33.2	71.3	47.4	98.1	65.3	130	86.3	168	112
$\phi_b BF$	BF/Ω_b, kN	1.56	1.04	2.26	1.50	3.09	2.06	4.02	2.67	5.11	3.40	6.31	4.20
$\phi_v V_n$	V_n/Ω_v, kN	238	158	289	193	343	229	416	277	479	319	545	363
	$Z_x \times 10^3$, mm^3	235.8		350.6		493.8		674.6		883.4		1135	
	L_p, m	1.30		1.54		1.79		2.02		2.26		2.50	
	L_r, m	17.6		17.9		18.3		19.2		19.7		20.5	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEM Shapes

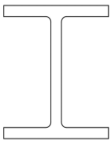
F_y = 275 MPa

Shape		HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**1230**	**818**	**1600**	**1070**	**1720**	**1150**	**1890**	**1260**	**2360**	**1570**	**2490**	**1660**
	1.50	**1230**	**818**	**1600**	**1070**	**1720**	**1150**	**1890**	**1260**	**2360**	**1570**	**2490**	**1660**
	2.00	**1230**	**818**	**1600**	**1070**	**1720**	**1150**	**1890**	**1260**	**2360**	**1570**	**2490**	**1660**
	2.50	1120	748	**1600**	**1070**	**1720**	**1150**	**1890**	**1260**	**2360**	**1570**	**2490**	**1660**
	3.00	937	623	1400	930	1670	1110	**1890**	**1260**	**2360**	**1570**	**2490**	**1660**
	3.50	803	534	1200	797	1430	950	1680	1120	2310	1530	**2490**	**1660**
	4.00	702	467	1050	697	1250	831	1470	977	2020	1340	2200	1460
	4.50	624	415	931	620	1110	739	1310	868	1790	1190	1950	1300
	5.00	562	374	838	558	1000	665	1170	781	1610	1070	1760	1170
	5.50	511	340	762	507	909	605	1070	710	1470	977	1600	1060
	6.00	468	312	699	465	833	554	979	651	1350	895	1460	974
	6.50	432	288	645	429	769	512	903	601	1240	826	1350	899
	7.00	401	267	599	398	714	475	839	558	1150	767	1250	835
	7.50	375	249	559	372	666	443	783	521	1080	716	1170	779
	8.00	351	234	524	349	625	416	734	488	1010	672	1100	730
	8.50	331	220	493	328	588	391	691	460	950	632	1030	687
	9.00	312	208	466	310	555	369	653	434	897	597	976	649
	9.50	296	197	441	294	526	350	618	411	850	565	924	615
	10.0	281	187	419	279	500	333	587	391	807	537	878	584
	10.5	268	178	399	266	476	317	559	372	769	512	836	556
	11.0	255	170	381	254	454	302	534	355	734	488	798	531
	11.5	244	163	364	243	435	289	511	340	702	467	764	508
	12.0	234	156	349	232	416	277	489	326	673	448	732	487
	12.5	225	150	335	223	400	266	470	313	646	430	703	467
	13.0	216	144	322	215	384	256	452	301	621	413	675	449
	13.5	208	138	310	207	370	246	435	289	598	398	650	433
	14.0	201	134	299	199	357	238	419	279	577	384	627	417
	14.5	194	129	289	192	345	229	405	269	557	370	606	403
	15.0	187	125	279	186	333	222	392	260	538	358	585	390
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	2810	1870	4190	2790	5000	3330	5870	3910	8070	5370	8780	5840
$\phi_b M_p$	M_p/Ω_b , kN·m	351	234	524	349	625	416	734	488	1010	672	1100	730
$\phi_b M_r$	M_r/Ω_b , kN·m	211	140	312	207	374	249	442	294	603	401	658	438
$\phi_b BF$	BF/Ω_b , kN	7.67	5.11	9.42	6.27	11.1	7.39	13.0	8.63	15.2	10.1	17.3	11.5
$\phi_v V_n$	V_n/Ω_v , kN	614	409	802	535	861	574	946	631	1180	785	1240	829
	$Z_x \times 10^3$, mm^3	1419		2117		2524		2966		4078		4435	
	L_p , m	2.75		3.03		3.27		3.51		3.80		3.77	
	L_r , m	21.0		25.6		25.8		26.0		30.5		29.2	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEM Shapes

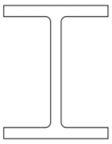
F_y = 275 MPa

Shape		**HEM 340**		**HEM 360**		**HEM 400**		**HEM 450**		**HEM 500**		**HEM 550**	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**2610**	**1740**	**2740**	**1820**	**2990**	**2000**	**3310**	**2210**	**3630**	**2420**	**3960**	**2640**
	1.50	**2610**	**1740**	**2740**	**1820**	**2990**	**2000**	**3310**	**2210**	**3630**	**2420**	**3960**	**2640**
	2.00	**2610**	**1740**	**2740**	**1820**	**2990**	**2000**	**3310**	**2210**	**3630**	**2420**	**3960**	**2640**
	2.50	**2610**	**1740**	**2740**	**1820**	**2990**	**2000**	**3310**	**2210**	**3630**	**2420**	**3960**	**2640**
	3.00	**2610**	**1740**	**2740**	**1820**	**2990**	**2000**	**3310**	**2210**	**3630**	**2420**	**3960**	**2640**
	3.50	**2610**	**1740**	**2740**	**1820**	**2990**	**2000**	**3310**	**2210**	**3630**	**2420**	**3960**	**2640**
	4.00	2340	1550	2470	1640	2760	1830	3130	2090	3510	2340	3930	2610
	4.50	2080	1380	2200	1460	2450	1630	2790	1850	3120	2080	3490	2320
	5.00	1870	1240	1980	1310	2210	1470	2510	1670	2810	1870	3140	2090
	5.50	1700	1130	1800	1190	2010	1330	2280	1520	2550	1700	2860	1900
	6.00	1560	1040	1650	1100	1840	1220	2090	1390	2340	1560	2620	1740
	6.50	1440	956	1520	1010	1700	1130	1930	1280	2160	1440	2420	1610
	7.00	1330	888	1410	939	1580	1050	1790	1190	2010	1340	2240	1490
	7.50	1250	829	1320	876	1470	979	1670	1110	1870	1250	2090	1390
	8.00	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
	8.50	1100	731	1160	773	1300	863	1470	981	1650	1100	1850	1230
	9.00	1040	691	1100	730	1230	815	1390	927	1560	1040	1750	1160
	9.50	983	654	1040	692	1160	773	1320	878	1480	984	1650	1100
	10.0	934	622	988	657	1100	734	1250	834	1400	935	1570	1050
	10.5	890	592	941	626	1050	699	1190	794	1340	890	1500	995
	11.0	849	565	898	597	1000	667	1140	758	1280	850	1430	950
	11.5	812	540	859	572	959	638	1090	725	1220	813	1370	909
	12.0	778	518	823	548	919	612	1040	695	1170	779	1310	871
	12.5	747	497	790	526	882	587	1000	667	1120	748	1260	836
	13.0	719	478	760	506	849	565	964	642	1080	719	1210	804
	13.5	692	460	732	487	817	544	929	618	1040	692	1160	774
	14.0	667	444	706	469	788	524	895	596	1000	668	1120	746
	14.5	644	429	681	453	761	506	865	575	969	645	1080	721
	15.0	623	414	659	438	735	489	836	556	936	623	1050	697
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	9340	6220	9880	6570	11000	7340	12500	8340	14000	9350	15700	10500
$\phi_b M_p$	M_p/Ω_b, kN·m	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
$\phi_b M_r$	M_r/Ω_b, kN·m	702	467	744	495	835	556	953	634	1070	712	1200	798
$\phi_b BF$	BF/Ω_b, kN	19.7	13.1	22.2	14.8	28.1	18.7	36.5	24.3	46.5	30.9	58.2	38.8
$\phi_v V_n$	V_n/Ω_v, kN	1310	871	1370	912	1500	998	1660	1100	1820	1210	1980	1320
	$Z_x \times 10^3$, mm^3	4718		4989		5571		6331		7094		7933	
	L_p, m	3.75		3.72		3.65		3.60		3.54		3.49	
	L_r, m	27.4		25.8		23.0		20.4		18.3		16.6	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEM Shapes

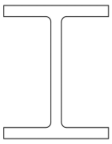
F_y = 275 MPa

Shape		HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**4300**	**2860**	**4630**	**3090**	**4960**	**3310**	**5640**	**3760**	**6310**	**4200**	**6990**	**4660**
	1.50	**4300**	**2860**	**4630**	**3090**	**4960**	**3310**	**5640**	**3760**	**6310**	**4200**	**6990**	**4660**
	2.00	**4300**	**2860**	**4630**	**3090**	**4960**	**3310**	**5640**	**3760**	**6310**	**4200**	**6990**	**4660**
	2.50	**4300**	**2860**	**4630**	**3090**	**4960**	**3310**	**5640**	**3760**	**6310**	**4200**	**6990**	**4660**
	3.00	**4300**	**2860**	**4630**	**3090**	**4960**	**3310**	**5640**	**3760**	**6310**	**4200**	**6990**	**4660**
	3.50	**4300**	**2860**	**4630**	**3090**	**4960**	**3310**	**5640**	**3760**	**6310**	**4200**	**6990**	**4660**
	4.00	**4300**	**2860**	**4630**	**3090**	**4960**	**3310**	**5640**	**3760**	**6310**	**4200**	**6990**	**4660**
	4.50	3860	2570	4250	2830	4640	3090	5500	3660	**6310**	**4200**	**6990**	**4660**
	5.00	3470	2310	3820	2540	4170	2780	4950	3290	5720	3800	6560	4370
	5.50	3160	2100	3480	2310	3790	2520	4500	2990	5200	3460	5970	3970
	6.00	2890	1930	3190	2120	3480	2310	4120	2740	4770	3170	5470	3640
	6.50	2670	1780	2940	1960	3210	2140	3800	2530	4400	2930	5050	3360
	7.00	2480	1650	2730	1820	2980	1980	3530	2350	4080	2720	4690	3120
	7.50	2320	1540	2550	1700	2780	1850	3300	2190	3810	2540	4370	2910
	8.00	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
	8.50	2040	1360	2250	1500	2460	1630	2910	1940	3360	2240	3860	2570
	9.00	1930	1280	2120	1410	2320	1540	2750	1830	3180	2110	3650	2430
	9.50	1830	1220	2010	1340	2200	1460	2600	1730	3010	2000	3450	2300
	10.0	1740	1160	1910	1270	2090	1390	2470	1650	2860	1900	3280	2180
	10.5	1650	1100	1820	1210	1990	1320	2360	1570	2720	1810	3120	2080
	11.0	1580	1050	1740	1160	1900	1260	2250	1500	2600	1730	2980	1980
	11.5	1510	1000	1660	1110	1810	1210	2150	1430	2490	1650	2850	1900
	12.0	1450	963	1590	1060	1740	1160	2060	1370	2380	1590	2730	1820
	12.5	1390	924	1530	1020	1670	1110	1980	1320	2290	1520	2620	1750
	13.0	1340	889	1470	979	1610	1070	1900	1270	2200	1460	2520	1680
	13.5	1290	856	1420	942	1550	1030	1830	1220	2120	1410	2430	1620
	14.0	1240	825	1370	909	1490	992	1770	1180	2040	1360	2340	1560
	14.5	1200	797	1320	877	1440	958	1710	1130	1970	1310	2260	1510
	15.0	1160	770	1270	848	1390	926	1650	1100	1910	1270	2190	1460
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	17400	11600	19100	12700	20900	13900	24700	16500	28600	19000	32800	21800
$\phi_b M_p$	M_p/Ω_b, kN·m	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
$\phi_b M_r$	M_r/Ω_b, kN·m	1330	883	1460	972	1590	1060	1880	1250	2170	1450	2480	1650
$\phi_b BF$	BF/Ω_b, kN	71.7	47.7	86.5	57.6	103	68.5	140	93.5	182	121	229	152
$\phi_v V_n$	V_n/Ω_v, kN	2150	1430	2310	1540	2480	1650	2820	1880	3150	2100	3490	2330
	$Z_x \times 10^3$, mm^3	8772		9657		10540		12490		14440		16570	
	L_p, m	3.43		3.38		3.33		3.22		3.13		3.06	
	L_r, m	15.2		14.1		13.2		11.8		10.8		10.1	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

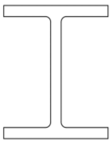


Maximum Total Uniform Load, kN
HEM Shapes

F_y = 355 MPa

Shape		HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	603	401	**746**	**497**	**886**	**591**	**1070**	**716**	**1240**	**824**	**1410**	**937**
	1.50	402	267	597	397	841	560	**1070**	**716**	**1240**	**824**	**1410**	**937**
	2.00	301	201	448	298	631	420	862	574	1130	751	**1410**	**937**
	2.50	241	160	358	238	505	336	690	459	903	601	1160	772
	3.00	201	134	299	199	421	280	575	382	753	501	967	643
	3.50	172	115	256	170	361	240	493	328	645	429	829	551
	4.00	151	100	224	149	316	210	431	287	564	376	725	483
	4.50	134	89.1	199	132	280	187	383	255	502	334	645	429
	5.00	121	80.2	179	119	252	168	345	229	452	300	580	386
	5.50	110	72.9	163	108	229	153	314	209	411	273	527	351
	6.00	100	66.8	149	99.4	210	140	287	191	376	250	484	322
	6.50	92.7	61.7	138	91.7	194	129	265	176	347	231	446	297
	7.00	86.1	57.3	128	85.2	180	120	246	164	323	215	414	276
	7.50	80.4	53.5	119	79.5	168	112	230	153	301	200	387	257
	8.00	75.3	50.1	112	74.5	158	105	216	143	282	188	363	241
	8.50	70.9	47.2	105	70.1	148	98.8	203	135	266	177	341	227
	9.00	67.0	44.6	99.6	66.2	140	93.3	192	127	251	167	322	214
	9.50	63.4	42.2	94.3	62.8	133	88.4	182	121	238	158	305	203
	10.0	60.3	40.1	89.6	59.6	126	84.0	172	115	226	150	290	193
	10.5	57.4	38.2	85.3	56.8	120	80.0	164	109	215	143	276	184
	11.0	54.8	36.5	81.5	54.2	115	76.3	157	104	205	137	264	175
	11.5	52.4	34.9	77.9	51.8	110	73.0	150	99.8	196	131	252	168
	12.0	50.2	33.4	74.7	49.7	105	70.0	144	95.6	188	125	242	161
	12.5	48.2	32.1	71.7	47.7	101	67.2	138	91.8	181	120	232	154
	13.0	46.4	30.8	68.9	45.9	97.1	64.6	133	88.2	174	116	223	148
	13.5	44.6	29.7	66.4	44.2	93.5	62.2	128	85.0	167	111	215	143
	14.0	43.1	28.6	64.0	42.6	90.2	60.0	123	81.9	161	107	207	138
	14.5	41.6	27.7	61.8	41.1	87.0	57.9	119	79.1	156	104	200	133
	15.0	40.2	26.7	59.7	39.7	84.1	56.0	115	76.5	151	100	193	129
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	603	401	896	596	1260	840	1720	1150	2260	1500	2900	1930
$\phi_b M_p$	M_p/Ω_b , kN·m	75.3	50.1	112	74.5	158	105	216	143	282	188	363	241
$\phi_b M_r$	M_r/Ω_b , kN·m	42.6	28.3	64.5	42.9	92.0	61.2	127	84.3	167	111	216	144
$\phi_b BF$	BF/Ω_b , kN	2.63	1.75	3.81	2.53	5.22	3.47	6.79	4.52	8.65	5.76	10.7	7.11
$\phi_v V_n$	V_n/Ω_v , kN	307	204	373	249	443	295	537	358	618	412	703	469
	$Z_x \times 10^3$, mm^3	235.8		350.6		493.8		674.6		883.4		1135	
	L_p , m	1.14		1.36		1.57		1.78		1.99		2.20	
	L_r , m	13.6		13.8		14.2		14.9		15.3		15.9	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEM Shapes

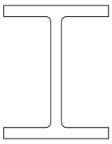
F_y = 355 MPa

Shape		HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**1580**	**1060**	**2070**	**1380**	**2220**	**1480**	**2440**	**1630**	**3040**	**2030**	**3210**	**2140**
	1.50	**1580**	**1060**	**2070**	**1380**	**2220**	**1480**	**2440**	**1630**	**3040**	**2030**	**3210**	**2140**
	2.00	**1580**	**1060**	**2070**	**1380**	**2220**	**1480**	**2440**	**1630**	**3040**	**2030**	**3210**	**2140**
	2.50	1450	965	**2070**	**1380**	**2220**	**1480**	**2440**	**1630**	**3040**	**2030**	**3210**	**2140**
	3.00	1210	804	1800	1200	2150	1430	**2440**	**1630**	**3040**	**2030**	**3210**	**2140**
	3.50	1040	689	1550	1030	1840	1230	2170	1440	2980	1980	**3210**	**2140**
	4.00	907	603	1350	900	1610	1070	1900	1260	2610	1730	2830	1890
	4.50	806	536	1200	800	1430	954	1680	1120	2320	1540	2520	1680
	5.00	725	483	1080	720	1290	858	1520	1010	2080	1390	2270	1510
	5.50	659	439	984	655	1170	780	1380	917	1900	1260	2060	1370
	6.00	604	402	902	600	1080	715	1260	841	1740	1160	1890	1260
	6.50	558	371	832	554	993	660	1170	776	1600	1070	1740	1160
	7.00	518	345	773	514	922	613	1080	721	1490	991	1620	1080
	7.50	484	322	721	480	860	572	1010	673	1390	925	1510	1010
	8.00	453	302	676	450	806	537	948	630	1300	867	1420	943
	8.50	427	284	637	424	759	505	892	593	1230	816	1330	887
	9.00	403	268	601	400	717	477	842	560	1160	771	1260	838
	9.50	382	254	570	379	679	452	798	531	1100	730	1190	794
	10.0	363	241	541	360	645	429	758	504	1040	694	1130	754
	10.5	345	230	515	343	614	409	722	480	993	660	1080	718
	11.0	330	219	492	327	586	390	689	459	948	630	1030	686
	11.5	315	210	471	313	561	373	659	439	906	603	986	656
	12.0	302	201	451	300	538	358	632	420	869	578	945	629
	12.5	290	193	433	288	516	343	606	404	834	555	907	603
	13.0	279	186	416	277	496	330	583	388	802	533	872	580
	13.5	269	179	401	267	478	318	562	374	772	514	840	559
	14.0	259	172	387	257	461	307	542	360	745	495	810	539
	14.5	250	166	373	248	445	296	523	348	719	478	782	520
	15.0	242	161	361	240	430	286	505	336	695	462	756	503
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	3630	2410	5410	3600	6450	4290	7580	5040	10400	6940	11300	7540
$\phi_b M_p$	M_p/Ω_b , kN·m	453	302	676	450	806	537	948	630	1300	867	1420	943
$\phi_b M_r$	M_r/Ω_b , kN·m	272	181	402	268	483	321	571	380	779	518	849	565
$\phi_b BF$	BF/Ω_b , kN	13.0	8.65	15.9	10.6	18.8	12.5	22.0	14.6	25.7	17.1	29.3	19.5
$\phi_v V_n$	V_n/Ω_v , kN	792	528	1040	690	1110	741	1220	814	1520	1010	1610	1070
	$Z_x \times 10^3$, mm^3	1419		2117		2524		2966		4078		4435	
	L_p , m	2.42		2.67		2.88		3.09		3.34		3.32	
	L_r , m	16.4		19.9		20.1		20.2		23.7		22.7	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



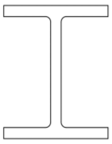
Maximum Total Uniform Load, kN

HEM Shapes

F_y = 355 MPa

Shape		**HEM 340**		**HEM 360**		**HEM 400**		**HEM 450**		**HEM 500**		**HEM 550**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**3370**	**2250**	**3530**	**2360**	**3860**	**2580**	**4280**	**2850**	**4690**	**3130**	**5120**	**3410**
	1.50	**3370**	**2250**	**3530**	**2360**	**3860**	**2580**	**4280**	**2850**	**4690**	**3130**	**5120**	**3410**
	2.00	**3370**	**2250**	**3530**	**2360**	**3860**	**2580**	**4280**	**2850**	**4690**	**3130**	**5120**	**3410**
	2.50	**3370**	**2250**	**3530**	**2360**	**3860**	**2580**	**4280**	**2850**	**4690**	**3130**	**5120**	**3410**
	3.00	**3370**	**2250**	**3530**	**2360**	**3860**	**2580**	**4280**	**2850**	**4690**	**3130**	**5120**	**3410**
	3.50	**3370**	**2250**	**3530**	**2360**	**3860**	**2580**	**4280**	**2850**	**4690**	**3130**	**5120**	**3410**
	4.00	3010	2010	3190	2120	3560	2370	4050	2690	4530	3020	5070	3370
	4.50	2680	1780	2830	1890	3160	2110	3600	2390	4030	2680	4510	3000
	5.00	2410	1600	2550	1700	2850	1890	3240	2150	3630	2410	4060	2700
	5.50	2190	1460	2320	1540	2590	1720	2940	1960	3300	2190	3690	2450
	6.00	2010	1340	2130	1410	2370	1580	2700	1790	3020	2010	3380	2250
	6.50	1860	1230	1960	1310	2190	1460	2490	1660	2790	1860	3120	2080
	7.00	1720	1150	1820	1210	2030	1350	2310	1540	2590	1720	2900	1930
	7.50	1610	1070	1700	1130	1900	1260	2160	1440	2420	1610	2700	1800
	8.00	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
	8.50	1420	944	1500	998	1680	1110	1900	1270	2130	1420	2390	1590
	9.00	1340	891	1420	943	1580	1050	1800	1200	2010	1340	2250	1500
	9.50	1270	845	1340	893	1500	997	1700	1130	1910	1270	2130	1420
	10.0	1210	802	1280	848	1420	947	1620	1080	1810	1210	2030	1350
	10.5	1150	764	1210	808	1360	902	1540	1030	1730	1150	1930	1280
	11.0	1100	729	1160	771	1290	861	1470	979	1650	1100	1840	1230
	11.5	1050	698	1110	738	1240	824	1410	936	1580	1050	1760	1170
	12.0	1000	669	1060	707	1190	790	1350	897	1510	1010	1690	1120
	12.5	965	642	1020	679	1140	758	1290	861	1450	965	1620	1080
	13.0	928	617	981	653	1100	729	1240	828	1390	928	1560	1040
	13.5	893	594	945	628	1050	702	1200	798	1340	894	1500	999
	14.0	861	573	911	606	1020	677	1160	769	1300	862	1450	964
	14.5	832	553	879	585	982	653	1120	743	1250	832	1400	930
	15.0	804	535	850	566	949	632	1080	718	1210	804	1350	899
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	12100	8020	12800	8480	14200	9470	16200	10800	18100	12100	20300	13500
$\phi_b M_p$	M_p/Ω_b , kN·m	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
$\phi_b M_r$	M_r/Ω_b , kN·m	906	603	961	639	1080	717	1230	819	1380	920	1550	1030
$\phi_b BF$	BF/Ω_b , kN	33.4	22.2	37.7	25.1	47.6	31.7	61.9	41.2	78.4	52.2	97.9	65.1
$\phi_v V_n$	V_n/Ω_v , kN	1690	1120	1770	1180	1930	1290	2140	1430	2340	1560	2560	1710
	$Z_x \times 10^3$, mm^3	4718		4989		5571		6331		7094		7933	
	L_p , m	3.30		3.27		3.22		3.17		3.12		3.07	
	L_r , m	21.3		20.1		18.0		16.0		14.4		13.1	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
HEM Shapes

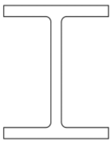
F_y = 355 MPa

Shape		HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**5550**	**3700**	**5980**	**3980**	**6410**	**4270**	**7280**	**4850**	**8140**	**5430**	**9020**	**6010**
	1.50	**5550**	**3700**	**5980**	**3980**	**6410**	**4270**	**7280**	**4850**	**8140**	**5430**	**9020**	**6010**
	2.00	**5550**	**3700**	**5980**	**3980**	**6410**	**4270**	**7280**	**4850**	**8140**	**5430**	**9020**	**6010**
	2.50	**5550**	**3700**	**5980**	**3980**	**6410**	**4270**	**7280**	**4850**	**8140**	**5430**	**9020**	**6010**
	3.00	**5550**	**3700**	**5980**	**3980**	**6410**	**4270**	**7280**	**4850**	**8140**	**5430**	**9020**	**6010**
	3.50	**5550**	**3700**	**5980**	**3980**	**6410**	**4270**	**7280**	**4850**	**8140**	**5430**	**9020**	**6010**
	4.00	**5550**	**3700**	**5980**	**3980**	**6410**	**4270**	**7280**	**4850**	**8140**	**5430**	**9020**	**6010**
	4.50	4980	3320	5490	3650	5990	3980	7090	4720	**8140**	**5430**	**9020**	**6010**
	5.00	4480	2980	4940	3280	5390	3580	6380	4250	7380	4910	8470	5640
	5.50	4080	2710	4490	2990	4900	3260	5800	3860	6710	4460	7700	5120
	6.00	3740	2490	4110	2740	4490	2990	5320	3540	6150	4090	7060	4700
	6.50	3450	2300	3800	2530	4140	2760	4910	3270	5680	3780	6520	4340
	7.00	3200	2130	3530	2350	3850	2560	4560	3030	5270	3510	6050	4030
	7.50	2990	1990	3290	2190	3590	2390	4260	2830	4920	3270	5650	3760
	8.00	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
	8.50	2640	1760	2900	1930	3170	2110	3760	2500	4340	2890	4980	3320
	9.00	2490	1660	2740	1820	2990	1990	3550	2360	4100	2730	4710	3130
	9.50	2360	1570	2600	1730	2840	1890	3360	2240	3890	2580	4460	2970
	10.0	2240	1490	2470	1640	2690	1790	3190	2120	3690	2460	4240	2820
	10.5	2140	1420	2350	1560	2570	1710	3040	2020	3520	2340	4030	2680
	11.0	2040	1360	2240	1490	2450	1630	2900	1930	3360	2230	3850	2560
	11.5	1950	1300	2150	1430	2340	1560	2780	1850	3210	2140	3680	2450
	12.0	1870	1240	2060	1370	2250	1490	2660	1770	3080	2050	3530	2350
	12.5	1790	1190	1970	1310	2160	1430	2550	1700	2950	1960	3390	2250
	13.0	1720	1150	1900	1260	2070	1380	2460	1630	2840	1890	3260	2170
	13.5	1660	1110	1830	1220	2000	1330	2360	1570	2730	1820	3140	2090
	14.0	1600	1070	1760	1170	1920	1280	2280	1520	2640	1750	3030	2010
	14.5	1550	1030	1700	1130	1860	1240	2200	1460	2550	1690	2920	1940
	15.0	1490	995	1650	1090	1800	1190	2130	1420	2460	1640	2820	1880
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	22400	14900	24700	16400	26900	17900	31900	21200	36900	24600	42400	28200
$\phi_b M_p$	M_p/Ω_b , kN·m	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
$\phi_b M_r$	M_r/Ω_b , kN·m	1710	1140	1890	1250	2060	1370	2430	1620	2800	1870	3200	2130
$\phi_b BF$	BF/Ω_b , kN	120	79.6	144	95.5	170	113	228	152	291	194	361	240
$\phi_v V_n$	V_n/Ω_v , kN	2770	1850	2990	1990	3200	2140	3640	2430	4070	2710	4510	3010
	$Z_x \times 10^3$, mm^3	8772		9657		10540		12490		14440		16570	
	L_p , m	3.02		2.98		2.93		2.84		2.76		2.69	
	L_r , m	12.1		11.3		10.7		9.68		8.97		8.48	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

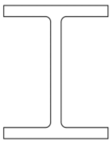


Maximum Total Uniform Load, kN
IPEA Shapes

F_y = 235 MPa

Shape		IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	32.1	21.4	55.8	37.1	84.4	56.1	121	80.6	168	112	**215**	**143**
	1.50	21.4	14.2	37.2	24.8	56.3	37.4	80.8	53.7	112	74.4	153	102
	2.00	16.1	10.7	27.9	18.6	42.2	28.1	60.6	40.3	83.8	55.8	114	76.2
	2.50	12.8	8.55	22.3	14.9	33.8	22.5	48.5	32.2	67.1	44.6	91.6	60.9
	3.00	10.7	7.12	18.6	12.4	28.1	18.7	40.4	26.9	55.9	37.2	76.3	50.8
	3.50	9.18	6.10	15.9	10.6	24.1	16.0	34.6	23.0	47.9	31.9	65.4	43.5
	4.00	8.03	5.34	14.0	9.28	21.1	14.0	30.3	20.2	41.9	27.9	57.2	38.1
	4.50	7.14	4.75	12.4	8.25	18.8	12.5	26.9	17.9	37.3	24.8	50.9	33.8
	5.00	6.42	4.27	11.2	7.43	16.9	11.2	24.2	16.1	33.5	22.3	45.8	30.5
	5.50	5.84	3.88	10.1	6.75	15.3	10.2	22.0	14.7	30.5	20.3	41.6	27.7
	6.00	5.35	3.56	9.30	6.19	14.1	9.36	20.2	13.4	27.9	18.6	38.2	25.4
	6.50	4.94	3.29	8.58	5.71	13.0	8.64	18.6	12.4	25.8	17.2	35.2	23.4
	7.00	4.59	3.05	7.97	5.30	12.1	8.02	17.3	11.5	24.0	15.9	32.7	21.8
	7.50	4.28	2.85	7.44	4.95	11.3	7.49	16.2	10.7	22.4	14.9	30.5	20.3
	8.00	4.01	2.67	6.98	4.64	10.5	7.02	15.1	10.1	21.0	13.9	28.6	19.0
	8.50	3.78	2.51	6.56	4.37	9.93	6.60	14.3	9.48	19.7	13.1	26.9	17.9
	9.00	3.57	2.37	6.20	4.13	9.38	6.24	13.5	8.96	18.6	12.4	25.4	16.9
	9.50	3.38	2.25	5.87	3.91	8.88	5.91	12.8	8.48	17.6	11.7	24.1	16.0
	10.0	3.21	2.14	5.58	3.71	8.44	5.61	12.1	8.06	16.8	11.2	22.9	15.2
	10.5	3.06	2.03	5.31	3.54	8.04	5.35	11.5	7.68	16.0	10.6	21.8	14.5
	11.0	2.92	1.94	5.07	3.38	7.67	5.10	11.0	7.33	15.2	10.1	20.8	13.8
	11.5	2.79	1.86	4.85	3.23	7.34	4.88	10.5	7.01	14.6	9.70	19.9	13.2
	12.0	2.68	1.78	4.65	3.09	7.03	4.68	10.1	6.72	14.0	9.30	19.1	12.7
	12.5	2.57	1.71	4.46	2.97	6.75	4.49	9.69	6.45	13.4	8.92	18.3	12.2
	13.0	2.47	1.64	4.29	2.86	6.49	4.32	9.32	6.20	12.9	8.58	17.6	11.7
	13.5	2.38	1.58	4.13	2.75	6.25	4.16	8.97	5.97	12.4	8.26	17.0	11.3
	14.0	2.29	1.53	3.99	2.65	6.03	4.01	8.65	5.76	12.0	7.97	16.4	10.9
	14.5	2.21	1.47	3.85	2.56	5.82	3.87	8.35	5.56	11.6	7.69	15.8	10.5
	15.0	2.14	1.42	3.72	2.48	5.63	3.74	8.08	5.37	11.2	7.44	15.3	10.2
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	32.1	21.4	55.8	37.1	84.4	56.1	121	80.6	168	112	229	152
$\phi_b M_p$	M_p/Ω_b , kN·m	4.01	2.67	6.98	4.64	10.5	7.02	15.1	10.1	21.0	13.9	28.6	19.0
$\phi_b M_r$	M_r/Ω_b , kN·m	2.44	1.63	4.27	2.84	6.48	4.31	9.37	6.24	13.0	8.65	17.8	11.8
$\phi_b BF$	BF/Ω_b , kN	0.782	0.520	1.26	0.840	1.89	1.26	2.64	1.76	3.41	2.27	4.36	2.90
$\phi_v V_n$	V_n/Ω_v , kN	36.3	24.2	49.7	33.2	63.0	42.0	73.6	49.1	88.5	59.0	107	71.5
	$Z_x \times 10^3$, mm^3	18.98		32.98		49.87		71.60		99.09		135.3	
	L_p , m	0.534		0.626		0.729		0.847		0.940		1.05	
	L_r , m	2.54		2.77		2.88		3.03		3.28		3.54	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.

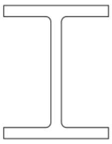


Maximum Total Uniform Load, kN
IPEA Shapes

F_y = 235 MPa

Shape		**IPEA 200**		**IPEA 220**		**IPEA 240**		**IPEA 270**		**IPEA 300**		**IPEA 330**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**250**	**167**	**306**	**204**	**348**	**232**	**414**	**276**	**511**	**341**	**599**	**400**
	1.50	205	136	271	180	**348**	**232**	**414**	**276**	**511**	**341**	**599**	**400**
	2.00	154	102	203	135	264	175	349	232	458	305	594	395
	2.50	123	81.8	163	108	211	140	279	186	367	244	475	316
	3.00	102	68.2	135	90.1	176	117	233	155	306	203	396	263
	3.50	87.8	58.4	116	77.3	151	100	199	133	262	174	339	226
	4.00	76.9	51.1	102	67.6	132	87.7	174	116	229	152	297	198
	4.50	68.3	45.5	90.3	60.1	117	78.0	155	103	204	136	264	176
	5.00	61.5	40.9	81.3	54.1	105	70.2	140	92.9	183	122	238	158
	5.50	55.9	37.2	73.9	49.2	95.9	63.8	127	84.4	167	111	216	144
	6.00	51.2	34.1	67.7	45.1	87.9	58.5	116	77.4	153	102	198	132
	6.50	47.3	31.5	62.5	41.6	81.1	54.0	107	71.4	141	93.8	183	122
	7.00	43.9	29.2	58.1	38.6	75.3	50.1	99.7	66.3	131	87.1	170	113
	7.50	41.0	27.3	54.2	36.1	70.3	46.8	93.1	61.9	122	81.3	158	105
	8.00	38.4	25.6	50.8	33.8	65.9	43.8	87.2	58.0	115	76.2	148	98.8
	8.50	36.2	24.1	47.8	31.8	62.0	41.3	82.1	54.6	108	71.8	140	93.0
	9.00	34.2	22.7	45.2	30.0	58.6	39.0	77.6	51.6	102	67.8	132	87.8
	9.50	32.4	21.5	42.8	28.5	55.5	36.9	73.5	48.9	96.5	64.2	125	83.2
	10.0	30.7	20.5	40.6	27.0	52.7	35.1	69.8	46.4	91.7	61.0	119	79.0
	10.5	29.3	19.5	38.7	25.8	50.2	33.4	66.5	44.2	87.3	58.1	113	75.3
	11.0	27.9	18.6	36.9	24.6	47.9	31.9	63.5	42.2	83.3	55.4	108	71.8
	11.5	26.7	17.8	35.3	23.5	45.8	30.5	60.7	40.4	79.7	53.0	103	68.7
	12.0	25.6	17.0	33.9	22.5	43.9	29.2	58.2	38.7	76.4	50.8	99.0	65.8
	12.5	24.6	16.4	32.5	21.6	42.2	28.1	55.8	37.1	73.3	48.8	95.0	63.2
	13.0	23.6	15.7	31.3	20.8	40.6	27.0	53.7	35.7	70.5	46.9	91.4	60.8
	13.5	22.8	15.2	30.1	20.0	39.1	26.0	51.7	34.4	67.9	45.2	88.0	58.5
	14.0	22.0	14.6	29.0	19.3	37.7	25.1	49.9	33.2	65.5	43.6	84.8	56.4
	14.5	21.2	14.1	28.0	18.6	36.4	24.2	48.1	32.0	63.2	42.1	81.9	54.5
	15.0	20.5	13.6	27.1	18.0	35.1	23.4	46.5	31.0	61.1	40.7	79.2	52.7
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	307	205	406	270	527	351	698	464	917	610	1190	790
$\phi_b M_p$	M_p/Ω_b, kN·m	38.4	25.6	50.8	33.8	65.9	43.8	87.2	58.0	115	76.2	148	98.8
$\phi_b M_r$	M_r/Ω_b, kN·m	23.9	15.9	31.6	21.0	41.1	27.4	54.5	36.3	71.5	47.6	92.6	61.6
$\phi_b BF$	BF/Ω_b, kN	5.33	3.55	6.50	4.33	7.66	5.10	9.61	6.39	11.8	7.85	14.3	9.54
$\phi_v V_n$	V_n/Ω_v, kN	125	83.3	153	102	174	116	207	138	255	170	300	200
	$Z_x \times 10^3$, mm^3	181.7		240.2		311.6		412.5		541.8		701.9	
	L_p, m	1.14		1.26		1.38		1.55		1.71		1.82	
	L_r, m	3.87		4.22		4.61		4.96		5.37		5.71	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.

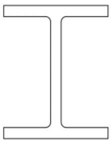


Maximum Total Uniform Load, kN
IPEA Shapes

F_y = 235 MPa

Shape		**IPEA 360**		**IPEA 400**		**IPEA 450**		**IPEA 500**		**IPEA 550**		**IPEA 600**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**666**	**444**	**784**	**522**	**958**	**639**	**1180**	**785**	**1390**	**926**	**1650**	**1100**
	1.50	**666**	**444**	**784**	**522**	**958**	**639**	**1180**	**785**	**1390**	**926**	**1650**	**1100**
	2.00	**666**	**444**	**784**	**522**	**958**	**639**	**1180**	**785**	**1390**	**926**	**1650**	**1100**
	2.50	614	408	774	515	**958**	**639**	**1180**	**785**	**1390**	**926**	**1650**	**1100**
	3.00	511	340	645	429	843	561	1100	730	**1390**	**926**	**1650**	**1100**
	3.50	438	292	553	368	722	481	941	626	1200	796	1520	1010
	4.00	384	255	484	322	632	420	823	548	1050	697	1330	884
	4.50	341	227	430	286	562	374	732	487	931	619	1180	786
	5.00	307	204	387	258	506	336	659	438	838	557	1060	707
	5.50	279	186	352	234	460	306	599	398	761	507	966	643
	6.00	256	170	323	215	421	280	549	365	698	464	886	589
	6.50	236	157	298	198	389	259	507	337	644	429	818	544
	7.00	219	146	277	184	361	240	470	313	598	398	759	505
	7.50	205	136	258	172	337	224	439	292	558	371	709	471
	8.00	192	128	242	161	316	210	412	274	523	348	664	442
	8.50	181	120	228	152	297	198	387	258	493	328	625	416
	9.00	170	113	215	143	281	187	366	243	465	310	591	393
	9.50	162	107	204	136	266	177	347	231	441	293	559	372
	10.0	153	102	194	129	253	168	329	219	419	279	531	354
	10.5	146	97.2	184	123	241	160	314	209	399	265	506	337
	11.0	139	92.8	176	117	230	153	299	199	381	253	483	321
	11.5	133	88.8	168	112	220	146	286	190	364	242	462	307
	12.0	128	85.1	161	107	211	140	274	183	349	232	443	295
	12.5	123	81.7	155	103	202	135	263	175	335	223	425	283
	13.0	118	78.5	149	99.1	194	129	253	169	322	214	409	272
	13.5	114	75.6	143	95.4	187	125	244	162	310	206	394	262
	14.0	110	72.9	138	92.0	181	120	235	156	299	199	380	253
	14.5	106	70.4	133	88.8	174	116	227	151	289	192	367	244
	15.0	102	68.1	129	85.9	169	112	220	146	279	186	354	236
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	1530	1020	1940	1290	2530	1680	3290	2190	4190	2790	5310	3540
$\phi_b M_p$	M_p/Ω_b, kN·m	192	128	242	161	316	210	412	274	523	348	664	442
$\phi_b M_r$	M_r/Ω_b, kN·m	120	80.0	151	101	197	131	256	170	325	216	411	274
$\phi_b BF$	BF/Ω_b, kN	17.4	11.6	21.4	14.2	27.3	18.2	34.4	22.9	42.1	28.0	51.1	34.0
$\phi_v V_n$	V_n/Ω_v, kN	333	222	392	261	479	319	589	392	694	463	825	550
	$Z_x \times 10^3$, mm^3	906.8		1144		1494		1946		2475		3141	
	L_p, m	1.97		2.05		2.15		2.25		2.34		2.45	
	L_r, m	6.09		6.30		6.50		6.78		7.06		7.40	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.

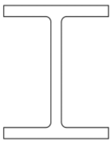


Maximum Total Uniform Load, kN
IPEA Shapes

F_y = 275 MPa

Shape		IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	37.6	25.0	65.3	43.4	98.7	65.7	142	94.3	196	131	**251**	**167**
	1.50	25.1	16.7	43.5	29.0	65.8	43.8	94.5	62.9	131	87.0	179	119
	2.00	18.8	12.5	32.7	21.7	49.4	32.8	70.9	47.2	98.1	65.3	134	89.1
	2.50	15.0	10.0	26.1	17.4	39.5	26.3	56.7	37.7	78.5	52.2	107	71.3
	3.00	12.5	8.33	21.8	14.5	32.9	21.9	47.3	31.4	65.4	43.5	89.3	59.4
	3.50	10.7	7.14	18.7	12.4	28.2	18.8	40.5	26.9	56.1	37.3	76.5	50.9
	4.00	9.40	6.25	16.3	10.9	24.7	16.4	35.4	23.6	49.0	32.6	67.0	44.6
	4.50	8.35	5.56	14.5	9.65	21.9	14.6	31.5	21.0	43.6	29.0	59.5	39.6
	5.00	7.52	5.00	13.1	8.69	19.7	13.1	28.4	18.9	39.2	26.1	53.6	35.6
	5.50	6.83	4.55	11.9	7.90	18.0	11.9	25.8	17.1	35.7	23.7	48.7	32.4
	6.00	6.26	4.17	10.9	7.24	16.5	10.9	23.6	15.7	32.7	21.8	44.6	29.7
	6.50	5.78	3.85	10.0	6.68	15.2	10.1	21.8	14.5	30.2	20.1	41.2	27.4
	7.00	5.37	3.57	9.33	6.21	14.1	9.39	20.3	13.5	28.0	18.6	38.3	25.5
	7.50	5.01	3.33	8.71	5.79	13.2	8.76	18.9	12.6	26.2	17.4	35.7	23.8
	8.00	4.70	3.13	8.16	5.43	12.3	8.21	17.7	11.8	24.5	16.3	33.5	22.3
	8.50	4.42	2.94	7.68	5.11	11.6	7.73	16.7	11.1	23.1	15.4	31.5	21.0
	9.00	4.18	2.78	7.26	4.83	11.0	7.30	15.8	10.5	21.8	14.5	29.8	19.8
	9.50	3.96	2.63	6.87	4.57	10.4	6.92	14.9	9.93	20.7	13.7	28.2	18.8
	10.0	3.76	2.50	6.53	4.34	9.87	6.57	14.2	9.43	19.6	13.1	26.8	17.8
	10.5	3.58	2.38	6.22	4.14	9.40	6.26	13.5	8.98	18.7	12.4	25.5	17.0
	11.0	3.42	2.27	5.94	3.95	8.98	5.97	12.9	8.57	17.8	11.9	24.4	16.2
	11.5	3.27	2.17	5.68	3.78	8.59	5.71	12.3	8.20	17.1	11.4	23.3	15.5
	12.0	3.13	2.08	5.44	3.62	8.23	5.47	11.8	7.86	16.3	10.9	22.3	14.9
	12.5	3.01	2.00	5.22	3.48	7.90	5.26	11.3	7.55	15.7	10.4	21.4	14.3
	13.0	2.89	1.92	5.02	3.34	7.60	5.05	10.9	7.26	15.1	10.0	20.6	13.7
	13.5	2.78	1.85	4.84	3.22	7.31	4.87	10.5	6.99	14.5	9.67	19.8	13.2
	14.0	2.68	1.79	4.66	3.10	7.05	4.69	10.1	6.74	14.0	9.32	19.1	12.7
	14.5	2.59	1.72	4.50	3.00	6.81	4.53	9.78	6.51	13.5	9.00	18.5	12.3
	15.0	2.51	1.67	4.35	2.90	6.58	4.38	9.45	6.29	13.1	8.70	17.9	11.9
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	37.6	25.0	65.3	43.4	98.7	65.7	142	94.3	196	131	268	178
$\phi_b M_p$	M_p/Ω_b , kN·m	4.70	3.13	8.16	5.43	12.3	8.21	17.7	11.8	24.5	16.3	33.5	22.3
$\phi_b M_r$	M_r/Ω_b , kN·m	2.86	1.90	4.99	3.32	7.58	5.05	11.0	7.30	15.2	10.1	20.8	13.8
$\phi_b BF$	BF/Ω_b , kN	1.08	0.716	1.73	1.15	2.58	1.71	3.56	2.37	4.58	3.05	5.84	3.88
$\phi_v V_n$	V_n/Ω_v , kN	42.5	28.3	58.2	38.8	73.7	49.2	86.1	57.4	104	69.1	126	83.7
	$Z_x \times 10^3$, mm^3	18.98		32.98		49.87		71.60		99.09		135.3	
	L_p , m	0.494		0.579		0.674		0.783		0.869		0.973	
	L_r , m	2.20		2.41		2.52		2.68		2.90		3.15	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPEA Shapes

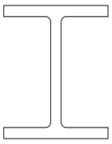
F_y = 275 MPa

Shape		**IPEA 200**		**IPEA 220**		**IPEA 240**		**IPEA 270**		**IPEA 300**		**IPEA 330**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**293**	**195**	**358**	**239**	**407**	**271**	**485**	**323**	**598**	**399**	**701**	**468**
	1.50	240	160	317	211	**407**	**271**	**485**	**323**	**598**	**399**	**701**	**468**
	2.00	180	120	238	158	308	205	408	272	536	357	695	462
	2.50	144	95.7	190	127	247	164	327	217	429	285	556	370
	3.00	120	79.8	159	105	206	137	272	181	358	238	463	308
	3.50	103	68.4	136	90.4	176	117	233	155	307	204	397	264
	4.00	89.9	59.8	119	79.1	154	103	204	136	268	178	347	231
	4.50	79.9	53.2	106	70.3	137	91.2	182	121	238	159	309	205
	5.00	72.0	47.9	95.1	63.3	123	82.1	163	109	215	143	278	185
	5.50	65.4	43.5	86.5	57.5	112	74.6	149	98.8	195	130	253	168
	6.00	60.0	39.9	79.3	52.7	103	68.4	136	90.6	179	119	232	154
	6.50	55.3	36.8	73.2	48.7	94.9	63.2	126	83.6	165	110	214	142
	7.00	51.4	34.2	67.9	45.2	88.1	58.6	117	77.6	153	102	199	132
	7.50	48.0	31.9	63.4	42.2	82.3	54.7	109	72.5	143	95.2	185	123
	8.00	45.0	29.9	59.4	39.6	77.1	51.3	102	67.9	134	89.2	174	116
	8.50	42.3	28.2	56.0	37.2	72.6	48.3	96.1	63.9	126	84.0	164	109
	9.00	40.0	26.6	52.8	35.2	68.6	45.6	90.8	60.4	119	79.3	154	103
	9.50	37.9	25.2	50.1	33.3	64.9	43.2	86.0	57.2	113	75.1	146	97.3
	10.0	36.0	23.9	47.6	31.6	61.7	41.0	81.7	54.3	107	71.4	139	92.5
	10.5	34.3	22.8	45.3	30.1	58.8	39.1	77.8	51.8	102	68.0	132	88.1
	11.0	32.7	21.8	43.2	28.8	56.1	37.3	74.3	49.4	97.5	64.9	126	84.1
	11.5	31.3	20.8	41.4	27.5	53.6	35.7	71.0	47.3	93.3	62.1	121	80.4
	12.0	30.0	19.9	39.6	26.4	51.4	34.2	68.1	45.3	89.4	59.5	116	77.1
	12.5	28.8	19.1	38.0	25.3	49.4	32.8	65.3	43.5	85.8	57.1	111	74.0
	13.0	27.7	18.4	36.6	24.3	47.5	31.6	62.8	41.8	82.5	54.9	107	71.1
	13.5	26.6	17.7	35.2	23.4	45.7	30.4	60.5	40.3	79.5	52.9	103	68.5
	14.0	25.7	17.1	34.0	22.6	44.1	29.3	58.3	38.8	76.6	51.0	99.3	66.0
	14.5	24.8	16.5	32.8	21.8	42.5	28.3	56.3	37.5	74.0	49.2	95.8	63.8
	15.0	24.0	16.0	31.7	21.1	41.1	27.4	54.5	36.2	71.5	47.6	92.7	61.6
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	360	239	476	316	617	410	817	543	1070	714	1390	925
$\phi_b M_p$	M_p/Ω_b, kN·m	45.0	29.9	59.4	39.6	77.1	51.3	102	67.9	134	89.2	174	116
$\phi_b M_r$	M_r/Ω_b, kN·m	28.0	18.6	37.0	24.6	48.1	32.0	63.8	42.5	83.7	55.7	108	72.1
$\phi_b BF$	BF/Ω_b, kN	7.14	4.75	8.69	5.78	10.3	6.83	12.8	8.50	15.6	10.4	19.0	12.6
$\phi_v V_n$	V_n/Ω_v, kN	146	97.5	179	119	203	136	242	162	299	199	351	234
$Z_x \times 10^3$, mm^3		181.7		240.2		311.6		412.5		541.8		701.9	
L_p, m		1.06		1.17		1.27		1.43		1.59		1.68	
L_r, m		3.44		3.75		4.10		4.43		4.81		5.12	

LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPEA Shapes

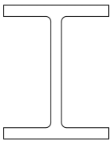
F_y = 275 MPa

Shape		IPEA 360		IPEA 400		IPEA 450		IPEA 500		IPEA 550		IPEA 600	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**779**	**519**	**917**	**611**	**1120**	**747**	**1380**	**918**	**1620**	**1080**	**1930**	**1290**
	1.50	**779**	**519**	**917**	**611**	**1120**	**747**	**1380**	**918**	**1620**	**1080**	**1930**	**1290**
	2.00	**779**	**519**	**917**	**611**	**1120**	**747**	**1380**	**918**	**1620**	**1080**	**1930**	**1290**
	2.50	718	478	906	603	**1120**	**747**	**1380**	**918**	**1620**	**1080**	**1930**	**1290**
	3.00	598	398	755	502	986	656	1280	855	**1620**	**1080**	**1930**	**1290**
	3.50	513	341	647	431	845	562	1100	732	1400	932	1780	1180
	4.00	449	299	566	377	740	492	963	641	1230	815	1550	1030
	4.50	399	265	503	335	657	437	856	570	1090	725	1380	920
	5.00	359	239	453	301	592	394	771	513	980	652	1240	828
	5.50	326	217	412	274	538	358	701	466	891	593	1130	752
	6.00	299	199	378	251	493	328	642	427	817	543	1040	690
	6.50	276	184	348	232	455	303	593	394	754	502	957	637
	7.00	256	171	324	215	423	281	550	366	700	466	888	591
	7.50	239	159	302	201	394	262	514	342	653	435	829	552
	8.00	224	149	283	188	370	246	482	320	613	408	777	517
	8.50	211	141	266	177	348	232	453	302	577	384	732	487
	9.00	199	133	252	167	329	219	428	285	545	362	691	460
	9.50	189	126	238	159	311	207	406	270	516	343	655	436
	10.0	180	119	227	151	296	197	385	256	490	326	622	414
	10.5	171	114	216	144	282	187	367	244	467	311	592	394
	11.0	163	109	206	137	269	179	350	233	446	296	565	376
	11.5	156	104	197	131	257	171	335	223	426	284	541	360
	12.0	150	99.5	189	126	247	164	321	214	408	272	518	345
	12.5	144	95.6	181	121	237	157	308	205	392	261	498	331
	13.0	138	91.9	174	116	228	151	296	197	377	251	478	318
	13.5	133	88.5	168	112	219	146	285	190	363	242	461	307
	14.0	128	85.3	162	108	211	141	275	183	350	233	444	296
	14.5	124	82.4	156	104	204	136	266	177	338	225	429	285
	15.0	120	79.6	151	100	197	131	257	171	327	217	415	276
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	1800	1190	2270	1510	2960	1970	3850	2560	4900	3260	6220	4140
$\phi_b M_p$	M_p/Ω_b, kN·m	224	149	283	188	370	246	482	320	613	408	777	517
$\phi_b M_r$	M_r/Ω_b, kN·m	141	93.6	177	118	231	153	299	199	380	253	481	320
$\phi_b BF$	BF/Ω_b, kN	23.0	15.3	28.2	18.8	36.0	23.9	45.1	30.0	55.3	36.8	67.0	44.6
$\phi_v V_n$	V_n/Ω_v, kN	389	260	459	306	561	374	689	459	812	542	965	644
	$Z_x \times 10^3$, mm^3	906.8		1144		1494		1946		2475		3141	
	L_p, m	1.82		1.90		1.99		2.08		2.16		2.26	
	L_r, m	5.47		5.66		5.86		6.12		6.37		6.68	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

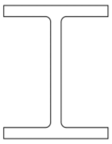


Maximum Total Uniform Load, kN
IPEA Shapes

F_y = 355 MPa

Shape		**IPEA 80**		**IPEA 100**		**IPEA 120**		**IPEA 140**		**IPEA 160**		**IPEA 180**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	48.5	32.3	84.3	56.1	127	84.8	183	122	253	169	**324**	**216**
	1.50	32.3	21.5	56.2	37.4	85.0	56.5	122	81.2	169	112	231	153
	2.00	24.3	16.1	42.1	28.0	63.7	42.4	91.5	60.9	127	84.3	173	115
	2.50	19.4	12.9	33.7	22.4	51.0	33.9	73.2	48.7	101	67.4	138	92.0
	3.00	16.2	10.8	28.1	18.7	42.5	28.3	61.0	40.6	84.4	56.2	115	76.7
	3.50	13.9	9.22	24.1	16.0	36.4	24.2	52.3	34.8	72.4	48.1	98.8	65.7
	4.00	12.1	8.07	21.1	14.0	31.9	21.2	45.8	30.4	63.3	42.1	86.5	57.5
	4.50	10.8	7.17	18.7	12.5	28.3	18.8	40.7	27.1	56.3	37.4	76.9	51.1
	5.00	9.70	6.46	16.9	11.2	25.5	17.0	36.6	24.4	50.7	33.7	69.2	46.0
	5.50	8.82	5.87	15.3	10.2	23.2	15.4	33.3	22.1	46.0	30.6	62.9	41.8
	6.00	8.09	5.38	14.0	9.35	21.2	14.1	30.5	20.3	42.2	28.1	57.6	38.3
	6.50	7.46	4.97	13.0	8.63	19.6	13.0	28.2	18.7	39.0	25.9	53.2	35.4
	7.00	6.93	4.61	12.0	8.01	18.2	12.1	26.1	17.4	36.2	24.1	49.4	32.9
	7.50	6.47	4.30	11.2	7.48	17.0	11.3	24.4	16.2	33.8	22.5	46.1	30.7
	8.00	6.06	4.03	10.5	7.01	15.9	10.6	22.9	15.2	31.7	21.1	43.2	28.8
	8.50	5.71	3.80	9.92	6.60	15.0	9.98	21.5	14.3	29.8	19.8	40.7	27.1
	9.00	5.39	3.59	9.37	6.23	14.2	9.42	20.3	13.5	28.1	18.7	38.4	25.6
	9.50	5.11	3.40	8.87	5.90	13.4	8.93	19.3	12.8	26.7	17.7	36.4	24.2
	10.0	4.85	3.23	8.43	5.61	12.7	8.48	18.3	12.2	25.3	16.9	34.6	23.0
	10.5	4.62	3.07	8.03	5.34	12.1	8.08	17.4	11.6	24.1	16.0	32.9	21.9
	11.0	4.41	2.93	7.66	5.10	11.6	7.71	16.6	11.1	23.0	15.3	31.4	20.9
	11.5	4.22	2.81	7.33	4.88	11.1	7.37	15.9	10.6	22.0	14.7	30.1	20.0
	12.0	4.04	2.69	7.02	4.67	10.6	7.07	15.3	10.1	21.1	14.0	28.8	19.2
	12.5	3.88	2.58	6.74	4.49	10.2	6.78	14.6	9.74	20.3	13.5	27.7	18.4
	13.0	3.73	2.48	6.48	4.31	9.81	6.52	14.1	9.37	19.5	13.0	26.6	17.7
	13.5	3.59	2.39	6.24	4.15	9.44	6.28	13.6	9.02	18.8	12.5	25.6	17.0
	14.0	3.47	2.31	6.02	4.01	9.10	6.06	13.1	8.70	18.1	12.0	24.7	16.4
	14.5	3.35	2.23	5.81	3.87	8.79	5.85	12.6	8.40	17.5	11.6	23.9	15.9
	15.0	3.23	2.15	5.62	3.74	8.50	5.65	12.2	8.12	16.9	11.2	23.1	15.3
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	48.5	32.3	84.3	56.1	127	84.8	183	122	253	169	346	230
$\phi_b M_p$	M_p/Ω_b , kN·m	6.06	4.03	10.5	7.01	15.9	10.6	22.9	15.2	31.7	21.1	43.2	28.8
$\phi_b M_r$	M_r/Ω_b , kN·m	3.69	2.46	6.44	4.29	9.79	6.51	14.2	9.42	19.6	13.1	26.9	17.9
$\phi_b BF$	BF/Ω_b , kN	1.80	1.19	2.86	1.91	4.20	2.79	5.72	3.80	7.31	4.86	9.26	6.16
$\phi_v V_n$	V_n/Ω_v , kN	54.8	36.6	75.1	50.1	95.2	63.5	111	74.1	134	89.2	162	108
	$Z_x \times 10^3$, mm^3	18.98		32.98		49.87		71.60		99.09		135.3	
	L_p , m	0.434		0.510		0.593		0.689		0.764		0.856	
	L_r , m	1.76		1.94		2.06		2.21		2.41		2.62	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPEA Shapes

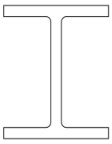
F_y = 355 MPa

Shape		IPEA 200		IPEA 220		IPEA 240		IPEA 270		IPEA 300		IPEA 330	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**378**	**252**	**462**	**308**	**525**	**350**	**626**	**417**	**772**	**515**	**905**	**604**
	1.50	310	206	409	272	**525**	**350**	**626**	**417**	**772**	**515**	**905**	**604**
	2.00	232	154	307	204	398	265	527	351	692	461	897	597
	2.50	186	124	246	163	319	212	422	281	554	369	718	477
	3.00	155	103	205	136	265	177	351	234	462	307	598	398
	3.50	133	88.3	175	117	228	151	301	200	396	263	513	341
	4.00	116	77.2	153	102	199	132	264	175	346	230	449	298
	4.50	103	68.7	136	90.8	177	118	234	156	308	205	399	265
	5.00	92.9	61.8	123	81.7	159	106	211	140	277	184	359	239
	5.50	84.4	56.2	112	74.3	145	96.3	192	128	252	168	326	217
	6.00	77.4	51.5	102	68.1	133	88.3	176	117	231	154	299	199
	6.50	71.5	47.5	94.5	62.8	123	81.5	162	108	213	142	276	184
	7.00	66.3	44.1	87.7	58.4	114	75.7	151	100	198	132	256	171
	7.50	61.9	41.2	81.9	54.5	106	70.7	141	93.5	185	123	239	159
	8.00	58.1	38.6	76.7	51.1	99.6	66.2	132	87.7	173	115	224	149
	8.50	54.6	36.4	72.2	48.1	93.7	62.3	124	82.5	163	108	211	140
	9.00	51.6	34.3	68.2	45.4	88.5	58.9	117	77.9	154	102	199	133
	9.50	48.9	32.5	64.6	43.0	83.8	55.8	111	73.8	146	97.0	189	126
	10.0	46.4	30.9	61.4	40.8	79.6	53.0	105	70.1	138	92.1	179	119
	10.5	44.2	29.4	58.5	38.9	75.9	50.5	100	66.8	132	87.8	171	114
	11.0	42.2	28.1	55.8	37.1	72.4	48.2	95.9	63.8	126	83.8	163	109
	11.5	40.4	26.9	53.4	35.5	69.3	46.1	91.7	61.0	120	80.1	156	104
	12.0	38.7	25.7	51.2	34.0	66.4	44.2	87.9	58.5	115	76.8	150	99.5
	12.5	37.2	24.7	49.1	32.7	63.7	42.4	84.3	56.1	111	73.7	144	95.5
	13.0	35.7	23.8	47.2	31.4	61.3	40.8	81.1	54.0	107	70.9	138	91.8
	13.5	34.4	22.9	45.5	30.3	59.0	39.3	78.1	52.0	103	68.3	133	88.4
	14.0	33.2	22.1	43.9	29.2	56.9	37.9	75.3	50.1	98.9	65.8	128	85.3
	14.5	32.0	21.3	42.3	28.2	54.9	36.5	72.7	48.4	95.5	63.5	124	82.3
	15.0	31.0	20.6	40.9	27.2	53.1	35.3	70.3	46.8	92.3	61.4	120	79.6
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	464	309	614	408	796	530	1050	701	1380	921	1790	1190
$\phi_b M_p$	M_p/Ω_b , kN·m	58.1	38.6	76.7	51.1	99.6	66.2	132	87.7	173	115	224	149
$\phi_b M_r$	M_r/Ω_b , kN·m	36.1	24.0	47.7	31.8	62.1	41.3	82.4	54.8	108	71.9	140	93.1
$\phi_b BF$	BF/Ω_b , kN	11.3	7.54	13.8	9.16	16.3	10.8	20.1	13.3	24.4	16.2	29.7	19.7
$\phi_v V_n$	V_n/Ω_v , kN	189	126	231	154	263	175	313	209	386	257	453	302
$Z_x \times 10^3$, mm^3		181.7		240.2		311.6		412.5		541.8		701.9	
L_p , m		0.932		1.03		1.12		1.26		1.40		1.48	
L_r , m		2.86		3.13		3.42		3.73		4.06		4.32	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPEA Shapes

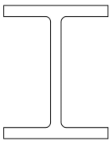
F_y = 355 MPa

Shape		IPEA 360		IPEA 400		IPEA 450		IPEA 500		IPEA 550		IPEA 600	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**1010**	**670**	**1180**	**789**	**1450**	**965**	**1780**	**1190**	**2100**	**1400**	**2490**	**1660**
	1.50	**1010**	**670**	**1180**	**789**	**1450**	**965**	**1780**	**1190**	**2100**	**1400**	**2490**	**1660**
	2.00	**1010**	**670**	**1180**	**789**	**1450**	**965**	**1780**	**1190**	**2100**	**1400**	**2490**	**1660**
	2.50	927	617	1170	778	**1450**	**965**	**1780**	**1190**	**2100**	**1400**	**2490**	**1660**
	3.00	773	514	975	648	1270	847	1660	1100	**2100**	**1400**	**2490**	**1660**
	3.50	662	441	835	556	1090	726	1420	946	1810	1200	2290	1530
	4.00	579	386	731	486	955	635	1240	827	1580	1050	2010	1340
	4.50	515	343	650	432	849	565	1110	735	1410	935	1780	1190
	5.00	464	308	585	389	764	508	995	662	1270	842	1610	1070
	5.50	421	280	532	354	694	462	904	602	1150	765	1460	971
	6.00	386	257	487	324	636	423	829	552	1050	701	1340	890
	6.50	357	237	450	299	587	391	765	509	973	648	1240	822
	7.00	331	220	418	278	546	363	711	473	904	601	1150	763
	7.50	309	206	390	259	509	339	663	441	843	561	1070	712
	8.00	290	193	366	243	477	318	622	414	791	526	1000	668
	8.50	273	181	344	229	449	299	585	389	744	495	945	628
	9.00	258	171	325	216	424	282	553	368	703	468	892	594
	9.50	244	162	308	205	402	267	524	348	666	443	845	562
	10.0	232	154	292	195	382	254	497	331	633	421	803	534
	10.5	221	147	278	185	364	242	474	315	602	401	765	509
	11.0	211	140	266	177	347	231	452	301	575	383	730	486
	11.5	202	134	254	169	332	221	433	288	550	366	698	464
	12.0	193	129	244	162	318	212	414	276	527	351	669	445
	12.5	185	123	234	156	305	203	398	265	506	337	642	427
	13.0	178	119	225	150	294	195	383	255	487	324	618	411
	13.5	172	114	217	144	283	188	368	245	469	312	595	396
	14.0	166	110	209	139	273	181	355	236	452	301	573	382
	14.5	160	106	202	134	263	175	343	228	436	290	554	368
	15.0	155	103	195	130	255	169	332	221	422	281	535	356
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	2320	1540	2920	1950	3820	2540	4970	3310	6330	4210	8030	5340
$\phi_b M_p$	M_p/Ω_b , kN·m	290	193	366	243	477	318	622	414	791	526	1000	668
$\phi_b M_r$	M_r/Ω_b , kN·m	182	121	229	152	298	198	386	257	490	326	621	413
$\phi_b BF$	BF/Ω_b , kN	35.8	23.8	43.8	29.2	55.6	37.0	69.6	46.3	85.2	56.7	103	68.7
$\phi_v V_n$	V_n/Ω_v , kN	503	335	592	395	724	482	889	593	1050	699	1250	831
	$Z_x \times 10^3$, mm^3	906.8		1144		1494		1946		2475		3141	
	L_p , m	1.60		1.67		1.75		1.83		1.90		1.99	
	L_r , m	4.62		4.80		4.98		5.21		5.43		5.70	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPE Shapes

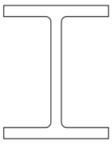
F_y = 235 MPa

Shape		**IPE 80**		**IPE 100**		**IPE 120**		**IPE 140**		**IPE 160**		**IPE 180**	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	39.3	26.1	66.7	44.4	103	68.4	149	99.4	210	139	**269**	**179**
	1.50	26.2	17.4	44.5	29.6	68.5	45.6	99.6	66.3	140	93.0	188	125
	2.00	19.6	13.1	33.3	22.2	51.4	34.2	74.7	49.7	105	69.7	141	93.7
	2.50	15.7	10.5	26.7	17.7	41.1	27.3	59.8	39.8	83.9	55.8	113	74.9
	3.00	13.1	8.71	22.2	14.8	34.3	22.8	49.8	33.1	69.9	46.5	93.8	62.4
	3.50	11.2	7.47	19.1	12.7	29.4	19.5	42.7	28.4	59.9	39.9	80.4	53.5
	4.00	9.82	6.53	16.7	11.1	25.7	17.1	37.4	24.9	52.4	34.9	70.4	46.8
	4.50	8.73	5.81	14.8	9.86	22.8	15.2	33.2	22.1	46.6	31.0	62.6	41.6
	5.00	7.86	5.23	13.3	8.87	20.6	13.7	29.9	19.9	41.9	27.9	56.3	37.5
	5.50	7.14	4.75	12.1	8.07	18.7	12.4	27.2	18.1	38.1	25.4	51.2	34.1
	6.00	6.55	4.36	11.1	7.39	17.1	11.4	24.9	16.6	34.9	23.2	46.9	31.2
	6.50	6.04	4.02	10.3	6.83	15.8	10.5	23.0	15.3	32.3	21.5	43.3	28.8
	7.00	5.61	3.73	9.53	6.34	14.7	9.77	21.4	14.2	29.9	19.9	40.2	26.8
	7.50	5.24	3.49	8.89	5.92	13.7	9.12	19.9	13.3	28.0	18.6	37.5	25.0
	8.00	4.91	3.27	8.34	5.55	12.8	8.55	18.7	12.4	26.2	17.4	35.2	23.4
	8.50	4.62	3.08	7.84	5.22	12.1	8.04	17.6	11.7	24.7	16.4	33.1	22.0
	9.00	4.37	2.90	7.41	4.93	11.4	7.60	16.6	11.0	23.3	15.5	31.3	20.8
	9.50	4.14	2.75	7.02	4.67	10.8	7.20	15.7	10.5	22.1	14.7	29.6	19.7
	10.0	3.93	2.61	6.67	4.44	10.3	6.84	14.9	9.94	21.0	13.9	28.2	18.7
	10.5	3.74	2.49	6.35	4.23	9.79	6.51	14.2	9.47	20.0	13.3	26.8	17.8
	11.0	3.57	2.38	6.06	4.03	9.34	6.22	13.6	9.04	19.1	12.7	25.6	17.0
	11.5	3.42	2.27	5.80	3.86	8.94	5.94	13.0	8.65	18.2	12.1	24.5	16.3
	12.0	3.27	2.18	5.56	3.70	8.56	5.70	12.5	8.29	17.5	11.6	23.5	15.6
	12.5	3.14	2.09	5.33	3.55	8.22	5.47	12.0	7.96	16.8	11.2	22.5	15.0
	13.0	3.02	2.01	5.13	3.41	7.90	5.26	11.5	7.65	16.1	10.7	21.7	14.4
	13.5	2.91	1.94	4.94	3.29	7.61	5.06	11.1	7.37	15.5	10.3	20.9	13.9
	14.0	2.81	1.87	4.76	3.17	7.34	4.88	10.7	7.10	15.0	9.96	20.1	13.4
	14.5	2.71	1.80	4.60	3.06	7.09	4.71	10.3	6.86	14.5	9.62	19.4	12.9
	15.0	2.62	1.74	4.45	2.96	6.85	4.56	9.96	6.63	14.0	9.30	18.8	12.5
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	39.3	26.1	66.7	44.4	103	68.4	149	99.4	210	139	282	187
$\phi_b M_p$	M_p/Ω_b, kN·m	4.91	3.27	8.34	5.55	12.8	8.55	18.7	12.4	26.2	17.4	35.2	23.4
$\phi_b M_r$	M_r/Ω_b, kN·m	2.97	1.97	5.06	3.37	7.84	5.22	11.4	7.62	16.1	10.7	21.7	14.4
$\phi_b BF$	BF/Ω_b, kN	0.823	0.547	1.30	0.868	1.97	1.31	2.75	1.83	3.60	2.40	4.61	3.07
$\phi_v V_n$	V_n/Ω_v, kN	42.9	28.6	57.8	38.5	74.4	49.6	92.8	61.9	113	75.2	135	89.7
	$Z_x \times 10^3$, mm^3	23.22		39.41		60.73		88.34		123.9		166.4	
	L_p, m	0.539		0.637		0.744		0.847		0.945		1.05	
	L_r, m	2.90		3.14		3.29		3.48		3.75		3.99	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

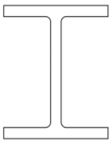


Maximum Total Uniform Load, kN
IPE Shapes

F_y = 235 MPa

Shape		**IPE 200**		**IPE 220**		**IPE 240**		**IPE 270**		**IPE 300**		**IPE 330**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**316**	**211**	**366**	**244**	**420**	**280**	**503**	**335**	**601**	**400**	**698**	**465**
	1.50	249	166	322	214	414	275	503	335	**601**	**400**	**698**	**465**
	2.00	187	124	241	161	310	206	409	272	532	354	680	453
	2.50	149	99.3	193	129	248	165	328	218	425	283	544	362
	3.00	124	82.8	161	107	207	138	273	182	354	236	454	302
	3.50	107	71.0	138	91.8	177	118	234	156	304	202	389	259
	4.00	93.3	62.1	121	80.3	155	103	205	136	266	177	340	226
	4.50	82.9	55.2	107	71.4	138	91.7	182	121	236	157	302	201
	5.00	74.7	49.7	96.6	64.3	124	82.5	164	109	213	141	272	181
	5.50	67.9	45.2	87.8	58.4	113	75.0	149	99.1	193	129	247	165
	6.00	62.2	41.4	80.5	53.5	103	68.8	136	90.8	177	118	227	151
	6.50	57.4	38.2	74.3	49.4	95.4	63.5	126	83.8	164	109	209	139
	7.00	53.3	35.5	69.0	45.9	88.6	59.0	117	77.8	152	101	194	129
	7.50	49.8	33.1	64.4	42.8	82.7	55.0	109	72.6	142	94.3	181	121
	8.00	46.7	31.0	60.4	40.2	77.5	51.6	102	68.1	133	88.4	170	113
	8.50	43.9	29.2	56.8	37.8	73.0	48.6	96.3	64.1	125	83.2	160	107
	9.00	41.5	27.6	53.7	35.7	68.9	45.9	91.0	60.5	118	78.6	151	101
	9.50	39.3	26.1	50.8	33.8	65.3	43.4	86.2	57.4	112	74.5	143	95.3
	10.0	37.3	24.8	48.3	32.1	62.0	41.3	81.9	54.5	106	70.7	136	90.5
	10.5	35.5	23.7	46.0	30.6	59.1	39.3	78.0	51.9	101	67.4	130	86.2
	11.0	33.9	22.6	43.9	29.2	56.4	37.5	74.4	49.5	96.7	64.3	124	82.3
	11.5	32.5	21.6	42.0	27.9	53.9	35.9	71.2	47.4	92.5	61.5	118	78.7
	12.0	31.1	20.7	40.2	26.8	51.7	34.4	68.2	45.4	88.6	59.0	113	75.5
	12.5	29.9	19.9	38.6	25.7	49.6	33.0	65.5	43.6	85.1	56.6	109	72.4
	13.0	28.7	19.1	37.1	24.7	47.7	31.7	63.0	41.9	81.8	54.4	105	69.6
	13.5	27.6	18.4	35.8	23.8	45.9	30.6	60.7	40.4	78.8	52.4	101	67.1
	14.0	26.7	17.7	34.5	22.9	44.3	29.5	58.5	38.9	75.9	50.5	97.2	64.7
	14.5	25.7	17.1	33.3	22.2	42.8	28.5	56.5	37.6	73.3	48.8	93.9	62.4
	15.0	24.9	16.6	32.2	21.4	41.4	27.5	54.6	36.3	70.9	47.2	90.7	60.4
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	373	248	483	321	620	413	819	545	1060	707	1360	905
$\phi_b M_p$	M_p/Ω_b , kN·m	46.7	31.0	60.4	40.2	77.5	51.6	102	68.1	133	88.4	170	113
$\phi_b M_r$	M_r/Ω_b , kN·m	28.8	19.1	37.3	24.8	48.0	31.9	63.5	42.2	82.5	54.9	106	70.2
$\phi_b BF$	BF/Ω_b , kN	5.65	3.76	6.87	4.57	8.09	5.38	10.2	6.81	12.6	8.37	15.2	10.1
$\phi_v V_n$	V_n/Ω_v , kN	158	105	183	122	210	140	251	168	300	200	349	233
	$Z_x \times 10^3$, mm^3	220.6		285.4		366.6		484.0		628.4		804.3	
	L_p , m	1.15		1.27		1.38		1.55		1.72		1.82	
	L_r , m	4.32		4.63		5.03		5.35		5.73		6.06	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.

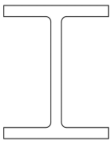


Maximum Total Uniform Load, kN
IPE Shapes

F_y = 235 MPa

Shape		IPE 360		IPE 400		IPE 450		IPE 500		IPE 550		IPE 600	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**812**	**541**	**970**	**647**	**1190**	**795**	**1440**	**959**	**1720**	**1150**	**2030**	**1350**
	1.50	**812**	**541**	**970**	**647**	**1190**	**795**	**1440**	**959**	**1720**	**1150**	**2030**	**1350**
	2.00	**812**	**541**	**970**	**647**	**1190**	**795**	**1440**	**959**	**1720**	**1150**	**2030**	**1350**
	2.50	690	459	885	589	1150	766	**1440**	**959**	**1720**	**1150**	**2030**	**1350**
	3.00	575	382	737	490	960	639	1240	823	1570	1050	1980	1320
	3.50	493	328	632	420	823	547	1060	706	1350	896	1700	1130
	4.00	431	287	553	368	720	479	928	617	1180	784	1490	988
	4.50	383	255	491	327	640	426	825	549	1050	697	1320	879
	5.00	345	229	442	294	576	383	742	494	943	627	1190	791
	5.50	313	209	402	268	524	348	675	449	857	570	1080	719
	6.00	287	191	369	245	480	319	619	412	786	523	990	659
	6.50	265	176	340	226	443	295	571	380	725	483	914	608
	7.00	246	164	316	210	411	274	530	353	674	448	849	565
	7.50	230	153	295	196	384	255	495	329	629	418	792	527
	8.00	216	143	276	184	360	240	464	309	589	392	743	494
	8.50	203	135	260	173	339	225	437	291	555	369	699	465
	9.00	192	127	246	163	320	213	412	274	524	349	660	439
	9.50	181	121	233	155	303	202	391	260	496	330	626	416
	10.0	172	115	221	147	288	192	371	247	472	314	594	395
	10.5	164	109	211	140	274	182	354	235	449	299	566	377
	11.0	157	104	201	134	262	174	337	225	429	285	540	359
	11.5	150	99.8	192	128	250	167	323	215	410	273	517	344
	12.0	144	95.6	184	123	240	160	309	206	393	261	495	329
	12.5	138	91.8	177	118	230	153	297	198	377	251	475	316
	13.0	133	88.2	170	113	222	147	286	190	363	241	457	304
	13.5	128	85.0	164	109	213	142	275	183	349	232	440	293
	14.0	123	81.9	158	105	206	137	265	176	337	224	424	282
	14.5	119	79.1	153	101	199	132	256	170	325	216	410	273
	15.0	115	76.5	147	98.1	192	128	247	165	314	209	396	264
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	1720	1150	2210	1470	2880	1920	3710	2470	4720	3140	5940	3950
$\phi_b M_p$	M_p/Ω_b , kN·m	216	143	276	184	360	240	464	309	589	392	743	494
$\phi_b M_r$	M_r/Ω_b , kN·m	134	89.0	171	114	222	148	285	190	361	240	454	302
$\phi_b BF$	BF/Ω_b , kN	18.4	12.2	22.8	15.2	29.4	19.5	36.8	24.5	45.2	30.1	54.7	36.4
$\phi_v V_n$	V_n/Ω_v , kN	406	271	485	323	596	398	719	479	861	574	1020	677
	$Z_x \times 10^3$, mm^3	1019		1307		1702		2194		2787		3512	
	L_p , m	1.95		2.03		2.12		2.21		2.28		2.39	
	L_r , m	6.40		6.65		6.81		7.06		7.33		7.66	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPE Shapes

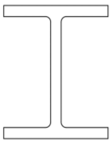
F_y = 275 MPa

Shape		IPE 80		IPE 100		IPE 120		IPE 140		IPE 160		IPE 180	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	46.0	30.6	78.0	51.9	120	80.0	175	116	245	163	**315**	**210**
	1.50	30.7	20.4	52.0	34.6	80.2	53.3	117	77.6	164	109	220	146
	2.00	23.0	15.3	39.0	26.0	60.1	40.0	87.5	58.2	123	81.6	165	110
	2.50	18.4	12.2	31.2	20.8	48.1	32.0	70.0	46.6	98.1	65.3	132	87.7
	3.00	15.3	10.2	26.0	17.3	40.1	26.7	58.3	38.8	81.8	54.4	110	73.1
	3.50	13.1	8.74	22.3	14.8	34.4	22.9	50.0	33.3	70.1	46.6	94.1	62.6
	4.00	11.5	7.65	19.5	13.0	30.1	20.0	43.7	29.1	61.3	40.8	82.4	54.8
	4.50	10.2	6.80	17.3	11.5	26.7	17.8	38.9	25.9	54.5	36.3	73.2	48.7
	5.00	9.20	6.12	15.6	10.4	24.0	16.0	35.0	23.3	49.1	32.6	65.9	43.8
	5.50	8.36	5.56	14.2	9.44	21.9	14.5	31.8	21.2	44.6	29.7	59.9	39.9
	6.00	7.66	5.10	13.0	8.65	20.0	13.3	29.2	19.4	40.9	27.2	54.9	36.5
	6.50	7.07	4.71	12.0	7.99	18.5	12.3	26.9	17.9	37.7	25.1	50.7	33.7
	7.00	6.57	4.37	11.1	7.42	17.2	11.4	25.0	16.6	35.0	23.3	47.1	31.3
	7.50	6.13	4.08	10.4	6.92	16.0	10.7	23.3	15.5	32.7	21.8	43.9	29.2
	8.00	5.75	3.82	9.75	6.49	15.0	10.0	21.9	14.5	30.7	20.4	41.2	27.4
	8.50	5.41	3.60	9.18	6.11	14.1	9.41	20.6	13.7	28.9	19.2	38.8	25.8
	9.00	5.11	3.40	8.67	5.77	13.4	8.89	19.4	12.9	27.3	18.1	36.6	24.4
	9.50	4.84	3.22	8.21	5.46	12.7	8.42	18.4	12.3	25.8	17.2	34.7	23.1
	10.0	4.60	3.06	7.80	5.19	12.0	8.00	17.5	11.6	24.5	16.3	32.9	21.9
	10.5	4.38	2.91	7.43	4.94	11.5	7.62	16.7	11.1	23.4	15.5	31.4	20.9
	11.0	4.18	2.78	7.09	4.72	10.9	7.27	15.9	10.6	22.3	14.8	30.0	19.9
	11.5	4.00	2.66	6.79	4.51	10.5	6.96	15.2	10.1	21.3	14.2	28.6	19.1
	12.0	3.83	2.55	6.50	4.33	10.0	6.67	14.6	9.70	20.4	13.6	27.5	18.3
	12.5	3.68	2.45	6.24	4.15	9.62	6.40	14.0	9.31	19.6	13.1	26.4	17.5
	13.0	3.54	2.35	6.00	3.99	9.25	6.15	13.5	8.95	18.9	12.6	25.3	16.9
	13.5	3.41	2.27	5.78	3.85	8.91	5.93	13.0	8.62	18.2	12.1	24.4	16.2
	14.0	3.28	2.18	5.57	3.71	8.59	5.71	12.5	8.31	17.5	11.7	23.5	15.7
	14.5	3.17	2.11	5.38	3.58	8.29	5.52	12.1	8.03	16.9	11.3	22.7	15.1
	15.0	3.07	2.04	5.20	3.46	8.02	5.33	11.7	7.76	16.4	10.9	22.0	14.6
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	46.0	30.6	78.0	51.9	120	80.0	175	116	245	163	329	219
$\phi_b M_p$	M_p/Ω_b , kN·m	5.75	3.82	9.75	6.49	15.0	10.0	21.9	14.5	30.7	20.4	41.2	27.4
$\phi_b M_r$	M_r/Ω_b , kN·m	3.47	2.31	5.93	3.94	9.18	6.10	13.4	8.91	18.8	12.5	25.3	16.9
$\phi_b BF$	BF/Ω_b , kN	1.14	0.756	1.80	1.20	2.70	1.79	3.75	2.49	4.91	3.26	6.25	4.16
$\phi_v V_n$	V_n/Ω_v , kN	50.2	33.4	67.7	45.1	87.1	58.1	109	72.4	132	88.0	157	105
	$Z_x \times 10^3$, mm^3	23.22		39.41		60.73		88.34		123.9		166.4	
	L_p , m	0.498		0.589		0.688		0.783		0.873		0.973	
	L_r , m	2.50		2.72		2.86		3.04		3.28		3.51	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPE Shapes

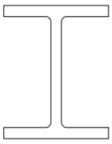
F_y = 275 MPa

Shape		IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**370**	**246**	**428**	**286**	**491**	**327**	**588**	**392**	**703**	**469**	**817**	**545**
	1.50	291	194	377	251	484	322	588	392	**703**	**469**	**817**	**545**
	2.00	218	145	283	188	363	241	479	319	622	414	796	530
	2.50	175	116	226	150	290	193	383	255	498	331	637	424
	3.00	146	96.9	188	125	242	161	319	213	415	276	531	353
	3.50	125	83.0	161	107	207	138	274	182	355	237	455	303
	4.00	109	72.7	141	94.0	181	121	240	159	311	207	398	265
	4.50	97.1	64.6	126	83.6	161	107	213	142	276	184	354	235
	5.00	87.4	58.1	113	75.2	145	96.6	192	128	249	166	319	212
	5.50	79.4	52.8	103	68.4	132	87.8	174	116	226	151	290	193
	6.00	72.8	48.4	94.2	62.7	121	80.5	160	106	207	138	265	177
	6.50	67.2	44.7	86.9	57.8	112	74.3	147	98.1	191	127	245	163
	7.00	62.4	41.5	80.7	53.7	104	69.0	137	91.1	178	118	228	151
	7.50	58.2	38.7	75.3	50.1	96.8	64.4	128	85.0	166	110	212	141
	8.00	54.6	36.3	70.6	47.0	90.7	60.4	120	79.7	156	103	199	132
	8.50	51.4	34.2	66.5	44.2	85.4	56.8	113	75.0	146	97.4	187	125
	9.00	48.5	32.3	62.8	41.8	80.7	53.7	106	70.8	138	92.0	177	118
	9.50	46.0	30.6	59.5	39.6	76.4	50.8	101	67.1	131	87.1	168	112
	10.0	43.7	29.1	56.5	37.6	72.6	48.3	95.8	63.8	124	82.8	159	106
	10.5	41.6	27.7	53.8	35.8	69.1	46.0	91.3	60.7	118	78.8	152	101
	11.0	39.7	26.4	51.4	34.2	66.0	43.9	87.1	58.0	113	75.3	145	96.3
	11.5	38.0	25.3	49.1	32.7	63.1	42.0	83.3	55.4	108	72.0	138	92.1
	12.0	36.4	24.2	47.1	31.3	60.5	40.2	79.9	53.1	104	69.0	133	88.3
	12.5	34.9	23.2	45.2	30.1	58.1	38.6	76.7	51.0	99.5	66.2	127	84.8
	13.0	33.6	22.4	43.5	28.9	55.8	37.1	73.7	49.0	95.7	63.7	123	81.5
	13.5	32.4	21.5	41.9	27.9	53.8	35.8	71.0	47.2	92.2	61.3	118	78.5
	14.0	31.2	20.8	40.4	26.9	51.8	34.5	68.5	45.5	88.9	59.1	114	75.7
	14.5	30.1	20.0	39.0	25.9	50.1	33.3	66.1	44.0	85.8	57.1	110	73.1
	15.0	29.1	19.4	37.7	25.1	48.4	32.2	63.9	42.5	82.9	55.2	106	70.6
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	437	291	565	376	726	483	958	638	1240	828	1590	1060
$\phi_b M_p$	M_p/Ω_b , kN·m	54.6	36.3	70.6	47.0	90.7	60.4	120	79.7	156	103	199	132
$\phi_b M_r$	M_r/Ω_b , kN·m	33.7	22.4	43.7	29.0	56.2	37.4	74.3	49.4	96.5	64.2	124	82.2
$\phi_b BF$	BF/Ω_b , kN	7.66	5.10	9.29	6.18	10.9	7.27	13.7	9.14	16.8	11.2	20.3	13.5
$\phi_v V_n$	V_n/Ω_v , kN	185	123	214	143	246	164	294	196	351	234	408	272
	$Z_x \times 10^3$, mm^3	220.6		285.4		366.6		484.0		628.4		804.3	
	L_p , m	1.06		1.18		1.28		1.43		1.59		1.68	
	L_r , m	3.80		4.08		4.44		4.74		5.10		5.40	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

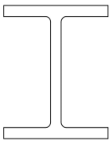


Maximum Total Uniform Load, kN
IPE Shapes

F_y = 275 MPa

Shape		**IPE 360**		**IPE 400**		**IPE 450**		**IPE 500**		**IPE 550**		**IPE 600**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**950**	**634**	**1140**	**757**	**1400**	**931**	**1680**	**1120**	**2010**	**1340**	**2380**	**1580**
	1.50	**950**	**634**	**1140**	**757**	**1400**	**931**	**1680**	**1120**	**2010**	**1340**	**2380**	**1580**
	2.00	**950**	**634**	**1140**	**757**	**1400**	**931**	**1680**	**1120**	**2010**	**1340**	**2380**	**1580**
	2.50	807	537	1040	689	1350	897	**1680**	**1120**	**2010**	**1340**	**2380**	**1580**
	3.00	673	447	863	574	1120	747	1450	963	1840	1220	2320	1540
	3.50	576	384	739	492	963	641	1240	826	1580	1050	1990	1320
	4.00	504	336	647	430	842	561	1090	723	1380	918	1740	1160
	4.50	448	298	575	383	749	498	965	642	1230	816	1550	1030
	5.00	404	268	518	344	674	448	869	578	1100	734	1390	925
	5.50	367	244	471	313	613	408	790	526	1000	668	1260	841
	6.00	336	224	431	287	562	374	724	482	920	612	1160	771
	6.50	310	207	398	265	518	345	668	445	849	565	1070	712
	7.00	288	192	370	246	481	320	621	413	788	524	993	661
	7.50	269	179	345	230	449	299	579	385	736	490	927	617
	8.00	252	168	323	215	421	280	543	361	690	459	869	578
	8.50	237	158	304	203	396	264	511	340	649	432	818	544
	9.00	224	149	288	191	374	249	483	321	613	408	773	514
	9.50	212	141	272	181	355	236	457	304	581	386	732	487
	10.0	202	134	259	172	337	224	434	289	552	367	695	463
	10.5	192	128	246	164	321	214	414	275	526	350	662	441
	11.0	183	122	235	157	306	204	395	263	502	334	632	421
	11.5	175	117	225	150	293	195	378	251	480	319	605	402
	12.0	168	112	216	143	281	187	362	241	460	306	579	386
	12.5	161	107	207	138	270	179	348	231	441	294	556	370
	13.0	155	103	199	132	259	172	334	222	424	282	535	356
	13.5	149	99.4	192	128	250	166	322	214	409	272	515	343
	14.0	144	95.9	185	123	241	160	310	206	394	262	497	330
	14.5	139	92.6	178	119	232	155	300	199	381	253	480	319
	15.0	135	89.5	173	115	225	149	290	193	368	245	464	308
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	2020	1340	2590	1720	3370	2240	4340	2890	5520	3670	6950	4630
$\phi_b M_p$	M_p/Ω_b , kN·m	252	168	323	215	421	280	543	361	690	459	869	578
$\phi_b M_r$	M_r/Ω_b , kN·m	157	104	200	133	260	173	334	222	423	281	532	354
$\phi_b BF$	BF/Ω_b , kN	24.5	16.3	30.3	20.2	38.9	25.9	48.7	32.4	59.7	39.7	72.3	48.1
$\phi_v V_n$	V_n/Ω_v , kN	475	317	568	378	698	465	842	561	1010	672	1190	792
	$Z_x \times 10^3$, mm^3	1019		1307		1702		2194		2787		3512	
	L_p , m	1.80		1.87		1.96		2.05		2.11		2.21	
	L_r , m	5.71		5.93		6.10		6.33		6.58		6.88	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPE Shapes

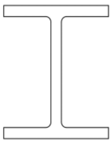
F_y = 355 MPa

Shape		**IPE 80**		**IPE 100**		**IPE 120**		**IPE 140**		**IPE 160**		**IPE 180**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	59.4	39.5	101	67.0	155	103	226	150	317	211	**406**	**271**
	1.50	39.6	26.3	67.2	44.7	103	68.9	151	100	211	140	284	189
	2.00	29.7	19.7	50.4	33.5	77.6	51.6	113	75.1	158	105	213	141
	2.50	23.7	15.8	40.3	26.8	62.1	41.3	90.3	60.1	127	84.3	170	113
	3.00	19.8	13.2	33.6	22.3	51.7	34.4	75.3	50.1	106	70.2	142	94.3
	3.50	17.0	11.3	28.8	19.1	44.4	29.5	64.5	42.9	90.5	60.2	122	80.9
	4.00	14.8	9.87	25.2	16.8	38.8	25.8	56.4	37.6	79.2	52.7	106	70.7
	4.50	13.2	8.78	22.4	14.9	34.5	23.0	50.2	33.4	70.4	46.8	94.5	62.9
	5.00	11.9	7.90	20.1	13.4	31.0	20.7	45.2	30.0	63.3	42.1	85.1	56.6
	5.50	10.8	7.18	18.3	12.2	28.2	18.8	41.1	27.3	57.6	38.3	77.3	51.5
	6.00	9.89	6.58	16.8	11.2	25.9	17.2	37.6	25.0	52.8	35.1	70.9	47.2
	6.50	9.13	6.08	15.5	10.3	23.9	15.9	34.7	23.1	48.7	32.4	65.4	43.5
	7.00	8.48	5.64	14.4	9.57	22.2	14.8	32.3	21.5	45.2	30.1	60.8	40.4
	7.50	7.91	5.27	13.4	8.94	20.7	13.8	30.1	20.0	42.2	28.1	56.7	37.7
	8.00	7.42	4.94	12.6	8.38	19.4	12.9	28.2	18.8	39.6	26.3	53.2	35.4
	8.50	6.98	4.65	11.9	7.88	18.3	12.2	26.6	17.7	37.3	24.8	50.0	33.3
	9.00	6.59	4.39	11.2	7.45	17.2	11.5	25.1	16.7	35.2	23.4	47.3	31.4
	9.50	6.25	4.16	10.6	7.05	16.3	10.9	23.8	15.8	33.3	22.2	44.8	29.8
	10.0	5.94	3.95	10.1	6.70	15.5	10.3	22.6	15.0	31.7	21.1	42.5	28.3
	10.5	5.65	3.76	9.59	6.38	14.8	9.84	21.5	14.3	30.2	20.1	40.5	27.0
	11.0	5.40	3.59	9.16	6.09	14.1	9.39	20.5	13.7	28.8	19.2	38.7	25.7
	11.5	5.16	3.43	8.76	5.83	13.5	8.98	19.6	13.1	27.5	18.3	37.0	24.6
	12.0	4.95	3.29	8.39	5.59	12.9	8.61	18.8	12.5	26.4	17.6	35.4	23.6
	12.5	4.75	3.16	8.06	5.36	12.4	8.26	18.1	12.0	25.3	16.9	34.0	22.6
	13.0	4.57	3.04	7.75	5.16	11.9	7.94	17.4	11.6	24.4	16.2	32.7	21.8
	13.5	4.40	2.93	7.46	4.96	11.5	7.65	16.7	11.1	23.5	15.6	31.5	21.0
	14.0	4.24	2.82	7.20	4.79	11.1	7.38	16.1	10.7	22.6	15.1	30.4	20.2
	14.5	4.09	2.72	6.95	4.62	10.7	7.12	15.6	10.4	21.8	14.5	29.3	19.5
	15.0	3.96	2.63	6.72	4.47	10.3	6.89	15.1	10.0	21.1	14.0	28.4	18.9
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	59.4	39.5	101	67.0	155	103	226	150	317	211	425	283
$\phi_b M_p$	M_p/Ω_b , kN·m	7.42	4.94	12.6	8.38	19.4	12.9	28.2	18.8	39.6	26.3	53.2	35.4
$\phi_b M_r$	M_r/Ω_b , kN·m	4.48	2.98	7.65	5.09	11.8	7.88	17.3	11.5	24.3	16.2	32.7	21.8
$\phi_b BF$	BF/Ω_b , kN	1.91	1.27	3.01	2.00	4.46	2.97	6.15	4.09	8.01	5.33	10.1	6.74
$\phi_v V_n$	V_n/Ω_v , kN	64.8	43.2	87.3	58.2	112	75.0	140	93.4	170	114	203	135
	$Z_x \times 10^3$, mm^3	23.22		39.41		60.73		88.34		123.9		166.4	
	L_p , m	0.439		0.518		0.606		0.689		0.769		0.856	
	L_r , m	1.98		2.16		2.30		2.47		2.68		2.87	

LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPE Shapes

F_y = 355 MPa

Shape		**IPE 200**		**IPE 220**		**IPE 240**		**IPE 270**		**IPE 300**		**IPE 330**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**477**	**318**	**553**	**369**	**634**	**423**	**759**	**506**	**907**	**605**	**1050**	**703**
	1.50	376	250	486	324	625	416	**759**	**506**	**907**	**605**	**1050**	**703**
	2.00	282	188	365	243	469	312	619	412	803	534	1030	684
	2.50	226	150	292	194	375	249	495	329	642	427	822	547
	3.00	188	125	243	162	312	208	412	274	535	356	685	456
	3.50	161	107	208	139	268	178	353	235	459	305	587	391
	4.00	141	93.8	182	121	234	156	309	206	402	267	514	342
	4.50	125	83.4	162	108	208	139	275	183	357	237	457	304
	5.00	113	75.0	146	97.1	187	125	247	165	321	214	411	274
	5.50	103	68.2	133	88.2	170	113	225	150	292	194	374	249
	6.00	94.0	62.5	122	80.9	156	104	206	137	268	178	343	228
	6.50	86.7	57.7	112	74.7	144	95.9	190	127	247	164	316	210
	7.00	80.6	53.6	104	69.3	134	89.1	177	118	229	153	294	195
	7.50	75.2	50.0	97.3	64.7	125	83.1	165	110	214	142	274	182
	8.00	70.5	46.9	91.2	60.7	117	77.9	155	103	201	134	257	171
	8.50	66.3	44.1	85.8	57.1	110	73.3	146	96.8	189	126	242	161
	9.00	62.7	41.7	81.1	53.9	104	69.3	137	91.5	178	119	228	152
	9.50	59.4	39.5	76.8	51.1	98.6	65.6	130	86.6	169	112	216	144
	10.0	56.4	37.5	72.9	48.5	93.7	62.3	124	82.3	161	107	206	137
	10.5	53.7	35.7	69.5	46.2	89.2	59.4	118	78.4	153	102	196	130
	11.0	51.3	34.1	66.3	44.1	85.2	56.7	112	74.8	146	97.2	187	124
	11.5	49.0	32.6	63.4	42.2	81.5	54.2	108	71.6	140	92.9	179	119
	12.0	47.0	31.3	60.8	40.4	78.1	52.0	103	68.6	134	89.1	171	114
	12.5	45.1	30.0	58.4	38.8	75.0	49.9	99.0	65.8	128	85.5	164	109
	13.0	43.4	28.9	56.1	37.3	72.1	48.0	95.2	63.3	124	82.2	158	105
	13.5	41.8	27.8	54.0	36.0	69.4	46.2	91.6	61.0	119	79.2	152	101
	14.0	40.3	26.8	52.1	34.7	66.9	44.5	88.4	58.8	115	76.3	147	97.7
	14.5	38.9	25.9	50.3	33.5	64.6	43.0	85.3	56.8	111	73.7	142	94.3
	15.0	37.6	25.0	48.6	32.4	62.5	41.6	82.5	54.9	107	71.2	137	91.2
Beam Properties													
$\phi_b W_c$	W_c/Ω_b, kN·m	564	375	729	485	937	623	1240	823	1610	1070	2060	1370
$\phi_b M_p$	M_p/Ω_b, kN·m	70.5	46.9	91.2	60.7	117	77.9	155	103	201	134	257	171
$\phi_b M_r$	M_r/Ω_b, kN·m	43.5	28.9	56.4	37.5	72.5	48.3	95.9	63.8	125	82.9	159	106
$\phi_b BF$	BF/Ω_b, kN	12.4	8.25	15.0	9.95	17.6	11.7	21.9	14.6	26.6	17.7	32.2	21.4
$\phi_v V_n$	V_n/Ω_v, kN	239	159	276	184	317	211	380	253	454	302	527	351
	$Z_x \times 10^3$, mm^3	220.6		285.4		366.6		484.0		628.4		804.3	
	L_p, m	0.936		1.04		1.12		1.26		1.40		1.48	
	L_r, m	3.11		3.36		3.65		3.94		4.27		4.51	
LRFD	**ASD**												
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

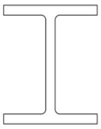
Table D.5 Continued.

Maximum Total Uniform Load, kN
IPE Shapes

F_y = 355 MPa

Shape		IPE 360		IPE 400		IPE 450		IPE 500		IPE 550		IPE 600	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**1230**	**818**	**1470**	**977**	**1800**	**1200**	**2170**	**1450**	**2600**	**1730**	**3070**	**2040**
	1.50	**1230**	**818**	**1470**	**977**	**1800**	**1200**	**2170**	**1450**	**2600**	**1730**	**3070**	**2040**
	2.00	**1230**	**818**	**1470**	**977**	**1800**	**1200**	**2170**	**1450**	**2600**	**1730**	**3070**	**2040**
	2.50	1040	693	1340	889	1740	1160	2170	**1450**	**2600**	**1730**	**3070**	**2040**
	3.00	868	578	1110	741	1450	965	1870	1240	2370	1580	2990	1990
	3.50	744	495	954	635	1240	827	1600	1070	2040	1350	2560	1710
	4.00	651	433	835	556	1090	724	1400	933	1780	1180	2240	1490
	4.50	579	385	742	494	967	643	1250	829	1580	1050	1990	1330
	5.00	521	347	668	445	870	579	1120	746	1420	948	1800	1190
	5.50	474	315	607	404	791	526	1020	678	1300	862	1630	1090
	6.00	434	289	557	370	725	482	935	622	1190	790	1500	995
	6.50	401	267	514	342	669	445	863	574	1100	729	1380	919
	7.00	372	248	477	318	621	413	801	533	1020	677	1280	853
	7.50	347	231	445	296	580	386	748	497	950	632	1200	796
	8.00	326	217	418	278	544	362	701	466	890	592	1120	747
	8.50	306	204	393	261	512	341	660	439	838	558	1060	703
	9.00	289	193	371	247	483	322	623	415	792	527	997	664
	9.50	274	182	352	234	458	305	590	393	750	499	945	629
	10.0	260	173	334	222	435	289	561	373	712	474	898	597
	10.5	248	165	318	212	414	276	534	355	678	451	855	569
	11.0	237	158	304	202	395	263	510	339	648	431	816	543
	11.5	226	151	290	193	378	252	488	324	619	412	781	519
	12.0	217	144	278	185	363	241	467	311	594	395	748	498
	12.5	208	139	267	178	348	232	449	298	570	379	718	478
	13.0	200	133	257	171	335	223	431	287	548	365	691	459
	13.5	193	128	247	165	322	214	415	276	528	351	665	442
	14.0	186	124	239	159	311	207	401	267	509	339	641	427
	14.5	180	120	230	153	300	200	387	257	491	327	619	412
	15.0	174	116	223	148	290	193	374	249	475	316	598	398
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	2600	1730	3340	2220	4350	2890	5610	3730	7120	4740	8980	5970
$\phi_b M_p$	M_p/Ω_b , kN·m	326	217	418	278	544	362	701	466	890	592	1120	747
$\phi_b M_r$	M_r/Ω_b , kN·m	202	134	259	172	335	223	431	287	546	363	686	457
$\phi_b BF$	BF/Ω_b , kN	38.6	25.7	47.8	31.8	60.9	40.5	76.0	50.5	93.0	61.9	113	74.9
$\phi_v V_n$	V_n/Ω_v , kN	613	409	733	488	901	601	1090	724	1300	867	1530	1020
	$Z_x \times 10^3$, mm^3	1019		1307		1702		2194		2787		3512	
	L_p , m	1.58		1.65		1.72		1.80		1.86		1.95	
	L_r , m	4.78		4.98		5.14		5.35		5.56		5.82	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.

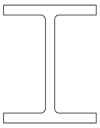


Maximum Total Uniform Load, kN
IPEO Shapes

F_y = 235 MPa

Shape		IPEO 180		IPEO 200		IPEO 220		IPEO 240		IPEO 270		IPEO 300	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**308**	**205**	**353**	**235**	**413**	**275**	**478**	**318**	**580**	**386**	**686**	**457**
	1.50	213	142	281	187	362	241	463	308	**580**	**386**	**686**	**457**
	2.00	160	106	211	140	272	181	347	231	486	323	629	419
	2.50	128	85.2	169	112	217	145	278	185	389	259	503	335
	3.00	107	71.0	141	93.6	181	120	231	154	324	216	420	279
	3.50	91.4	60.8	121	80.2	155	103	198	132	278	185	360	239
	4.00	80.0	53.2	105	70.2	136	90.4	174	115	243	162	315	209
	4.50	71.1	47.3	93.8	62.4	121	80.3	154	103	216	144	280	186
	5.00	64.0	42.6	84.4	56.2	109	72.3	139	92.4	194	129	252	167
	5.50	58.2	38.7	76.7	51.0	98.8	65.7	126	84.0	177	118	229	152
	6.00	53.3	35.5	70.3	46.8	90.6	60.2	116	77.0	162	108	210	140
	6.50	49.2	32.8	64.9	43.2	83.6	55.6	107	71.1	150	99.5	194	129
	7.00	45.7	30.4	60.3	40.1	77.6	51.6	99.2	66.0	139	92.4	180	120
	7.50	42.7	28.4	56.3	37.4	72.4	48.2	92.6	61.6	130	86.2	168	112
	8.00	40.0	26.6	52.7	35.1	67.9	45.2	86.8	57.7	122	80.9	157	105
	8.50	37.6	25.0	49.6	33.0	63.9	42.5	81.7	54.3	114	76.1	148	98.5
	9.00	35.6	23.7	46.9	31.2	60.4	40.2	77.1	51.3	108	71.9	140	93.0
	9.50	33.7	22.4	44.4	29.6	57.2	38.1	73.1	48.6	102	68.1	132	88.1
	10.0	32.0	21.3	42.2	28.1	54.3	36.1	69.4	46.2	97.2	64.7	126	83.7
	10.5	30.5	20.3	40.2	26.7	51.7	34.4	66.1	44.0	92.6	61.6	120	79.7
	11.0	29.1	19.4	38.4	25.5	49.4	32.9	63.1	42.0	88.4	58.8	114	76.1
	11.5	27.8	18.5	36.7	24.4	47.2	31.4	60.4	40.2	84.5	56.2	109	72.8
	12.0	26.7	17.7	35.2	23.4	45.3	30.1	57.9	38.5	81.0	53.9	105	69.8
	12.5	25.6	17.0	33.8	22.5	43.5	28.9	55.5	37.0	77.8	51.7	101	67.0
	13.0	24.6	16.4	32.5	21.6	41.8	27.8	53.4	35.5	74.8	49.8	96.8	64.4
	13.5	23.7	15.8	31.3	20.8	40.2	26.8	51.4	34.2	72.0	47.9	93.2	62.0
	14.0	22.9	15.2	30.1	20.1	38.8	25.8	49.6	33.0	69.4	46.2	89.9	59.8
	14.5	22.1	14.7	29.1	19.4	37.5	24.9	47.9	31.9	67.0	44.6	86.8	57.7
	15.0	21.3	14.2	28.1	18.7	36.2	24.1	46.3	30.8	64.8	43.1	83.9	55.8
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	320	213	422	281	543	361	694	462	972	647	1260	837
$\phi_b M_p$	M_p/Ω_b , kN·m	40.0	26.6	52.7	35.1	67.9	45.2	86.8	57.7	122	80.9	157	105
$\phi_b M_r$	M_r/Ω_b , kN·m	24.5	16.3	32.4	21.6	41.8	27.8	53.5	35.6	75.1	50.0	97.3	64.8
$\phi_b BF$	BF/Ω_b , kN	4.69	3.12	5.74	3.82	6.99	4.65	8.24	5.48	10.7	7.12	13.2	8.77
$\phi_v V_n$	V_n/Ω_v , kN	154	103	177	118	207	138	239	159	290	193	343	229
$Z_x \times 10^3$, mm^3		189.1		249.4		321.1		410.3		574.6		743.8	
L_p , m		1.07		1.18		1.30		1.41		1.59		1.77	
L_r , m		4.37		4.72		5.04		5.45		5.93		6.32	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPEO Shapes

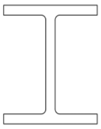
F_y = 235 MPa

Shape		IPEO 330		IPEO 360		IPEO 400		IPEO 450		IPEO 500		IPEO 550		IPEO 600	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**801**	**534**	**944**	**630**	**1110**	**737**	**1410**	**943**	**1710**	**1140**	**1990**	**1330**	**2580**	**1720**
	1.50	**801**	**534**	**944**	**630**	**1110**	**737**	**1410**	**943**	**1710**	**1140**	**1990**	**1330**	**2580**	**1720**
	2.00	798	531	**944**	**630**	**1110**	**737**	**1410**	**943**	**1710**	**1140**	**1990**	**1330**	**2580**	**1720**
	2.50	638	425	803	534	1020	676	1380	921	**1710**	**1140**	**1990**	**1330**	**2580**	**1720**
	3.00	532	354	669	445	847	564	1150	768	1470	981	1840	1220	2520	1680
	3.50	456	303	573	381	726	483	989	658	1260	840	1580	1050	2160	1440
	4.00	399	265	502	334	635	423	865	576	1110	735	1380	918	1890	1260
	4.50	354	236	446	297	565	376	769	512	982	654	1230	816	1680	1120
	5.00	319	212	401	267	508	338	692	461	884	588	1100	735	1510	1010
	5.50	290	193	365	243	462	307	629	419	804	535	1000	668	1380	915
	6.00	266	177	334	223	424	282	577	384	737	490	920	612	1260	839
	6.50	245	163	309	205	391	260	533	354	680	453	849	565	1160	774
	7.00	228	152	287	191	363	242	495	329	632	420	789	525	1080	719
	7.50	213	142	268	178	339	225	462	307	589	392	736	490	1010	671
	8.00	199	133	251	167	318	211	433	288	553	368	690	459	946	629
	8.50	188	125	236	157	299	199	407	271	520	346	650	432	890	592
	9.00	177	118	223	148	282	188	385	256	491	327	613	408	841	559
	9.50	168	112	211	141	268	178	364	242	465	310	581	387	796	530
	10.0	160	106	201	134	254	169	346	230	442	294	552	367	756	503
	10.5	152	101	191	127	242	161	330	219	421	280	526	350	720	479
	11.0	145	96.5	182	121	231	154	315	209	402	267	502	334	688	458
	11.5	139	92.3	174	116	221	147	301	200	384	256	480	319	658	438
	12.0	133	88.4	167	111	212	141	288	192	368	245	460	306	630	419
	12.5	128	84.9	161	107	203	135	277	184	354	235	442	294	605	403
	13.0	123	81.6	154	103	195	130	266	177	340	226	425	283	582	387
	13.5	118	78.6	149	98.9	188	125	256	171	327	218	409	272	560	373
	14.0	114	75.8	143	95.4	182	121	247	165	316	210	394	262	540	360
	14.5	110	73.2	138	92.1	175	117	239	159	305	203	381	253	522	347
	15.0	106	70.8	134	89.0	169	113	231	154	295	196	368	245	504	336
Beam Properties															
$\phi_b W_c$	W_c/Ω_b , kN·m	1600	1060	2010	1340	2540	1690	3460	2300	4420	2940	5520	3670	7560	5030
$\phi_b M_p$	M_p/Ω_b , kN·m	199	133	251	167	318	211	433	288	553	368	690	459	946	629
$\phi_b M_r$	M_r/Ω_b , kN·m	123	82.1	155	103	196	130	266	177	338	225	421	280	574	382
$\phi_b BF$	BF/Ω_b , kN	16.0	10.6	19.2	12.8	23.8	15.9	31.3	20.8	39.2	26.1	47.9	31.9	59.4	39.5
$\phi_v V_n$	V_n/Ω_v , kN	400	267	472	315	553	368	707	472	856	571	996	664	1290	860
$Z_x \times 10^3$, mm^3		942.8		1186		1502		2046		2613		3263		4471	
L_p , m		1.87		1.98		2.07		2.16		2.25		2.34		2.46	
L_r , m		6.63		6.98		7.17		7.50		7.71		7.94		8.71	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

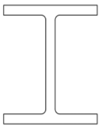


Maximum Total Uniform Load, kN
IPEO Shapes

F_y = 275 MPa

Shape		IPEO 180		IPEO 200		IPEO 220		IPEO 240		IPEO 270		IPEO 300	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**360**	**240**	**413**	**276**	**484**	**322**	**559**	**373**	**678**	**452**	**803**	**535**
	1.50	250	166	329	219	424	282	542	360	**678**	**452**	**803**	**535**
	2.00	187	125	247	164	318	212	406	270	569	378	736	490
	2.50	150	99.6	198	131	254	169	325	216	455	303	589	392
	3.00	125	83.0	165	110	212	141	271	180	379	252	491	327
	3.50	107	71.2	141	93.9	182	121	232	154	325	216	421	280
	4.00	93.6	62.3	123	82.1	159	106	203	135	284	189	368	245
	4.50	83.2	55.4	110	73.0	141	94.0	181	120	253	168	327	218
	5.00	74.9	49.8	98.8	65.7	127	84.6	162	108	228	151	295	196
	5.50	68.1	45.3	89.8	59.7	116	76.9	148	98.3	207	138	268	178
	6.00	62.4	41.5	82.3	54.8	106	70.5	135	90.1	190	126	245	163
	6.50	57.6	38.3	76.0	50.5	97.8	65.1	125	83.2	175	116	227	151
	7.00	53.5	35.6	70.5	46.9	90.8	60.4	116	77.2	163	108	210	140
	7.50	49.9	33.2	65.8	43.8	84.8	56.4	108	72.1	152	101	196	131
	8.00	46.8	31.1	61.7	41.1	79.5	52.9	102	67.6	142	94.6	184	122
	8.50	44.0	29.3	58.1	38.7	74.8	49.8	95.6	63.6	134	89.1	173	115
	9.00	41.6	27.7	54.9	36.5	70.6	47.0	90.3	60.1	126	84.1	164	109
	9.50	39.4	26.2	52.0	34.6	66.9	44.5	85.5	56.9	120	79.7	155	103
	10.0	37.4	24.9	49.4	32.9	63.6	42.3	81.2	54.1	114	75.7	147	98.0
	10.5	35.7	23.7	47.0	31.3	60.6	40.3	77.4	51.5	108	72.1	140	93.3
	11.0	34.0	22.6	44.9	29.9	57.8	38.5	73.9	49.1	103	68.8	134	89.1
	11.5	32.6	21.7	42.9	28.6	55.3	36.8	70.6	47.0	98.9	65.8	128	85.2
	12.0	31.2	20.8	41.2	27.4	53.0	35.3	67.7	45.0	94.8	63.1	123	81.7
	12.5	30.0	19.9	39.5	26.3	50.9	33.8	65.0	43.2	91.0	60.6	118	78.4
	13.0	28.8	19.2	38.0	25.3	48.9	32.5	62.5	41.6	87.5	58.2	113	75.4
	13.5	27.7	18.5	36.6	24.3	47.1	31.3	60.2	40.0	84.3	56.1	109	72.6
	14.0	26.7	17.8	35.3	23.5	45.4	30.2	58.0	38.6	81.3	54.1	105	70.0
	14.5	25.8	17.2	34.1	22.7	43.8	29.2	56.0	37.3	78.5	52.2	102	67.6
	15.0	25.0	16.6	32.9	21.9	42.4	28.2	54.2	36.0	75.8	50.5	98.2	65.3
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	374	249	494	329	636	423	812	541	1140	757	1470	980
$\phi_b M_p$	M_p/Ω_b , kN·m	46.8	31.1	61.7	41.1	79.5	52.9	102	67.6	142	94.6	184	122
$\phi_b M_r$	M_r/Ω_b , kN·m	28.7	19.1	37.9	25.2	48.9	32.5	62.6	41.6	87.9	58.5	114	75.8
$\phi_b BF$	BF/Ω_b , kN	6.40	4.26	7.83	5.21	9.50	6.32	11.2	7.45	14.5	9.64	17.8	11.8
$\phi_v V_n$	V_n/Ω_v , kN	180	120	207	138	242	161	280	186	339	226	401	268
$Z_x \times 10^3$, mm^3		189.1		249.4		321.1		410.3		574.6		743.8	
L_p , m		0.987		1.09		1.20		1.30		1.47		1.64	
L_r , m		3.82		4.13		4.42		4.78		5.22		5.59	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												
$\phi_v = 1.00$	$\Omega_v = 1.50$												

Table D.5 Continued.

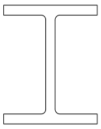


Maximum Total Uniform Load, kN
IPEO Shapes

F_y = 275 MPa

Shape		**IPEO 330**		**IPEO 360**		**IPEO 400**		**IPEO 450**		**IPEO 500**		**IPEO 550**		**IPEO 600**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**937**	**625**	**1110**	**737**	**1290**	**862**	**1660**	**1100**	**2000**	**1340**	**2330**	**1550**	**3020**	**2010**
	1.50	**937**	**625**	**1110**	**737**	**1290**	**862**	**1660**	**1100**	**2000**	**1340**	**2330**	**1550**	**3020**	**2010**
	2.00	933	621	**1110**	**737**	**1290**	**862**	**1660**	**1100**	**2000**	**1340**	**2330**	**1550**	**3020**	**2010**
	2.50	747	497	939	625	1190	791	1620	1080	**2000**	**1340**	**2330**	**1550**	**3020**	**2010**
	3.00	622	414	783	521	991	660	1350	898	1720	1150	2150	1430	2950	1960
	3.50	533	355	671	446	850	565	1160	770	1480	984	1850	1230	2530	1680
	4.00	467	311	587	391	743	495	1010	674	1290	861	1620	1070	2210	1470
	4.50	415	276	522	347	661	440	900	599	1150	765	1440	955	1970	1310
	5.00	373	248	470	312	595	396	810	539	1030	688	1290	860	1770	1180
	5.50	339	226	427	284	541	360	737	490	941	626	1170	782	1610	1070
	6.00	311	207	391	260	496	330	675	449	862	574	1080	716	1480	982
	6.50	287	191	361	240	458	304	623	415	796	530	994	661	1360	906
	7.00	267	177	335	223	425	283	579	385	739	492	923	614	1260	841
	7.50	249	166	313	208	397	264	540	359	690	459	861	573	1180	785
	8.00	233	155	294	195	372	247	506	337	647	430	808	537	1110	736
	8.50	220	146	276	184	350	233	477	317	609	405	760	506	1040	693
	9.00	207	138	261	174	330	220	450	299	575	382	718	478	984	654
	9.50	196	131	247	164	313	208	426	284	545	362	680	452	932	620
	10.0	187	124	235	156	297	198	405	270	517	344	646	430	885	589
	10.5	178	118	224	149	283	188	386	257	493	328	615	409	843	561
	11.0	170	113	213	142	270	180	368	245	470	313	587	391	805	535
	11.5	162	108	204	136	259	172	352	234	450	299	562	374	770	512
	12.0	156	104	196	130	248	165	338	225	431	287	538	358	738	491
	12.5	149	99.4	188	125	238	158	324	216	414	275	517	344	708	471
	13.0	144	95.5	181	120	229	152	312	207	398	265	497	331	681	453
	13.5	138	92.0	174	116	220	147	300	200	383	255	479	318	656	436
	14.0	133	88.7	168	112	212	141	289	193	370	246	461	307	632	421
	14.5	129	85.7	162	108	205	136	279	186	357	237	446	296	611	406
	15.0	124	82.8	157	104	198	132	270	180	345	229	431	287	590	393
Beam Properties															
$\phi_b W_c$	W_c/Ω_b , kN·m	1870	1240	2350	1560	2970	1980	4050	2700	5170	3440	6460	4300	8850	5890
$\phi_b M_p$	M_p/Ω_b , kN·m	233	155	294	195	372	247	506	337	647	430	808	537	1110	736
$\phi_b M_r$	M_r/Ω_b , kN·m	144	96.0	181	121	229	153	311	207	396	263	493	328	672	447
$\phi_b BF$	BF/Ω_b , kN	21.5	14.3	25.8	17.2	32.0	21.3	41.9	27.9	52.5	34.9	64.0	42.6	79.6	53.0
$\phi_v V_n$	V_n/Ω_v , kN	468	312	553	368	647	431	828	552	1000	668	1170	777	1510	1010
$Z_x \times 10^3$, mm^3		942.8		1186		1502		2046		2613		3263		4471	
L_p , m		1.73		1.83		1.91		2.00		2.08		2.16		2.27	
L_r , m		5.87		6.18		6.36		6.66		6.86		7.07		7.73	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.													
$\phi_b = 0.90$	$\Omega_b = 1.67$														
$\phi_v = 1.00$	$\Omega_v = 1.50$														

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPEO Shapes

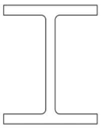
F_y = 355 MPa

Shape		IPEO 180		IPEO 200		IPEO 220		IPEO 240		IPEO 270		IPEO 300	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**465**	**310**	**534**	**356**	**624**	**416**	**722**	**481**	**875**	**584**	**1040**	**691**
	1.50	322	214	425	283	547	364	699	465	**875**	**584**	**1040**	**691**
	2.00	242	161	319	212	410	273	524	349	734	489	951	632
	2.50	193	129	255	170	328	218	419	279	587	391	760	506
	3.00	161	107	212	141	274	182	350	233	490	326	634	422
	3.50	138	91.9	182	121	234	156	300	199	420	279	543	361
	4.00	121	80.4	159	106	205	137	262	174	367	244	475	316
	4.50	107	71.5	142	94.3	182	121	233	155	326	217	422	281
	5.00	96.7	64.3	127	84.8	164	109	210	140	294	195	380	253
	5.50	87.9	58.5	116	77.1	149	99.3	191	127	267	178	346	230
	6.00	80.6	53.6	106	70.7	137	91.0	175	116	245	163	317	211
	6.50	74.4	49.5	98.1	65.3	126	84.0	161	107	226	150	292	195
	7.00	69.0	45.9	91.1	60.6	117	78.0	150	99.7	210	140	272	181
	7.50	64.4	42.9	85.0	56.6	109	72.8	140	93.0	196	130	253	169
	8.00	60.4	40.2	79.7	53.0	103	68.3	131	87.2	184	122	238	158
	8.50	56.9	37.8	75.0	49.9	96.6	64.2	123	82.1	173	115	224	149
	9.00	53.7	35.7	70.8	47.1	91.2	60.7	117	77.5	163	109	211	141
	9.50	50.9	33.9	67.1	44.6	86.4	57.5	110	73.4	155	103	200	133
	10.0	48.3	32.2	63.7	42.4	82.1	54.6	105	69.8	147	97.7	190	126
	10.5	46.0	30.6	60.7	40.4	78.2	52.0	99.9	66.5	140	93.1	181	120
	11.0	43.9	29.2	58.0	38.6	74.6	49.6	95.3	63.4	134	88.8	173	115
	11.5	42.0	28.0	55.4	36.9	71.4	47.5	91.2	60.7	128	85.0	165	110
	12.0	40.3	26.8	53.1	35.3	68.4	45.5	87.4	58.1	122	81.4	158	105
	12.5	38.7	25.7	51.0	33.9	65.7	43.7	83.9	55.8	117	78.2	152	101
	13.0	37.2	24.7	49.0	32.6	63.1	42.0	80.7	53.7	113	75.2	146	97.3
	13.5	35.8	23.8	47.2	31.4	60.8	40.4	77.7	51.7	109	72.4	141	93.7
	14.0	34.5	23.0	45.5	30.3	58.6	39.0	74.9	49.8	105	69.8	136	90.4
	14.5	33.3	22.2	44.0	29.3	56.6	37.7	72.3	48.1	101	67.4	131	87.2
	15.0	32.2	21.4	42.5	28.3	54.7	36.4	69.9	46.5	97.9	65.1	127	84.3
Beam Properties													
$\phi_b W_c$	W_c/Ω_b , kN·m	483	322	637	424	821	546	1050	698	1470	977	1900	1260
$\phi_b M_p$	M_p/Ω_b , kN·m	60.4	40.2	79.7	53.0	103	68.3	131	87.2	184	122	238	158
$\phi_b M_r$	M_r/Ω_b , kN·m	37.0	24.6	49.0	32.6	63.1	42.0	80.8	53.7	113	75.5	147	97.8
$\phi_b BF$	BF/Ω_b , kN	10.5	6.98	12.8	8.52	15.5	10.3	18.2	12.1	23.5	15.6	28.5	19.0
$\phi_v V_n$	V_n/Ω_v , kN	233	155	267	178	312	208	361	241	438	292	518	345
$Z_x \times 10^3$, mm^3		189.1		249.4		321.1		410.3		574.6		743.8	
L_p , m		0.869		0.961		1.06		1.14		1.29		1.44	
L_r , m		3.10		3.36		3.61		3.91		4.28		4.62	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPEO Shapes

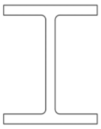
F_y = 355 MPa

Shape		IPEO 330		IPEO 360		IPEO 400		IPEO 450		IPEO 500		IPEO 550		IPEO 600	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**1210**	**806**	**1430**	**951**	**1670**	**1110**	**2140**	**1420**	**2590**	**1720**	**3010**	**2010**	**3900**	**2600**
	1.50	**1210**	**806**	**1430**	**951**	**1670**	**1110**	**2140**	**1420**	**2590**	**1720**	**3010**	**2010**	**3900**	**2600**
	2.00	1200	802	**1430**	**951**	**1670**	**1110**	**2140**	**1420**	**2590**	**1720**	**3010**	**2010**	**3900**	**2600**
	2.50	964	641	1210	807	1540	1020	2090	1390	**2590**	**1720**	**3010**	**2010**	**3900**	**2600**
	3.00	803	534	1010	672	1280	851	1740	1160	2230	1480	2780	1850	3810	2530
	3.50	689	458	866	576	1100	730	1490	994	1910	1270	2380	1590	3270	2170
	4.00	602	401	758	504	960	639	1310	870	1670	1110	2090	1390	2860	1900
	4.50	536	356	674	448	853	568	1160	773	1480	987	1850	1230	2540	1690
	5.00	482	321	606	403	768	511	1050	696	1340	889	1670	1110	2290	1520
	5.50	438	292	551	367	698	464	951	633	1210	808	1520	1010	2080	1380
	6.00	402	267	505	336	640	426	872	580	1110	741	1390	925	1900	1270
	6.50	371	247	466	310	591	393	805	535	1030	684	1280	854	1760	1170
	7.00	344	229	433	288	548	365	747	497	954	635	1190	793	1630	1090
	7.50	321	214	404	269	512	341	697	464	891	592	1110	740	1520	1010
	8.00	301	200	379	252	480	319	654	435	835	555	1040	694	1430	950
	8.50	284	189	357	237	452	301	615	409	786	523	981	653	1340	895
	9.00	268	178	337	224	427	284	581	387	742	494	927	617	1270	845
	9.50	254	169	319	212	404	269	550	366	703	468	878	584	1200	800
	10.0	241	160	303	202	384	255	523	348	668	444	834	555	1140	760
	10.5	230	153	289	192	366	243	498	331	636	423	794	528	1090	724
	11.0	219	146	276	183	349	232	475	316	607	404	758	504	1040	691
	11.5	210	139	264	175	334	222	455	303	581	386	725	483	994	661
	12.0	201	134	253	168	320	213	436	290	557	370	695	462	952	634
	12.5	193	128	243	161	307	204	418	278	534	355	667	444	914	608
	13.0	185	123	233	155	295	196	402	268	514	342	642	427	879	585
	13.5	179	119	225	149	284	189	387	258	495	329	618	411	847	563
	14.0	172	115	217	144	274	182	374	249	477	317	596	396	816	543
	14.5	166	111	209	139	265	176	361	240	461	306	575	383	788	524
	15.0	161	107	202	134	256	170	349	232	445	296	556	370	762	507
Beam Properties															
$\phi_b W_c$	W_c/Ω_b, kN·m	2410	1600	3030	2020	3840	2550	5230	3480	6680	4440	8340	5550	11400	7600
$\phi_b M_p$	M_p/Ω_b, kN·m	301	200	379	252	480	319	654	435	835	555	1040	694	1430	950
$\phi_b M_r$	M_r/Ω_b, kN·m	186	124	234	156	296	197	401	267	511	340	637	424	868	577
$\phi_b BF$	BF/Ω_b, kN	34.5	22.9	41.3	27.5	51.0	33.9	66.6	44.3	83.1	55.3	101	67.2	127	84.2
$\phi_v V_n$	V_n/Ω_v, kN	605	403	713	476	835	556	1070	712	1290	862	1500	1000	1950	1300
	$Z_x \times 10^3$, mm^3	942.8		1186		1502		2046		2613		3263		4471	
	L_p, m	1.52		1.61		1.68		1.76		1.83		1.90		2.00	
	L_r, m	4.85		5.12		5.29		5.54		5.73		5.92		6.43	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPN Shapes

F_y = 235 MPa

Shape		IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180		IPN 200	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	38.6	25.7	67.3	44.8	108	71.6	161	107	230	153	316	211	423	281
	1.50	25.7	17.1	44.9	29.9	71.7	47.7	108	71.6	153	102	211	140	282	188
	2.00	19.3	12.8	33.7	22.4	53.8	35.8	80.7	53.7	115	76.6	158	105	212	141
	2.50	15.4	10.3	26.9	17.9	43.0	28.6	64.6	43.0	92.0	61.2	127	84.2	169	113
	3.00	12.9	8.56	22.4	14.9	35.9	23.9	53.8	35.8	76.7	51.0	105	70.2	141	93.8
	3.50	11.0	7.33	19.2	12.8	30.7	20.5	46.1	30.7	65.7	43.7	90.4	60.1	121	80.4
	4.00	9.64	6.42	16.8	11.2	26.9	17.9	40.4	26.8	57.5	38.3	79.1	52.6	106	70.4
	4.50	8.57	5.70	15.0	9.96	23.9	15.9	35.9	23.9	51.1	34.0	70.3	46.8	94.0	62.5
	5.00	7.72	5.13	13.5	8.96	21.5	14.3	32.3	21.5	46.0	30.6	63.3	42.1	84.6	56.3
	5.50	7.01	4.67	12.2	8.15	19.6	13.0	29.3	19.5	41.8	27.8	57.5	38.3	76.9	51.2
	6.00	6.43	4.28	11.2	7.47	17.9	11.9	26.9	17.9	38.4	25.5	52.7	35.1	70.5	46.9
	6.50	5.94	3.95	10.4	6.89	16.6	11.0	24.8	16.5	35.4	23.6	48.7	32.4	65.1	43.3
	7.00	5.51	3.67	9.62	6.40	15.4	10.2	23.1	15.3	32.9	21.9	45.2	30.1	60.4	40.2
	7.50	5.14	3.42	8.98	5.97	14.3	9.55	21.5	14.3	30.7	20.4	42.2	28.1	56.4	37.5
	8.00	4.82	3.21	8.42	5.60	13.5	8.95	20.2	13.4	28.8	19.1	39.6	26.3	52.9	35.2
	8.50	4.54	3.02	7.92	5.27	12.7	8.42	19.0	12.6	27.1	18.0	37.2	24.8	49.8	33.1
	9.00	4.29	2.85	7.48	4.98	12.0	7.96	17.9	11.9	25.6	17.0	35.2	23.4	47.0	31.3
	9.50	4.06	2.70	7.09	4.72	11.3	7.54	17.0	11.3	24.2	16.1	33.3	22.2	44.5	29.6
	10.0	3.86	2.57	6.73	4.48	10.8	7.16	16.1	10.7	23.0	15.3	31.6	21.1	42.3	28.1
	10.5	3.67	2.44	6.41	4.27	10.2	6.82	15.4	10.2	21.9	14.6	30.1	20.0	40.3	26.8
	11.0	3.51	2.33	6.12	4.07	9.78	6.51	14.7	9.76	20.9	13.9	28.8	19.1	38.5	25.6
	11.5	3.35	2.23	5.86	3.90	9.36	6.23	14.0	9.34	20.0	13.3	27.5	18.3	36.8	24.5
	12.0	3.21	2.14	5.61	3.73	8.97	5.97	13.5	8.95	19.2	12.8	26.4	17.5	35.3	23.5
	12.5	3.09	2.05	5.39	3.58	8.61	5.73	12.9	8.59	18.4	12.2	25.3	16.8	33.8	22.5
	13.0	2.97	1.97	5.18	3.45	8.28	5.51	12.4	8.26	17.7	11.8	24.3	16.2	32.5	21.6
	13.5	2.86	1.90	4.99	3.32	7.97	5.30	12.0	7.96	17.0	11.3	23.4	15.6	31.3	20.8
	14.0	2.76	1.83	4.81	3.20	7.69	5.11	11.5	7.67	16.4	10.9	22.6	15.0	30.2	20.1
	14.5	2.66	1.77	4.64	3.09	7.42	4.94	11.1	7.41	15.9	10.6	21.8	14.5	29.2	19.4
	15.0	2.57	1.71	4.49	2.99	7.17	4.77	10.8	7.16	15.3	10.2	21.1	14.0	28.2	18.8
Beam Properties															
$\phi_b W_c$	W_c/Ω_b, kN·m	38.6	25.7	67.3	44.8	108	71.6	161	107	230	153	316	211	423	281
$\phi_b M_p$	M_p/Ω_b, kN·m	4.82	3.21	8.42	5.60	13.5	8.95	20.2	13.4	28.8	19.1	39.6	26.3	52.9	35.2
$\phi_b M_r$	M_r/Ω_b, kN·m	2.89	1.92	5.06	3.37	8.10	5.39	12.1	8.07	17.3	11.5	23.8	15.9	31.7	21.1
$\phi_b BF$	BF/Ω_b, kN	0.800	0.532	1.30	0.865	1.93	1.29	2.71	1.81	3.59	2.39	4.62	3.07	5.82	3.87
$\phi_v V_n$	V_n/Ω_v, kN	44.0	29.3	63.5	42.3	86.3	57.5	113	75.0	142	94.8	175	117	212	141
$Z_x \times 10^3$, mm^3		22.80		39.80		63.60		95.40		136.0		187.0		250.0	
L_p, m		0.467		0.549		0.632		0.719		0.796		0.878		0.960	
L_r, m		2.89		3.13		3.40		3.69		3.99		4.28		4.60	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

Maximum Total Uniform Load, kN
IPN Shapes

F_y = 235 MPa

Shape		**IPN 220**		**IPN 240**		**IPN 260**		**IPN 280**		**IPN 300**		**IPN 320**		**IPN 340**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**503**	**335**	**589**	**393**	**689**	**459**	**797**	**532**	**914**	**609**	**1040**	**692**	**1170**	**780**
	1.50	365	243	465	309	580	386	713	474	860	572	1030	686	**1170**	**780**
	2.00	274	182	349	232	435	289	535	356	645	429	773	514	914	608
	2.50	219	146	279	186	348	231	428	285	516	343	619	412	731	486
	3.00	183	122	232	155	290	193	356	237	430	286	515	343	609	405
	3.50	157	104	199	133	248	165	306	203	368	245	442	294	522	347
	4.00	137	91.2	174	116	217	145	267	178	322	214	387	257	457	304
	4.50	122	81.1	155	103	193	129	238	158	287	191	344	229	406	270
	5.00	110	72.9	139	92.8	174	116	214	142	258	172	309	206	365	243
	5.50	99.7	66.3	127	84.3	158	105	194	129	234	156	281	187	332	221
	6.00	91.4	60.8	116	77.3	145	96.4	178	119	215	143	258	171	305	203
	6.50	84.3	56.1	107	71.4	134	89.0	165	109	198	132	238	158	281	187
	7.00	78.3	52.1	99.6	66.3	124	82.7	153	102	184	123	221	147	261	174
	7.50	73.1	48.6	92.9	61.8	116	77.2	143	94.9	172	114	206	137	244	162
	8.00	68.5	45.6	87.1	58.0	109	72.3	134	88.9	161	107	193	129	228	152
	8.50	64.5	42.9	82.0	54.6	102	68.1	126	83.7	152	101	182	121	215	143
	9.00	60.9	40.5	77.5	51.5	96.6	64.3	119	79.1	143	95.3	172	114	203	135
	9.50	57.7	38.4	73.4	48.8	91.5	60.9	113	74.9	136	90.3	163	108	192	128
	10.0	54.8	36.5	69.7	46.4	87.0	57.9	107	71.1	129	85.8	155	103	183	122
	10.5	52.2	34.7	66.4	44.2	82.8	55.1	102	67.8	123	81.7	147	98.0	174	116
	11.0	49.8	33.2	63.4	42.2	79.1	52.6	97.2	64.7	117	78.0	141	93.5	166	111
	11.5	47.7	31.7	60.6	40.3	75.6	50.3	93.0	61.9	112	74.6	134	89.5	159	106
	12.0	45.7	30.4	58.1	38.7	72.5	48.2	89.1	59.3	107	71.5	129	85.7	152	101
	12.5	43.9	29.2	55.8	37.1	69.6	46.3	85.5	56.9	103	68.6	124	82.3	146	97.3
	13.0	42.2	28.1	53.6	35.7	66.9	44.5	82.3	54.7	99.2	66.0	119	79.1	141	93.5
	13.5	40.6	27.0	51.6	34.4	64.4	42.9	79.2	52.7	95.5	63.5	115	76.2	135	90.1
	14.0	39.2	26.1	49.8	33.1	62.1	41.3	76.4	50.8	92.1	61.3	110	73.5	131	86.8
	14.5	37.8	25.2	48.1	32.0	60.0	39.9	73.7	49.1	88.9	59.2	107	71.0	126	83.8
	15.0	36.5	24.3	46.5	30.9	58.0	38.6	71.3	47.4	86.0	57.2	103	68.6	122	81.1
Beam Properties															
$\phi_b W_c$	W_c/Ω_b , kN·m	548	365	697	464	870	579	1070	711	1290	858	1550	1030	1830	1220
$\phi_b M_p$	M_p/Ω_b , kN·m	68.5	45.6	87.1	58.0	109	72.3	134	88.9	161	107	193	129	228	152
$\phi_b M_r$	M_r/Ω_b , kN·m	41.2	27.4	52.4	34.9	65.4	43.5	80.2	53.4	96.7	64.3	116	77.0	137	90.9
$\phi_b BF$	BF/Ω_b , kN	7.07	4.70	8.46	5.63	9.93	6.61	11.7	7.75	13.4	8.93	15.4	10.2	17.5	11.6
$\phi_v V_n$	V_n/Ω_v , kN	251	168	294	196	345	230	399	266	457	305	519	346	585	390
$Z_x \times 10^3$, mm^3		324.0		412.0		514.0		632.0		762.0		914.0		1080	
L_p , m		1.04		1.13		1.19		1.26		1.31		1.37		1.44	
L_r , m		4.91		5.24		5.55		5.84		6.12		6.41		6.68	

LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

Maximum Total Uniform Load, kN
IPN Shapes

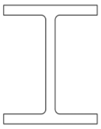
F_y = 235 MPa

Shape		IPN 360		IPN 380		IPN 400		IPN 450		IPN 500		IPN 550		IPN 600	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	1.00	**1320**	**880**	**1470**	**979**	**1620**	**1080**	**2060**	**1370**	**2540**	**1690**	**2950**	**1960**	**3650**	**2440**
	1.50	**1320**	**880**	**1470**	**979**	**1620**	**1080**	**2060**	**1370**	**2540**	**1690**	**2950**	**1960**	**3650**	**2440**
	2.00	1080	718	1250	834	1450	965	2030	1350	**2540**	**1690**	**2950**	**1960**	**3650**	**2440**
	2.50	864	575	1000	667	1160	772	1620	1080	2190	1460	2870	1910	**3650**	**2440**
	3.00	720	479	836	556	967	643	1350	901	1830	1220	2390	1590	3070	2050
	3.50	617	410	716	477	829	551	1160	772	1570	1040	2050	1360	2640	1750
	4.00	540	359	627	417	725	482	1020	675	1370	912	1790	1190	2310	1530
	4.50	480	319	557	371	644	429	902	600	1220	811	1590	1060	2050	1360
	5.00	432	287	502	334	580	386	812	540	1100	729	1430	955	1840	1230
	5.50	393	261	456	303	527	351	738	491	997	663	1300	868	1680	1120
	6.00	360	239	418	278	483	322	677	450	914	608	1200	796	1540	1020
	6.50	332	221	386	257	446	297	625	416	843	561	1100	734	1420	944
	7.00	308	205	358	238	414	276	580	386	783	521	1020	682	1320	877
	7.50	288	192	334	222	387	257	541	360	731	486	957	636	1230	818
	8.00	270	180	313	209	363	241	508	338	685	456	897	597	1150	767
	8.50	254	169	295	196	341	227	478	318	645	429	844	562	1090	722
	9.00	240	160	279	185	322	214	451	300	609	405	797	530	1020	682
	9.50	227	151	264	176	305	203	427	284	577	384	755	502	971	646
	10.0	216	144	251	167	290	193	406	270	548	365	717	477	922	614
	10.5	206	137	239	159	276	184	387	257	522	347	683	455	879	585
	11.0	196	131	228	152	264	175	369	246	498	332	652	434	839	558
	11.5	188	125	218	145	252	168	353	235	477	317	624	415	802	534
	12.0	180	120	209	139	242	161	338	225	457	304	598	398	769	511
	12.5	173	115	201	133	232	154	325	216	439	292	574	382	738	491
	13.0	166	110	193	128	223	148	312	208	422	281	552	367	710	472
	13.5	160	106	186	124	215	143	301	200	406	270	531	354	683	455
	14.0	154	103	179	119	207	138	290	193	392	261	512	341	659	438
	14.5	149	99.1	173	115	200	133	280	186	378	252	495	329	636	423
	15.0	144	95.8	167	111	193	129	271	180	365	243	478	318	615	409
Beam Properties															
$\phi_b W_c$	W_c/Ω_b , kN·m	2160	1440	2510	1670	2900	1930	4060	2700	5480	3650	7170	4770	9220	6140
$\phi_b M_p$	M_p/Ω_b , kN·m	270	180	313	209	363	241	508	338	685	456	897	597	1150	767
$\phi_b M_r$	M_r/Ω_b , kN·m	161	107	187	124	216	144	302	201	407	271	534	356	685	456
$\phi_b BF$	BF/Ω_b , kN	19.6	13.1	21.9	14.6	24.4	16.3	31.4	20.9	38.9	25.9	48.2	32.1	57.3	38.1
$\phi_v V_n$	V_n/Ω_v , kN	660	440	734	489	812	541	1030	685	1270	846	1470	982	1830	1220
$Z_x \times 10^3$, mm^3		1276		1482		1714		2400		3240		4240		5452	
L_p , m		1.49		1.55		1.61		1.76		1.91		2.06		2.20	
L_r , m		7.02		7.34		7.59		8.32		9.06		9.58		10.4	

LRFD	ASD
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.

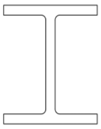


Maximum Total Uniform Load, kN
IPN Shapes

F_y = 275 MPa

Shape		**IPN 80**		**IPN 100**		**IPN 120**		**IPN 140**		**IPN 160**		**IPN 180**		**IPN 200**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	45.1	30.0	78.8	52.4	126	83.8	189	126	269	179	370	246	495	329
	1.50	30.1	20.0	52.5	35.0	84.0	55.9	126	83.8	180	119	247	164	330	220
	2.00	22.6	15.0	39.4	26.2	63.0	41.9	94.4	62.8	135	89.6	185	123	248	165
	2.50	18.1	12.0	31.5	21.0	50.4	33.5	75.6	50.3	108	71.7	148	98.5	198	132
	3.00	15.0	10.0	26.3	17.5	42.0	27.9	63.0	41.9	89.8	59.7	123	82.1	165	110
	3.50	12.9	8.58	22.5	15.0	36.0	23.9	54.0	35.9	76.9	51.2	106	70.4	141	94.1
	4.00	11.3	7.51	19.7	13.1	31.5	20.9	47.2	31.4	67.3	44.8	92.6	61.6	124	82.3
	4.50	10.0	6.67	17.5	11.7	28.0	18.6	42.0	27.9	59.8	39.8	82.3	54.7	110	73.2
	5.00	9.03	6.01	15.8	10.5	25.2	16.8	37.8	25.1	53.9	35.8	74.1	49.3	99.0	65.9
	5.50	8.21	5.46	14.3	9.53	22.9	15.2	34.3	22.9	49.0	32.6	67.3	44.8	90.0	59.9
	6.00	7.52	5.01	13.1	8.74	21.0	14.0	31.5	20.9	44.9	29.9	61.7	41.1	82.5	54.9
	6.50	6.95	4.62	12.1	8.07	19.4	12.9	29.1	19.3	41.4	27.6	57.0	37.9	76.2	50.7
	7.00	6.45	4.29	11.3	7.49	18.0	12.0	27.0	18.0	38.5	25.6	52.9	35.2	70.7	47.0
	7.50	6.02	4.00	10.5	6.99	16.8	11.2	25.2	16.8	35.9	23.9	49.4	32.8	66.0	43.9
	8.00	5.64	3.75	9.85	6.55	15.7	10.5	23.6	15.7	33.7	22.4	46.3	30.8	61.9	41.2
	8.50	5.31	3.53	9.27	6.17	14.8	9.86	22.2	14.8	31.7	21.1	43.6	29.0	58.2	38.7
	9.00	5.02	3.34	8.76	5.83	14.0	9.31	21.0	14.0	29.9	19.9	41.1	27.4	55.0	36.6
	9.50	4.75	3.16	8.30	5.52	13.3	8.82	19.9	13.2	28.3	18.9	39.0	25.9	52.1	34.7
	10.0	4.51	3.00	7.88	5.24	12.6	8.38	18.9	12.6	26.9	17.9	37.0	24.6	49.5	32.9
	10.5	4.30	2.86	7.51	4.99	12.0	7.98	18.0	12.0	25.6	17.1	35.3	23.5	47.1	31.4
	11.0	4.10	2.73	7.16	4.77	11.4	7.62	17.2	11.4	24.5	16.3	33.7	22.4	45.0	29.9
	11.5	3.93	2.61	6.85	4.56	11.0	7.29	16.4	10.9	23.4	15.6	32.2	21.4	43.0	28.6
	12.0	3.76	2.50	6.57	4.37	10.5	6.98	15.7	10.5	22.4	14.9	30.9	20.5	41.3	27.4
	12.5	3.61	2.40	6.30	4.19	10.1	6.70	15.1	10.1	21.5	14.3	29.6	19.7	39.6	26.3
	13.0	3.47	2.31	6.06	4.03	9.69	6.44	14.5	9.67	20.7	13.8	28.5	18.9	38.1	25.3
	13.5	3.34	2.22	5.84	3.88	9.33	6.21	14.0	9.31	19.9	13.3	27.4	18.2	36.7	24.4
	14.0	3.22	2.15	5.63	3.75	8.99	5.98	13.5	8.98	19.2	12.8	26.4	17.6	35.4	23.5
	14.5	3.11	2.07	5.43	3.62	8.68	5.78	13.0	8.67	18.6	12.4	25.5	17.0	34.1	22.7
	15.0	3.01	2.00	5.25	3.50	8.40	5.59	12.6	8.38	18.0	11.9	24.7	16.4	33.0	22.0
Beam Properties															
$\phi_b W_c$	W_c/Ω_b , kN·m	45.1	30.0	78.8	52.4	126	83.8	189	126	269	179	370	246	495	329
$\phi_b M_p$	M_p/Ω_b , kN·m	5.64	3.75	9.85	6.55	15.7	10.5	23.6	15.7	33.7	22.4	46.3	30.8	61.9	41.2
$\phi_b M_r$	M_r/Ω_b , kN·m	3.38	2.25	5.93	3.94	9.48	6.31	14.2	9.44	20.3	13.5	27.9	18.6	37.1	24.7
$\phi_b BF$	BF/Ω_b , kN	1.11	0.736	1.80	1.20	2.67	1.78	3.74	2.49	4.94	3.29	6.35	4.23	7.99	5.32
$\phi_v V_n$	V_n/Ω_v , kN	51.5	34.3	74.3	49.5	101	67.3	132	87.8	166	111	205	137	248	165
$Z_x \times 10^3$, mm^3		22.80		39.80		63.60		95.40		136.0		187.0		250.0	
L_p , m		0.432		0.508		0.584		0.664		0.736		0.812		0.888	
L_r , m		2.48		2.69		2.93		3.18		3.45		3.71		3.99	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.													
$\phi_b = 0.90$ $\phi_v = 1.00$	$\Omega_b = 1.67$ $\Omega_v = 1.50$														

Table D.5 Continued.

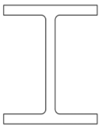


Maximum Total Uniform Load, kN
IPN Shapes

F_y = 275 MPa

Shape		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300		IPN 320		IPN 340	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**588**	**392**	**689**	**459**	**807**	**538**	**933**	**622**	**1070**	**713**	**1210**	**810**	**1370**	**913**
	1.50	428	285	544	362	678	451	834	555	1010	669	1210	803	**1370**	**913**
	2.00	321	213	408	271	509	339	626	416	754	502	905	602	1070	711
	2.50	257	171	326	217	407	271	501	333	604	402	724	482	855	569
	3.00	214	142	272	181	339	226	417	278	503	335	603	401	713	474
	3.50	183	122	233	155	291	193	358	238	431	287	517	344	611	407
	4.00	160	107	204	136	254	169	313	208	377	251	452	301	535	356
	4.50	143	94.9	181	121	226	150	278	185	335	223	402	268	475	316
	5.00	128	85.4	163	109	204	135	250	167	302	201	362	241	428	285
	5.50	117	77.6	148	98.7	185	123	228	151	274	183	329	219	389	259
	6.00	107	71.1	136	90.5	170	113	209	139	251	167	302	201	356	237
	6.50	98.7	65.7	126	83.5	157	104	193	128	232	154	278	185	329	219
	7.00	91.6	61.0	117	77.5	145	96.7	179	119	216	143	259	172	305	203
	7.50	85.5	56.9	109	72.4	136	90.3	167	111	201	134	241	161	285	190
	8.00	80.2	53.4	102	67.8	127	84.6	156	104	189	125	226	151	267	178
	8.50	75.5	50.2	96.0	63.9	120	79.7	147	97.9	178	118	213	142	252	167
	9.00	71.3	47.4	90.6	60.3	113	75.2	139	92.5	168	112	201	134	238	158
	9.50	67.5	44.9	85.9	57.1	107	71.3	132	87.6	159	106	190	127	225	150
	10.0	64.2	42.7	81.6	54.3	102	67.7	125	83.3	151	100	181	120	214	142
	10.5	61.1	40.7	77.7	51.7	96.9	64.5	119	79.3	144	95.6	172	115	204	136
	11.0	58.3	38.8	74.2	49.3	92.5	61.6	114	75.7	137	91.3	165	109	194	129
	11.5	55.8	37.1	70.9	47.2	88.5	58.9	109	72.4	131	87.3	157	105	186	124
	12.0	53.5	35.6	68.0	45.2	84.8	56.4	104	69.4	126	83.7	151	100	178	119
	12.5	51.3	34.1	65.3	43.4	81.4	54.2	100	66.6	121	80.3	145	96.3	171	114
	13.0	49.3	32.8	62.8	41.8	78.3	52.1	96.3	64.0	116	77.2	139	92.6	164	109
	13.5	47.5	31.6	60.4	40.2	75.4	50.2	92.7	61.7	112	74.4	134	89.2	158	105
	14.0	45.8	30.5	58.3	38.8	72.7	48.4	89.4	59.5	108	71.7	129	86.0	153	102
	14.5	44.2	29.4	56.3	37.4	70.2	46.7	86.3	57.4	104	69.2	125	83.0	147	98.1
	15.0	42.8	28.5	54.4	36.2	67.8	45.1	83.4	55.5	101	66.9	121	80.3	143	94.9
Beam Properties															
$\phi_b W_c$	W_c/Ω_b , kN·m	642	427	816	543	1020	677	1250	833	1510	1000	1810	1200	2140	1420
$\phi_b M_p$	M_p/Ω_b , kN·m	80.2	53.4	102	67.8	127	84.6	156	104	189	125	226	151	267	178
$\phi_b M_r$	M_r/Ω_b , kN·m	48.2	32.0	61.3	40.8	76.6	50.9	93.9	62.5	113	75.3	135	90.1	160	106
$\phi_b BF$	BF/Ω_b , kN	9.71	6.46	11.6	7.72	13.6	9.07	16.0	10.6	18.4	12.2	21.1	14.1	24.0	16.0
$\phi_v V_n$	V_n/Ω_v , kN	294	196	345	230	403	269	467	311	535	356	607	405	684	456
	$Z_x \times 10^3$, mm^3	324.0		412.0		514.0		632.0		762.0		914.0		1080	
	L_p , m	0.959		1.04		1.10		1.16		1.22		1.27		1.33	
	L_r , m	4.26		4.55		4.82		5.07		5.31		5.56		5.80	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.													
$\phi_b = 0.90$	$\Omega_b = 1.67$														
$\phi_v = 1.00$	$\Omega_v = 1.50$														

Table D.5 Continued.

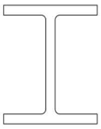


Maximum Total Uniform Load, kN
IPN Shapes

F_y = 275 MPa

Shape		IPN 360		IPN 380		IPN 400		IPN 450		IPN 500		IPN 550		IPN 600	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**1540**	**1030**	**1720**	**1150**	**1900**	**1270**	**2410**	**1600**	**2970**	**1980**	**3450**	**2300**	**4280**	**2850**
	1.50	**1540**	**1030**	**1720**	**1150**	**1900**	**1270**	**2410**	**1600**	**2970**	**1980**	**3450**	**2300**	**4280**	**2850**
	2.00	1260	840	1470	976	1700	1130	2380	1580	**2970**	**1980**	**3450**	**2300**	**4280**	**2850**
	2.50	1010	672	1170	781	1360	903	1900	1260	2570	1710	3360	2230	**4280**	**2850**
	3.00	842	560	978	651	1130	753	1580	1050	2140	1420	2800	1860	3600	2390
	3.50	722	480	838	558	970	645	1360	903	1830	1220	2400	1600	3080	2050
	4.00	632	420	734	488	848	564	1190	790	1600	1070	2100	1400	2700	1800
	4.50	561	374	652	434	754	502	1060	703	1430	949	1870	1240	2400	1600
	5.00	505	336	587	390	679	452	950	632	1280	854	1680	1120	2160	1440
	5.50	459	306	534	355	617	411	864	575	1170	776	1530	1020	1960	1310
	6.00	421	280	489	325	566	376	792	527	1070	711	1400	931	1800	1200
	6.50	389	259	451	300	522	347	731	486	987	657	1290	859	1660	1100
	7.00	361	240	419	279	485	323	679	452	916	610	1200	798	1540	1030
	7.50	337	224	391	260	452	301	634	422	855	569	1120	745	1440	958
	8.00	316	210	367	244	424	282	594	395	802	534	1050	698	1350	898
	8.50	297	198	345	230	399	266	559	372	755	502	988	657	1270	845
	9.00	281	187	326	217	377	251	528	351	713	474	933	621	1200	798
	9.50	266	177	309	206	357	238	500	333	675	449	884	588	1140	756
	10.0	253	168	293	195	339	226	475	316	642	427	840	559	1080	718
	10.5	241	160	279	186	323	215	453	301	611	407	800	532	1030	684
	11.0	230	153	267	177	309	205	432	287	583	388	763	508	981	653
	11.5	220	146	255	170	295	196	413	275	558	371	730	486	939	625
	12.0	211	140	245	163	283	188	396	263	535	356	700	465	900	599
	12.5	202	134	235	156	271	181	380	253	513	341	672	447	864	575
	13.0	194	129	226	150	261	174	366	243	493	328	646	430	830	552
	13.5	187	125	217	145	251	167	352	234	475	316	622	414	800	532
	14.0	180	120	210	139	242	161	339	226	458	305	600	399	771	513
	14.5	174	116	202	135	234	156	328	218	442	294	579	385	744	495
	15.0	168	112	196	130	226	151	317	211	428	285	560	372	720	479
Beam Properties															
$\phi_b W_c$	W_c/Ω_b , kN·m	2530	1680	2930	1950	3390	2260	4750	3160	6420	4270	8400	5590	10800	7180
$\phi_b M_p$	M_p/Ω_b , kN·m	316	210	367	244	424	282	594	395	802	534	1050	698	1350	898
$\phi_b M_r$	M_r/Ω_b , kN·m	189	126	218	145	253	168	353	235	476	317	625	416	802	533
$\phi_b BF$	BF/Ω_b , kN	26.9	17.9	30.1	20.0	33.5	22.3	43.0	28.6	53.4	35.5	66.0	43.9	78.5	52.2
$\phi_v V_n$	V_n/Ω_v , kN	772	515	859	573	950	634	1200	802	1490	990	1720	1150	2140	1430
	$Z_x \times 10^3$, mm^3	1276		1482		1714		2400		3240		4240		5452	
	L_p , m	1.38		1.43		1.49		1.63		1.77		1.91		2.04	
	L_r , m	6.09		6.37		6.59		7.22		7.87		8.33		9.01	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.													
$\phi_b = 0.90$	$\Omega_b = 1.67$														
$\phi_v = 1.00$	$\Omega_v = 1.50$														

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPN Shapes

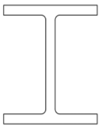
F_y = 355 MPa

Shape		**IPN 80**		**IPN 100**		**IPN 120**		**IPN 140**		**IPN 160**		**IPN 180**		**IPN 200**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	58.3	38.8	102	67.7	163	108	244	162	348	231	478	318	639	425
	1.50	38.9	25.8	67.8	45.1	108	72.1	163	108	232	154	319	212	426	283
	2.00	29.1	19.4	50.9	33.8	81.3	54.1	122	81.1	174	116	239	159	320	213
	2.50	23.3	15.5	40.7	27.1	65.0	43.3	97.5	64.9	139	92.5	191	127	256	170
	3.00	19.4	12.9	33.9	22.6	54.2	36.1	81.3	54.1	116	77.1	159	106	213	142
	3.50	16.7	11.1	29.1	19.3	46.4	30.9	69.7	46.4	99.3	66.1	137	90.9	183	121
	4.00	14.6	9.69	25.4	16.9	40.6	27.0	61.0	40.6	86.9	57.8	119	79.5	160	106
	4.50	13.0	8.62	22.6	15.0	36.1	24.0	54.2	36.1	77.2	51.4	106	70.7	142	94.5
	5.00	11.7	7.75	20.3	13.5	32.5	21.6	48.8	32.4	69.5	46.3	95.6	63.6	128	85.0
	5.50	10.6	7.05	18.5	12.3	29.6	19.7	44.3	29.5	63.2	42.1	86.9	57.8	116	77.3
	6.00	9.71	6.46	17.0	11.3	27.1	18.0	40.6	27.0	57.9	38.5	79.7	53.0	107	70.9
	6.50	8.97	5.97	15.7	10.4	25.0	16.6	37.5	25.0	53.5	35.6	73.5	48.9	98.3	65.4
	7.00	8.33	5.54	14.5	9.67	23.2	15.5	34.8	23.2	49.7	33.0	68.3	45.4	91.3	60.7
	7.50	7.77	5.17	13.6	9.02	21.7	14.4	32.5	21.6	46.3	30.8	63.7	42.4	85.2	56.7
	8.00	7.28	4.85	12.7	8.46	20.3	13.5	30.5	20.3	43.5	28.9	59.7	39.8	79.9	53.1
	8.50	6.86	4.56	12.0	7.96	19.1	12.7	28.7	19.1	40.9	27.2	56.2	37.4	75.2	50.0
	9.00	6.48	4.31	11.3	7.52	18.1	12.0	27.1	18.0	38.6	25.7	53.1	35.3	71.0	47.2
	9.50	6.13	4.08	10.7	7.12	17.1	11.4	25.7	17.1	36.6	24.3	50.3	33.5	67.3	44.8
	10.0	5.83	3.88	10.2	6.77	16.3	10.8	24.4	16.2	34.8	23.1	47.8	31.8	63.9	42.5
	10.5	5.55	3.69	9.69	6.45	15.5	10.3	23.2	15.5	33.1	22.0	45.5	30.3	60.9	40.5
	11.0	5.30	3.52	9.25	6.15	14.8	9.83	22.2	14.7	31.6	21.0	43.5	28.9	58.1	38.6
	11.5	5.07	3.37	8.85	5.89	14.1	9.41	21.2	14.1	30.2	20.1	41.6	27.7	55.6	37.0
	12.0	4.86	3.23	8.48	5.64	13.5	9.01	20.3	13.5	29.0	19.3	39.8	26.5	53.3	35.4
	12.5	4.66	3.10	8.14	5.41	13.0	8.65	19.5	13.0	27.8	18.5	38.2	25.4	51.1	34.0
	13.0	4.48	2.98	7.83	5.21	12.5	8.32	18.8	12.5	26.7	17.8	36.8	24.5	49.2	32.7
	13.5	4.32	2.87	7.54	5.01	12.0	8.01	18.1	12.0	25.7	17.1	35.4	23.6	47.3	31.5
	14.0	4.16	2.77	7.27	4.83	11.6	7.73	17.4	11.6	24.8	16.5	34.1	22.7	45.6	30.4
	14.5	4.02	2.67	7.02	4.67	11.2	7.46	16.8	11.2	24.0	16.0	33.0	21.9	44.1	29.3
	15.0	3.89	2.58	6.78	4.51	10.8	7.21	16.3	10.8	23.2	15.4	31.9	21.2	42.6	28.3
Beam Properties															
$\phi_b W_c$	W_c/Ω_b, kN·m	163	108	163	108	163	108	244	162	348	231	478	318	639	425
$\phi_b M_p$	M_p/Ω_b, kN·m	20.3	13.5	20.3	13.5	20.3	13.5	30.5	20.3	43.5	28.9	59.7	39.8	79.9	53.1
$\phi_b M_r$	M_r/Ω_b, kN·m	12.2	8.14	12.2	8.14	12.2	8.14	18.3	12.2	26.2	17.4	36.0	24.0	47.9	31.8
$\phi_b BF$	BF/Ω_b, kN	4.48	2.98	4.48	2.98	4.48	2.98	6.27	4.17	8.26	5.49	10.6	7.05	13.3	8.86
$\phi_v V_n$	V_n/Ω_v, kN	130	86.9	130	86.9	130	86.9	170	113	215	143	265	176	320	213
	$Z_x \times 10^3$, mm^3	22.80		39.80		63.60		95.40		136.0		187.0		250.0	
	L_p, m	0.380		0.447		0.514		0.585		0.648		0.714		0.781	
	L_r, m	1.95		2.12		2.32		2.53		2.74		2.95		3.19	

LRFD	**ASD**
$\phi_b = 0.90$	$\Omega_b = 1.67$
$\phi_v = 1.00$	$\Omega_v = 1.50$

Notes: For beams laterally unspported, see Table D.6.
Available strength tabulated in bold is limited by available shear strength.

Table D.5 Continued.



Maximum Total Uniform Load, kN
IPN Shapes

F_y = 355 MPa

Shape		**IPN 220**		**IPN 240**		**IPN 260**		**IPN 280**		**IPN 300**		**IPN 320**		**IPN 340**	
Design		**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Span Length (m)	**1.00**	**759**	**506**	**889**	**593**	**1040**	**694**	**1200**	**803**	**1380**	**920**	**1570**	**1050**	**1770**	**1180**
	1.50	552	367	702	467	876	583	1080	717	1300	864	1560	1040	**1770**	**1180**
	2.00	414	275	527	350	657	437	808	537	974	648	1170	777	1380	918
	2.50	331	220	421	280	526	350	646	430	779	518	934	622	1100	735
	3.00	276	184	351	234	438	291	538	358	649	432	779	518	920	612
	3.50	237	157	301	200	375	250	462	307	556	370	667	444	789	525
	4.00	207	138	263	175	328	219	404	269	487	324	584	389	690	459
	4.50	184	122	234	156	292	194	359	239	433	288	519	345	613	408
	5.00	166	110	211	140	263	175	323	215	390	259	467	311	552	367
	5.50	151	100	191	127	239	159	294	195	354	236	425	283	502	334
	6.00	138	91.8	176	117	219	146	269	179	325	216	389	259	460	306
	6.50	127	84.8	162	108	202	134	249	165	300	199	359	239	425	283
	7.00	118	78.7	150	100	188	125	231	154	278	185	334	222	394	262
	7.50	110	73.5	140	93.4	175	117	215	143	260	173	311	207	368	245
	8.00	104	68.9	132	87.6	164	109	202	134	243	162	292	194	345	230
	8.50	97.4	64.8	124	82.4	155	103	190	126	229	152	275	183	325	216
	9.00	92.0	61.2	117	77.8	146	97.1	179	119	216	144	260	173	307	204
	9.50	87.2	58.0	111	73.8	138	92.0	170	113	205	136	246	164	291	193
	10.0	82.8	55.1	105	70.1	131	87.4	162	107	195	130	234	155	276	184
	10.5	78.9	52.5	100	66.7	125	83.2	154	102	185	123	222	148	263	175
	11.0	75.3	50.1	95.7	63.7	119	79.5	147	97.7	177	118	212	141	251	167
	11.5	72.0	47.9	91.6	60.9	114	76.0	140	93.5	169	113	203	135	240	160
	12.0	69.0	45.9	87.8	58.4	109	72.8	135	89.6	162	108	195	130	230	153
	12.5	66.3	44.1	84.2	56.1	105	69.9	129	86.0	156	104	187	124	221	147
	13.0	63.7	42.4	81.0	53.9	101	67.2	124	82.7	150	99.7	180	120	212	141
	13.5	61.3	40.8	78.0	51.9	97.3	64.7	120	79.6	144	96.0	173	115	204	136
	14.0	59.2	39.4	75.2	50.0	93.8	62.4	115	76.8	139	92.6	167	111	197	131
	14.5	57.1	38.0	72.6	48.3	90.6	60.3	111	74.1	134	89.4	161	107	190	127
	15.0	55.2	36.7	70.2	46.7	87.6	58.3	108	71.7	130	86.4	156	104	184	122
Beam Properties															
$\phi_b W_c$	W_c/Ω_b , kN·m	828	551	1050	701	1310	874	1620	1070	1950	1300	2340	1550	2760	1840
$\phi_b M_p$	M_p/Ω_b , kN·m	104	68.9	132	87.6	164	109	202	134	243	162	292	194	345	230
$\phi_b M_r$	M_r/Ω_b , kN·m	62.2	41.4	79.2	52.7	98.9	65.8	121	80.7	146	97.2	175	116	206	137
$\phi_b BF$	BF/Ω_b , kN	16.1	10.7	19.3	12.8	22.6	15.1	26.5	17.7	30.5	20.3	35.0	23.3	39.8	26.5
$\phi_v V_n$	V_n/Ω_v , kN	380	253	445	296	521	347	602	402	690	460	784	523	884	589
$Z_x \times 10^3$, mm^3		324.0		412.0		514.0		632.0		762.0		914.0		1080	
L_p , m		0.844		0.919		0.969		1.02		1.07		1.12		1.17	
L_r , m		3.41		3.64		3.86		4.06		4.26		4.46		4.65	
LRFD	**ASD**	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.													
$\phi_b = 0.90$	$\Omega_b = 1.67$														
$\phi_v = 1.00$	$\Omega_v = 1.50$														

Table D.5 Continued.

Maximum Total Uniform Load, kN
IPN Shapes

F_y = 355 MPa

Shape		IPN 360		IPN 380		IPN 400		IPN 450		IPN 500		IPN 550		IPN 600	
Design		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Span Length (m)	**1.00**	**1990**	**1330**	**2220**	**1480**	**2450**	**1640**	**3110**	**2070**	**3830**	**2560**	**4450**	**2970**	**5520**	**3680**
	1.50	**1990**	**1330**	**2220**	**1480**	**2450**	**1640**	**3110**	**2070**	**3830**	**2560**	**4450**	**2970**	**5520**	**3680**
	2.00	1630	1080	1890	1260	2190	1460	3070	2040	**3830**	**2560**	**4450**	**2970**	**5520**	**3680**
	2.50	1300	868	1520	1010	1750	1170	2450	1630	3310	2200	4330	2880	**5520**	**3680**
	3.00	1090	723	1260	840	1460	972	2040	1360	2760	1840	3610	2400	4650	3090
	3.50	932	620	1080	720	1250	833	1750	1170	2370	1570	3100	2060	3980	2650
	4.00	815	542	947	630	1100	729	1530	1020	2070	1380	2710	1800	3480	2320
	4.50	725	482	842	560	974	648	1360	907	1840	1220	2410	1600	3100	2060
	5.00	652	434	758	504	876	583	1230	816	1660	1100	2170	1440	2790	1850
	5.50	593	395	689	458	797	530	1120	742	1510	1000	1970	1310	2530	1690
	6.00	544	362	631	420	730	486	1020	680	1380	918	1810	1200	2320	1550
	6.50	502	334	583	388	674	448	944	628	1270	848	1670	1110	2140	1430
	7.00	466	310	541	360	626	416	876	583	1180	787	1550	1030	1990	1320
	7.50	435	289	505	336	584	389	818	544	1100	735	1440	961	1860	1240
	8.00	408	271	473	315	548	364	767	510	1040	689	1350	901	1740	1160
	8.50	384	255	446	297	515	343	722	480	974	648	1270	848	1640	1090
	9.00	362	241	421	280	487	324	682	453	920	612	1200	801	1550	1030
	9.50	343	228	399	265	461	307	646	430	872	580	1140	759	1470	976
	10.0	326	217	379	252	438	291	613	408	828	551	1080	721	1390	927
	10.5	311	207	361	240	417	278	584	389	789	525	1030	687	1330	883
	11.0	296	197	344	229	398	265	558	371	753	501	985	656	1270	843
	11.5	284	189	329	219	381	253	533	355	720	479	942	627	1210	806
	12.0	272	181	316	210	365	243	511	340	690	459	903	601	1160	773
	12.5	261	174	303	202	350	233	491	327	663	441	867	577	1110	742
	13.0	251	167	291	194	337	224	472	314	637	424	834	555	1070	713
	13.5	242	161	281	187	325	216	454	302	613	408	803	534	1030	687
	14.0	233	155	271	180	313	208	438	292	592	394	774	515	995	662
	14.5	225	150	261	174	302	201	423	281	571	380	747	497	961	639
	15.0	217	145	253	168	292	194	409	272	552	367	722	481	929	618
Beam Properties															
$\phi_b W_c$	W_c/Ω_b , kN·m	3260	2170	3790	2520	4380	2910	6130	4080	8280	5510	10800	7210	13900	9270
$\phi_b M_p$	M_p/Ω_b , kN·m	408	271	473	315	548	364	767	510	1040	689	1350	901	1740	1160
$\phi_b M_r$	M_r/Ω_b , kN·m	244	162	282	187	327	217	456	304	615	409	807	537	1030	689
$\phi_b BF$	BF/Ω_b , kN	44.6	29.7	49.9	33.2	55.6	37.0	71.3	47.4	88.5	58.9	109	72.6	130	86.5
$\phi_v V_n$	V_n/Ω_v , kN	997	665	1110	739	1230	818	1550	1040	1920	1280	2230	1480	2760	1840
$Z_x \times 10^3$, mm^3		1276		1482		1714		2400		3240		4240		5452	
L_p , m		1.21		1.26		1.31		1.43		1.55		1.68		1.79	
L_r , m		4.88		5.10		5.28		5.79		6.30		6.69		7.23	
LRFD	ASD	Notes: For beams laterally unspported, see Table D.6. Available strength tabulated in bold is limited by available shear strength.													
$\phi_b = 0.90$	$\Omega_b = 1.67$														
$\phi_v = 1.00$	$\Omega_v = 1.50$														

Table D.6 Available moment vs. unbraced length.

Available Moment vs. Unbraced Length, kN·m

HD Shapes

F_y = 235 MPa

Shape		HD 260×54.1[f]		HD 260×68.2		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	143	95.4	195	129	271	181	338	225	426	284	534	355
	1.00	143	95.4	195	129	271	181	338	225	426	284	534	355
	1.50	143	95.4	195	129	271	181	338	225	426	284	534	355
	2.00	143	95.4	195	129	271	181	338	225	426	284	534	355
	2.50	143	95.4	195	129	271	181	338	225	426	284	534	355
	3.00	143	95.4	195	129	271	181	338	225	426	284	534	355
	3.50	143	95.4	193	129	270	180	338	225	426	283	534	355
	4.00	143	95.4	190	126	267	177	334	222	422	281	530	353
	4.50	143	95.3	186	124	263	175	330	220	418	278	526	350
	5.00	140	93.1	183	122	259	172	326	217	414	276	522	347
	5.50	137	91.0	179	119	255	170	323	215	410	273	518	345
	6.00	134	88.8	176	117	252	167	319	212	407	270	514	342
	6.50	130	86.7	172	114	248	165	315	210	403	268	510	339
	7.00	127	84.6	169	112	244	162	311	207	399	265	506	337
	7.50	124	82.4	165	110	240	160	307	204	395	263	502	334
	8.00	121	80.3	161	107	237	158	303	202	391	260	498	331
	8.50	117	78.1	158	105	233	155	300	199	387	258	494	329
	9.00	114	76.0	154	103	229	153	296	197	383	255	490	326
	9.50	111	73.9	151	100	225	150	292	194	379	252	486	323
	10.0	108	71.7	147	97.9	222	148	288	192	375	250	482	321
	10.5	105	69.6	144	95.6	218	145	284	189	372	247	478	318
	11.0	101	67.4	140	93.2	214	143	281	187	368	245	474	315
	11.5	98.2	65.3	137	90.8	211	140	277	184	364	242	470	313
	12.0	94.1	62.6	133	88.5	207	138	273	182	360	239	466	310
	12.5	89.7	59.7	129	86.1	203	135	269	179	356	237	462	307
	13.0	85.6	57.0	126	83.7	199	133	265	177	352	234	458	305
	13.5	82.0	54.6	122	80.9	196	130	262	174	348	232	454	302
	14.0	78.6	52.3	117	77.7	192	128	258	171	344	229	450	299
	14.5	75.6	50.3	112	74.7	188	125	254	169	340	226	446	297
	15.0	72.7	48.4	108	71.9	184	123	250	166	337	224	442	294
Properties													
	$Z_x \times 10^3$, mm^3	714.5		919.8		1283		1600		2015		2524	
	L_p, m	4.48		3.34		3.38		3.42		3.47		3.54	
	L_r, m	11.7		13.3		16.9		20.4		25.0		30.2	
LRFD	ASD												
$\phi_b = 0.90$	$\Omega_b = 1.67$												

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Note: C_b = 1.00.

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

$F_y = 235$ MPa

Shape		**HD 320×74.2^f**		**HD 320×97.6**		**HD 320×127**		**HD 320×158**		**HD 320×198**		**HD 320×245**	
Design		$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	240	160	344	229	455	302	575	382	736	490	938	624
	1.00	240	160	344	229	455	302	575	382	736	490	938	624
	1.50	240	160	344	229	455	302	575	382	736	490	938	624
	2.00	240	160	344	229	455	302	575	382	736	490	938	624
	2.50	240	160	344	229	455	302	575	382	736	490	938	624
	3.00	240	160	344	229	455	302	575	382	736	490	938	624
	3.50	240	160	344	229	455	302	575	382	736	490	938	624
	4.00	240	160	343	228	453	302	574	382	736	490	938	624
	4.50	240	160	337	224	447	298	568	378	730	486	933	621
	5.00	240	160	331	220	441	294	562	374	724	481	927	616
	5.50	235	157	326	217	436	290	556	370	718	477	920	612
	6.00	230	153	320	213	430	286	550	366	712	473	914	608
	6.50	225	150	314	209	424	282	544	362	705	469	908	604
	7.00	220	147	309	205	418	278	538	358	699	465	901	600
	7.50	216	143	303	202	412	274	533	354	693	461	895	596
	8.00	211	140	298	198	406	270	527	350	687	457	889	591
	8.50	206	137	292	194	401	266	521	346	681	453	883	587
	9.00	201	134	286	191	395	263	515	342	675	449	876	583
	9.50	196	130	281	187	389	259	509	339	669	445	870	579
	10.0	191	127	275	183	383	255	503	335	663	441	864	575
	10.5	186	124	270	179	377	251	497	331	657	437	858	571
	11.0	181	120	264	176	371	247	491	327	651	433	851	566
	11.5	176	117	258	172	365	243	485	323	645	429	845	562
	12.0	171	114	253	168	360	239	479	319	639	425	839	558
	12.5	166	111	247	164	354	235	473	315	633	421	833	554
	13.0	161	107	241	161	348	231	467	311	627	417	826	550
	13.5	154	102	236	157	342	228	461	307	621	413	820	546
	14.0	147	97.9	230	153	336	224	455	303	614	409	814	541
	14.5	141	93.9	225	149	330	220	449	299	608	405	807	537
	15.0	136	90.2	219	146	324	216	443	295	602	401	801	533
Properties													
$Z_x \times 10^3$, mm^3		1196		1628		2149		2718		3479		4435	
L_p, m		5.02		3.85		3.89		3.94		4.00		4.08	
L_r, m		12.9		15.0		18.4		22.4		27.7		34.1	
LRFD	**ASD**	^{f}Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.											
$\Phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.											

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 235 MPa

Shape		**HD 320×300**		**HD 360×134**		**HD 360×147**		**HD 360×162**		**HD 360×179**		**HD 360×196**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	1170	777	542	361	600	399	664	442	736	490	812	540
	1.00	1170	777	542	361	600	399	664	442	736	490	812	540
	1.50	1170	777	542	361	600	399	664	442	736	490	812	540
	2.00	1170	777	542	361	600	399	664	442	736	490	812	540
	2.50	1170	777	542	361	600	399	664	442	736	490	812	540
	3.00	1170	777	542	361	600	399	664	442	736	490	812	540
	3.50	1170	777	542	361	600	399	664	442	736	490	812	540
	4.00	1170	777	542	361	600	399	664	442	736	490	812	540
	4.50	1160	774	542	361	600	399	664	442	736	490	812	540
	5.00	1160	769	539	359	598	398	662	440	735	489	810	539
	5.50	1150	765	532	354	590	393	654	435	727	484	802	534
	6.00	1140	761	524	349	582	388	646	430	719	478	795	529
	6.50	1140	757	517	344	575	382	639	425	711	473	787	523
	7.00	1130	752	509	339	567	377	631	420	704	468	779	518
	7.50	1120	748	501	334	559	372	623	415	696	463	771	513
	8.00	1120	744	494	329	552	367	615	409	688	458	763	508
	8.50	1110	739	486	324	544	362	608	404	680	453	756	503
	9.00	1100	735	479	318	536	357	600	399	672	447	748	498
	9.50	1100	731	471	313	529	352	592	394	665	442	740	492
	10.0	1090	726	464	308	521	347	584	389	657	437	732	487
	10.5	1090	722	456	303	513	342	577	384	649	432	724	482
	11.0	1080	718	448	298	506	336	569	379	641	427	717	477
	11.5	1070	714	441	293	498	331	561	373	634	422	709	472
	12.0	1070	709	433	288	490	326	553	368	626	416	701	466
	12.5	1060	705	426	283	483	321	546	363	618	411	693	461
	13.0	1050	701	418	278	475	316	538	358	610	406	685	456
	13.5	1050	696	411	273	467	311	530	353	602	401	678	451
	14.0	1040	692	403	268	460	306	522	348	595	396	670	446
	14.5	1030	688	395	263	452	301	515	342	587	390	662	441
	15.0	1030	683	388	258	444	296	507	337	579	385	654	435

Properties

	HD 320×300	HD 360×134	HD 360×147	HD 360×162	HD 360×179	HD 360×196
$Z_x \times 10^3$, mm^3	5522	2562	2838	3139	3482	3837
L_p, m	4.12	4.83	4.84	4.87	4.89	4.91
L_r, m	41.4	17.8	19.1	20.7	22.5	24.5

LRFD	**ASD**	
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 235 MPa

Shape		**HD 400×187**		**HD 400×216**		**HD 400×237**		**HD 400×262**		**HD 400×287**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	770	512	901	600	991	659	1110	740	1230	818
	1.00	770	512	901	600	991	659	1110	740	1230	818
	1.50	770	512	901	600	991	659	1110	740	1230	818
	2.00	770	512	901	600	991	659	1110	740	1230	818
	2.50	770	512	901	600	991	659	1110	740	1230	818
	3.00	770	512	901	600	991	659	1110	740	1230	818
	3.50	770	512	901	600	991	659	1110	740	1230	818
	4.00	770	512	901	600	991	659	1110	740	1230	818
	4.50	770	512	901	600	991	659	1110	740	1230	818
	5.00	770	512	901	600	991	659	1110	740	1230	818
	5.50	765	509	897	597	987	656	1110	738	1230	816
	6.00	757	504	889	592	979	651	1100	732	1220	810
	6.50	749	499	881	586	971	646	1090	727	1210	805
	7.00	742	494	874	581	963	641	1080	722	1200	800
	7.50	734	488	866	576	956	636	1080	717	1190	795
	8.00	726	483	858	571	948	631	1070	711	1190	789
	8.50	719	478	850	566	940	625	1060	706	1180	784
	9.00	711	473	843	561	932	620	1050	701	1170	779
	9.50	703	468	835	555	924	615	1050	696	1160	774
	10.0	696	463	827	550	917	610	1040	690	1150	768
	10.5	688	458	819	545	909	605	1030	685	1150	763
	11.0	680	452	812	540	901	599	1020	680	1140	758
	11.5	672	447	804	535	893	594	1010	675	1130	753
	12.0	665	442	796	530	885	589	1010	669	1120	747
	12.5	657	437	788	525	878	584	998	664	1120	742
	13.0	649	432	781	519	870	579	990	659	1110	737
	13.5	642	427	773	514	862	574	983	654	1100	731
	14.0	634	422	765	509	854	568	975	649	1090	726
	14.5	626	417	757	504	846	563	967	643	1080	721
	15.0	618	411	750	499	839	558	959	638	1080	716
Properties											
	$Z_x \times 10^3$, $\mathbf{mm^3}$	3642		4262		4686		5260		5813	
	L_p, m	5.15		5.20		5.22		5.25		5.28	
	L_r, m	23.7		27.1		29.4		32.5		35.5	
LRFD	**ASD**	Note: C_b = 1.00.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										

Table D.6 Continued.

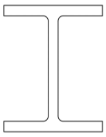
Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 235 MPa

Shape	**HD 400×314**		**HD 400×347**		**HD 400×382**		**HD 400×421**		**HD 400×463**	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)										
0.00	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
1.00	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
1.50	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
2.00	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
2.50	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
3.00	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
3.50	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
4.00	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
4.50	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
5.00	1350	897	1510	1000	1680	1120	1880	1250	2090	1390
5.50	1340	895	1510	1000	1680	1120	1880	1250	2090	1390
6.00	1340	890	1500	998	1670	1110	1870	1240	2080	1380
6.50	1330	884	1490	992	1670	1110	1860	1240	2070	1380
7.00	1320	879	1480	987	1660	1100	1850	1230	2060	1370
7.50	1310	874	1480	982	1650	1100	1840	1230	2050	1370
8.00	1310	868	1470	976	1640	1090	1840	1220	2050	1360
8.50	1300	863	1460	971	1630	1090	1830	1220	2040	1360
9.00	1290	858	1450	965	1630	1080	1820	1210	2030	1350
9.50	1280	852	1440	960	1620	1080	1810	1200	2020	1340
10.0	1270	847	1430	955	1610	1070	1800	1200	2010	1340
10.5	1270	842	1430	949	1600	1060	1790	1190	2000	1330
11.0	1260	836	1420	944	1590	1060	1790	1190	2000	1330
11.5	1250	831	1410	939	1580	1050	1780	1180	1990	1320
12.0	1240	826	1400	933	1580	1050	1770	1180	1980	1320
12.5	1230	821	1390	928	1570	1040	1760	1170	1970	1310
13.0	1230	815	1390	923	1560	1040	1750	1170	1960	1300
13.5	1220	810	1380	917	1550	1030	1740	1160	1950	1300
14.0	1210	805	1370	912	1540	1030	1740	1150	1940	1290
14.5	1200	799	1360	906	1540	1020	1730	1150	1940	1290
15.0	1190	794	1350	901	1530	1020	1720	1140	1930	1280
Properties										
$Z_x \times 10^3$, mm^3	6374		7139		7965		8880		9878	
L_p, m	5.30		5.36		5.39		5.43		5.47	
L_r, m	38.5		42.6		46.8		51.4		56.2	

LRFD	**ASD**	Note: C_b = 1.00.
$\phi_b = 0.90$	$\Omega_b = 1.67$	

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m

HD Shapes

F_y = 235 MPa

Shape		HD 400×509		HD 400×551		HD 400×592		HD 400×634		HD 400×677	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	1.00	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	1.50	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	2.00	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	2.50	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	3.00	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	3.50	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	4.00	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	4.50	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	5.00	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	5.50	2330	1550	2550	1700	2780	1850	3010	2000	3250	2160
	6.00	2320	1550	2540	1690	2770	1840	3000	2000	3240	2160
	6.50	2320	1540	2530	1680	2760	1840	2990	1990	3230	2150
	7.00	2310	1540	2520	1680	2750	1830	2980	1980	3220	2140
	7.50	2300	1530	2510	1670	2740	1830	2970	1980	3210	2140
	8.00	2290	1520	2510	1670	2740	1820	2960	1970	3200	2130
	8.50	2280	1520	2500	1660	2730	1810	2960	1970	3190	2130
	9.00	2270	1510	2490	1660	2720	1810	2950	1960	3180	2120
	9.50	2260	1510	2480	1650	2710	1800	2940	1950	3180	2110
	10.0	2260	1500	2470	1640	2700	1800	2930	1950	3170	2110
	10.5	2250	1490	2460	1640	2690	1790	2920	1940	3160	2100
	11.0	2240	1490	2450	1630	2680	1780	2910	1940	3150	2090
	11.5	2230	1480	2440	1630	2670	1780	2900	1930	3140	2090
	12.0	2220	1480	2430	1620	2660	1770	2890	1920	3130	2080
	12.5	2210	1470	2430	1610	2650	1770	2880	1920	3120	2080
	13.0	2200	1470	2420	1610	2650	1760	2870	1910	3110	2070
	13.5	2190	1460	2410	1600	2640	1750	2860	1910	3100	2060
	14.0	2190	1450	2400	1600	2630	1750	2850	1900	3090	2060
	14.5	2180	1450	2390	1590	2620	1740	2850	1890	3080	2050
	15.0	2170	1440	2380	1580	2610	1740	2840	1890	3070	2040
Properties											
	$Z_x \times 10^3$, mm^3	11030		12050		13140		14220		15350	
	L_p, m	5.53		5.57		5.61		5.66		5.71	
	L_r, m	61.6		66.5		71.2		76.1		81.0	
LRFD	ASD	Note: C_b = 1.00.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 235 MPa

Shape		HD 400×744		HD 400×818		HD 400×900		HD 400×990		HD 400×1086	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	1.00	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	1.50	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	2.00	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	2.50	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	3.00	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	3.50	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	4.00	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	4.50	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	5.00	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	5.50	3630	2420	4070	2710	4570	3040	5140	3420	5750	3830
	6.00	3630	2410	4070	2710	4570	3040	5140	3420	5750	3830
	6.50	3620	2410	4060	2700	4560	3030	5120	3410	5750	3820
	7.00	3610	2400	4050	2690	4550	3030	5110	3400	5740	3820
	7.50	3600	2390	4040	2690	4540	3020	5100	3400	5720	3810
	8.00	3590	2390	4030	2680	4530	3010	5090	3390	5710	3800
	8.50	3580	2380	4020	2680	4520	3010	5080	3380	5700	3790
	9.00	3570	2370	4010	2670	4510	3000	5070	3370	5690	3790
	9.50	3560	2370	4000	2660	4500	2990	5060	3370	5680	3780
	10.0	3550	2360	3990	2660	4490	2990	5050	3360	5670	3770
	10.5	3540	2360	3980	2650	4480	2980	5040	3350	5660	3760
	11.0	3530	2350	3970	2640	4470	2970	5030	3350	5650	3760
	11.5	3520	2340	3960	2640	4460	2970	5020	3340	5630	3750
	12.0	3510	2340	3950	2630	4450	2960	5010	3330	5620	3740
	12.5	3500	2330	3940	2620	4440	2950	5000	3320	5610	3730
	13.0	3490	2320	3930	2620	4430	2950	4990	3320	5600	3730
	13.5	3480	2320	3920	2610	4420	2940	4970	3310	5590	3720
	14.0	3470	2310	3910	2600	4410	2930	4960	3300	5580	3710
	14.5	3460	2300	3900	2600	4400	2920	4950	3300	5570	3700
	15.0	3450	2300	3890	2590	4390	2920	4940	3290	5560	3700
Properties											
	$Z_x \times 10^3$, mm^3	17170		19260		21620		24280		27210	
	L_p , m	5.78		5.85		5.93		6.02		6.11	
	L_r , m	88.3		96.6		106		115		125	
LRFD	**ASD**	Note C_b = 1.00.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 275 MPa

Shape		**HD 260×54.1^f**		**HD 260×68.2^f**		**HD 260×93.0**		**HD 260×114**		**HD 260×142**		**HD 260×172**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	164	109	227	151	318	211	396	263	499	332	625	416
	1.00	164	109	227	151	318	211	396	263	499	332	625	416
	1.50	164	109	227	151	318	211	396	263	499	332	625	416
	2.00	164	109	227	151	318	211	396	263	499	332	625	416
	2.50	164	109	227	151	318	211	396	263	499	332	625	416
	3.00	164	109	227	151	318	211	396	263	499	332	625	416
	3.50	164	109	224	149	314	209	392	261	496	330	622	414
	4.00	164	109	219	146	308	205	387	258	490	326	617	410
	4.50	164	109	214	142	303	202	382	254	485	323	611	407
	5.00	160	106	209	139	298	198	377	251	479	319	606	403
	5.50	155	103	204	136	293	195	371	247	474	315	600	399
	6.00	151	100	199	133	288	191	366	244	469	312	594	395
	6.50	146	97.4	194	129	283	188	361	240	463	308	589	392
	7.00	142	94.5	189	126	277	185	355	237	458	305	583	388
	7.50	138	91.6	185	123	272	181	350	233	453	301	578	384
	8.00	133	88.7	180	120	267	178	345	229	447	298	572	381
	8.50	129	85.8	175	116	262	174	340	226	442	294	567	377
	9.00	125	82.8	170	113	257	171	334	222	436	290	561	373
	9.50	120	79.9	165	110	252	167	329	219	431	287	556	370
	10.0	116	77.0	160	107	246	164	324	215	426	283	550	366
	10.5	110	73.5	155	103	241	160	319	212	420	280	544	362
	11.0	104	69.5	150	100	236	157	313	208	415	276	539	359
	11.5	99.0	65.8	146	96.8	231	154	308	205	409	272	533	355
	12.0	94.1	62.6	139	92.4	226	150	303	201	404	269	528	351
	12.5	89.7	59.7	133	88.2	220	147	297	198	399	265	522	347
	13.0	85.6	57.0	127	84.4	215	143	292	194	393	262	517	344
	13.5	82.0	54.6	122	80.9	210	140	287	191	388	258	511	340
	14.0	78.6	52.3	117	77.7	205	136	282	187	383	255	506	336
	14.5	75.6	50.3	112	74.7	200	133	276	184	377	251	500	333
	15.0	72.7	48.4	108	71.9	193	128	271	180	372	247	494	329

Properties

	HD 260×54.1^f	HD 260×68.2^f	HD 260×93.0	HD 260×114	HD 260×142	HD 260×172
$Z_x \times 10^3$, mm^3	714.5	919.8	1283	1600	2015	2524
L_p , m	4.51	3.09	3.12	3.16	3.21	3.27
L_r , m	10.3	11.6	14.6	17.5	21.4	25.8

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

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Note: C_b = 1.00.

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 275 MPa

Shape		HD 320×74.2[f]		HD 320×97.6		HD 320×127		HD 320×158		HD 320×198		HD 320×245	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	274	183	403	268	532	354	673	448	861	573	1100	730
	1.00	274	183	403	268	532	354	673	448	861	573	1100	730
	1.50	274	183	403	268	532	354	673	448	861	573	1100	730
	2.00	274	183	403	268	532	354	673	448	861	573	1100	730
	2.50	274	183	403	268	532	354	673	448	861	573	1100	730
	3.00	274	183	403	268	532	354	673	448	861	573	1100	730
	3.50	274	183	403	268	532	354	673	448	861	573	1100	730
	4.00	274	183	396	264	525	350	667	444	856	570	1090	728
	4.50	274	183	388	258	517	344	659	438	848	564	1090	722
	5.00	274	183	381	253	509	339	650	433	839	558	1080	716
	5.50	268	179	373	248	501	333	642	427	831	553	1070	710
	6.00	262	174	365	243	493	328	634	422	822	547	1060	705
	6.50	255	170	358	238	485	323	626	416	814	542	1050	699
	7.00	248	165	350	233	477	317	617	411	806	536	1040	693
	7.50	242	161	342	228	469	312	609	405	797	530	1030	687
	8.00	235	156	335	223	461	307	601	400	789	525	1020	682
	8.50	228	152	327	217	453	301	593	394	780	519	1020	676
	9.00	221	147	319	212	445	296	585	389	772	514	1010	670
	9.50	215	143	311	207	436	290	576	383	764	508	998	664
	10.0	208	138	304	202	428	285	568	378	755	502	990	659
	10.5	201	134	296	197	420	280	560	373	747	497	981	653
	11.0	195	130	288	192	412	274	552	367	738	491	972	647
	11.5	187	125	281	187	404	269	543	362	730	486	964	641
	12.0	178	118	273	182	396	264	535	356	722	480	955	636
	12.5	169	112	265	177	388	258	527	351	713	475	947	630
	13.0	161	107	258	171	380	253	519	345	705	469	938	624
	13.5	154	102	247	164	372	247	511	340	696	463	929	618
	14.0	147	97.9	237	158	364	242	502	334	688	458	921	612
	14.5	141	93.9	227	151	356	237	494	329	680	452	912	607
	15.0	136	90.2	219	146	348	231	486	323	671	447	903	601
Properties													
$Z_x \times 10^3$, mm^3		1196		1628		2149		2718		3479		4435	
L_p, m		5.04		3.56		3.59		3.64		3.70		3.77	
L_r, m		11.4		13.1		15.9		19.2		23.8		29.2	

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

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Note: C_b = 1.00.

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 275 MPa

Shape		HD 320×300		HD 360×134^f		HD 360×147		HD 360×162		HD 360×179		HD 360×196	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	1370	909	634	422	702	467	777	517	862	573	950	632
	1.00	1370	909	634	422	702	467	777	517	862	573	950	632
	1.50	1370	909	634	422	702	467	777	517	862	573	950	632
	2.00	1370	909	634	422	702	467	777	517	862	573	950	632
	2.50	1370	909	634	422	702	467	777	517	862	573	950	632
	3.00	1370	909	634	422	702	467	777	517	862	573	950	632
	3.50	1370	909	634	422	702	467	777	517	862	573	950	632
	4.00	1360	907	634	422	702	467	777	517	862	573	950	632
	4.50	1350	901	633	421	702	467	777	517	862	573	950	632
	5.00	1350	895	623	414	691	460	766	510	851	567	940	625
	5.50	1340	889	613	408	681	453	756	503	841	559	929	618
	6.00	1330	883	602	401	670	446	745	496	830	552	918	611
	6.50	1320	877	592	394	660	439	734	489	819	545	907	604
	7.00	1310	871	582	387	649	432	724	482	809	538	897	597
	7.50	1300	865	571	380	639	425	713	474	798	531	886	589
	8.00	1290	860	561	373	628	418	702	467	787	524	875	582
	8.50	1280	854	551	366	618	411	692	460	776	517	864	575
	9.00	1270	848	540	359	607	404	681	453	766	509	854	568
	9.50	1270	842	530	353	597	397	670	446	755	502	843	561
	10.0	1260	836	520	346	586	390	660	439	744	495	832	554
	10.5	1250	830	509	339	576	383	649	432	733	488	821	546
	11.0	1240	824	499	332	565	376	639	425	723	481	811	539
	11.5	1230	818	489	325	555	369	628	418	712	474	800	532
	12.0	1220	812	478	318	544	362	617	411	701	467	789	525
	12.5	1210	806	468	311	534	355	607	404	690	459	778	518
	13.0	1200	800	458	305	523	348	596	396	680	452	768	511
	13.5	1190	794	447	298	513	341	585	389	669	445	757	503
	14.0	1180	788	437	291	502	334	575	382	658	438	746	496
	14.5	1180	782	427	284	492	327	564	375	648	431	735	489
	15.0	1170	776	416	277	481	320	553	368	637	424	724	482
Properties													
	$Z_x \times 10^3$, mm^3	5522		2562		2838		3139		3482		3837	
	L_p, m	3.81		4.46		4.48		4.50		4.52		4.54	
	L_r, m	35.4		15.6		16.7		17.9		19.5		21.1	
LRFD	ASD	^{f}Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.											
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.											

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 275 MPa

Shape		HD 400×187		HD 400×216		HD 400×237		HD 400×262		HD 400×287	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	901	600	1050	702	1160	772	1300	866	1440	957
	1.00	901	600	1050	702	1160	772	1300	866	1440	957
	1.50	901	600	1050	702	1160	772	1300	866	1440	957
	2.00	901	600	1050	702	1160	772	1300	866	1440	957
	2.50	901	600	1050	702	1160	772	1300	866	1440	957
	3.00	901	600	1050	702	1160	772	1300	866	1440	957
	3.50	901	600	1050	702	1160	772	1300	866	1440	957
	4.00	901	600	1050	702	1160	772	1300	866	1440	957
	4.50	901	600	1050	702	1160	772	1300	866	1440	957
	5.00	896	596	1050	699	1160	769	1300	864	1440	956
	5.50	886	589	1040	692	1150	762	1290	857	1430	948
	6.00	875	582	1030	685	1130	755	1280	850	1410	941
	6.50	864	575	1020	678	1120	748	1270	842	1400	934
	7.00	854	568	1010	671	1110	740	1260	835	1390	926
	7.50	843	561	997	663	1100	733	1240	828	1380	919
	8.00	833	554	986	656	1090	726	1230	821	1370	912
	8.50	822	547	976	649	1080	719	1220	813	1360	905
	9.00	811	540	965	642	1070	712	1210	806	1350	897
	9.50	801	533	954	635	1060	705	1200	799	1340	890
	10.0	790	526	944	628	1050	697	1190	792	1330	883
	10.5	779	519	933	621	1040	690	1180	784	1320	875
	11.0	769	511	922	614	1030	683	1170	777	1300	868
	11.5	758	504	911	606	1020	676	1160	770	1290	861
	12.0	747	497	901	599	1010	669	1150	763	1280	854
	12.5	737	490	890	592	994	662	1140	755	1270	846
	13.0	726	483	879	585	983	654	1120	748	1260	839
	13.5	716	476	869	578	973	647	1110	741	1250	832
	14.0	705	469	858	571	962	640	1100	734	1240	824
	14.5	694	462	847	564	951	633	1090	726	1230	817
	15.0	684	455	836	557	940	626	1080	719	1220	810
Properties											
	$Z_x \times 10^3$, mm^3	3642		4262		4686		5260		5813	
	L_p, m	4.76		4.81		4.82		4.86		4.88	
	L_r, m	20.5		23.4		25.3		27.9		30.4	
LRFD	ASD	Note: C_b = 1.00.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 275 MPa

Shape		HD 400×314		HD 400×347		HD 400×382		HD 400×421		HD 400×463	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
	1.00	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
	1.50	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
	2.00	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
	2.50	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
	3.00	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
	3.50	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
	4.00	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
	4.50	1580	1050	1770	1180	1970	1310	2200	1460	2440	1630
	5.00	1580	1050	1770	1170	1970	1310	2200	1460	2440	1630
	5.50	1560	1040	1750	1170	1960	1300	2190	1450	2430	1620
	6.00	1550	1030	1740	1160	1950	1300	2180	1450	2420	1610
	6.50	1540	1030	1730	1150	1940	1290	2160	1440	2410	1600
	7.00	1530	1020	1720	1150	1930	1280	2150	1430	2400	1600
	7.50	1520	1010	1710	1140	1910	1270	2140	1420	2390	1590
	8.00	1510	1000	1700	1130	1900	1270	2130	1420	2380	1580
	8.50	1500	997	1690	1120	1890	1260	2120	1410	2360	1570
	9.00	1490	989	1680	1120	1880	1250	2110	1400	2350	1570
	9.50	1480	982	1670	1110	1870	1240	2090	1390	2340	1560
	10.0	1470	975	1650	1100	1860	1240	2080	1390	2330	1550
	10.5	1450	967	1640	1090	1850	1230	2070	1380	2320	1540
	11.0	1440	960	1630	1090	1830	1220	2060	1370	2310	1530
	11.5	1430	953	1620	1080	1820	1210	2050	1360	2290	1530
	12.0	1420	945	1610	1070	1810	1210	2040	1360	2280	1520
	12.5	1410	938	1600	1060	1800	1200	2030	1350	2270	1510
	13.0	1400	931	1590	1060	1790	1190	2010	1340	2260	1500
	13.5	1390	923	1580	1050	1780	1180	2000	1330	2250	1490
	14.0	1380	916	1570	1040	1770	1180	1990	1320	2230	1490
	14.5	1370	909	1550	1030	1760	1170	1980	1320	2220	1480
	15.0	1350	901	1540	1030	1740	1160	1970	1310	2210	1470
Properties											
$Z_x \times 10^3, \text{mm}^3$		6374		7139		7965		8880		9878	
L_p, m		4.90		4.95		4.98		5.02		5.06	
L_r, m		33.0		36.5		40.0		44.0		48.1	
LRFD	ASD	Note: C_b = 1.00.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										

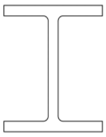
Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 275 MPa

Shape		HD 400×509		HD 400×551		HD 400×592		HD 400×634		HD 400×677	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	1.00	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	1.50	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	2.00	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	2.50	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	3.00	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	3.50	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	4.00	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	4.50	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	5.00	2730	1820	2980	1980	3250	2160	3520	2340	3800	2530
	5.50	2720	1810	2970	1980	3240	2160	3510	2340	3790	2520
	6.00	2710	1800	2960	1970	3230	2150	3500	2330	3780	2520
	6.50	2700	1790	2950	1960	3220	2140	3490	2320	3770	2510
	7.00	2680	1790	2940	1950	3210	2130	3470	2310	3750	2500
	7.50	2670	1780	2930	1950	3190	2130	3460	2300	3740	2490
	8.00	2660	1770	2910	1940	3180	2120	3450	2300	3730	2480
	8.50	2650	1760	2900	1930	3170	2110	3440	2290	3720	2470
	9.00	2640	1750	2890	1920	3160	2100	3420	2280	3700	2460
	9.50	2620	1750	2880	1910	3140	2090	3410	2270	3690	2460
	10.0	2610	1740	2860	1910	3130	2080	3400	2260	3680	2450
	10.5	2600	1730	2850	1900	3120	2080	3390	2250	3660	2440
	11.0	2590	1720	2840	1890	3110	2070	3370	2240	3650	2430
	11.5	2580	1710	2830	1880	3090	2060	3360	2240	3640	2420
	12.0	2560	1710	2820	1870	3080	2050	3350	2230	3630	2410
	12.5	2550	1700	2800	1870	3070	2040	3340	2220	3610	2400
	13.0	2540	1690	2790	1860	3060	2030	3320	2210	3600	2400
	13.5	2530	1680	2780	1850	3040	2030	3310	2200	3590	2390
	14.0	2520	1670	2770	1840	3030	2020	3300	2190	3570	2380
	14.5	2500	1670	2750	1830	3020	2010	3280	2190	3560	2370
	15.0	2490	1660	2740	1820	3010	2000	3270	2180	3550	2360
Properties											
	$Z_x \times 10^3$, mm^3	11030		12050		13140		14220		15350	
	L_p, m	5.12		5.15		5.19		5.24		5.28	
	L_r, m	52.7		56.9		60.9		65.0		69.3	
LRFD	ASD	Note: C_b = 1.00.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 275 MPa

Shape		HD 400×744		HD 400×818		HD 400×900		HD 400×990		HD 400×1086	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	1.00	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	1.50	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	2.00	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	2.50	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	3.00	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	3.50	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	4.00	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	4.50	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	5.00	4250	2830	4770	3170	5350	3560	6010	4000	6730	4480
	5.50	4250	2820	4760	3170	5350	3560	6010	4000	6730	4480
	6.00	4230	2820	4750	3160	5340	3550	6000	3990	6720	4470
	6.50	4220	2810	4740	3150	5320	3540	5980	3980	6710	4460
	7.00	4210	2800	4720	3140	5310	3530	5970	3970	6690	4450
	7.50	4190	2790	4710	3130	5290	3520	5950	3960	6680	4440
	8.00	4180	2780	4700	3120	5280	3510	5940	3950	6660	4430
	8.50	4170	2770	4680	3110	5270	3500	5920	3940	6650	4420
	9.00	4150	2760	4670	3110	5250	3490	5910	3930	6630	4410
	9.50	4140	2750	4650	3100	5240	3480	5890	3920	6620	4400
	10.0	4130	2740	4640	3090	5220	3470	5880	3910	6600	4390
	10.5	4110	2740	4630	3080	5210	3470	5860	3900	6590	4380
	11.0	4100	2730	4610	3070	5190	3460	5850	3890	6570	4370
	11.5	4090	2720	4600	3060	5180	3450	5830	3880	6560	4360
	12.0	4070	2710	4590	3050	5170	3440	5820	3870	6540	4350
	12.5	4060	2700	4570	3040	5150	3430	5800	3860	6520	4340
	13.0	4050	2690	4560	3030	5140	3420	5790	3850	6510	4330
	13.5	4030	2680	4540	3020	5120	3410	5770	3840	6490	4320
	14.0	4020	2670	4530	3010	5110	3400	5760	3830	6480	4310
	14.5	4010	2670	4520	3010	5090	3390	5740	3820	6460	4300
	15.0	3990	2660	4500	3000	5080	3380	5730	3810	6450	4290
Properties											
	$Z_x \times 10^3$, mm^3	17170		19260		21620		24280		27210	
	L_p , m	5.34		5.41		5.48		5.56		5.65	
	L_r , m	75.5		82.5		90.4		98.2		107	
LRFD	ASD	Note C_b = 1.00.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										

Table D.6 Continued.

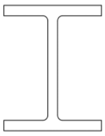
Available Moment vs. Unbraced Length, kN·m

HD Shapes

F_y = 355 MPa

Shape		**HD 260×54.1^f**		**HD 260×68.2^f**		**HD 260×93.0**		**HD 260×114**		**HD 260×142**		**HD 260×172**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	202	135	284	189	410	273	511	340	644	428	806	537
	1.00	202	135	284	189	410	273	511	340	644	428	806	537
	1.50	202	135	284	189	410	273	511	340	644	428	806	537
	2.00	202	135	284	189	410	273	511	340	644	428	806	537
	2.50	202	135	284	189	410	273	511	340	644	428	806	537
	3.00	202	135	284	189	406	270	507	338	641	426	804	535
	3.50	202	135	281	187	397	264	498	332	631	420	795	529
	4.00	202	135	273	182	388	258	489	326	622	414	785	523
	4.50	202	134	265	176	379	252	480	320	613	408	776	516
	5.00	195	130	257	171	371	247	472	314	604	402	767	510
	5.50	188	125	249	166	362	241	463	308	595	396	757	504
	6.00	181	120	241	160	353	235	454	302	586	390	748	498
	6.50	174	115	233	155	344	229	445	296	577	384	738	491
	7.00	166	111	225	150	336	223	436	290	568	378	729	485
	7.50	159	106	217	144	327	218	427	284	558	372	720	479
	8.00	152	101	209	139	318	212	418	278	549	366	710	472
	8.50	144	96.1	200	133	310	206	409	272	540	359	701	466
	9.00	134	89.2	192	128	301	200	400	266	531	353	691	460
	9.50	125	83.3	183	122	292	194	391	260	522	347	682	454
	10.0	117	78.1	172	115	283	189	382	254	513	341	672	447
	10.5	110	73.5	162	108	275	183	373	248	504	335	663	441
	11.0	104	69.5	154	102	266	177	364	242	495	329	654	435
	11.5	99.0	65.8	146	97.1	257	171	355	236	485	323	644	429
	12.0	94.1	62.6	139	92.4	245	163	346	230	476	317	635	422
	12.5	89.7	59.7	133	88.2	235	156	337	225	467	311	625	416
	13.0	85.6	57.0	127	84.4	225	150	328	219	458	305	616	410
	13.5	82.0	54.6	122	80.9	216	144	320	213	449	299	607	404
	14.0	78.6	52.3	117	77.7	208	138	309	205	440	293	597	397
	14.5	75.6	50.3	112	74.7	200	133	298	198	431	287	588	391
	15.0	72.7	48.4	108	71.9	193	128	287	191	422	281	578	385
Properties													
$Z_x \times 10^3$, mm^3		714.5		919.8		1283		1600		2015		2524	
L_p, m		4.48		3.34		2.75		2.78		2.82		2.88	
L_r, m		8.41		9.33		11.5		13.7		16.7		20.1	
LRFD	**ASD**	^{f} Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.											
$\phi_b = 0.90$	**$\Omega_b = 1.67$**	Note: C_b = 1.00.											

Table D.6 Continued.

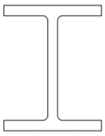


Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 355 MPa

Shape		HD 320×74.2^{f}		HD 320×97.6^{f}		HD 320×127		HD 320×158		HD 320×198		HD 320×245	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	339	226	512	340	687	457	868	578	1110	740	1420	943
	1.00	339	226	512	340	687	457	868	578	1110	740	1420	943
	1.50	339	226	512	340	687	457	868	578	1110	740	1420	943
	2.00	339	226	512	340	687	457	868	578	1110	740	1420	943
	2.50	339	226	512	340	687	457	868	578	1110	740	1420	943
	3.00	339	226	512	340	687	457	868	578	1110	740	1420	943
	3.50	339	226	511	340	677	451	860	572	1100	735	1410	939
	4.00	339	226	498	331	664	442	846	563	1090	725	1400	930
	4.50	339	226	485	323	650	433	832	554	1080	716	1380	920
	5.00	339	226	473	314	637	424	818	545	1060	706	1370	910
	5.50	328	219	460	306	623	415	805	535	1050	697	1350	900
	6.00	318	211	447	298	610	406	791	526	1030	688	1340	890
	6.50	307	204	434	289	596	397	777	517	1020	678	1320	881
	7.00	296	197	422	281	583	388	763	508	1000	669	1310	871
	7.50	285	190	409	272	569	379	749	498	991	659	1290	861
	8.00	274	182	396	264	555	370	735	489	976	650	1280	851
	8.50	263	175	384	255	542	361	721	480	962	640	1260	842
	9.00	253	168	371	247	528	351	707	470	948	631	1250	832
	9.50	240	160	358	238	515	342	693	461	934	621	1240	822
	10.0	225	149	346	230	501	333	679	452	919	612	1220	812
	10.5	211	140	333	221	488	324	665	443	905	602	1210	803
	11.0	198	132	316	210	474	315	651	433	891	593	1190	793
	11.5	187	125	299	199	460	306	638	424	877	583	1180	783
	12.0	178	118	284	189	447	297	624	415	862	574	1160	773
	12.5	169	112	270	180	433	288	610	406	848	564	1150	764
	13.0	161	107	258	172	415	276	596	396	834	555	1130	754
	13.5	154	102	247	164	398	265	582	387	820	545	1120	744
	14.0	147	97.9	237	158	383	255	568	378	806	536	1100	734
	14.5	141	93.9	227	151	368	245	554	369	791	526	1090	724
	15.0	136	90.2	219	146	355	236	540	359	777	517	1070	715
Properties													
$Z_x \times 10^3$, mm^3		1196		1628		2149		2718		3479		4435	
L_p, m		5.02		3.46		3.16		3.20		3.25		3.32	
L_r, m		9.37		10.6		12.6		15.1		18.5		22.7	
LRFD	ASD	^{f}Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly. Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 355 MPa

Shape		HD 320×300		HD 360×134^f		HD 360×147^f		HD 360×162		HD 360×179		HD 360×196	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
	1.00	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
	1.50	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
	2.00	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
	2.50	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
	3.00	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
	3.50	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
	4.00	1740	1160	794	528	899	598	1000	666	1110	740	1230	815
	4.50	1730	1150	794	528	887	590	984	655	1090	728	1210	803
	5.00	1710	1140	782	520	870	579	966	643	1080	716	1190	791
	5.50	1700	1130	765	509	852	567	948	631	1060	704	1170	779
	6.00	1680	1120	748	498	835	556	931	619	1040	692	1150	767
	6.50	1670	1110	732	487	818	544	913	607	1020	680	1140	755
	7.00	1650	1100	715	475	800	532	895	596	1000	668	1120	743
	7.50	1640	1090	698	464	783	521	878	584	986	656	1100	731
	8.00	1620	1080	681	453	765	509	860	572	968	644	1080	719
	8.50	1610	1070	664	442	748	498	842	560	950	632	1060	707
	9.00	1590	1060	647	430	731	486	824	548	932	620	1040	695
	9.50	1580	1050	630	419	713	475	807	537	914	608	1030	683
	10.0	1560	1040	613	408	696	463	789	525	896	596	1010	671
	10.5	1550	1030	596	397	678	451	771	513	878	584	990	659
	11.0	1530	1020	579	385	661	440	753	501	860	572	972	647
	11.5	1520	1010	562	374	644	428	736	489	842	560	954	635
	12.0	1500	1000	545	363	626	417	718	478	824	548	936	623
	12.5	1490	990	529	352	609	405	700	466	806	536	918	610
	13.0	1470	980	507	337	591	394	682	454	788	524	899	598
	13.5	1460	970	483	322	574	382	665	442	770	512	881	586
	14.0	1440	960	462	307	549	365	647	430	752	500	863	574
	14.5	1430	950	442	294	526	350	627	417	734	488	845	562
	15.0	1410	940	424	282	505	336	602	401	716	476	827	550

Properties

	HD 320×300	HD 360×134^f	HD 360×147^f	HD 360×162	HD 360×179	HD 360×196
$Z_x \times 10^3$, mm^3	5522	2562	2838	3139	3482	3837
L_p, m	3.35	4.15	3.94	3.96	3.98	3.99
L_r, m	27.5	12.7	13.5	14.4	15.5	16.7

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

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Note: C_b = 1.00.

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 355 MPa

Shape		**HD 400×187**		**HD 400×216**		**HD 400×237**		**HD 400×262**		**HD 400×287**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	1160	774	1360	906	1500	996	1680	1120	1860	1240
	1.00	1160	774	1360	906	1500	996	1680	1120	1860	1240
	1.50	1160	774	1360	906	1500	996	1680	1120	1860	1240
	2.00	1160	774	1360	906	1500	996	1680	1120	1860	1240
	2.50	1160	774	1360	906	1500	996	1680	1120	1860	1240
	3.00	1160	774	1360	906	1500	996	1680	1120	1860	1240
	3.50	1160	774	1360	906	1500	996	1680	1120	1860	1240
	4.00	1160	774	1360	906	1500	996	1680	1120	1860	1240
	4.50	1150	767	1350	900	1490	990	1670	1110	1850	1230
	5.00	1130	755	1330	888	1470	978	1650	1100	1830	1220
	5.50	1120	743	1320	875	1450	966	1640	1090	1810	1210
	6.00	1100	731	1300	863	1430	954	1620	1080	1790	1190
	6.50	1080	719	1280	851	1410	941	1600	1060	1780	1180
	7.00	1060	708	1260	839	1400	929	1580	1050	1760	1170
	7.50	1050	696	1240	827	1380	917	1560	1040	1740	1160
	8.00	1030	684	1230	815	1360	905	1540	1030	1720	1140
	8.50	1010	672	1210	803	1340	893	1520	1010	1700	1130
	9.00	992	660	1190	791	1320	881	1510	1000	1680	1120
	9.50	974	648	1170	779	1310	869	1490	990	1660	1110
	10.0	956	636	1150	767	1290	856	1470	977	1650	1090
	10.5	939	625	1130	755	1270	844	1450	965	1630	1080
	11.0	921	613	1120	743	1250	832	1430	953	1610	1070
	11.5	903	601	1100	731	1230	820	1410	941	1590	1060
	12.0	885	589	1080	719	1210	808	1400	928	1570	1050
	12.5	867	577	1060	707	1200	796	1380	916	1550	1030
	13.0	850	565	1040	695	1180	784	1360	904	1530	1020
	13.5	832	553	1030	683	1160	771	1340	891	1520	1010
	14.0	814	541	1010	671	1140	759	1320	879	1500	996
	14.5	796	530	990	659	1120	747	1300	867	1480	984
	15.0	778	518	972	647	1100	735	1280	854	1460	971

Properties

	HD 400×187	HD 400×216	HD 400×237	HD 400×262	HD 400×287
$Z_x \times 10^3$, mm^3	3642	4262	4686	5260	5813
L_p, m	4.19	4.23	4.24	4.27	4.30
L_r, m	16.3	18.4	19.9	21.8	23.7

LRFD	**ASD**	
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 355 MPa

Shape		**HD 400×314**		**HD 400×347**		**HD 400×382**		**HD 400×421**		**HD 400×463**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	2040	1350	2280	1520	2540	1690	2840	1890	3160	2100
	1.00	2040	1350	2280	1520	2540	1690	2840	1890	3160	2100
	1.50	2040	1350	2280	1520	2540	1690	2840	1890	3160	2100
	2.00	2040	1350	2280	1520	2540	1690	2840	1890	3160	2100
	2.50	2040	1350	2280	1520	2540	1690	2840	1890	3160	2100
	3.00	2040	1350	2280	1520	2540	1690	2840	1890	3160	2100
	3.50	2040	1350	2280	1520	2540	1690	2840	1890	3160	2100
	4.00	2040	1350	2280	1520	2540	1690	2840	1890	3160	2100
	4.50	2030	1350	2280	1510	2540	1690	2830	1890	3150	2100
	5.00	2010	1340	2260	1500	2520	1680	2810	1870	3130	2090
	5.50	1990	1330	2240	1490	2500	1660	2800	1860	3110	2070
	6.00	1970	1310	2220	1480	2480	1650	2780	1850	3090	2060
	6.50	1950	1300	2200	1460	2460	1640	2760	1830	3070	2050
	7.00	1940	1290	2180	1450	2440	1630	2740	1820	3050	2030
	7.50	1920	1280	2160	1440	2430	1610	2720	1810	3040	2020
	8.00	1900	1260	2140	1430	2410	1600	2700	1790	3020	2010
	8.50	1880	1250	2120	1410	2390	1590	2680	1780	3000	1990
	9.00	1860	1240	2110	1400	2370	1580	2660	1770	2980	1980
	9.50	1840	1230	2090	1390	2350	1560	2640	1760	2960	1970
	10.0	1820	1210	2070	1380	2330	1550	2620	1740	2940	1950
	10.5	1810	1200	2050	1360	2310	1540	2600	1730	2920	1940
	11.0	1790	1190	2030	1350	2290	1520	2580	1720	2900	1930
	11.5	1770	1180	2010	1340	2270	1510	2560	1700	2880	1910
	12.0	1750	1160	1990	1330	2250	1500	2540	1690	2860	1900
	12.5	1730	1150	1970	1310	2230	1490	2520	1680	2840	1890
	13.0	1710	1140	1950	1300	2210	1470	2500	1670	2820	1870
	13.5	1690	1130	1940	1290	2190	1460	2480	1650	2800	1860
	14.0	1670	1110	1920	1270	2180	1450	2460	1640	2780	1850
	14.5	1660	1100	1900	1260	2160	1430	2440	1630	2760	1830
	15.0	1640	1090	1880	1250	2140	1420	2430	1610	2740	1820
Properties											
	$Z_x \times 10^3$, mm^3	6374		7139		7965		8880		9878	
	L_p, m	4.32		4.36		4.38		4.42		4.45	
	L_r, m	25.7		28.4		31.1		34.1		37.3	
LRFD	**ASD**	Note: C_b = 1.00.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										

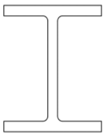
Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 355 MPa

Shape		HD 400×509		HD 400×551		HD 400×592		HD 400×634		HD 400×677	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
	1.00	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
	1.50	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
	2.00	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
	2.50	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
	3.00	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
	3.50	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
	4.00	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
	4.50	3520	2340	3850	2560	4200	2790	4540	3020	4900	3260
	5.00	3500	2330	3830	2550	4180	2780	4530	3010	4890	3250
	5.50	3480	2320	3810	2540	4160	2770	4510	3000	4870	3240
	6.00	3460	2300	3790	2520	4140	2750	4480	2980	4850	3220
	6.50	3440	2290	3770	2510	4120	2740	4460	2970	4820	3210
	7.00	3420	2280	3750	2490	4100	2730	4440	2950	4800	3200
	7.50	3400	2260	3730	2480	4070	2710	4420	2940	4780	3180
	8.00	3380	2250	3710	2470	4050	2700	4400	2930	4760	3170
	8.50	3360	2240	3690	2450	4030	2680	4380	2910	4740	3150
	9.00	3340	2220	3670	2440	4010	2670	4360	2900	4720	3140
	9.50	3320	2210	3650	2430	3990	2660	4330	2880	4690	3120
	10.0	3300	2200	3630	2410	3970	2640	4310	2870	4670	3110
	10.5	3280	2180	3600	2400	3950	2630	4290	2860	4650	3090
	11.0	3260	2170	3580	2380	3930	2610	4270	2840	4630	3080
	11.5	3240	2160	3560	2370	3910	2600	4250	2830	4610	3060
	12.0	3220	2140	3540	2360	3890	2590	4230	2810	4580	3050
	12.5	3200	2130	3520	2340	3860	2570	4210	2800	4560	3040
	13.0	3180	2120	3500	2330	3840	2560	4180	2780	4540	3020
	13.5	3160	2100	3480	2320	3820	2540	4160	2770	4520	3010
	14.0	3140	2090	3460	2300	3800	2530	4140	2760	4500	2990
	14.5	3120	2080	3440	2290	3780	2520	4120	2740	4480	2980
	15.0	3100	2060	3420	2280	3760	2500	4100	2730	4450	2960
Properties											
	$Z_x \times 10^3$, mm^3	11030		12050		13140		14220		15350	
	L_p, m	4.50		4.53		4.57		4.61		4.65	
	L_r, m	40.8		44.1		47.2		50.4		53.7	
LRFD	ASD	Note: C_b = 1.00.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										

Table D.6 Continued.

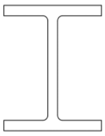


Available Moment vs. Unbraced Length, kN·m
HD Shapes

F_y = 355 MPa

Shape		**HD 400×744**		**HD 400×818**		**HD 400×900**		**HD 400×990**		**HD 400×1086**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
	1.00	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
	1.50	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
	2.00	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
	2.50	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
	3.00	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
	3.50	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
	4.00	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
	4.50	5490	3650	6150	4090	6910	4600	7760	5160	8690	5780
	5.00	5470	3640	6140	4090	6900	4590	7750	5160	8690	5780
	5.50	5450	3630	6120	4070	6880	4570	7730	5140	8670	5770
	6.00	5430	3610	6100	4060	6850	4560	7700	5120	8640	5750
	6.50	5410	3600	6070	4040	6830	4540	7680	5110	8610	5730
	7.00	5380	3580	6050	4030	6800	4530	7650	5090	8590	5710
	7.50	5360	3570	6030	4010	6780	4510	7630	5080	8560	5700
	8.00	5340	3550	6000	3990	6760	4500	7600	5060	8540	5680
	8.50	5320	3540	5980	3980	6730	4480	7580	5040	8510	5660
	9.00	5290	3520	5960	3960	6710	4460	7550	5030	8490	5650
	9.50	5270	3510	5930	3950	6680	4450	7530	5010	8460	5630
	10.0	5250	3490	5910	3930	6660	4430	7500	4990	8430	5610
	10.5	5230	3480	5890	3920	6640	4420	7480	4980	8410	5590
	11.0	5200	3460	5860	3900	6610	4400	7450	4960	8380	5580
	11.5	5180	3450	5840	3890	6590	4380	7430	4940	8360	5560
	12.0	5160	3430	5820	3870	6570	4370	7400	4930	8330	5540
	12.5	5140	3420	5800	3860	6540	4350	7380	4910	8310	5530
	13.0	5110	3400	5770	3840	6520	4340	7350	4890	8280	5510
	13.5	5090	3390	5750	3830	6490	4320	7330	4880	8250	5490
	14.0	5070	3370	5730	3810	6470	4300	7310	4860	8230	5470
	14.5	5050	3360	5700	3790	6450	4290	7280	4840	8200	5460
	15.0	5020	3340	5680	3780	6420	4270	7260	4830	8180	5440
Properties											
$Z_x \times 10^3$, mm^3		17170		19260		21620		24280		27210	
L_p, m		4.70		4.76		4.82		4.90		4.97	
L_r, m		58.5		64.0		70.1		76.1		82.9	
LRFD	**ASD**	Note C_b = 1.00.									
$\phi_b = 0.90$	$\Omega_b = 1.67$										

Table D.6 Continued.



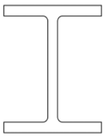
Available Moment vs. Unbraced Length, kN·m

HEA Shapes

F_y = 235 MPa

Shape		**HEA 100**		**HEA 120**		**HEA 140**		**HEA 160**		**HEA 180**		**HEA 200**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	17.6	11.7	25.3	16.8	36.7	24.4	51.8	34.5	68.7	45.7	90.8	60.4
	1.00	17.6	11.7	25.3	16.8	36.7	24.4	51.8	34.5	68.7	45.7	90.8	60.4
	1.50	17.4	11.6	25.3	16.8	36.7	24.4	51.8	34.5	68.7	45.7	90.8	60.4
	2.00	16.9	11.2	24.7	16.4	36.3	24.2	51.8	34.5	68.7	45.7	90.8	60.4
	2.50	16.4	10.9	24.0	15.9	35.3	23.5	50.7	33.7	68.1	45.3	90.8	60.4
	3.00	16.0	10.6	23.3	15.5	34.4	22.9	49.4	32.9	66.5	44.2	89.0	59.2
	3.50	15.5	10.3	22.6	15.0	33.4	22.2	48.2	32.0	64.8	43.1	87.0	57.9
	4.00	15.1	10.0	21.9	14.6	32.4	21.6	46.9	31.2	63.1	42.0	85.0	56.6
	4.50	14.6	9.73	21.2	14.1	31.5	20.9	45.6	30.4	61.5	40.9	83.0	55.2
	5.00	14.2	9.42	20.5	13.6	30.5	20.3	44.4	29.5	59.8	39.8	80.9	53.9
	5.50	13.7	9.12	19.8	13.2	29.5	19.6	43.1	28.7	58.2	38.7	78.9	52.5
	6.00	13.2	8.81	19.1	12.7	28.5	19.0	41.8	27.8	56.5	37.6	76.9	51.2
	6.50	12.8	8.51	18.4	12.3	27.6	18.3	40.6	27.0	54.9	36.5	74.9	49.8
	7.00	12.3	8.20	17.7	11.8	26.6	17.7	39.3	26.2	53.2	35.4	72.8	48.5
	7.50	11.9	7.90	17.1	11.3	25.6	17.0	38.0	25.3	51.5	34.3	70.8	47.1
	8.00	11.4	7.59	16.4	10.9	24.6	16.4	36.8	24.5	49.9	33.2	68.8	45.8
	8.50	11.0	7.29	15.6	10.4	23.7	15.7	35.5	23.6	48.2	32.1	66.8	44.4
	9.00	10.4	6.92	14.7	9.81	22.6	15.0	34.2	22.8	46.6	31.0	64.7	43.1
	9.50	9.85	6.55	13.9	9.28	21.3	14.2	33.0	21.9	44.9	29.9	62.7	41.7
	10.0	9.35	6.22	13.2	8.80	20.2	13.4	31.4	20.9	43.1	28.7	60.7	40.4
	10.5	8.90	5.92	12.6	8.37	19.2	12.8	29.8	19.8	40.9	27.2	58.7	39.0
	11.0	8.49	5.65	12.0	7.98	18.3	12.2	28.4	18.9	38.9	25.9	56.2	37.4
	11.5	8.12	5.40	11.5	7.63	17.5	11.6	27.1	18.0	37.1	24.7	53.6	35.6
	12.0	7.78	5.17	11.0	7.30	16.7	11.1	25.9	17.2	35.4	23.6	51.1	34.0
	12.5	7.46	4.96	10.5	7.01	16.0	10.7	24.8	16.5	33.9	22.6	48.9	32.6
	13.0	7.17	4.77	10.1	6.73	15.4	10.2	23.8	15.9	32.5	21.6	46.9	31.2
	13.5	6.91	4.59	9.74	6.48	14.8	9.85	22.9	15.2	31.3	20.8	45.1	30.0
	14.0	6.66	4.43	9.39	6.24	14.3	9.49	22.1	14.7	30.1	20.0	43.3	28.8
	14.5	6.43	4.28	9.06	6.03	13.8	9.16	21.3	14.2	29.0	19.3	41.8	27.8
	15.0	6.21	4.13	8.75	5.82	13.3	8.85	20.6	13.7	28.0	18.6	40.3	26.8
Properties													
	$Z_x \times 10^3$, mm^3	83.01		119.5		173.5		245.1		324.9		429.5	
	L_p, m	1.29		1.55		1.81		2.04		2.32		2.56	
	L_r, m	8.70		8.45		8.84		9.66		9.93		10.8	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HEA Shapes

F_y = 235 MPa

Shape		**HEA 220**		**HEA 240**		**HEA 260**		**HEA 280**		**HEA 300**		**HEA 320**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	120	80.0	157	105	195	129	235	156	293	195	344	229
	1.00	120	80.0	157	105	195	129	235	156	293	195	344	229
	1.50	120	80.0	157	105	195	129	235	156	293	195	344	229
	2.00	120	80.0	157	105	195	129	235	156	293	195	344	229
	2.50	120	80.0	157	105	195	129	235	156	293	195	344	229
	3.00	119	79.4	157	105	195	129	235	156	293	195	344	229
	3.50	117	77.7	155	103	193	129	235	156	293	195	344	229
	4.00	114	76.1	152	101	190	126	232	154	291	194	343	228
	4.50	112	74.4	149	99.1	186	124	228	151	286	190	337	224
	5.00	109	72.7	146	97.1	183	122	223	149	281	187	331	220
	5.50	107	71.0	143	95.1	179	119	219	146	277	184	326	217
	6.00	104	69.4	140	93.1	176	117	215	143	272	181	320	213
	6.50	102	67.7	137	91.1	172	114	211	140	267	178	314	209
	7.00	99.2	66.0	134	89.1	169	112	207	138	262	174	309	205
	7.50	96.7	64.3	131	87.1	165	110	203	135	257	171	303	202
	8.00	94.2	62.6	128	85.1	161	107	198	132	253	168	298	198
	8.50	91.6	61.0	125	83.1	158	105	194	129	248	165	292	194
	9.00	89.1	59.3	122	81.1	154	103	190	126	243	162	286	191
	9.50	86.6	57.6	119	79.1	151	100	186	124	238	158	281	187
	10.0	84.1	55.9	116	77.1	147	97.9	182	121	233	155	275	183
	10.5	81.5	54.3	113	75.1	144	95.6	177	118	229	152	270	179
	11.0	79.0	52.6	110	73.1	140	93.2	173	115	224	149	264	176
	11.5	76.5	50.9	107	71.1	137	90.8	169	112	219	146	258	172
	12.0	73.0	48.6	104	69.1	133	88.5	165	110	214	143	253	168
	12.5	69.8	46.4	101	67.1	129	86.1	161	107	209	139	247	164
	13.0	66.9	44.5	96.9	64.5	126	83.7	156	104	205	136	241	161
	13.5	64.2	42.7	92.9	61.8	122	80.9	152	101	200	133	236	157
	14.0	61.7	41.0	89.3	59.4	117	77.7	147	97.9	195	130	230	153
	14.5	59.4	39.5	85.9	57.2	112	74.7	141	94.1	190	127	225	149
	15.0	57.3	38.1	82.8	55.1	108	71.9	136	90.5	185	123	219	146

Properties

$Z_x \times 10^3$, mm^3	568.5	744.6	919.8	1112	1383	1628
L_p , m	2.83	3.08	3.34	3.59	3.85	3.85
L_r , m	11.5	12.6	13.3	13.8	14.9	15.0

LRFD	**ASD**	
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.

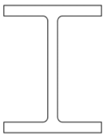
Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEA Shapes

F_y = 235 MPa

Shape		HEA 340		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	391	260	442	294	542	361	680	453	835	556	978	650
	1.00	391	260	442	294	542	361	680	453	835	556	978	650
	1.50	391	260	442	294	542	361	680	453	835	556	978	650
	2.00	391	260	442	294	542	361	680	453	835	556	978	650
	2.50	391	260	442	294	542	361	680	453	835	556	978	650
	3.00	391	260	442	294	542	361	680	453	835	556	978	650
	3.50	391	260	442	294	542	361	680	453	835	556	978	650
	4.00	389	259	439	292	537	358	674	448	826	550	964	642
	4.50	383	255	431	287	528	351	661	440	810	539	945	628
	5.00	376	250	424	282	518	345	649	432	794	528	925	615
	5.50	370	246	417	277	509	339	636	423	778	518	905	602
	6.00	363	242	409	272	499	332	624	415	762	507	885	589
	6.50	357	237	402	267	490	326	611	407	746	497	865	576
	7.00	350	233	394	262	480	320	599	398	731	486	845	562
	7.50	344	229	387	257	471	313	586	390	715	475	825	549
	8.00	337	224	380	253	461	307	574	382	699	465	805	536
	8.50	331	220	372	248	452	301	561	373	683	454	785	523
	9.00	324	216	365	243	442	294	549	365	667	444	766	509
	9.50	318	211	357	238	433	288	536	357	651	433	746	496
	10.0	311	207	350	233	423	282	524	348	635	422	726	483
	10.5	305	203	342	228	414	275	511	340	619	412	706	470
	11.0	298	198	335	223	404	269	499	332	603	401	686	456
	11.5	292	194	328	218	395	263	486	323	587	391	666	443
	12.0	285	190	320	213	385	256	474	315	571	380	646	430
	12.5	279	186	313	208	376	250	461	307	555	369	626	417
	13.0	272	181	305	203	366	244	449	298	539	359	603	401
	13.5	266	177	298	198	357	237	436	290	522	347	575	383
	14.0	259	173	291	193	347	231	421	280	500	332	550	366
	14.5	253	168	283	188	336	223	404	269	479	319	528	351
	15.0	245	163	274	182	323	215	388	258	460	306	507	337
Properties													
	$Z_x \times 10^3$, mm^3	1850		2088		2562		3216		3949		4622	
	L_p , m	3.83		3.81		3.77		3.74		3.72		3.67	
	L_r , m	14.8		14.7		14.3		13.8		13.4		12.8	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HEA Shapes

F_y = 235 MPa

Shape		HEA 600		HEA 650		HEA 700		HEA 800		HEA 900		HEA 1000	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
	1.00	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
	1.50	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
	2.00	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
	2.50	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
	3.00	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
	3.50	1130	753	1300	863	1490	990	1830	1220	2270	1510	2670	1780
	4.00	1110	741	1270	847	1450	967	1790	1190	2210	1470	2600	1730
	4.50	1090	724	1240	828	1420	944	1740	1160	2140	1430	2520	1680
	5.00	1060	708	1210	808	1380	921	1690	1130	2080	1390	2440	1630
	5.50	1040	692	1190	789	1350	898	1640	1090	2020	1350	2370	1570
	6.00	1020	676	1160	769	1310	875	1600	1060	1960	1300	2290	1520
	6.50	992	660	1130	750	1280	851	1550	1030	1900	1260	2210	1470
	7.00	967	644	1100	731	1250	828	1500	1000	1840	1220	2140	1420
	7.50	943	628	1070	711	1210	805	1460	970	1780	1180	2060	1370
	8.00	919	611	1040	692	1180	782	1410	939	1720	1140	1980	1320
	8.50	895	595	1010	672	1140	759	1360	908	1660	1100	1910	1270
	9.00	870	579	982	653	1110	736	1320	877	1590	1060	1830	1220
	9.50	846	563	952	634	1070	713	1270	846	1530	1020	1750	1170
	10.0	822	547	923	614	1040	690	1220	814	1470	979	1680	1110
	10.5	798	531	894	595	1000	667	1180	783	1410	939	1570	1040
	11.0	773	514	865	575	967	644	1130	749	1320	879	1460	974
	11.5	749	498	836	556	933	620	1060	704	1240	826	1370	913
	12.0	725	482	804	535	885	589	999	665	1170	779	1290	860
	12.5	696	463	762	507	839	558	946	629	1110	736	1220	812
	13.0	662	441	725	482	798	531	898	597	1050	699	1160	769
	13.5	632	420	691	460	760	506	854	568	998	664	1100	731
	14.0	604	402	661	439	726	483	815	542	952	633	1050	696
	14.5	579	385	632	421	695	462	779	518	909	605	998	664
	15.0	555	370	607	404	666	443	747	497	871	579	954	635
Properties													
$Z_x \times 10^3$, mm^3		5350		6136		7032		8699		10810		12820	
L_p, m		3.62		3.58		3.51		3.41		3.34		3.26	
L_r, m		12.3		11.9		11.6		10.9		10.6		10.1	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

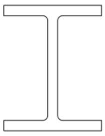
Available Moment vs. Unbraced Length, kN·m
HEA Shapes

F_y = 275 MPa

Shape		HEA 100		HEA 120		HEA 140		HEA 160		HEA 180		HEA 200	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	20.5	13.7	29.6	19.7	42.9	28.6	60.7	40.4	80.4	53.5	106	70.7
	1.00	20.5	13.7	29.6	19.7	42.9	28.6	60.7	40.4	80.4	53.5	106	70.7
	1.50	20.2	13.4	29.4	19.6	42.9	28.6	60.7	40.4	80.4	53.5	106	70.7
	2.00	19.5	13.0	28.5	19.0	42.1	28.0	60.3	40.1	80.4	53.5	106	70.7
	2.50	18.9	12.6	27.5	18.3	40.7	27.1	58.5	38.9	78.8	52.4	106	70.2
	3.00	18.3	12.1	26.6	17.7	39.4	26.2	56.8	37.8	76.5	50.9	103	68.4
	3.50	17.6	11.7	25.6	17.1	38.0	25.3	55.0	36.6	74.2	49.4	100	66.5
	4.00	17.0	11.3	24.7	16.4	36.7	24.4	53.3	35.5	72.0	47.9	97.2	64.7
	4.50	16.4	10.9	23.7	15.8	35.3	23.5	51.6	34.3	69.7	46.4	94.4	62.8
	5.00	15.7	10.5	22.8	15.1	34.0	22.6	49.8	33.1	67.4	44.8	91.6	61.0
	5.50	15.1	10.0	21.8	14.5	32.6	21.7	48.1	32.0	65.1	43.3	88.8	59.1
	6.00	14.5	9.62	20.8	13.9	31.3	20.8	46.3	30.8	62.8	41.8	86.1	57.3
	6.50	13.8	9.19	19.9	13.2	30.0	19.9	44.6	29.7	60.5	40.3	83.3	55.4
	7.00	13.2	8.77	18.9	12.6	28.6	19.0	42.8	28.5	58.3	38.8	80.5	53.6
	7.50	12.5	8.33	17.8	11.9	27.3	18.1	41.1	27.3	56.0	37.2	77.7	51.7
	8.00	11.7	7.80	16.7	11.1	25.6	17.0	39.3	26.2	53.7	35.7	74.9	49.8
	8.50	11.0	7.33	15.6	10.4	24.0	16.0	37.4	24.9	51.4	34.2	72.1	48.0
	9.00	10.4	6.92	14.7	9.81	22.6	15.0	35.1	23.4	48.5	32.2	69.4	46.1
	9.50	9.85	6.55	13.9	9.28	21.3	14.2	33.1	22.1	45.6	30.4	66.2	44.0
	10.0	9.35	6.22	13.2	8.80	20.2	13.4	31.4	20.9	43.1	28.7	62.5	41.6
	10.5	8.90	5.92	12.6	8.37	19.2	12.8	29.8	19.8	40.9	27.2	59.2	39.4
	11.0	8.49	5.65	12.0	7.98	18.3	12.2	28.4	18.9	38.9	25.9	56.2	37.4
	11.5	8.12	5.40	11.5	7.63	17.5	11.6	27.1	18.0	37.1	24.7	53.6	35.6
	12.0	7.78	5.17	11.0	7.30	16.7	11.1	25.9	17.2	35.4	23.6	51.1	34.0
	12.5	7.46	4.96	10.5	7.01	16.0	10.7	24.8	16.5	33.9	22.6	48.9	32.6
	13.0	7.17	4.77	10.1	6.73	15.4	10.2	23.8	15.9	32.5	21.6	46.9	31.2
	13.5	6.91	4.59	9.74	6.48	14.8	9.85	22.9	15.2	31.3	20.8	45.1	30.0
	14.0	6.66	4.43	9.39	6.24	14.3	9.49	22.1	14.7	30.1	20.0	43.3	28.8
	14.5	6.43	4.28	9.06	6.03	13.8	9.16	21.3	14.2	29.0	19.3	41.8	27.8
	15.0	6.21	4.13	8.75	5.82	13.3	8.85	20.6	13.7	28.0	18.6	40.3	26.8
Properties													
$Z_x \times 10^3$, **mm**^{3}		83.01		119.5		173.5		245.1		324.9		429.5	
L_p **, m**		1.19		1.43		1.67		1.89		2.15		2.36	
L_r **, m**		7.46		7.27		7.63		8.35		8.62		9.37	

LRFD	ASD	
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HEA Shapes

F_y = 275 MPa

Shape		HEA 220		HEA 240		HEA 260^f		HEA 280^f		HEA 300^f		HEA 320	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	141	93.6	184	123	227	151	272	181	339	225	403	268
	1.00	141	93.6	184	123	227	151	272	181	339	225	403	268
	1.50	141	93.6	184	123	227	151	272	181	339	225	403	268
	2.00	141	93.6	184	123	227	151	272	181	339	225	403	268
	2.50	141	93.6	184	123	227	151	272	181	339	225	403	268
	3.00	138	91.8	183	122	227	151	272	181	339	225	403	268
	3.50	135	89.5	179	119	224	149	272	181	339	225	403	268
	4.00	131	87.2	175	116	219	146	267	178	336	224	396	264
	4.50	128	84.9	171	114	214	142	262	174	330	219	388	258
	5.00	124	82.6	167	111	209	139	256	170	323	215	381	253
	5.50	121	80.3	162	108	204	136	250	167	317	211	373	248
	6.00	117	78.0	158	105	199	133	245	163	310	206	365	243
	6.50	114	75.7	154	103	194	129	239	159	304	202	358	238
	7.00	110	73.4	150	99.8	189	126	233	155	297	198	350	233
	7.50	107	71.1	146	97.1	185	123	227	151	290	193	342	228
	8.00	103	68.8	142	94.3	180	120	222	147	284	189	335	223
	8.50	100	66.5	138	91.6	175	116	216	144	277	184	327	217
	9.00	96.5	64.2	133	88.8	170	113	210	140	271	180	319	212
	9.50	93.0	61.9	129	86.1	165	110	204	136	264	176	311	207
	10.0	89.6	59.6	125	83.3	160	107	199	132	257	171	304	202
	10.5	84.8	56.4	121	80.6	155	103	193	128	251	167	296	197
	11.0	80.5	53.5	117	77.8	150	100	187	125	244	163	288	192
	11.5	76.6	50.9	111	73.9	146	96.8	182	121	238	158	281	187
	12.0	73.0	48.6	106	70.5	139	92.4	176	117	231	154	273	182
	12.5	69.8	46.4	101	67.3	133	88.2	168	112	225	149	265	177
	13.0	66.9	44.5	96.9	64.5	127	84.4	160	107	218	145	258	171
	13.5	64.2	42.7	92.9	61.8	122	80.9	153	102	209	139	247	164
	14.0	61.7	41.0	89.3	59.4	117	77.7	147	97.9	200	133	237	158
	14.5	59.4	39.5	85.9	57.2	112	74.7	141	94.1	192	128	227	151
	15.0	57.3	38.1	82.8	55.1	108	71.9	136	90.5	185	123	219	146

Properties

	HEA 220	HEA 240	HEA 260^f	HEA 280^f	HEA 300^f	HEA 320
$Z_x \times 10^3$, mm^3	568.5	744.6	919.8	1112	1383	1628
L_p, m	2.62	2.85	3.16	3.59	3.82	3.56
L_r, m	10.0	11.0	11.6	12.0	13.0	13.1

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

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Note: C_b = 1.00.

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m

HEA Shapes

F_y = 275 MPa

Shape		HEA 340		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	458	305	517	344	634	422	796	530	977	650	1140	761
	1.00	458	305	517	344	634	422	796	530	977	650	1140	761
	1.50	458	305	517	344	634	422	796	530	977	650	1140	761
	2.00	458	305	517	344	634	422	796	530	977	650	1140	761
	2.50	458	305	517	344	634	422	796	530	977	650	1140	761
	3.00	458	305	517	344	634	422	796	530	977	650	1140	761
	3.50	458	305	517	344	634	422	795	529	975	648	1140	757
	4.00	450	299	507	337	621	413	778	517	953	634	1110	739
	4.50	441	293	497	331	608	404	761	506	931	620	1080	722
	5.00	432	287	487	324	595	396	744	495	910	605	1060	704
	5.50	423	282	477	317	582	387	727	483	888	591	1030	686
	6.00	414	276	467	310	569	378	710	472	867	577	1000	668
	6.50	405	270	457	304	556	370	693	461	845	562	977	650
	7.00	397	264	446	297	543	361	676	449	823	548	950	632
	7.50	388	258	436	290	530	353	659	438	802	533	923	614
	8.00	379	252	426	284	517	344	642	427	780	519	897	597
	8.50	370	246	416	277	504	335	625	416	758	505	870	579
	9.00	361	240	406	270	491	327	608	404	737	490	843	561
	9.50	352	234	396	263	478	318	591	393	715	476	816	543
	10.0	343	228	386	257	465	310	574	382	694	461	789	525
	10.5	334	223	375	250	452	301	557	370	672	447	762	507
	11.0	326	217	365	243	439	292	540	359	650	433	735	489
	11.5	317	211	355	236	426	284	522	348	629	418	703	468
	12.0	308	205	345	230	413	275	505	336	603	401	666	443
	12.5	299	199	335	223	400	266	482	321	573	381	633	421
	13.0	290	193	323	215	382	254	460	306	546	363	603	401
	13.5	277	184	309	206	365	243	440	292	522	347	575	383
	14.0	266	177	296	197	350	233	421	280	500	332	550	366
	14.5	255	170	285	189	336	223	404	269	479	319	528	351
	15.0	245	163	274	182	323	215	388	258	460	306	507	337
Properties													
$Z_x \times 10^3$, mm^3		1850		2088		2562		3216		3949		4622	
L_p , m		3.54		3.53		3.48		3.46		3.44		3.39	
L_r , m		13.0		12.9		12.5		12.1		11.8		11.3	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEA Shapes

F_y = 275 MPa

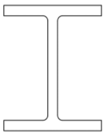
Shape		**HEA 600**		**HEA 650**		**HEA 700**		**HEA 800**		**HEA 900**		**HEA 1000**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
	1.00	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
	1.50	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
	2.00	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
	2.50	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
	3.00	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
	3.50	1310	874	1500	1000	1720	1140	2110	1400	2610	1740	3070	2050
	4.00	1280	853	1460	974	1670	1110	2050	1360	2530	1680	2970	1980
	4.50	1250	831	1430	948	1620	1080	1990	1320	2450	1630	2870	1910
	5.00	1220	809	1390	922	1580	1050	1920	1280	2370	1570	2770	1840
	5.50	1180	787	1350	896	1530	1020	1860	1240	2290	1520	2670	1780
	6.00	1150	766	1310	870	1480	988	1800	1200	2200	1470	2570	1710
	6.50	1120	744	1270	844	1440	957	1740	1160	2120	1410	2470	1640
	7.00	1090	722	1230	818	1390	926	1680	1120	2040	1360	2370	1580
	7.50	1050	701	1190	792	1350	895	1610	1070	1960	1310	2270	1510
	8.00	1020	679	1150	766	1300	865	1550	1030	1880	1250	2170	1440
	8.50	988	657	1110	740	1250	834	1490	992	1800	1200	2070	1370
	9.00	955	635	1070	714	1210	803	1430	950	1720	1140	1960	1310
	9.50	922	614	1030	688	1160	772	1370	909	1640	1090	1820	1210
	10.0	890	592	996	663	1110	741	1290	857	1520	1010	1690	1120
	10.5	857	570	957	637	1060	705	1200	800	1410	940	1570	1040
	11.0	821	546	902	600	994	661	1130	749	1320	879	1460	974
	11.5	775	515	850	566	936	623	1060	704	1240	826	1370	913
	12.0	733	488	804	535	885	589	999	665	1170	779	1290	860
	12.5	696	463	762	507	839	558	946	629	1110	736	1220	812
	13.0	662	441	725	482	798	531	898	597	1050	699	1160	769
	13.5	632	420	691	460	760	506	854	568	998	664	1100	731
	14.0	604	402	661	439	726	483	815	542	952	633	1050	696
	14.5	579	385	632	421	695	462	779	518	909	605	998	664
	15.0	555	370	607	404	666	443	747	497	871	579	954	635

Properties

	HEA 600	HEA 650	HEA 700	HEA 800	HEA 900	HEA 1000
$Z_x \times 10^3$, mm^3	5350	6136	7032	8699	10810	12820
L_p , m	3.35	3.31	3.25	3.16	3.09	3.01
L_r , m	10.9	10.6	10.4	9.79	9.48	9.13

LRFD	**ASD**	Note: C_b = 1.00.
$\phi_b = 0.90$	$\Omega_b = 1.67$	

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m

HEA Shapes

F_y = 355 MPa

Shape		**HEA 100**		**HEA 120**		**HEA 140**		**HEA 160**		**HEA 180**^{f}		**HEA 200**^{f}	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	26.5	17.6	38.2	25.4	55.4	36.9	78.3	52.1	103	68.3	134	89.1
	1.00	26.5	17.6	38.2	25.4	55.4	36.9	78.3	52.1	103	68.3	134	89.1
	1.50	25.6	17.0	37.4	24.9	55.3	36.8	78.3	52.1	103	68.3	134	89.1
	2.00	24.5	16.3	35.8	23.8	53.0	35.3	76.3	50.8	103	68.3	134	89.1
	2.50	23.4	15.6	34.2	22.7	50.8	33.8	73.4	48.8	99.1	66.0	133	88.7
	3.00	22.3	14.9	32.6	21.7	48.5	32.3	70.5	46.9	95.3	63.4	129	85.6
	3.50	21.3	14.1	30.9	20.6	46.3	30.8	67.5	44.9	91.5	60.9	124	82.5
	4.00	20.2	13.4	29.3	19.5	44.0	29.3	64.6	43.0	87.7	58.4	119	79.5
	4.50	19.1	12.7	27.7	18.4	41.7	27.8	61.7	41.0	83.9	55.8	115	76.4
	5.00	18.0	12.0	26.1	17.4	39.5	26.3	58.8	39.1	80.1	53.3	110	73.3
	5.50	17.0	11.3	24.5	16.3	37.2	24.8	55.8	37.1	76.3	50.8	106	70.2
	6.00	15.8	10.5	22.6	15.0	34.9	23.2	52.9	35.2	72.5	48.2	101	67.1
	6.50	14.5	9.65	20.7	13.8	32.0	21.3	50.0	33.2	68.7	45.7	96.2	64.0
	7.00	13.4	8.94	19.2	12.7	29.5	19.6	46.3	30.8	64.6	43.0	91.6	60.9
	7.50	12.5	8.33	17.8	11.9	27.4	18.2	42.8	28.5	59.6	39.6	87.0	57.9
	8.00	11.7	7.80	16.7	11.1	25.6	17.0	39.9	26.6	55.3	36.8	80.7	53.7
	8.50	11.0	7.33	15.6	10.4	24.0	16.0	37.4	24.9	51.7	34.4	75.2	50.0
	9.00	10.4	6.92	14.7	9.81	22.6	15.0	35.1	23.4	48.5	32.2	70.4	46.8
	9.50	9.85	6.55	13.9	9.28	21.3	14.2	33.1	22.1	45.6	30.4	66.2	44.0
	10.0	9.35	6.22	13.2	8.80	20.2	13.4	31.4	20.9	43.1	28.7	62.5	41.6
	10.5	8.90	5.92	12.6	8.37	19.2	12.8	29.8	19.8	40.9	27.2	59.2	39.4
	11.0	8.49	5.65	12.0	7.98	18.3	12.2	28.4	18.9	38.9	25.9	56.2	37.4
	11.5	8.12	5.40	11.5	7.63	17.5	11.6	27.1	18.0	37.1	24.7	53.6	35.6
	12.0	7.78	5.17	11.0	7.30	16.7	11.1	25.9	17.2	35.4	23.6	51.1	34.0
	12.5	7.46	4.96	10.5	7.01	16.0	10.7	24.8	16.5	33.9	22.6	48.9	32.6
	13.0	7.17	4.77	10.1	6.73	15.4	10.2	23.8	15.9	32.5	21.6	46.9	31.2
	13.5	6.91	4.59	9.74	6.48	14.8	9.85	22.9	15.2	31.3	20.8	45.1	30.0
	14.0	6.66	4.43	9.39	6.24	14.3	9.49	22.1	14.7	30.1	20.0	43.3	28.8
	14.5	6.43	4.28	9.06	6.03	13.8	9.16	21.3	14.2	29.0	19.3	41.8	27.8
	15.0	6.21	4.13	8.75	5.82	13.3	8.85	20.6	13.7	28.0	18.6	40.3	26.8
Properties													
	$Z_x \times 10^3$, mm^3	83.01		119.5		173.5		245.1		324.9		429.5	
	L_p, m	1.05		1.26		1.47		1.66		2.04		2.44	
	L_r, m	5.82		5.72		6.04		6.63		6.90		7.51	
LRFD	**ASD**	^{f}Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.											
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.											

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEA Shapes

F_y = 355 MPa

Shape		**HEA 220^f**		**HEA 240^f**		**HEA 260^f**		**HEA 280^f**		**HEA 300^f**		**HEA 320^f**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	177	118	232	154	284	189	340	226	423	282	512	340
	1.00	177	118	232	154	284	189	340	226	423	282	512	340
	1.50	177	118	232	154	284	189	340	226	423	282	512	340
	2.00	177	118	232	154	284	189	340	226	423	282	512	340
	2.50	177	118	232	154	284	189	340	226	423	282	512	340
	3.00	174	116	231	154	284	189	340	226	423	282	512	340
	3.50	168	112	224	149	281	187	340	226	423	282	511	340
	4.00	162	108	217	145	273	182	335	223	423	281	498	331
	4.50	156	104	211	140	265	176	326	217	412	274	485	323
	5.00	151	100	204	136	257	171	316	210	401	267	473	314
	5.50	145	96.4	197	131	249	166	307	204	390	260	460	306
	6.00	139	92.6	190	126	241	160	297	198	380	253	447	298
	6.50	133	88.7	183	122	233	155	288	191	369	245	434	289
	7.00	128	84.9	176	117	225	150	278	185	358	238	422	281
	7.50	122	81.1	169	113	217	144	269	179	347	231	409	272
	8.00	116	77.3	163	108	209	139	260	173	336	224	396	264
	8.50	108	72.2	156	104	200	133	250	166	325	216	384	255
	9.00	101	67.4	148	98.4	192	128	241	160	314	209	371	247
	9.50	95.2	63.3	139	92.2	183	122	231	154	304	202	358	238
	10.0	89.7	59.7	131	86.8	172	115	220	146	293	195	346	230
	10.5	84.8	56.4	123	82.1	162	108	207	138	282	188	333	221
	11.0	80.5	53.5	117	77.8	154	102	195	130	266	177	316	210
	11.5	76.6	50.9	111	73.9	146	97.1	185	123	252	168	299	199
	12.0	73.0	48.6	106	70.5	139	92.4	176	117	240	160	284	189
	12.5	69.8	46.4	101	67.3	133	88.2	168	112	228	152	270	180
	13.0	66.9	44.5	96.9	64.5	127	84.4	160	107	218	145	258	172
	13.5	64.2	42.7	92.9	61.8	122	80.9	153	102	209	139	247	164
	14.0	61.7	41.0	89.3	59.4	117	77.7	147	97.9	200	133	237	158
	14.5	59.4	39.5	85.9	57.2	112	74.7	141	94.1	192	128	227	151
	15.0	57.3	38.1	82.8	55.1	108	71.9	136	90.5	185	123	219	146
Properties													
	$Z_x \times 10^3$, mm^3	568.5		744.6		919.8		1112		1383		1628	
	L_p, m	2.69		2.93		3.34		3.74		3.13		3.46	
	L_r, m	8.08		8.84		9.33		9.75		10.5		10.6	
LRFD	**ASD**	[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.											
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.											

Table D.6 Continued.

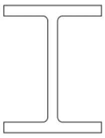
Available Moment vs. Unbraced Length, kN·m

HEA Shapes

F_y = 355 MPa

Shape		HEA 340^f		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	590	393	667	444	819	545	1030	684	1260	839	1480	983
	1.00	590	393	667	444	819	545	1030	684	1260	839	1480	983
	1.50	590	393	667	444	819	545	1030	684	1260	839	1480	983
	2.00	590	393	667	444	819	545	1030	684	1260	839	1480	983
	2.50	590	393	667	444	819	545	1030	684	1260	839	1480	983
	3.00	590	393	667	444	819	545	1030	684	1260	839	1480	982
	3.50	580	386	654	435	800	532	1000	667	1230	817	1430	953
	4.00	565	376	637	424	779	518	975	648	1190	794	1390	924
	4.50	551	366	621	413	758	504	947	630	1160	771	1350	896
	5.00	536	357	604	402	736	490	919	612	1120	747	1300	867
	5.50	521	347	587	391	715	476	892	593	1090	724	1260	838
	6.00	507	337	571	380	694	462	864	575	1050	701	1220	809
	6.50	492	327	554	369	673	448	836	556	1020	677	1170	781
	7.00	477	318	537	357	652	434	808	538	983	654	1130	752
	7.50	463	308	521	346	630	419	781	519	948	631	1090	723
	8.00	448	298	504	335	609	405	753	501	913	607	1040	694
	8.50	434	288	487	324	588	391	725	483	878	584	1000	666
	9.00	419	279	471	313	567	377	698	464	843	561	957	637
	9.50	404	269	454	302	546	363	670	446	808	537	906	603
	10.0	390	259	437	291	524	349	639	425	761	507	845	562
	10.5	375	250	419	279	496	330	600	399	714	475	792	527
	11.0	354	236	396	263	468	311	565	376	673	448	745	496
	11.5	335	223	375	249	443	295	535	356	636	423	703	468
	12.0	319	212	356	237	420	280	507	337	603	401	666	443
	12.5	303	202	339	225	400	266	482	321	573	381	633	421
	13.0	290	193	323	215	382	254	460	306	546	363	603	401
	13.5	277	184	309	206	365	243	440	292	522	347	575	383
	14.0	266	177	296	197	350	233	421	280	500	332	550	366
	14.5	255	170	285	189	336	223	404	269	479	319	528	351
	15.0	245	163	274	182	323	215	388	258	460	306	507	337
Properties													
	$Z_x \times 10^3$, mm^3	1850		2088		2562		3216		3949		4622	
	L_p, m	3.15		3.10		3.07		3.05		3.02		2.99	
	L_r, m	10.5		10.4		10.2		9.90		9.70		9.35	
LRFD	ASD	[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.											
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.											

Table D.6 Continued.

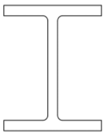


Available Moment vs. Unbraced Length, kN·m
HEA Shapes

F_y = 355 MPa

Shape		**HEA 600**		**HEA 650**		**HEA 700**		**HEA 800**		**HEA 900**		**HEA 1000**	
Design		ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	1710	1140	1960	1300	2250	1490	2780	1850	3450	2300	4100	2730
	1.00	1710	1140	1960	1300	2250	1490	2780	1850	3450	2300	4100	2730
	1.50	1710	1140	1960	1300	2250	1490	2780	1850	3450	2300	4100	2730
	2.00	1710	1140	1960	1300	2250	1490	2780	1850	3450	2300	4100	2730
	2.50	1710	1140	1960	1300	2250	1490	2780	1850	3450	2300	4100	2730
	3.00	1700	1130	1950	1300	2230	1480	2740	1820	3380	2250	3990	2650
	3.50	1650	1100	1890	1260	2150	1430	2640	1760	3260	2170	3830	2550
	4.00	1600	1060	1830	1210	2080	1380	2540	1690	3130	2080	3680	2450
	4.50	1550	1030	1760	1170	2010	1330	2450	1630	3010	2000	3520	2340
	5.00	1490	995	1700	1130	1930	1290	2350	1560	2880	1920	3370	2240
	5.50	1440	960	1640	1090	1860	1240	2250	1500	2760	1830	3210	2140
	6.00	1390	925	1580	1050	1790	1190	2150	1430	2630	1750	3050	2030
	6.50	1340	891	1510	1010	1710	1140	2060	1370	2500	1670	2900	1930
	7.00	1290	856	1450	967	1640	1090	1960	1300	2380	1580	2740	1820
	7.50	1230	821	1390	925	1570	1040	1860	1240	2250	1500	2590	1720
	8.00	1180	786	1330	884	1490	993	1770	1180	2130	1420	2380	1590
	8.50	1130	752	1270	843	1420	944	1640	1090	1940	1290	2160	1440
	9.00	1080	717	1190	793	1320	876	1500	1000	1770	1180	1980	1320
	9.50	1000	667	1100	734	1220	811	1390	924	1640	1090	1820	1210
	10.0	934	621	1030	683	1130	754	1290	857	1520	1010	1690	1120
	10.5	874	581	961	639	1060	705	1200	800	1410	940	1570	1040
	11.0	821	546	902	600	994	661	1130	749	1320	879	1460	974
	11.5	775	515	850	566	936	623	1060	704	1240	826	1370	913
	12.0	733	488	804	535	885	589	999	665	1170	779	1290	860
	12.5	696	463	762	507	839	558	946	629	1110	736	1220	812
	13.0	662	441	725	482	798	531	898	597	1050	699	1160	769
	13.5	632	420	691	460	760	506	854	568	998	664	1100	731
	14.0	604	402	661	439	726	483	815	542	952	633	1050	696
	14.5	579	385	632	421	695	462	779	518	909	605	998	664
	15.0	555	370	607	404	666	443	747	497	871	579	954	635
Properties													
	$Z_x \times 10^3$, mm^3	5350		6136		7032		8699		10810		12820	
	L_p, m	2.95		2.91		2.86		2.78		2.72		2.65	
	L_r, m	9.07		8.84		8.66		8.25		8.03		7.77	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 235 MPa

Shape		**HEB 100**		**HEB 120**		**HEB 140**		**HEB 160**		**HEB 180**		**HEB 200**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	22.0	14.7	34.9	23.2	51.9	34.5	74.9	49.8	102	67.7	136	90.4
	1.00	22.0	14.7	34.9	23.2	51.9	34.5	74.9	49.8	102	67.7	136	90.4
	1.50	21.8	14.5	34.9	23.2	51.9	34.5	74.9	49.8	102	67.7	136	90.4
	2.00	21.4	14.2	34.3	22.8	51.6	34.3	74.9	49.8	102	67.7	136	90.4
	2.50	20.9	13.9	33.6	22.4	50.6	33.6	73.7	49.1	101	67.4	136	90.4
	3.00	20.4	13.6	32.9	21.9	49.5	33.0	72.4	48.2	99.6	66.2	134	89.3
	3.50	19.9	13.3	32.2	21.4	48.5	32.3	71.1	47.3	97.8	65.1	132	87.8
	4.00	19.5	12.9	31.4	20.9	47.5	31.6	69.7	46.4	96.1	63.9	130	86.4
	4.50	19.0	12.6	30.7	20.4	46.5	30.9	68.4	45.5	94.4	62.8	128	85.0
	5.00	18.5	12.3	30.0	19.9	45.5	30.3	67.1	44.6	92.6	61.6	126	83.6
	5.50	18.0	12.0	29.3	19.5	44.5	29.6	65.7	43.7	90.9	60.5	123	82.1
	6.00	17.5	11.7	28.5	19.0	43.4	28.9	64.4	42.8	89.2	59.3	121	80.7
	6.50	17.1	11.4	27.8	18.5	42.4	28.2	63.1	42.0	87.4	58.2	119	79.3
	7.00	16.6	11.0	27.1	18.0	41.4	27.6	61.7	41.1	85.7	57.0	117	77.8
	7.50	16.1	10.7	26.4	17.5	40.4	26.9	60.4	40.2	84.0	55.9	115	76.4
	8.00	15.6	10.4	25.6	17.1	39.4	26.2	59.0	39.3	82.3	54.7	113	75.0
	8.50	15.1	10.1	24.9	16.6	38.4	25.5	57.7	38.4	80.5	53.6	111	73.5
	9.00	14.7	9.76	24.2	16.1	37.3	24.8	56.4	37.5	78.8	52.4	108	72.1
	9.50	14.2	9.44	23.5	15.6	36.3	24.2	55.0	36.6	77.1	51.3	106	70.7
	10.0	13.7	9.12	22.8	15.1	35.3	23.5	53.7	35.7	75.3	50.1	104	69.2
	10.5	13.2	8.78	22.0	14.7	34.3	22.8	52.4	34.8	73.6	49.0	102	67.8
	11.0	12.6	8.38	21.3	14.2	33.3	22.1	51.0	33.9	71.9	47.8	99.8	66.4
	11.5	12.0	8.01	20.4	13.5	32.3	21.5	49.7	33.1	70.1	46.7	97.6	65.0
	12.0	11.5	7.68	19.5	13.0	31.0	20.6	48.4	32.2	68.4	45.5	95.5	63.5
	12.5	11.1	7.37	18.7	12.4	29.7	19.8	47.0	31.3	66.7	44.4	93.3	62.1
	13.0	10.6	7.08	18.0	12.0	28.6	19.0	45.5	30.3	65.0	43.2	91.2	60.7
	13.5	10.2	6.82	17.3	11.5	27.5	18.3	43.8	29.1	63.2	42.1	89.0	59.2
	14.0	9.88	6.57	16.7	11.1	26.5	17.6	42.2	28.1	60.9	40.5	86.9	57.8
	14.5	9.54	6.35	16.1	10.7	25.6	17.0	40.7	27.1	58.8	39.1	84.7	56.4
	15.0	9.22	6.13	15.6	10.4	24.7	16.4	39.3	26.2	56.8	37.8	81.9	54.5
Properties													
	$Z_x \times 10^3$, mm³	104.2		165.2		245.4		345.0		481.4		642.5	
	L_p, m	1.30		1.57		1.84		2.08		2.35		2.60	
	L_r, m	10.4		11.0		11.7		12.8		13.6		14.6	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 235 MPa

Shape		HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	175	116	223	148	271	181	324	216	395	263	455	302
	1.00	175	116	223	148	271	181	324	216	395	263	455	302
	1.50	175	116	223	148	271	181	324	216	395	263	455	302
	2.00	175	116	223	148	271	181	324	216	395	263	455	302
	2.50	175	116	223	148	271	181	324	216	395	263	455	302
	3.00	174	116	223	148	271	181	324	216	395	263	455	302
	3.50	172	114	220	147	270	180	324	216	395	263	455	302
	4.00	169	112	217	144	267	177	321	214	394	262	453	302
	4.50	166	111	214	142	263	175	317	211	389	259	447	298
	5.00	164	109	211	140	259	172	312	208	384	256	441	294
	5.50	161	107	208	138	255	170	308	205	379	252	436	290
	6.00	158	105	205	136	252	167	304	202	374	249	430	286
	6.50	156	104	201	134	248	165	299	199	369	245	424	282
	7.00	153	102	198	132	244	162	295	196	364	242	418	278
	7.50	150	100	195	130	240	160	290	193	359	239	412	274
	8.00	148	98.3	192	128	237	158	286	190	354	235	406	270
	8.50	145	96.6	189	126	233	155	282	187	349	232	401	266
	9.00	142	94.8	186	123	229	153	277	184	344	229	395	263
	9.50	140	93.0	182	121	225	150	273	181	338	225	389	259
	10.0	137	91.3	179	119	222	148	268	179	333	222	383	255
	10.5	135	89.5	176	117	218	145	264	176	328	218	377	251
	11.0	132	87.8	173	115	214	143	260	173	323	215	371	247
	11.5	129	86.0	170	113	211	140	255	170	318	212	365	243
	12.0	127	84.2	167	111	207	138	251	167	313	208	360	239
	12.5	124	82.5	164	109	203	135	246	164	308	205	354	235
	13.0	121	80.7	160	107	199	133	242	161	303	202	348	231
	13.5	119	79.0	157	105	196	130	237	158	298	198	342	228
	14.0	116	77.2	154	102	192	128	233	155	293	195	336	224
	14.5	113	75.5	151	100	188	125	229	152	288	192	330	220
	15.0	111	73.7	148	98.3	184	123	224	149	283	188	324	216
Properties													
$Z_x \times 10^3$, mm^3		827.0		1053		1283		1534		1869		2149	
L_p, m		2.87		3.12		3.38		3.64		3.89		3.89	
L_r, m		15.4		16.4		16.9		17.3		18.4		18.4	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 235 MPa

Shape		**HEB 340**		**HEB 360**		**HEB 400**		**HEB 450**		**HEB 500**		**HEB 550**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	509	339	567	378	684	455	842	560	1020	678	1180	787
	1.00	509	339	567	378	684	455	842	560	1020	678	1180	787
	1.50	509	339	567	378	684	455	842	560	1020	678	1180	787
	2.00	509	339	567	378	684	455	842	560	1020	678	1180	787
	2.50	509	339	567	378	684	455	842	560	1020	678	1180	787
	3.00	509	339	567	378	684	455	842	560	1020	678	1180	787
	3.50	509	339	567	378	684	455	842	560	1020	678	1180	787
	4.00	507	338	565	376	680	452	836	556	1010	672	1170	778
	4.50	501	333	557	371	670	446	823	548	993	661	1150	764
	5.00	494	329	550	366	660	439	810	539	977	650	1130	751
	5.50	487	324	542	361	650	433	797	531	960	639	1110	737
	6.00	481	320	534	356	640	426	785	522	944	628	1090	723
	6.50	474	315	527	350	631	420	772	513	927	617	1070	709
	7.00	467	311	519	345	621	413	759	505	911	606	1050	696
	7.50	460	306	511	340	611	407	746	496	894	595	1030	682
	8.00	454	302	504	335	601	400	733	488	878	584	1000	668
	8.50	447	297	496	330	591	394	720	479	862	573	984	655
	9.00	440	293	488	325	582	387	707	471	845	562	963	641
	9.50	434	288	481	320	572	380	694	462	829	551	943	627
	10.0	427	284	473	315	562	374	682	453	812	540	922	614
	10.5	420	280	465	310	552	367	669	445	796	530	902	600
	11.0	413	275	458	305	542	361	656	436	779	519	881	586
	11.5	407	271	450	300	533	354	643	428	763	508	860	572
	12.0	400	266	442	294	523	348	630	419	747	497	840	559
	12.5	393	262	435	289	513	341	617	411	730	486	819	545
	13.0	386	257	427	284	503	335	604	402	714	475	799	531
	13.5	380	253	420	279	493	328	591	393	697	464	778	518
	14.0	373	248	412	274	484	322	579	385	681	453	757	504
	14.5	366	244	404	269	474	315	566	376	664	442	737	490
	15.0	360	239	397	264	464	309	553	368	648	431	708	471

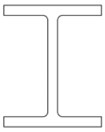
Properties

	HEB 340	HEB 360	HEB 400	HEB 450	HEB 500	HEB 550
$Z_x \times 10^3$, mm^3	2408	2683	3232	3982	4815	5591
L_p, m	3.87	3.85	3.80	3.76	3.73	3.68
L_r, m	18.0	17.7	16.9	16.0	15.4	14.5

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

Note: C_b = 1.00.

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 235 MPa

Shape		HEB 600		HEB 650		HEB 700		HEB 800		HEB 900		HEB 1000	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
	1.00	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
	1.50	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
	2.00	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
	2.50	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
	3.00	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
	3.50	1360	904	1550	1030	1760	1170	2160	1430	2640	1760	3110	2070
	4.00	1340	892	1520	1010	1730	1150	2110	1400	2580	1710	3020	2010
	4.50	1320	875	1490	993	1690	1120	2060	1370	2510	1670	2940	1960
	5.00	1290	858	1460	973	1650	1100	2010	1340	2450	1630	2860	1900
	5.50	1260	841	1430	952	1620	1080	1960	1300	2380	1580	2780	1850
	6.00	1240	825	1400	932	1580	1050	1910	1270	2320	1540	2690	1790
	6.50	1210	808	1370	912	1540	1030	1860	1240	2250	1500	2610	1740
	7.00	1190	791	1340	891	1510	1000	1810	1200	2190	1450	2530	1680
	7.50	1160	774	1310	871	1470	979	1760	1170	2120	1410	2440	1630
	8.00	1140	757	1280	851	1440	955	1710	1140	2060	1370	2360	1570
	8.50	1110	740	1250	831	1400	931	1660	1100	1990	1320	2280	1520
	9.00	1090	724	1220	810	1360	906	1610	1070	1930	1280	2200	1460
	9.50	1060	707	1190	790	1330	882	1560	1040	1860	1240	2110	1410
	10.0	1040	690	1160	770	1290	858	1510	1010	1800	1190	2030	1350
	10.5	1010	673	1130	749	1250	834	1460	973	1730	1150	1950	1300
	11.0	986	656	1100	729	1220	809	1410	940	1670	1110	1850	1230
	11.5	961	639	1070	709	1180	785	1360	906	1590	1060	1740	1150
	12.0	936	623	1030	688	1140	761	1300	868	1500	998	1640	1090
	12.5	910	606	1000	668	1110	737	1240	824	1420	946	1550	1030
	13.0	885	589	974	648	1060	708	1180	784	1350	899	1470	979
	13.5	860	572	936	623	1020	676	1120	747	1290	857	1400	932
	14.0	830	552	896	596	972	647	1070	715	1230	819	1340	890
	14.5	797	530	859	572	932	620	1030	684	1180	784	1280	851
	15.0	766	510	826	549	895	596	987	657	1130	752	1230	815
Properties													
	$Z_x \times 10^3$, mm^3	6425		7320		8327		10230		12580		14860	
	L_p, m	3.64		3.59		3.53		3.43		3.35		3.28	
	L_r, m	13.8		13.2		12.8		11.8		11.3		10.7	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

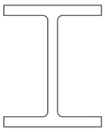
Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 275 MPa

Shape		**HEB 100**		**HEB 120**		**HEB 140**		**HEB 160**		**HEB 180**		**HEB 200**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	25.8	17.2	40.9	27.2	60.7	40.4	87.6	58.3	119	79.3	159	106
	1.00	25.8	17.2	40.9	27.2	60.7	40.4	87.6	58.3	119	79.3	159	106
	1.50	25.4	16.9	40.8	27.1	60.7	40.4	87.6	58.3	119	79.3	159	106
	2.00	24.7	16.5	39.8	26.5	59.9	39.8	87.3	58.1	119	79.3	159	106
	2.50	24.1	16.0	38.8	25.8	58.5	38.9	85.5	56.9	118	78.2	158	105
	3.00	23.4	15.6	37.8	25.1	57.1	38.0	83.6	55.6	115	76.6	155	103
	3.50	22.7	15.1	36.8	24.5	55.7	37.0	81.8	54.4	113	75.0	153	101
	4.00	22.1	14.7	35.8	23.8	54.3	36.1	79.9	53.2	110	73.4	150	99.5
	4.50	21.4	14.3	34.8	23.1	52.9	35.2	78.1	51.9	108	71.8	147	97.5
	5.00	20.8	13.8	33.8	22.5	51.4	34.2	76.2	50.7	106	70.3	144	95.5
	5.50	20.1	13.4	32.8	21.8	50.0	33.3	74.4	49.5	103	68.7	141	93.5
	6.00	19.4	12.9	31.8	21.2	48.6	32.4	72.5	48.3	101	67.1	138	91.6
	6.50	18.8	12.5	30.8	20.5	47.2	31.4	70.7	47.0	98.4	65.5	135	89.6
	7.00	18.1	12.1	29.8	19.8	45.8	30.5	68.8	45.8	96.0	63.9	132	87.6
	7.50	17.5	11.6	28.8	19.2	44.4	29.5	67.0	44.6	93.6	62.3	129	85.6
	8.00	16.8	11.2	27.8	18.5	43.0	28.6	65.1	43.3	91.2	60.7	126	83.6
	8.50	16.1	10.7	26.8	17.8	41.6	27.7	63.3	42.1	88.8	59.1	123	81.7
	9.00	15.4	10.3	25.8	17.2	40.2	26.7	61.4	40.9	86.4	57.5	120	79.7
	9.50	14.6	9.72	24.7	16.4	38.8	25.8	59.6	39.6	84.0	55.9	117	77.7
	10.0	13.9	9.23	23.5	15.6	37.4	24.9	57.7	38.4	81.6	54.3	114	75.7
	10.5	13.2	8.78	22.3	14.9	35.5	23.6	55.9	37.2	79.2	52.7	111	73.7
	11.0	12.6	8.38	21.3	14.2	33.9	22.5	54.0	35.9	76.9	51.1	108	71.8
	11.5	12.0	8.01	20.4	13.5	32.4	21.5	51.6	34.3	74.5	49.5	105	69.8
	12.0	11.5	7.68	19.5	13.0	31.0	20.6	49.4	32.9	71.5	47.5	102	67.8
	12.5	11.1	7.37	18.7	12.4	29.7	19.8	47.4	31.5	68.5	45.6	98.9	65.8
	13.0	10.6	7.08	18.0	12.0	28.6	19.0	45.5	30.3	65.8	43.8	95.0	63.2
	13.5	10.2	6.82	17.3	11.5	27.5	18.3	43.8	29.1	63.3	42.1	91.4	60.8
	14.0	9.88	6.57	16.7	11.1	26.5	17.6	42.2	28.1	60.9	40.5	88.0	58.5
	14.5	9.54	6.35	16.1	10.7	25.6	17.0	40.7	27.1	58.8	39.1	84.8	56.4
	15.0	9.22	6.13	15.6	10.4	24.7	16.4	39.3	26.2	56.8	37.8	81.9	54.5
Properties													
	$Z_x \times 10^3$, mm^3	104.2		165.2		245.4		345.0		481.4		642.5	
	L_p , m	1.20		1.45		1.70		1.92		2.17		2.41	
	L_r , m	8.92		9.41		10.0		11.0		11.6		12.5	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

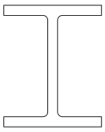


Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 275 MPa

Shape		HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	205	136	261	173	318	211	380	253	463	308	532	354
	1.00	205	136	261	173	318	211	380	253	463	308	532	354
	1.50	205	136	261	173	318	211	380	253	463	308	532	354
	2.00	205	136	261	173	318	211	380	253	463	308	532	354
	2.50	205	136	261	173	318	211	380	253	463	308	532	354
	3.00	202	134	260	173	318	211	380	253	463	308	532	354
	3.50	198	132	255	170	314	209	378	252	463	308	532	354
	4.00	195	130	251	167	308	205	372	247	457	304	525	350
	4.50	191	127	247	164	303	202	366	243	450	299	517	344
	5.00	188	125	242	161	298	198	360	239	443	295	509	339
	5.50	184	122	238	158	293	195	354	235	436	290	501	333
	6.00	180	120	233	155	288	191	348	231	429	285	493	328
	6.50	177	117	229	152	283	188	341	227	422	281	485	323
	7.00	173	115	225	150	277	185	335	223	415	276	477	317
	7.50	169	113	220	147	272	181	329	219	408	271	469	312
	8.00	166	110	216	144	267	178	323	215	401	267	461	307
	8.50	162	108	212	141	262	174	317	211	394	262	453	301
	9.00	158	105	207	138	257	171	311	207	387	258	445	296
	9.50	155	103	203	135	252	167	305	203	380	253	436	290
	10.0	151	100	199	132	246	164	299	199	373	248	428	285
	10.5	147	98.0	194	129	241	160	293	195	366	244	420	280
	11.0	144	95.6	190	126	236	157	287	191	359	239	412	274
	11.5	140	93.1	185	123	231	154	281	187	352	234	404	269
	12.0	136	90.7	181	120	226	150	275	183	345	230	396	264
	12.5	133	88.2	177	118	220	147	268	179	338	225	388	258
	13.0	129	85.8	172	115	215	143	262	175	331	220	380	253
	13.5	125	82.8	168	112	210	140	256	170	324	216	372	247
	14.0	120	79.7	164	109	205	136	250	166	317	211	364	242
	14.5	116	76.9	158	105	200	133	244	162	310	206	356	237
	15.0	112	74.2	152	101	193	128	238	158	303	202	348	231
Properties													
$Z_x \times 10^3$, mm^3		827.0		1053		1283		1534		1869		2149	
L_p, m		2.65		2.89		3.12		3.37		3.60		3.59	
L_r, m		13.2		14.1		14.6		15.0		15.9		15.9	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 275 MPa

Shape		HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	596	397	664	442	800	532	986	656	1190	793	1380	921
	1.00	596	397	664	442	800	532	986	656	1190	793	1380	921
	1.50	596	397	664	442	800	532	986	656	1190	793	1380	921
	2.00	596	397	664	442	800	532	986	656	1190	793	1380	921
	2.50	596	397	664	442	800	532	986	656	1190	793	1380	921
	3.00	596	397	664	442	800	532	986	656	1190	793	1380	921
	3.50	596	397	664	442	800	532	985	655	1190	791	1380	917
	4.00	588	391	655	436	787	523	967	643	1170	776	1350	898
	4.50	579	385	644	429	773	514	949	632	1140	761	1320	880
	5.00	570	379	634	422	760	506	932	620	1120	746	1290	861
	5.50	560	373	623	414	746	497	914	608	1100	731	1270	842
	6.00	551	367	612	407	733	488	896	596	1080	716	1240	824
	6.50	542	360	602	400	719	479	879	585	1050	701	1210	805
	7.00	532	354	591	393	706	470	861	573	1030	687	1180	786
	7.50	523	348	581	386	692	461	843	561	1010	672	1150	767
	8.00	514	342	570	379	679	452	826	549	987	657	1130	749
	8.50	505	336	560	372	665	443	808	538	964	642	1100	730
	9.00	495	330	549	365	652	434	790	526	942	627	1070	711
	9.50	486	323	538	358	638	425	773	514	919	612	1040	693
	10.0	477	317	528	351	625	416	755	502	897	597	1010	674
	10.5	468	311	517	344	611	407	737	491	874	582	985	655
	11.0	458	305	507	337	598	398	720	479	852	567	957	636
	11.5	449	299	496	330	584	389	702	467	829	552	928	618
	12.0	440	293	486	323	571	380	684	455	807	537	900	599
	12.5	430	286	475	316	557	371	666	443	784	522	872	580
	13.0	421	280	465	309	544	362	649	432	762	507	837	557
	13.5	412	274	454	302	530	353	631	420	737	490	800	533
	14.0	403	268	443	295	517	344	612	407	707	470	767	510
	14.5	393	262	433	288	504	335	588	392	679	452	737	490
	15.0	384	256	422	281	486	323	566	377	653	435	708	471
Properties													
	$Z_x \times 10^3, \text{mm}^3$	2408		2683		3232		3982		4815		5591	
	L_p, m	3.57		3.56		3.51		3.48		3.45		3.40	
	L_r, m	15.6		15.3		14.6		13.9		13.4		12.7	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m

HEB Shapes

F_y = 275 MPa

Shape		HEB 600		HEB 650		HEB 700		HEB 800		HEB 900		HEB 1000	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
	1.00	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
	1.50	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
	2.00	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
	2.50	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
	3.00	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
	3.50	1580	1050	1800	1200	2040	1360	2490	1660	3040	2030	3570	2380
	4.00	1550	1030	1760	1170	1990	1320	2420	1610	2960	1970	3470	2310
	4.50	1510	1010	1710	1140	1940	1290	2360	1570	2870	1910	3360	2230
	5.00	1480	983	1670	1110	1890	1260	2290	1520	2780	1850	3250	2160
	5.50	1440	960	1630	1090	1840	1220	2220	1480	2700	1790	3140	2090
	6.00	1410	937	1590	1060	1790	1190	2160	1430	2610	1740	3030	2010
	6.50	1370	914	1550	1030	1740	1160	2090	1390	2520	1680	2920	1940
	7.00	1340	891	1510	1000	1690	1130	2020	1350	2440	1620	2810	1870
	7.50	1310	869	1470	975	1640	1090	1960	1300	2350	1560	2700	1800
	8.00	1270	846	1420	948	1590	1060	1890	1260	2260	1510	2590	1720
	8.50	1240	823	1380	920	1550	1030	1820	1210	2180	1450	2480	1650
	9.00	1200	800	1340	893	1500	995	1760	1170	2090	1390	2370	1580
	9.50	1170	777	1300	865	1450	963	1690	1120	2000	1330	2260	1500
	10.0	1130	754	1260	838	1400	930	1620	1080	1920	1270	2110	1400
	10.5	1100	731	1220	810	1350	897	1560	1040	1800	1190	1970	1310
	11.0	1060	708	1180	783	1300	864	1460	973	1680	1120	1850	1230
	11.5	1030	685	1130	755	1240	825	1380	917	1590	1060	1740	1150
	12.0	996	663	1080	719	1170	781	1300	868	1500	998	1640	1090
	12.5	950	632	1030	684	1120	743	1240	824	1420	946	1550	1030
	13.0	907	603	980	652	1060	708	1180	784	1350	899	1470	979
	13.5	867	577	936	623	1020	676	1120	747	1290	857	1400	932
	14.0	830	552	896	596	972	647	1070	715	1230	819	1340	890
	14.5	797	530	859	572	932	620	1030	684	1180	784	1280	851
	15.0	766	510	826	549	895	596	987	657	1130	752	1230	815
Properties													
	$Z_x \times 10^3$, mm^3	6425		7320		8327		10230		12580		14860	
	L_p, m	3.36		3.32		3.26		3.17		3.10		3.03	
	L_r, m	12.1		11.6		11.3		10.5		10.1		9.62	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 355 MPa

Shape		HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	33.3	22.2	52.8	35.1	78.4	52.2	113	75.3	154	102	205	137
	1.00	33.3	22.2	52.8	35.1	78.4	52.2	113	75.3	154	102	205	137
	1.50	32.3	21.5	52.0	34.6	78.4	52.2	113	75.3	154	102	205	137
	2.00	31.2	20.7	50.3	33.5	76.0	50.6	111	74.0	153	102	205	137
	2.50	30.1	20.0	48.6	32.4	73.6	49.0	108	71.9	149	99.1	201	134
	3.00	28.9	19.3	46.9	31.2	71.2	47.4	105	69.8	145	96.4	196	131
	3.50	27.8	18.5	45.2	30.1	68.8	45.8	102	67.7	141	93.8	191	127
	4.00	26.7	17.8	43.5	29.0	66.5	44.2	98.6	65.6	137	91.1	186	124
	4.50	25.6	17.0	41.9	27.8	64.1	42.6	95.5	63.5	133	88.4	181	121
	5.00	24.4	16.3	40.2	26.7	61.7	41.0	92.4	61.4	129	85.7	176	117
	5.50	23.3	15.5	38.5	25.6	59.3	39.5	89.2	59.4	125	83.0	171	114
	6.00	22.2	14.8	36.8	24.5	56.9	37.9	86.1	57.3	121	80.3	166	111
	6.50	21.1	14.0	35.1	23.3	54.5	36.3	82.9	55.2	117	77.6	161	107
	7.00	19.9	13.2	33.4	22.2	52.1	34.7	79.8	53.1	113	74.9	156	104
	7.50	18.6	12.3	31.5	20.9	49.8	33.1	76.7	51.0	108	72.2	151	101
	8.00	17.4	11.6	29.5	19.6	47.1	31.3	73.5	48.9	104	69.5	146	97.2
	8.50	16.3	10.9	27.7	18.4	44.2	29.4	70.4	46.8	100	66.8	141	93.8
	9.00	15.4	10.3	26.1	17.4	41.7	27.7	66.5	44.3	96.3	64.1	136	90.5
	9.50	14.6	9.72	24.7	16.4	39.4	26.2	62.9	41.8	91.3	60.7	131	87.1
	10.0	13.9	9.23	23.5	15.6	37.4	24.9	59.6	39.7	86.5	57.5	125	83.4
	10.5	13.2	8.78	22.3	14.9	35.5	23.6	56.7	37.7	82.1	54.7	119	79.1
	11.0	12.6	8.38	21.3	14.2	33.9	22.5	54.0	35.9	78.2	52.1	113	75.3
	11.5	12.0	8.01	20.4	13.5	32.4	21.5	51.6	34.3	74.7	49.7	108	71.9
	12.0	11.5	7.68	19.5	13.0	31.0	20.6	49.4	32.9	71.5	47.5	103	68.7
	12.5	11.1	7.37	18.7	12.4	29.7	19.8	47.4	31.5	68.5	45.6	99.0	65.9
	13.0	10.6	7.08	18.0	12.0	28.6	19.0	45.5	30.3	65.8	43.8	95.0	63.2
	13.5	10.2	6.82	17.3	11.5	27.5	18.3	43.8	29.1	63.3	42.1	91.4	60.8
	14.0	9.88	6.57	16.7	11.1	26.5	17.6	42.2	28.1	60.9	40.5	88.0	58.5
	14.5	9.54	6.35	16.1	10.7	25.6	17.0	40.7	27.1	58.8	39.1	84.8	56.4
	15.0	9.22	6.13	15.6	10.4	24.7	16.4	39.3	26.2	56.8	37.8	81.9	54.5
Properties													
$Z_x \times 10^3$, mm^3		104.2		165.2		245.4		345.0		481.4		642.5	
L_p, m		1.06		1.28		1.50		1.69		1.91		2.12	
L_r, m		6.93		7.34		7.82		8.62		9.14		9.85	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

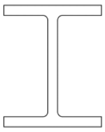
Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 355 MPa

Shape		HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	264	176	336	224	410	273	490	326	597	397	687	457
	1.00	264	176	336	224	410	273	490	326	597	397	687	457
	1.50	264	176	336	224	410	273	490	326	597	397	687	457
	2.00	264	176	336	224	410	273	490	326	597	397	687	457
	2.50	262	174	336	224	410	273	490	326	597	397	687	457
	3.00	256	170	330	219	406	270	489	326	597	397	687	457
	3.50	250	166	322	214	397	264	479	319	589	392	677	451
	4.00	244	162	315	210	388	258	469	312	578	384	664	442
	4.50	237	158	308	205	379	252	459	305	566	376	650	433
	5.00	231	154	300	200	371	247	448	298	554	369	637	424
	5.50	225	150	293	195	362	241	438	292	542	361	623	415
	6.00	219	146	285	190	353	235	428	285	531	353	610	406
	6.50	213	142	278	185	344	229	418	278	519	345	596	397
	7.00	207	137	271	180	336	223	407	271	507	337	583	388
	7.50	200	133	263	175	327	218	397	264	495	330	569	379
	8.00	194	129	256	170	318	212	387	257	484	322	555	370
	8.50	188	125	249	165	310	206	377	251	472	314	542	361
	9.00	182	121	241	160	301	200	367	244	460	306	528	351
	9.50	176	117	234	156	292	194	356	237	448	298	515	342
	10.0	169	113	226	151	283	189	346	230	437	291	501	333
	10.5	163	108	219	146	275	183	336	223	425	283	488	324
	11.0	155	103	212	141	266	177	326	217	413	275	474	315
	11.5	148	98.2	202	135	257	171	315	210	401	267	460	306
	12.0	141	93.8	193	129	245	163	304	202	390	259	447	297
	12.5	135	89.8	185	123	235	156	290	193	378	251	433	288
	13.0	130	86.2	177	118	225	150	278	185	362	241	415	276
	13.5	125	82.8	170	113	216	144	267	177	347	231	398	265
	14.0	120	79.7	164	109	208	138	256	170	334	222	383	255
	14.5	116	76.9	158	105	200	133	247	164	321	214	368	245
	15.0	112	74.2	152	101	193	128	238	158	309	206	355	236
Properties													
$Z_x \times 10^3$, mm^3		827.0		1053		1283		1534		1869		2149	
L_p , m		2.34		2.54		2.75		2.96		3.17		3.16	
L_r , m		10.4		11.1		11.5		11.9		12.6		12.6	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

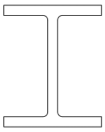


Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 355 MPa

Shape		HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
	1.00	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
	1.50	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
	2.00	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
	2.50	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
	3.00	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
	3.50	758	505	844	562	1010	675	1250	829	1500	1000	1740	1160
	4.00	743	494	826	550	992	660	1220	810	1470	976	1690	1130
	4.50	727	484	809	538	969	645	1190	790	1430	951	1650	1100
	5.00	712	474	791	526	947	630	1160	771	1390	926	1600	1070
	5.50	696	463	773	515	924	615	1130	751	1360	902	1560	1030
	6.00	681	453	756	503	902	600	1100	732	1320	877	1510	1000
	6.50	665	442	738	491	879	585	1070	712	1280	852	1460	973
	7.00	649	432	720	479	857	570	1040	693	1240	827	1420	943
	7.50	634	422	703	467	834	555	1010	673	1210	803	1370	912
	8.00	618	411	685	456	812	540	982	654	1170	778	1320	881
	8.50	603	401	667	444	789	525	953	634	1130	753	1280	851
	9.00	587	391	649	432	767	510	924	615	1090	728	1230	820
	9.50	572	380	632	420	744	495	894	595	1060	703	1190	789
	10.0	556	370	614	409	722	480	865	575	1020	679	1140	759
	10.5	541	360	596	397	699	465	836	556	983	654	1090	722
	11.0	525	349	579	385	677	450	806	536	939	625	1020	681
	11.5	510	339	561	373	654	435	769	512	890	592	970	645
	12.0	494	329	543	362	626	417	732	487	846	563	921	613
	12.5	477	317	521	347	597	397	697	464	806	536	877	583
	13.0	456	303	498	332	571	380	667	443	770	512	837	557
	13.5	437	291	478	318	547	364	638	425	737	490	800	533
	14.0	420	279	459	305	525	349	612	407	707	470	767	510
	14.5	404	269	441	293	505	336	588	392	679	452	737	490
	15.0	389	259	425	283	486	323	566	377	653	435	708	471
Properties													
	$Z_x \times 10^3$, mm^3	2408		2683		3232		3982		4815		5591	
	L_p, m	3.15		3.13		3.09		3.06		3.04		3.00	
	L_r, m	12.4		12.2		11.7		11.2		10.8		10.3	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

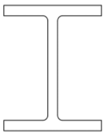


Available Moment vs. Unbraced Length, kN·m
HEB Shapes

F_y = 355 MPa

Shape		HEB 600		HEB 650		HEB 700		HEB 800		HEB 900		HEB 1000	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
	1.00	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
	1.50	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
	2.00	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
	2.50	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
	3.00	2050	1360	2330	1550	2640	1760	3220	2150	3940	2620	4630	3080
	3.50	1990	1330	2260	1500	2560	1700	3120	2070	3810	2530	4460	2970
	4.00	1940	1290	2190	1460	2480	1650	3010	2000	3670	2440	4290	2860
	4.50	1880	1250	2130	1420	2400	1600	2910	1930	3530	2350	4120	2740
	5.00	1820	1210	2060	1370	2320	1550	2800	1860	3400	2260	3950	2630
	5.50	1770	1180	1990	1330	2240	1490	2700	1790	3260	2170	3780	2510
	6.00	1710	1140	1930	1280	2160	1440	2590	1720	3120	2080	3610	2400
	6.50	1660	1100	1860	1240	2090	1390	2480	1650	2990	1990	3440	2290
	7.00	1600	1060	1790	1190	2010	1330	2380	1580	2850	1900	3260	2170
	7.50	1540	1030	1730	1150	1930	1280	2270	1510	2710	1810	3090	2060
	8.00	1490	990	1660	1100	1850	1230	2170	1440	2580	1710	2920	1940
	8.50	1430	953	1590	1060	1770	1180	2060	1370	2430	1620	2680	1790
	9.00	1380	915	1520	1010	1690	1120	1930	1280	2230	1490	2460	1640
	9.50	1320	878	1460	970	1590	1060	1790	1190	2070	1370	2270	1510
	10.0	1260	836	1360	908	1490	989	1660	1110	1920	1280	2110	1400
	10.5	1180	786	1280	852	1390	928	1560	1040	1800	1190	1970	1310
	11.0	1110	741	1210	802	1310	873	1460	973	1680	1120	1850	1230
	11.5	1050	700	1140	758	1240	825	1380	917	1590	1060	1740	1150
	12.0	999	665	1080	719	1170	781	1300	868	1500	998	1640	1090
	12.5	950	632	1030	684	1120	743	1240	824	1420	946	1550	1030
	13.0	907	603	980	652	1060	708	1180	784	1350	899	1470	979
	13.5	867	577	936	623	1020	676	1120	747	1290	857	1400	932
	14.0	830	552	896	596	972	647	1070	715	1230	819	1340	890
	14.5	797	530	859	572	932	620	1030	684	1180	784	1280	851
	15.0	766	510	826	549	895	596	987	657	1130	752	1230	815
Properties													
$Z_x \times 10^3, \mathrm{mm}^3$		6425		7320		8327		10230		12580		14860	
L_p, m		2.96		2.92		2.87		2.79		2.73		2.67	
L_r, m		9.90		9.56		9.30		8.75		8.44		8.12	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 235 MPa

Shape		HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	49.9	33.2	74.2	49.3	104	69.5	143	94.9	187	124	240	160
	1.00	49.9	33.2	74.2	49.3	104	69.5	143	94.9	187	124	240	160
	1.50	49.8	33.1	74.2	49.3	104	69.5	143	94.9	187	124	240	160
	2.00	49.2	32.7	73.6	49.0	104	69.4	143	94.9	187	124	240	160
	2.50	48.6	32.4	72.8	48.4	103	68.6	142	94.3	187	124	240	160
	3.00	48.1	32.0	72.0	47.9	102	67.9	140	93.4	185	123	239	159
	3.50	47.5	31.6	71.2	47.3	101	67.2	139	92.4	183	122	236	157
	4.00	46.9	31.2	70.3	46.8	99.8	66.4	137	91.4	181	120	234	156
	4.50	46.4	30.9	69.5	46.3	98.7	65.7	136	90.5	179	119	232	154
	5.00	45.8	30.5	68.7	45.7	97.6	64.9	134	89.5	177	118	230	153
	5.50	45.2	30.1	67.9	45.2	96.5	64.2	133	88.5	176	117	227	151
	6.00	44.7	29.7	67.1	44.6	95.3	63.4	132	87.6	174	116	225	150
	6.50	44.1	29.3	66.2	44.1	94.2	62.7	130	86.6	172	114	223	148
	7.00	43.5	29.0	65.4	43.5	93.1	61.9	129	85.6	170	113	220	147
	7.50	43.0	28.6	64.6	43.0	92.0	61.2	127	84.6	168	112	218	145
	8.00	42.4	28.2	63.8	42.4	90.9	60.5	126	83.7	166	111	216	144
	8.50	41.8	27.8	63.0	41.9	89.7	59.7	124	82.7	164	109	214	142
	9.00	41.3	27.5	62.1	41.3	88.6	59.0	123	81.7	163	108	211	141
	9.50	40.7	27.1	61.3	40.8	87.5	58.2	121	80.8	161	107	209	139
	10.0	40.1	26.7	60.5	40.3	86.4	57.5	120	79.8	159	106	207	138
	10.5	39.6	26.3	59.7	39.7	85.3	56.7	118	78.8	157	104	204	136
	11.0	39.0	26.0	58.9	39.2	84.1	56.0	117	77.9	155	103	202	135
	11.5	38.4	25.6	58.1	38.6	83.0	55.2	116	76.9	153	102	200	133
	12.0	37.9	25.2	57.2	38.1	81.9	54.5	114	75.9	151	101	198	131
	12.5	37.3	24.8	56.4	37.5	80.8	53.8	113	75.0	150	99.6	195	130
	13.0	36.7	24.4	55.6	37.0	79.7	53.0	111	74.0	148	98.3	193	128
	13.5	36.2	24.1	54.8	36.4	78.5	52.3	110	73.0	146	97.1	191	127
	14.0	35.6	23.7	54.0	35.9	77.4	51.5	108	72.1	144	95.9	189	125
	14.5	35.0	23.3	53.1	35.4	76.3	50.8	107	71.1	142	94.6	186	124
	15.0	34.5	22.9	52.3	34.8	75.2	50.0	105	70.1	140	93.4	184	122
Properties													
	$Z_x \times 10^3$, mm^3	235.8		350.6		493.8		674.6		883.4		1135	
	L_p, m	1.41		1.67		1.94		2.19		2.45		2.71	
	L_r, m	20.6		20.9		21.4		22.4		23.0		23.9	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 235 MPa

Shape		HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	300	200	448	298	534	355	627	417	862	574	938	624
	1.00	300	200	448	298	534	355	627	417	862	574	938	624
	1.50	300	200	448	298	534	355	627	417	862	574	938	624
	2.00	300	200	448	298	534	355	627	417	862	574	938	624
	2.50	300	200	448	298	534	355	627	417	862	574	938	624
	3.00	300	200	448	298	534	355	627	417	862	574	938	624
	3.50	297	198	446	297	534	355	627	417	862	574	938	624
	4.00	294	196	443	295	530	353	625	416	862	574	938	624
	4.50	292	194	439	292	526	350	621	413	858	571	933	621
	5.00	289	192	436	290	522	347	616	410	853	567	927	616
	5.50	286	190	433	288	518	345	611	407	847	564	920	612
	6.00	283	189	429	286	514	342	607	404	842	560	914	608
	6.50	281	187	426	283	510	339	602	401	836	556	908	604
	7.00	278	185	422	281	506	337	597	397	831	553	901	600
	7.50	275	183	419	279	502	334	593	394	825	549	895	596
	8.00	272	181	416	277	498	331	588	391	820	545	889	591
	8.50	269	179	412	274	494	329	583	388	814	542	883	587
	9.00	267	177	409	272	490	326	579	385	809	538	876	583
	9.50	264	176	405	270	486	323	574	382	803	534	870	579
	10.0	261	174	402	267	482	321	569	379	798	531	864	575
	10.5	258	172	399	265	478	318	564	376	792	527	858	571
	11.0	256	170	395	263	474	315	560	372	787	523	851	566
	11.5	253	168	392	261	470	313	555	369	781	520	845	562
	12.0	250	166	388	258	466	310	550	366	776	516	839	558
	12.5	247	164	385	256	462	307	546	363	770	513	833	554
	13.0	244	163	382	254	458	305	541	360	765	509	826	550
	13.5	242	161	378	252	454	302	536	357	759	505	820	546
	14.0	239	159	375	249	450	299	532	354	754	502	814	541
	14.5	236	157	371	247	446	297	527	351	748	498	807	537
	15.0	233	155	368	245	442	294	522	347	743	494	801	533

Properties

	HEM 220	HEM 240	HEM 260	HEM 280	HEM 300	HEM 320
$Z_x \times 10^3$, mm^3	1419	2117	2524	2966	4078	4435
L_p , m	2.97	3.28	3.54	3.80	4.11	4.08
L_r , m	24.6	29.9	30.2	30.4	35.7	34.1

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

Note: C_b = 1.00.

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 235 MPa

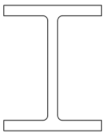
Shape		HEM 340		HEM 360		HEM 400		HEM 450		HEM 500		HEM 550	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
	1.00	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
	1.50	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
	2.00	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
	2.50	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
	3.00	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
	3.50	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
	4.00	998	664	1060	702	1180	783	1340	889	1490	994	1670	1110
	4.50	992	660	1050	697	1170	777	1320	880	1480	983	1650	1100
	5.00	984	655	1040	692	1160	770	1310	872	1460	972	1630	1080
	5.50	977	650	1030	686	1150	763	1300	863	1440	961	1600	1070
	6.00	970	646	1020	681	1140	756	1280	854	1430	950	1580	1050
	6.50	963	641	1020	676	1130	750	1270	845	1410	939	1560	1040
	7.00	956	636	1010	670	1120	743	1260	836	1390	927	1540	1030
	7.50	949	631	999	665	1110	736	1240	828	1380	916	1520	1010
	8.00	942	627	991	659	1100	729	1230	819	1360	905	1500	998
	8.50	935	622	983	654	1090	723	1220	810	1340	894	1480	984
	9.00	928	617	975	649	1080	716	1200	801	1330	883	1460	970
	9.50	920	612	967	643	1070	709	1190	792	1310	872	1440	956
	10.0	913	608	959	638	1060	702	1180	784	1290	860	1420	941
	10.5	906	603	951	633	1050	696	1160	775	1280	849	1390	927
	11.0	899	598	943	627	1040	689	1150	766	1260	838	1370	913
	11.5	892	593	935	622	1030	682	1140	757	1240	827	1350	899
	12.0	885	589	927	617	1020	675	1120	748	1230	816	1330	885
	12.5	878	584	919	611	1000	669	1110	740	1210	804	1310	871
	13.0	871	579	911	606	995	662	1100	731	1190	793	1290	857
	13.5	863	575	903	601	985	655	1090	722	1180	782	1270	843
	14.0	856	570	895	595	974	648	1070	713	1160	771	1250	829
	14.5	849	565	887	590	964	642	1060	705	1140	760	1230	815
	15.0	842	560	879	585	954	635	1050	696	1130	749	1200	801

Properties

$Z_x \times 10^3$, mm^3	4718	4989	5571	6331	7094	7933
L_p , m	4.06	4.02	3.95	3.90	3.83	3.77
L_r , m	32.0	30.1	26.9	23.8	21.3	19.2

LRFD	ASD	
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 235 MPa

Shape		HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
	1.00	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
	1.50	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
	2.00	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
	2.50	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
	3.00	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
	3.50	1860	1230	2040	1360	2230	1480	2640	1760	3040	2020	3470	2310
	4.00	1840	1220	2020	1340	2200	1460	2590	1720	2970	1980	3390	2250
	4.50	1810	1210	1990	1320	2160	1440	2540	1690	2900	1930	3300	2200
	5.00	1790	1190	1960	1300	2120	1410	2480	1650	2840	1890	3210	2140
	5.50	1760	1170	1930	1280	2090	1390	2430	1620	2770	1840	3130	2080
	6.00	1740	1150	1890	1260	2050	1360	2380	1580	2700	1800	3040	2020
	6.50	1710	1140	1860	1240	2010	1340	2330	1550	2630	1750	2960	1970
	7.00	1680	1120	1830	1220	1970	1310	2280	1520	2570	1710	2870	1910
	7.50	1660	1100	1800	1200	1940	1290	2230	1480	2500	1660	2790	1850
	8.00	1630	1090	1770	1180	1900	1260	2170	1450	2430	1620	2700	1800
	8.50	1610	1070	1740	1160	1860	1240	2120	1410	2360	1570	2610	1740
	9.00	1580	1050	1710	1130	1820	1210	2070	1380	2290	1530	2530	1680
	9.50	1550	1030	1670	1110	1780	1190	2020	1340	2230	1480	2440	1630
	10.0	1530	1020	1640	1090	1750	1160	1970	1310	2160	1440	2360	1570
	10.5	1500	999	1610	1070	1710	1140	1920	1270	2090	1390	2270	1510
	11.0	1480	982	1580	1050	1670	1110	1860	1240	2020	1350	2190	1450
	11.5	1450	965	1550	1030	1630	1090	1810	1210	1960	1300	2090	1390
	12.0	1420	947	1520	1010	1600	1060	1760	1170	1890	1260	1970	1310
	12.5	1400	930	1490	988	1560	1040	1710	1140	1810	1200	1870	1250
	13.0	1370	913	1450	967	1520	1010	1660	1100	1720	1140	1780	1180
	13.5	1350	895	1420	946	1480	987	1600	1070	1640	1090	1700	1130
	14.0	1320	878	1390	925	1450	962	1530	1020	1570	1040	1620	1080
	14.5	1290	861	1360	904	1410	937	1470	979	1500	1000	1550	1030
	15.0	1270	843	1330	883	1370	912	1410	941	1450	961	1490	990
Properties													
	$Z_x \times 10^3$, mm^3	8772		9657		10540		12490		14440		16570	
	L_p , m	3.71		3.66		3.60		3.49		3.39		3.31	
	L_r , m	17.6		16.3		15.1		13.5		12.2		11.4	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 275 MPa

Shape		HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	58.4	38.8	86.8	57.7	122	81.3	167	111	219	145	281	187
	1.00	58.4	38.8	86.8	57.7	122	81.3	167	111	219	145	281	187
	1.50	58.0	38.6	86.8	57.7	122	81.3	167	111	219	145	281	187
	2.00	57.3	38.1	85.7	57.0	122	80.9	167	111	219	145	281	187
	2.50	56.5	37.6	84.6	56.3	120	79.9	165	110	217	145	281	187
	3.00	55.7	37.1	83.5	55.5	118	78.8	163	108	215	143	278	185
	3.50	54.9	36.5	82.4	54.8	117	77.8	161	107	212	141	275	183
	4.00	54.2	36.0	81.2	54.0	115	76.8	159	106	210	140	271	181
	4.50	53.4	35.5	80.1	53.3	114	75.7	157	104	207	138	268	179
	5.00	52.6	35.0	79.0	52.5	112	74.7	155	103	205	136	265	176
	5.50	51.8	34.5	77.8	51.8	111	73.7	153	102	202	134	262	174
	6.00	51.0	34.0	76.7	51.0	109	72.7	151	100	200	133	259	172
	6.50	50.3	33.4	75.6	50.3	108	71.6	149	99.1	197	131	256	170
	7.00	49.5	32.9	74.5	49.5	106	70.6	147	97.8	194	129	253	168
	7.50	48.7	32.4	73.3	48.8	105	69.6	145	96.5	192	128	249	166
	8.00	47.9	31.9	72.2	48.0	103	68.5	143	95.1	189	126	246	164
	8.50	47.1	31.4	71.1	47.3	101	67.5	141	93.8	187	124	243	162
	9.00	46.4	30.8	69.9	46.5	99.9	66.5	139	92.4	184	123	240	160
	9.50	45.6	30.3	68.8	45.8	98.4	65.5	137	91.1	182	121	237	158
	10.0	44.8	29.8	67.7	45.0	96.8	64.4	135	89.8	179	119	234	155
	10.5	44.0	29.3	66.6	44.3	95.3	63.4	133	88.4	177	117	230	153
	11.0	43.2	28.8	65.4	43.5	93.8	62.4	131	87.1	174	116	227	151
	11.5	42.5	28.2	64.3	42.8	92.2	61.4	129	85.8	171	114	224	149
	12.0	41.7	27.7	63.2	42.0	90.7	60.3	127	84.4	169	112	221	147
	12.5	40.9	27.2	62.0	41.3	89.1	59.3	125	83.1	166	111	218	145
	13.0	40.1	26.7	60.9	40.5	87.6	58.3	123	81.8	164	109	215	143
	13.5	39.3	26.2	59.8	39.8	86.0	57.2	121	80.4	161	107	212	141
	14.0	38.6	25.7	58.6	39.0	84.5	56.2	119	79.1	159	106	208	139
	14.5	37.8	25.1	57.5	38.3	82.9	55.2	117	77.7	156	104	205	137
	15.0	37.0	24.6	56.4	37.5	81.4	54.2	115	76.4	154	102	202	134
Properties													
$Z_x \times 10^3$, mm^3		235.8		350.6		493.8		674.6		883.4		1135	
L_p , m		1.30		1.54		1.79		2.02		2.26		2.50	
L_r , m		17.6		17.9		18.3		19.2		19.7		20.5	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 275 MPa

Shape		HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	351	234	524	349	625	416	734	488	1010	672	1100	730
	1.00	351	234	524	349	625	416	734	488	1010	672	1100	730
	1.50	351	234	524	349	625	416	734	488	1010	672	1100	730
	2.00	351	234	524	349	625	416	734	488	1010	672	1100	730
	2.50	351	234	524	349	625	416	734	488	1010	672	1100	730
	3.00	349	232	524	349	625	416	734	488	1010	672	1100	730
	3.50	345	230	520	346	622	414	734	488	1010	672	1100	730
	4.00	342	227	515	343	617	410	728	484	1010	669	1090	728
	4.50	338	225	510	339	611	407	721	480	999	664	1090	722
	5.00	334	222	505	336	606	403	715	476	991	659	1080	716
	5.50	330	220	501	333	600	399	708	471	983	654	1070	710
	6.00	326	217	496	330	594	395	702	467	976	649	1060	705
	6.50	322	215	491	327	589	392	695	463	968	644	1050	699
	7.00	319	212	487	324	583	388	689	458	961	639	1040	693
	7.50	315	209	482	321	578	384	682	454	953	634	1030	687
	8.00	311	207	477	317	572	381	676	450	945	629	1020	682
	8.50	307	204	472	314	567	377	669	445	938	624	1020	676
	9.00	303	202	468	311	561	373	663	441	930	619	1010	670
	9.50	299	199	463	308	556	370	656	437	923	614	998	664
	10.0	296	197	458	305	550	366	650	432	915	609	990	659
	10.5	292	194	454	302	544	362	643	428	908	604	981	653
	11.0	288	192	449	299	539	359	637	424	900	599	972	647
	11.5	284	189	444	296	533	355	631	419	892	594	964	641
	12.0	280	186	440	292	528	351	624	415	885	589	955	636
	12.5	276	184	435	289	522	347	618	411	877	584	947	630
	13.0	273	181	430	286	517	344	611	407	870	579	938	624
	13.5	269	179	425	283	511	340	605	402	862	574	929	618
	14.0	265	176	421	280	506	336	598	398	854	568	921	612
	14.5	261	174	416	277	500	333	592	394	847	563	912	607
	15.0	257	171	411	274	494	329	585	389	839	558	903	601

Properties

	HEM 220	HEM 240	HEM 260	HEM 280	HEM 300	HEM 320
$Z_x \times 10^3$, mm^3	1419	2117	2524	2966	4078	4435
L_p, m	2.75	3.03	3.27	3.51	4.11	3.77
L_r, m	21.0	25.6	25.8	26.0	30.5	29.2

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

Note: C_b = 1.00.

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 275 MPa

Shape		**HEM 340**		**HEM 360**		**HEM 400**		**HEM 450**		**HEM 500**		**HEM 550**	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
	1.00	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
	1.50	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
	2.00	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
	2.50	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
	3.00	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
	3.50	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
	4.00	1160	774	1230	817	1370	911	1550	1030	1730	1150	1930	1290
	4.50	1150	767	1220	810	1360	902	1530	1020	1710	1140	1900	1270
	5.00	1140	761	1210	803	1340	892	1520	1010	1690	1120	1880	1250
	5.50	1130	754	1200	795	1330	883	1500	996	1660	1110	1850	1230
	6.00	1120	747	1180	788	1310	874	1480	984	1640	1090	1820	1210
	6.50	1110	741	1170	780	1300	864	1460	972	1620	1080	1790	1190
	7.00	1100	734	1160	773	1280	855	1440	960	1600	1060	1760	1170
	7.50	1090	728	1150	766	1270	846	1420	948	1570	1050	1730	1150
	8.00	1080	721	1140	758	1260	836	1410	936	1550	1030	1700	1130
	8.50	1070	715	1130	751	1240	827	1390	923	1530	1010	1670	1110
	9.00	1060	708	1120	743	1230	818	1370	911	1500	999	1640	1090
	9.50	1050	702	1110	736	1210	808	1350	899	1480	984	1610	1070
	10.0	1040	695	1100	729	1200	799	1330	887	1460	969	1580	1050
	10.5	1030	689	1080	721	1190	790	1310	875	1430	953	1560	1030
	11.0	1030	682	1070	714	1170	780	1300	863	1410	938	1530	1020
	11.5	1020	675	1060	706	1160	771	1280	850	1390	922	1500	996
	12.0	1010	669	1050	699	1140	761	1260	838	1360	907	1470	976
	12.5	996	662	1040	692	1130	752	1240	826	1340	891	1440	957
	13.0	986	656	1030	684	1120	743	1220	814	1320	876	1410	938
	13.5	976	649	1020	677	1100	733	1210	802	1290	860	1380	918
	14.0	966	643	1010	669	1090	724	1190	790	1270	845	1350	899
	14.5	956	636	995	662	1070	715	1170	778	1250	829	1320	880
	15.0	946	630	984	655	1060	705	1150	765	1220	814	1290	860
Properties													
$Z_x \times 10^3$, mm^3		4718		4989		5571		6331		7094		7933	
L_p, m		3.75		3.72		3.65		3.60		3.54		3.49	
L_r, m		27.4		25.8		23.0		20.4		18.3		16.6	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

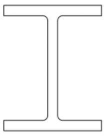
Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 275 MPa

Shape		HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
	1.00	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
	1.50	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
	2.00	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
	2.50	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
	3.00	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
	3.50	2170	1440	2380	1580	2590	1720	3050	2030	3510	2330	4000	2660
	4.00	2130	1420	2340	1550	2540	1690	2980	1980	3420	2270	3890	2590
	4.50	2090	1390	2290	1530	2490	1660	2910	1940	3320	2210	3770	2510
	5.00	2060	1370	2250	1500	2440	1620	2840	1890	3230	2150	3660	2430
	5.50	2020	1350	2210	1470	2380	1590	2770	1840	3140	2090	3540	2360
	6.00	1990	1320	2160	1440	2330	1550	2700	1800	3050	2030	3430	2280
	6.50	1950	1300	2120	1410	2280	1520	2630	1750	2960	1970	3310	2210
	7.00	1920	1270	2080	1380	2230	1480	2560	1700	2870	1910	3200	2130
	7.50	1880	1250	2030	1350	2180	1450	2490	1660	2780	1850	3090	2050
	8.00	1840	1230	1990	1320	2130	1420	2420	1610	2690	1790	2970	1980
	8.50	1810	1200	1950	1300	2080	1380	2350	1560	2600	1730	2860	1900
	9.00	1770	1180	1900	1270	2020	1350	2280	1520	2510	1670	2740	1820
	9.50	1740	1150	1860	1240	1970	1310	2210	1470	2410	1610	2630	1750
	10.0	1700	1130	1820	1210	1920	1280	2140	1420	2320	1550	2510	1670
	10.5	1660	1110	1770	1180	1870	1240	2070	1380	2230	1490	2360	1570
	11.0	1630	1080	1730	1150	1820	1210	2000	1330	2130	1420	2220	1480
	11.5	1590	1060	1690	1120	1770	1180	1930	1280	2010	1340	2090	1390
	12.0	1560	1040	1640	1090	1720	1140	1850	1230	1900	1270	1970	1310
	12.5	1520	1010	1600	1070	1660	1110	1760	1170	1810	1200	1870	1250
	13.0	1490	988	1560	1040	1610	1070	1680	1110	1720	1140	1780	1180
	13.5	1450	964	1510	1010	1550	1030	1600	1070	1640	1090	1700	1130
	14.0	1410	940	1470	979	1490	989	1530	1020	1570	1040	1620	1080
	14.5	1380	917	1420	943	1430	950	1470	979	1500	1000	1550	1030
	15.0	1340	893	1360	908	1370	914	1410	941	1450	961	1490	990
Properties													
$Z_x \times 10^3$, mm^3		8772		9657		10540		12490		14440		16570	
L_p , m		3.43		3.38		3.33		3.22		3.13		3.06	
L_r , m		15.2		14.1		13.2		11.8		10.8		10.1	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

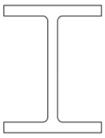


Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 355 MPa

Shape		**HEM 100**		**HEM 120**		**HEM 140**		**HEM 160**		**HEM 180**		**HEM 200**	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	75.3	50.1	112	74.5	158	105	216	143	282	188	363	241
	1.00	75.3	50.1	112	74.5	158	105	216	143	282	188	363	241
	1.50	74.4	49.5	111	74.2	158	105	216	143	282	188	363	241
	2.00	73.1	48.6	110	72.9	156	103	214	142	282	188	363	241
	2.50	71.8	47.8	108	71.6	153	102	211	140	278	185	359	239
	3.00	70.5	46.9	106	70.4	150	100	207	138	274	182	354	236
	3.50	69.2	46.0	104	69.1	148	98.3	204	136	269	179	349	232
	4.00	67.8	45.1	102	67.8	145	96.5	200	133	265	176	343	228
	4.50	66.5	44.3	100	66.6	143	94.8	197	131	261	173	338	225
	5.00	65.2	43.4	98.1	65.3	140	93.1	194	129	256	170	333	221
	5.50	63.9	42.5	96.2	64.0	137	91.3	190	127	252	168	327	218
	6.00	62.6	41.6	94.3	62.8	135	89.6	187	124	248	165	322	214
	6.50	61.3	40.8	92.4	61.5	132	87.9	183	122	243	162	317	211
	7.00	60.0	39.9	90.5	60.2	129	86.1	180	120	239	159	311	207
	7.50	58.6	39.0	88.6	59.0	127	84.4	177	118	235	156	306	204
	8.00	57.3	38.1	86.7	57.7	124	82.7	173	115	230	153	301	200
	8.50	56.0	37.3	84.8	56.4	122	80.9	170	113	226	150	295	197
	9.00	54.7	36.4	82.9	55.2	119	79.2	167	111	222	147	290	193
	9.50	53.4	35.5	81.0	53.9	116	77.5	163	109	217	145	285	189
	10.0	52.1	34.7	79.1	52.6	114	75.7	160	106	213	142	279	186
	10.5	50.8	33.8	77.2	51.4	111	74.0	156	104	209	139	274	182
	11.0	49.5	32.9	75.3	50.1	109	72.2	153	102	204	136	269	179
	11.5	48.1	32.0	73.4	48.8	106	70.5	150	99.5	200	133	263	175
	12.0	46.8	31.2	71.5	47.6	103	68.8	146	97.2	196	130	258	172
	12.5	45.5	30.3	69.6	46.3	101	67.0	143	95.0	191	127	253	168
	13.0	44.2	29.4	67.7	45.0	98.1	65.3	139	92.7	187	124	247	165
	13.5	42.9	28.5	65.8	43.8	95.5	63.6	136	90.5	183	122	242	161
	14.0	41.4	27.5	63.7	42.4	92.9	61.8	133	88.2	178	119	237	157
	14.5	40.0	26.6	61.5	40.9	89.9	59.8	129	85.9	174	116	231	154
	15.0	38.6	25.7	59.5	39.6	86.9	57.8	125	83.5	170	113	226	150
Properties													
$Z_x \times 10^3$, mm^3		235.8		350.6		493.8		674.6		883.4		1135	
L_p , m		1.14		1.36		1.57		1.78		1.99		2.20	
L_r , m		13.6		13.8		14.2		14.9		15.3		15.9	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 355 MPa

Shape		HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	453	302	676	450	806	537	948	630	1300	867	1420	943
	1.00	453	302	676	450	806	537	948	630	1300	867	1420	943
	1.50	453	302	676	450	806	537	948	630	1300	867	1420	943
	2.00	453	302	676	450	806	537	948	630	1300	867	1420	943
	2.50	452	301	676	450	806	537	948	630	1300	867	1420	943
	3.00	446	297	671	447	804	535	948	630	1300	867	1420	943
	3.50	439	292	663	441	795	529	939	625	1300	864	1410	939
	4.00	433	288	655	436	785	523	928	617	1290	856	1400	930
	4.50	426	284	647	431	776	516	917	610	1270	847	1380	920
	5.00	420	279	639	425	767	510	906	603	1260	839	1370	910
	5.50	413	275	631	420	757	504	895	595	1250	830	1350	900
	6.00	407	271	623	415	748	498	884	588	1230	821	1340	890
	6.50	400	266	615	409	738	491	873	581	1220	813	1320	881
	7.00	394	262	607	404	729	485	862	573	1210	804	1310	871
	7.50	387	258	599	399	720	479	851	566	1200	796	1290	861
	8.00	381	253	591	393	710	472	840	559	1180	787	1280	851
	8.50	374	249	583	388	701	466	829	551	1170	779	1260	842
	9.00	368	245	575	383	691	460	818	544	1160	770	1250	832
	9.50	361	240	567	378	682	454	807	537	1140	762	1240	822
	10.0	355	236	559	372	672	447	796	529	1130	753	1220	812
	10.5	348	232	552	367	663	441	785	522	1120	744	1210	803
	11.0	342	227	544	362	654	435	774	515	1110	736	1190	793
	11.5	335	223	536	356	644	429	763	508	1090	727	1180	783
	12.0	329	219	528	351	635	422	752	500	1080	719	1160	773
	12.5	322	214	520	346	625	416	741	493	1070	710	1150	764
	13.0	316	210	512	340	616	410	730	486	1050	702	1130	754
	13.5	309	206	504	335	607	404	719	478	1040	693	1120	744
	14.0	303	201	496	330	597	397	708	471	1030	685	1100	734
	14.5	296	197	488	325	588	391	697	464	1020	676	1090	724
	15.0	290	193	480	319	578	385	686	456	1000	667	1070	715
Properties													
$Z_x \times 10^3$, mm^3		1419		2117		2524		2966		4078		4435	
L_p, m		2.42		2.67		2.88		3.09		4.11		3.32	
L_r, m		16.4		19.9		20.1		20.2		23.7		22.7	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 355 MPa

Shape		**HEM 340**		**HEM 360**		**HEM 400**		**HEM 450**		**HEM 500**		**HEM 550**	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
	1.00	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
	1.50	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
	2.00	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
	2.50	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
	3.00	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
	3.50	1500	998	1590	1050	1770	1180	2000	1330	2240	1490	2490	1660
	4.00	1480	987	1570	1040	1740	1160	1970	1310	2200	1460	2440	1630
	4.50	1470	976	1550	1030	1720	1140	1940	1290	2160	1440	2390	1590
	5.00	1450	965	1530	1020	1700	1130	1910	1270	2120	1410	2350	1560
	5.50	1430	954	1510	1000	1670	1110	1880	1250	2080	1380	2300	1530
	6.00	1420	943	1490	992	1650	1100	1850	1230	2040	1360	2250	1500
	6.50	1400	932	1470	980	1620	1080	1820	1210	2000	1330	2200	1460
	7.00	1380	921	1450	967	1600	1060	1790	1190	1960	1310	2150	1430
	7.50	1370	910	1430	954	1580	1050	1750	1170	1920	1280	2100	1400
	8.00	1350	899	1420	942	1550	1030	1720	1150	1880	1250	2050	1370
	8.50	1330	888	1400	929	1530	1020	1690	1130	1840	1230	2000	1330
	9.00	1320	876	1380	917	1500	1000	1660	1110	1810	1200	1950	1300
	9.50	1300	865	1360	904	1480	985	1630	1090	1770	1180	1910	1270
	10.0	1280	854	1340	892	1460	969	1600	1060	1730	1150	1860	1240
	10.5	1270	843	1320	879	1430	954	1570	1040	1690	1120	1810	1200
	11.0	1250	832	1300	867	1410	938	1540	1020	1650	1100	1760	1170
	11.5	1230	821	1280	854	1390	922	1510	1000	1610	1070	1710	1140
	12.0	1220	810	1270	842	1360	906	1480	982	1570	1040	1660	1100
	12.5	1200	799	1250	829	1340	890	1450	962	1530	1020	1610	1070
	13.0	1180	788	1230	817	1310	874	1410	941	1490	992	1560	1040
	13.5	1170	777	1210	804	1290	859	1380	921	1450	966	1500	1000
	14.0	1150	765	1190	792	1270	843	1350	900	1410	940	1440	960
	14.5	1130	754	1170	779	1240	827	1320	880	1370	912	1390	924
	15.0	1120	743	1150	766	1220	811	1290	859	1320	879	1340	890
Properties													
	$Z_x \times 10^3$, mm^3	4718		4989		5571		6331		7094		7933	
	L_p, m	3.30		3.27		3.22		3.17		3.12		3.07	
	L_r, m	21.3		20.1		18.0		16.0		14.4		13.1	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
HEM Shapes

F_y = 355 MPa

Shape		HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
	1.00	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
	1.50	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
	2.00	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
	2.50	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
	3.00	2800	1860	3080	2050	3360	2230	3950	2630	4540	3020	5180	3450
	3.50	2740	1830	3010	2000	3270	2180	3840	2550	4400	2930	5000	3330
	4.00	2680	1790	2940	1960	3190	2120	3730	2480	4250	2830	4820	3210
	4.50	2630	1750	2870	1910	3100	2060	3610	2400	4110	2730	4640	3090
	5.00	2570	1710	2800	1860	3020	2010	3500	2330	3960	2640	4460	2970
	5.50	2510	1670	2720	1810	2930	1950	3380	2250	3820	2540	4280	2850
	6.00	2450	1630	2650	1760	2850	1890	3270	2180	3670	2440	4100	2730
	6.50	2390	1590	2580	1720	2760	1840	3160	2100	3520	2340	3920	2610
	7.00	2330	1550	2510	1670	2680	1780	3040	2020	3380	2250	3740	2490
	7.50	2270	1510	2440	1620	2590	1720	2930	1950	3230	2150	3560	2370
	8.00	2210	1470	2360	1570	2510	1670	2810	1870	3090	2050	3380	2250
	8.50	2150	1430	2290	1530	2420	1610	2700	1800	2940	1960	3190	2120
	9.00	2090	1390	2220	1480	2340	1560	2590	1720	2790	1860	2930	1950
	9.50	2030	1350	2150	1430	2250	1500	2470	1640	2590	1720	2720	1810
	10.0	1970	1310	2080	1380	2170	1440	2330	1550	2410	1610	2530	1680
	10.5	1910	1270	2010	1330	2080	1390	2180	1450	2260	1500	2360	1570
	11.0	1850	1230	1930	1290	1980	1320	2060	1370	2130	1420	2220	1480
	11.5	1790	1190	1850	1230	1870	1250	1950	1300	2010	1340	2090	1390
	12.0	1730	1150	1760	1170	1780	1180	1850	1230	1900	1270	1970	1310
	12.5	1650	1100	1680	1120	1700	1130	1760	1170	1810	1200	1870	1250
	13.0	1580	1050	1600	1070	1620	1080	1680	1110	1720	1140	1780	1180
	13.5	1510	1010	1540	1020	1550	1030	1600	1070	1640	1090	1700	1130
	14.0	1450	967	1470	981	1490	989	1530	1020	1570	1040	1620	1080
	14.5	1400	930	1420	943	1430	950	1470	979	1500	1000	1550	1030
	15.0	1350	896	1360	908	1370	914	1410	941	1450	961	1490	990

Properties

	HEM 600	HEM 650	HEM 700	HEM 800	HEM 900	HEM 1000
$Z_x \times 10^3$, mm^3	8772	9657	10540	12490	14440	16570
L_p , m	3.02	2.98	2.93	2.84	2.76	2.69
L_r , m	12.1	11.3	10.7	9.68	8.97	8.48

LRFD	ASD	
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m

IPE Shapes

F_y = 235 MPa

Shape		IPE 80		IPE 100		IPE 120		IPE 140		IPE 160		IPE 180	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	4.91	3.27	8.34	5.55	12.8	8.55	18.7	12.4	26.2	17.4	35.2	23.4
	1.00	4.53	3.02	7.86	5.23	12.3	8.21	18.3	12.2	26.0	17.3	35.2	23.4
	1.50	4.12	2.74	7.21	4.80	11.4	7.56	16.9	11.2	24.2	16.1	33.1	22.0
	2.00	3.71	2.47	6.56	4.36	10.4	6.90	15.5	10.3	22.4	14.9	30.8	20.5
	2.50	3.30	2.19	5.90	3.93	9.39	6.25	14.1	9.41	20.6	13.7	28.5	19.0
	3.00	2.86	1.91	5.25	3.49	8.41	5.60	12.8	8.50	18.8	12.5	26.2	17.4
	3.50	2.44	1.62	4.51	3.00	7.32	4.87	11.4	7.57	17.0	11.3	23.9	15.9
	4.00	2.13	1.41	3.92	2.61	6.33	4.21	9.78	6.51	14.9	9.93	21.6	14.3
	4.50	1.88	1.25	3.47	2.31	5.58	3.71	8.59	5.71	13.1	8.68	18.8	12.5
	5.00	1.69	1.13	3.11	2.07	5.00	3.32	7.66	5.10	11.6	7.72	16.6	11.1
	5.50	1.54	1.02	2.82	1.88	4.52	3.01	6.92	4.60	10.5	6.96	14.9	9.93
	6.00	1.41	0.936	2.58	1.72	4.13	2.75	6.31	4.20	9.52	6.34	13.5	9.01
	6.50	1.30	0.863	2.38	1.58	3.80	2.53	5.80	3.86	8.74	5.82	12.4	8.26
	7.00	1.20	0.801	2.21	1.47	3.52	2.34	5.37	3.57	8.08	5.38	11.5	7.62
	7.50	1.12	0.747	2.06	1.37	3.28	2.18	5.00	3.32	7.52	5.00	10.6	7.08
	8.00	1.05	0.700	1.93	1.28	3.07	2.05	4.67	3.11	7.03	4.68	9.94	6.61
	8.50	0.989	0.658	1.81	1.21	2.89	1.92	4.39	2.92	6.60	4.39	9.32	6.20
	9.00	0.934	0.622	1.71	1.14	2.73	1.81	4.14	2.76	6.22	4.14	8.78	5.84
	9.50	0.885	0.589	1.62	1.08	2.58	1.72	3.92	2.61	5.88	3.91	8.30	5.52
	10.0	0.840	0.559	1.54	1.02	2.45	1.63	3.72	2.47	5.58	3.71	7.87	5.23
	10.5	0.800	0.532	1.47	0.975	2.33	1.55	3.54	2.35	5.31	3.53	7.48	4.98
	11.0	0.764	0.508	1.40	0.930	2.23	1.48	3.37	2.25	5.06	3.37	7.13	4.74
	11.5	0.730	0.486	1.34	0.890	2.13	1.42	3.23	2.15	4.84	3.22	6.81	4.53
	12.0	0.700	0.466	1.28	0.852	2.04	1.36	3.09	2.06	4.63	3.08	6.52	4.34
	12.5	0.672	0.447	1.23	0.818	1.96	1.30	2.96	1.97	4.44	2.95	6.25	4.16
	13.0	0.646	0.430	1.18	0.787	1.88	1.25	2.85	1.90	4.27	2.84	6.00	3.99
	13.5	0.622	0.414	1.14	0.757	1.81	1.20	2.74	1.82	4.11	2.73	5.78	3.84
	14.0	0.600	0.399	1.10	0.730	1.74	1.16	2.64	1.76	3.96	2.63	5.57	3.70
	14.5	0.579	0.385	1.06	0.705	1.68	1.12	2.55	1.70	3.82	2.54	5.37	3.57
	15.0	0.559	0.372	1.02	0.681	1.63	1.08	2.46	1.64	3.69	2.46	5.19	3.45

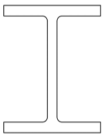
Properties

	IPE 80	IPE 100	IPE 120	IPE 140	IPE 160	IPE 180
$Z_x \times 10^3$, mm^3	23.22	39.41	60.73	88.34	123.9	166.4
L_p , m	0.539	0.637	0.744	0.847	0.945	1.05
L_r , m	2.90	3.14	3.29	3.48	3.75	3.99

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

Note: C_b = 1.00.

Table D.6 Continued.



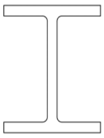
Available Moment vs. Unbraced Length, kN·m
IPE Shapes

F_y = 235 MPa

Shape		IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	46.7	31.0	60.4	40.2	77.5	51.6	102	68.1	133	88.4	170	113
	1.00	46.7	31.0	60.4	40.2	77.5	51.6	102	68.1	133	88.4	170	113
	1.50	44.7	29.7	58.8	39.1	76.6	50.9	102	68.1	133	88.4	170	113
	2.00	41.9	27.8	55.4	36.8	72.5	48.3	97.8	65.0	129	86.1	167	111
	2.50	39.0	26.0	51.9	34.6	68.5	45.6	92.7	61.6	123	81.9	160	106
	3.00	36.2	24.1	48.5	32.3	64.4	42.9	87.5	58.2	117	77.7	152	101
	3.50	33.4	22.2	45.1	30.0	60.4	40.2	82.4	54.8	111	73.5	145	96.2
	4.00	30.5	20.3	41.6	27.7	56.3	37.5	77.3	51.4	104	69.3	137	91.1
	4.50	27.3	18.2	38.2	25.4	52.3	34.8	72.2	48.0	97.9	65.2	129	86.0
	5.00	24.2	16.1	33.9	22.6	48.3	32.1	67.1	44.6	91.6	61.0	122	81.0
	5.50	21.6	14.4	30.3	20.1	43.1	28.6	61.2	40.7	85.4	56.8	114	75.9
	6.00	19.6	13.1	27.4	18.2	38.8	25.8	54.9	36.5	77.5	51.6	106	70.8
	6.50	18.0	11.9	25.0	16.6	35.4	23.5	49.8	33.1	69.9	46.5	96.2	64.0
	7.00	16.6	11.0	23.0	15.3	32.5	21.6	45.5	30.3	63.7	42.4	87.4	58.2
	7.50	15.4	10.2	21.3	14.2	30.1	20.0	42.0	27.9	58.5	38.9	80.2	53.3
	8.00	14.3	9.54	19.8	13.2	28.0	18.6	38.9	25.9	54.1	36.0	74.0	49.3
	8.50	13.4	8.94	18.6	12.4	26.2	17.4	36.3	24.2	50.3	33.5	68.8	45.8
	9.00	12.6	8.42	17.5	11.6	24.6	16.4	34.1	22.7	47.0	31.3	64.3	42.8
	9.50	11.9	7.95	16.5	11.0	23.2	15.5	32.1	21.3	44.2	29.4	60.3	40.1
	10.0	11.3	7.53	15.6	10.4	22.0	14.6	30.3	20.2	41.7	27.7	56.8	37.8
	10.5	10.8	7.16	14.8	9.86	20.9	13.9	28.7	19.1	39.4	26.2	53.7	35.7
	11.0	10.3	6.82	14.1	9.39	19.9	13.2	27.3	18.2	37.4	24.9	51.0	33.9
	11.5	9.79	6.51	13.5	8.96	19.0	12.6	26.0	17.3	35.6	23.7	48.5	32.2
	12.0	9.37	6.23	12.9	8.57	18.1	12.1	24.8	16.5	34.0	22.6	46.2	30.8
	12.5	8.98	5.98	12.3	8.21	17.4	11.6	23.8	15.8	32.5	21.6	44.2	29.4
	13.0	8.63	5.74	11.9	7.89	16.7	11.1	22.8	15.2	31.1	20.7	42.3	28.1
	13.5	8.30	5.52	11.4	7.58	16.0	10.7	21.9	14.6	29.9	19.9	40.6	27.0
	14.0	8.00	5.32	11.0	7.30	15.4	10.3	21.1	14.0	28.7	19.1	39.0	26.0
	14.5	7.71	5.13	10.6	7.05	14.9	9.90	20.3	13.5	27.7	18.4	37.6	25.0
	15.0	7.45	4.96	10.2	6.80	14.4	9.56	19.6	13.0	26.7	17.8	36.2	24.1
Properties													
$Z_x \times 10^3, \mathrm{mm}^3$		220.6		285.4		366.6		484.0		628.4		804.3	
L_p , m		1.15		1.27		1.38		1.55		1.72		1.82	
L_r , m		4.32		4.63		5.03		5.35		5.73		6.06	

LRFD	ASD	
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.

Table D.6 Continued.



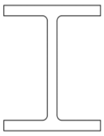
Available Moment vs. Unbraced Length, kN·m
IPE Shapes

F_y = 235 MPa

Shape		IPE 360		IPE 400		IPE 450		IPE 500		IPE 550		IPE 600	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	216	143	276	184	360	240	464	309	589	392	743	494
	1.00	216	143	276	184	360	240	464	309	589	392	743	494
	1.50	216	143	276	184	360	240	464	309	589	392	743	494
	2.00	215	143	276	184	360	240	464	309	589	392	743	494
	2.50	205	137	266	177	349	232	453	302	580	386	737	490
	3.00	196	131	254	169	334	222	435	289	557	371	710	472
	3.50	187	124	243	162	319	212	417	277	535	356	682	454
	4.00	178	118	231	154	305	203	398	265	512	341	655	436
	4.50	169	112	220	146	290	193	380	253	489	326	627	417
	5.00	159	106	209	139	275	183	361	240	467	311	600	399
	5.50	150	100	197	131	261	173	343	228	444	296	573	381
	6.00	141	93.9	186	124	246	164	325	216	422	281	545	363
	6.50	131	87.1	175	116	231	154	306	204	399	266	518	345
	7.00	119	79.0	159	106	214	142	288	191	376	250	491	326
	7.50	109	72.2	146	96.9	194	129	262	174	350	233	463	308
	8.00	100	66.6	134	89.1	178	119	240	160	320	213	427	284
	8.50	92.8	61.8	124	82.5	165	110	221	147	294	196	392	261
	9.00	86.6	57.6	116	76.9	153	102	205	136	272	181	363	241
	9.50	81.1	54.0	108	72.0	143	95.1	191	127	254	169	338	225
	10.0	76.3	50.8	102	67.6	134	89.3	179	119	237	158	315	210
	10.5	72.1	48.0	95.9	63.8	126	84.1	168	112	223	148	296	197
	11.0	68.3	45.5	90.8	60.4	119	79.5	159	106	211	140	279	186
	11.5	64.9	43.2	86.2	57.4	113	75.4	150	100	199	133	264	176
	12.0	61.9	41.2	82.1	54.6	108	71.7	143	95.1	189	126	250	166
	12.5	59.1	39.3	78.4	52.1	103	68.3	136	90.6	180	120	238	158
	13.0	56.5	37.6	75.0	49.9	98.2	65.3	130	86.5	172	114	227	151
	13.5	54.2	36.1	71.9	47.8	94.0	62.5	124	82.8	164	109	217	144
	14.0	52.1	34.7	69.0	45.9	90.2	60.0	119	79.3	157	105	208	138
	14.5	50.1	33.4	66.4	44.2	86.7	57.7	115	76.2	151	101	199	133
	15.0	48.3	32.1	63.9	42.5	83.4	55.5	110	73.3	145	96.7	192	127
Properties													
	$Z_x \times 10^3$, mm^3	1019		1307		1702		2194		2787		3512	
	L_p , m	1.95		2.03		2.12		2.21		2.28		2.39	
	L_r , m	6.40		6.65		6.81		7.06		7.33		7.66	

LRFD	ASD	
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m

IPE Shapes

F_y = 275 MPa

Shape		**IPE 80**		**IPE 100**		**IPE 120**		**IPE 140**		**IPE 160**		**IPE 180**	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	5.75	3.82	9.75	6.49	15.0	10.0	21.9	14.5	30.7	20.4	41.2	27.4
	1.00	5.18	3.44	9.01	6.00	14.2	9.44	21.1	14.0	30.0	20.0	41.0	27.3
	1.50	4.61	3.07	8.12	5.40	12.8	8.54	19.2	12.8	27.6	18.4	37.9	25.2
	2.00	4.04	2.69	7.22	4.80	11.5	7.65	17.3	11.5	25.1	16.7	34.8	23.1
	2.50	3.47	2.31	6.32	4.20	10.1	6.75	15.4	10.3	22.7	15.1	31.6	21.0
	3.00	2.86	1.91	5.32	3.54	8.69	5.78	13.6	9.02	20.2	13.5	28.5	19.0
	3.50	2.44	1.62	4.51	3.00	7.32	4.87	11.4	7.57	17.4	11.6	25.4	16.9
	4.00	2.13	1.41	3.92	2.61	6.33	4.21	9.78	6.51	14.9	9.93	21.6	14.3
	4.50	1.88	1.25	3.47	2.31	5.58	3.71	8.59	5.71	13.1	8.68	18.8	12.5
	5.00	1.69	1.13	3.11	2.07	5.00	3.32	7.66	5.10	11.6	7.72	16.6	11.1
	5.50	1.54	1.02	2.82	1.88	4.52	3.01	6.92	4.60	10.5	6.96	14.9	9.93
	6.00	1.41	0.936	2.58	1.72	4.13	2.75	6.31	4.20	9.52	6.34	13.5	9.01
	6.50	1.30	0.863	2.38	1.58	3.80	2.53	5.80	3.86	8.74	5.82	12.4	8.26
	7.00	1.20	0.801	2.21	1.47	3.52	2.34	5.37	3.57	8.08	5.38	11.5	7.62
	7.50	1.12	0.747	2.06	1.37	3.28	2.18	5.00	3.32	7.52	5.00	10.6	7.08
	8.00	1.05	0.700	1.93	1.28	3.07	2.05	4.67	3.11	7.03	4.68	9.94	6.61
	8.50	0.989	0.658	1.81	1.21	2.89	1.92	4.39	2.92	6.60	4.39	9.32	6.20
	9.00	0.934	0.622	1.71	1.14	2.73	1.81	4.14	2.76	6.22	4.14	8.78	5.84
	9.50	0.885	0.589	1.62	1.08	2.58	1.72	3.92	2.61	5.88	3.91	8.30	5.52
	10.0	0.840	0.559	1.54	1.02	2.45	1.63	3.72	2.47	5.58	3.71	7.87	5.23
	10.5	0.800	0.532	1.47	0.975	2.33	1.55	3.54	2.35	5.31	3.53	7.48	4.98
	11.0	0.764	0.508	1.40	0.930	2.23	1.48	3.37	2.25	5.06	3.37	7.13	4.74
	11.5	0.730	0.486	1.34	0.890	2.13	1.42	3.23	2.15	4.84	3.22	6.81	4.53
	12.0	0.700	0.466	1.28	0.852	2.04	1.36	3.09	2.06	4.63	3.08	6.52	4.34
	12.5	0.672	0.447	1.23	0.818	1.96	1.30	2.96	1.97	4.44	2.95	6.25	4.16
	13.0	0.646	0.430	1.18	0.787	1.88	1.25	2.85	1.90	4.27	2.84	6.00	3.99
	13.5	0.622	0.414	1.14	0.757	1.81	1.20	2.74	1.82	4.11	2.73	5.78	3.84
	14.0	0.600	0.399	1.10	0.730	1.74	1.16	2.64	1.76	3.96	2.63	5.57	3.70
	14.5	0.579	0.385	1.06	0.705	1.68	1.12	2.55	1.70	3.82	2.54	5.37	3.57
	15.0	0.559	0.372	1.02	0.681	1.63	1.08	2.46	1.64	3.69	2.46	5.19	3.45
Properties													
	$Z_x \times 10^3$, mm^3	23.22		39.41		60.73		88.34		123.9		166.4	
	L_p, m	0.498		0.589		0.688		0.783		0.873		0.973	
	L_r, m	2.50		2.72		2.86		3.04		3.28		3.51	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

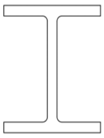
Available Moment vs. Unbraced Length, kN·m

IPE Shapes

F_y = 275 MPa

Shape		**IPE 200**		**IPE 220**		**IPE 240**		**IPE 270**		**IPE 300**		**IPE 330**	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	54.6	36.3	70.6	47.0	90.7	60.4	120	79.7	156	103	199	132
	1.00	54.6	36.3	70.6	47.0	90.7	60.4	120	79.7	156	103	199	132
	1.50	51.3	34.1	67.6	45.0	88.3	58.7	119	79.1	156	103	199	132
	2.00	47.4	31.6	63.0	41.9	82.8	55.1	112	74.5	149	98.9	193	128
	2.50	43.6	29.0	58.4	38.8	77.4	51.5	105	70.0	140	93.3	182	121
	3.00	39.8	26.5	53.7	35.7	71.9	47.8	98.3	65.4	132	87.7	172	115
	3.50	35.9	23.9	49.1	32.6	66.4	44.2	91.4	60.8	123	82.1	162	108
	4.00	31.5	21.0	44.4	29.6	61.0	40.6	84.5	56.2	115	76.5	152	101
	4.50	27.3	18.2	38.6	25.7	55.1	36.7	77.7	51.7	107	70.9	142	94.3
	5.00	24.2	16.1	33.9	22.6	48.3	32.2	69.3	46.1	98.2	65.4	132	87.6
	5.50	21.6	14.4	30.3	20.1	43.1	28.6	61.2	40.7	87.0	57.9	120	80.0
	6.00	19.6	13.1	27.4	18.2	38.8	25.8	54.9	36.5	77.5	51.6	107	71.1
	6.50	18.0	11.9	25.0	16.6	35.4	23.5	49.8	33.1	69.9	46.5	96.2	64.0
	7.00	16.6	11.0	23.0	15.3	32.5	21.6	45.5	30.3	63.7	42.4	87.4	58.2
	7.50	15.4	10.2	21.3	14.2	30.1	20.0	42.0	27.9	58.5	38.9	80.2	53.3
	8.00	14.3	9.54	19.8	13.2	28.0	18.6	38.9	25.9	54.1	36.0	74.0	49.3
	8.50	13.4	8.94	18.6	12.4	26.2	17.4	36.3	24.2	50.3	33.5	68.8	45.8
	9.00	12.6	8.42	17.5	11.6	24.6	16.4	34.1	22.7	47.0	31.3	64.3	42.8
	9.50	11.9	7.95	16.5	11.0	23.2	15.5	32.1	21.3	44.2	29.4	60.3	40.1
	10.0	11.3	7.53	15.6	10.4	22.0	14.6	30.3	20.2	41.7	27.7	56.8	37.8
	10.5	10.8	7.16	14.8	9.86	20.9	13.9	28.7	19.1	39.4	26.2	53.7	35.7
	11.0	10.3	6.82	14.1	9.39	19.9	13.2	27.3	18.2	37.4	24.9	51.0	33.9
	11.5	9.79	6.51	13.5	8.96	19.0	12.6	26.0	17.3	35.6	23.7	48.5	32.2
	12.0	9.37	6.23	12.9	8.57	18.1	12.1	24.8	16.5	34.0	22.6	46.2	30.8
	12.5	8.98	5.98	12.3	8.21	17.4	11.6	23.8	15.8	32.5	21.6	44.2	29.4
	13.0	8.63	5.74	11.9	7.89	16.7	11.1	22.8	15.2	31.1	20.7	42.3	28.1
	13.5	8.30	5.52	11.4	7.58	16.0	10.7	21.9	14.6	29.9	19.9	40.6	27.0
	14.0	8.00	5.32	11.0	7.30	15.4	10.3	21.1	14.0	28.7	19.1	39.0	26.0
	14.5	7.71	5.13	10.6	7.05	14.9	9.90	20.3	13.5	27.7	18.4	37.6	25.0
	15.0	7.45	4.96	10.2	6.80	14.4	9.56	19.6	13.0	26.7	17.8	36.2	24.1
							Properties						
	$Z_x \times 10^3$, mm^3	220.6		285.4		366.6		484.0		628.4		804.3	
	L_p , m	1.06		1.18		1.28		1.43		1.59		1.68	
	L_r , m	3.80		4.08		4.44		4.74		5.10		5.40	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
IPE Shapes

F_y = 275 MPa

Shape		IPE 360		IPE 400		IPE 450		IPE 500		IPE 550		IPE 600	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	252	168	323	215	421	280	543	361	690	459	869	578
	1.00	252	168	323	215	421	280	543	361	690	459	869	578
	1.50	252	168	323	215	421	280	543	361	690	459	869	578
	2.00	247	165	320	213	420	279	543	361	690	459	869	578
	2.50	235	156	305	203	400	266	521	347	667	444	848	564
	3.00	223	148	289	193	381	253	497	330	637	424	812	540
	3.50	211	140	274	182	361	240	472	314	607	404	776	516
	4.00	198	132	259	172	342	227	448	298	577	384	740	492
	4.50	186	124	244	162	322	214	423	282	547	364	704	468
	5.00	174	116	229	152	303	201	399	266	517	344	668	444
	5.50	162	108	213	142	283	188	375	249	487	324	631	420
	6.00	146	97.1	197	131	264	176	350	233	458	304	595	396
	6.50	131	87.1	176	117	237	158	321	214	428	285	559	372
	7.00	119	79.0	159	106	214	142	289	192	386	257	518	344
	7.50	109	72.2	146	96.9	194	129	262	174	350	233	468	311
	8.00	100	66.6	134	89.1	178	119	240	160	320	213	427	284
	8.50	92.8	61.8	124	82.5	165	110	221	147	294	196	392	261
	9.00	86.6	57.6	116	76.9	153	102	205	136	272	181	363	241
	9.50	81.1	54.0	108	72.0	143	95.1	191	127	254	169	338	225
	10.0	76.3	50.8	102	67.6	134	89.3	179	119	237	158	315	210
	10.5	72.1	48.0	95.9	63.8	126	84.1	168	112	223	148	296	197
	11.0	68.3	45.5	90.8	60.4	119	79.5	159	106	211	140	279	186
	11.5	64.9	43.2	86.2	57.4	113	75.4	150	100	199	133	264	176
	12.0	61.9	41.2	82.1	54.6	108	71.7	143	95.1	189	126	250	166
	12.5	59.1	39.3	78.4	52.1	103	68.3	136	90.6	180	120	238	158
	13.0	56.5	37.6	75.0	49.9	98.2	65.3	130	86.5	172	114	227	151
	13.5	54.2	36.1	71.9	47.8	94.0	62.5	124	82.8	164	109	217	144
	14.0	52.1	34.7	69.0	45.9	90.2	60.0	119	79.3	157	105	208	138
	14.5	50.1	33.4	66.4	44.2	86.7	57.7	115	76.2	151	101	199	133
	15.0	48.3	32.1	63.9	42.5	83.4	55.5	110	73.3	145	96.7	192	127
Properties													
$Z_x \times 10^3$, mm^3		1019		1307		1702		2194		2787		3512	
L_p , m		1.80		1.87		1.96		2.05		2.11		2.21	
L_r , m		5.71		5.93		6.10		6.33		6.58		6.88	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

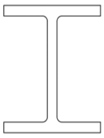
Available Moment vs. Unbraced Length, kN·m

IPE Shapes

F_y = 355 MPa

Shape		**IPE 80**		**IPE 100**		**IPE 120**		**IPE 140**		**IPE 160**		**IPE 180**	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	7.42	4.94	12.6	8.38	19.4	12.9	28.2	18.8	39.6	26.3	53.2	35.4
	1.00	6.35	4.22	11.1	7.41	17.6	11.7	26.3	17.5	37.7	25.1	51.7	34.4
	1.50	5.39	3.59	9.64	6.41	15.4	10.3	23.2	15.5	33.7	22.4	46.6	31.0
	2.00	4.42	2.94	8.14	5.41	13.2	8.77	20.2	13.4	29.7	19.8	41.6	27.7
	2.50	3.47	2.31	6.49	4.32	10.7	7.13	17.0	11.3	25.7	17.1	36.5	24.3
	3.00	2.86	1.91	5.32	3.54	8.69	5.78	13.6	9.06	21.0	14.0	30.9	20.6
	3.50	2.44	1.62	4.51	3.00	7.32	4.87	11.4	7.57	17.4	11.6	25.4	16.9
	4.00	2.13	1.41	3.92	2.61	6.33	4.21	9.78	6.51	14.9	9.93	21.6	14.3
	4.50	1.88	1.25	3.47	2.31	5.58	3.71	8.59	5.71	13.1	8.68	18.8	12.5
	5.00	1.69	1.13	3.11	2.07	5.00	3.32	7.66	5.10	11.6	7.72	16.6	11.1
	5.50	1.54	1.02	2.82	1.88	4.52	3.01	6.92	4.60	10.5	6.96	14.9	9.93
	6.00	1.41	0.936	2.58	1.72	4.13	2.75	6.31	4.20	9.52	6.34	13.5	9.01
	6.50	1.30	0.863	2.38	1.58	3.80	2.53	5.80	3.86	8.74	5.82	12.4	8.26
	7.00	1.20	0.801	2.21	1.47	3.52	2.34	5.37	3.57	8.08	5.38	11.5	7.62
	7.50	1.12	0.747	2.06	1.37	3.28	2.18	5.00	3.32	7.52	5.00	10.6	7.08
	8.00	1.05	0.700	1.93	1.28	3.07	2.05	4.67	3.11	7.03	4.68	9.94	6.61
	8.50	0.989	0.658	1.81	1.21	2.89	1.92	4.39	2.92	6.60	4.39	9.32	6.20
	9.00	0.934	0.622	1.71	1.14	2.73	1.81	4.14	2.76	6.22	4.14	8.78	5.84
	9.50	0.885	0.589	1.62	1.08	2.58	1.72	3.92	2.61	5.88	3.91	8.30	5.52
	10.0	0.840	0.559	1.54	1.02	2.45	1.63	3.72	2.47	5.58	3.71	7.87	5.23
	10.5	0.800	0.532	1.47	0.975	2.33	1.55	3.54	2.35	5.31	3.53	7.48	4.98
	11.0	0.764	0.508	1.40	0.930	2.23	1.48	3.37	2.25	5.06	3.37	7.13	4.74
	11.5	0.730	0.486	1.34	0.890	2.13	1.42	3.23	2.15	4.84	3.22	6.81	4.53
	12.0	0.700	0.466	1.28	0.852	2.04	1.36	3.09	2.06	4.63	3.08	6.52	4.34
	12.5	0.672	0.447	1.23	0.818	1.96	1.30	2.96	1.97	4.44	2.95	6.25	4.16
	13.0	0.646	0.430	1.18	0.787	1.88	1.25	2.85	1.90	4.27	2.84	6.00	3.99
	13.5	0.622	0.414	1.14	0.757	1.81	1.20	2.74	1.82	4.11	2.73	5.78	3.84
	14.0	0.600	0.399	1.10	0.730	1.74	1.16	2.64	1.76	3.96	2.63	5.57	3.70
	14.5	0.579	0.385	1.06	0.705	1.68	1.12	2.55	1.70	3.82	2.54	5.37	3.57
	15.0	0.559	0.372	1.02	0.681	1.63	1.08	2.46	1.64	3.69	2.46	5.19	3.45
Properties													
	$Z_x \times 10^3$, mm^3	23.22		39.41		60.73		88.34		123.9		166.4	
	L_p , m	0.439		0.518		0.606		0.689		0.769		0.856	
	L_r , m	1.98		2.16		2.30		2.47		2.68		2.87	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



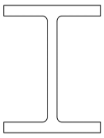
Available Moment vs. Unbraced Length, kN·m

IPE Shapes

F_y = 355 MPa

Shape		IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	70.5	46.9	91.2	60.7	117	77.9	155	103	201	134	257	171
	1.00	69.7	46.4	91.2	60.7	117	77.9	155	103	201	134	257	171
	1.50	63.5	42.2	84.2	56.1	110	73.5	149	99.4	198	132	256	171
	2.00	57.3	38.1	76.8	51.1	102	67.7	138	92.1	185	123	240	160
	2.50	51.1	34.0	69.3	46.1	92.9	61.8	128	84.8	172	114	224	149
	3.00	44.9	29.9	61.8	41.1	84.1	55.9	117	77.6	158	105	208	139
	3.50	37.3	24.8	53.4	35.5	75.3	50.1	106	70.3	145	96.4	192	128
	4.00	31.5	21.0	44.8	29.8	64.2	42.7	93.9	62.5	132	87.6	176	117
	4.50	27.3	18.2	38.6	25.7	55.1	36.7	79.7	53.1	115	76.6	160	106
	5.00	24.2	16.1	33.9	22.6	48.3	32.2	69.3	46.1	99.2	66.0	137	91.4
	5.50	21.6	14.4	30.3	20.1	43.1	28.6	61.2	40.7	87.0	57.9	120	80.0
	6.00	19.6	13.1	27.4	18.2	38.8	25.8	54.9	36.5	77.5	51.6	107	71.1
	6.50	18.0	11.9	25.0	16.6	35.4	23.5	49.8	33.1	69.9	46.5	96.2	64.0
	7.00	16.6	11.0	23.0	15.3	32.5	21.6	45.5	30.3	63.7	42.4	87.4	58.2
	7.50	15.4	10.2	21.3	14.2	30.1	20.0	42.0	27.9	58.5	38.9	80.2	53.3
	8.00	14.3	9.54	19.8	13.2	28.0	18.6	38.9	25.9	54.1	36.0	74.0	49.3
	8.50	13.4	8.94	18.6	12.4	26.2	17.4	36.3	24.2	50.3	33.5	68.8	45.8
	9.00	12.6	8.42	17.5	11.6	24.6	16.4	34.1	22.7	47.0	31.3	64.3	42.8
	9.50	11.9	7.95	16.5	11.0	23.2	15.5	32.1	21.3	44.2	29.4	60.3	40.1
	10.0	11.3	7.53	15.6	10.4	22.0	14.6	30.3	20.2	41.7	27.7	56.8	37.8
	10.5	10.8	7.16	14.8	9.86	20.9	13.9	28.7	19.1	39.4	26.2	53.7	35.7
	11.0	10.3	6.82	14.1	9.39	19.9	13.2	27.3	18.2	37.4	24.9	51.0	33.9
	11.5	9.79	6.51	13.5	8.96	19.0	12.6	26.0	17.3	35.6	23.7	48.5	32.2
	12.0	9.37	6.23	12.9	8.57	18.1	12.1	24.8	16.5	34.0	22.6	46.2	30.8
	12.5	8.98	5.98	12.3	8.21	17.4	11.6	23.8	15.8	32.5	21.6	44.2	29.4
	13.0	8.63	5.74	11.9	7.89	16.7	11.1	22.8	15.2	31.1	20.7	42.3	28.1
	13.5	8.30	5.52	11.4	7.58	16.0	10.7	21.9	14.6	29.9	19.9	40.6	27.0
	14.0	8.00	5.32	11.0	7.30	15.4	10.3	21.1	14.0	28.7	19.1	39.0	26.0
	14.5	7.71	5.13	10.6	7.05	14.9	9.90	20.3	13.5	27.7	18.4	37.6	25.0
	15.0	7.45	4.96	10.2	6.80	14.4	9.56	19.6	13.0	26.7	17.8	36.2	24.1
Properties													
	$Z_x \times 10^3$, mm^3	220.6		285.4		366.6		484.0		628.4		804.3	
	L_p, m	0.936		1.04		1.12		1.26		1.40		1.48	
	L_r, m	3.11		3.36		3.65		3.94		4.27		4.51	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



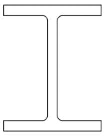
Available Moment vs. Unbraced Length, kN·m

IPE Shapes

F_y = 355 MPa

Shape		IPE 360		IPE 400		IPE 450		IPE 500		IPE 550		IPE 600	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	326	217	418	278	544	362	701	466	890	592	1120	747
	1.00	326	217	418	278	544	362	701	466	890	592	1120	747
	1.50	326	217	418	278	544	362	701	466	890	592	1120	747
	2.00	309	206	401	267	527	351	686	456	877	584	1120	743
	2.50	290	193	377	251	496	330	648	431	831	553	1060	705
	3.00	271	180	353	235	466	310	610	406	784	522	1000	668
	3.50	252	167	329	219	435	290	572	381	738	491	947	630
	4.00	232	155	305	203	405	269	534	355	691	460	891	593
	4.50	213	142	281	187	375	249	496	330	645	429	835	555
	5.00	189	126	257	171	344	229	458	305	598	398	779	518
	5.50	165	110	223	148	303	201	413	275	552	367	722	481
	6.00	146	97.1	197	131	266	177	362	241	485	323	654	435
	6.50	131	87.1	176	117	237	158	321	214	430	286	578	385
	7.00	119	79.0	159	106	214	142	289	192	386	257	518	344
	7.50	109	72.2	146	96.9	194	129	262	174	350	233	468	311
	8.00	100	66.6	134	89.1	178	119	240	160	320	213	427	284
	8.50	92.8	61.8	124	82.5	165	110	221	147	294	196	392	261
	9.00	86.6	57.6	116	76.9	153	102	205	136	272	181	363	241
	9.50	81.1	54.0	108	72.0	143	95.1	191	127	254	169	338	225
	10.0	76.3	50.8	102	67.6	134	89.3	179	119	237	158	315	210
	10.5	72.1	48.0	95.9	63.8	126	84.1	168	112	223	148	296	197
	11.0	68.3	45.5	90.8	60.4	119	79.5	159	106	211	140	279	186
	11.5	64.9	43.2	86.2	57.4	113	75.4	150	100	199	133	264	176
	12.0	61.9	41.2	82.1	54.6	108	71.7	143	95.1	189	126	250	166
	12.5	59.1	39.3	78.4	52.1	103	68.3	136	90.6	180	120	238	158
	13.0	56.5	37.6	75.0	49.9	98.2	65.3	130	86.5	172	114	227	151
	13.5	54.2	36.1	71.9	47.8	94.0	62.5	124	82.8	164	109	217	144
	14.0	52.1	34.7	69.0	45.9	90.2	60.0	119	79.3	157	105	208	138
	14.5	50.1	33.4	66.4	44.2	86.7	57.7	115	76.2	151	101	199	133
	15.0	48.3	32.1	63.9	42.5	83.4	55.5	110	73.3	145	96.7	192	127
Properties													
	$Z_x \times 10^3$, mm^3	1019		1307		1702		2194		2787		3512	
	L_p , m	1.58		1.65		1.72		1.80		1.86		1.95	
	L_r , m	4.78		4.98		5.14		5.35		5.56		5.82	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
IPEA Shapes

F_y = 235 MPa

Shape		IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	4.01	2.67	6.98	4.64	10.5	7.02	15.1	10.1	21.0	13.9	28.6	19.0
	1.00	3.65	2.43	6.50	4.33	10.0	6.68	14.7	9.81	20.8	13.8	28.6	19.0
	1.50	3.26	2.17	5.87	3.91	9.09	6.05	13.4	8.93	19.0	12.7	26.7	17.7
	2.00	2.87	1.91	5.24	3.49	8.14	5.42	12.1	8.05	17.3	11.5	24.5	16.3
	2.50	2.48	1.65	4.61	3.07	7.19	4.79	10.8	7.17	15.6	10.4	22.3	14.8
	3.00	2.05	1.36	3.91	2.60	6.17	4.10	9.46	6.29	13.9	9.27	20.1	13.4
	3.50	1.74	1.16	3.31	2.20	5.17	3.44	7.87	5.23	11.9	7.95	17.9	11.9
	4.00	1.51	1.01	2.87	1.91	4.46	2.97	6.72	4.47	10.1	6.75	15.2	10.1
	4.50	1.34	0.892	2.54	1.69	3.92	2.61	5.88	3.91	8.82	5.87	13.1	8.72
	5.00	1.20	0.801	2.27	1.51	3.50	2.33	5.22	3.48	7.81	5.20	11.6	7.69
	5.50	1.09	0.727	2.06	1.37	3.17	2.11	4.71	3.13	7.02	4.67	10.3	6.88
	6.00	1.00	0.665	1.88	1.25	2.89	1.92	4.28	2.85	6.37	4.24	9.35	6.22
	6.50	0.922	0.613	1.73	1.15	2.66	1.77	3.93	2.62	5.84	3.88	8.55	5.69
	7.00	0.855	0.569	1.61	1.07	2.46	1.64	3.63	2.42	5.39	3.58	7.87	5.24
	7.50	0.797	0.531	1.50	0.998	2.29	1.52	3.38	2.25	5.00	3.33	7.30	4.85
	8.00	0.747	0.497	1.40	0.934	2.14	1.43	3.16	2.10	4.67	3.11	6.80	4.53
	8.50	0.703	0.468	1.32	0.879	2.02	1.34	2.96	1.97	4.38	2.92	6.37	4.24
	9.00	0.664	0.441	1.25	0.829	1.90	1.26	2.79	1.86	4.13	2.75	6.00	3.99
	9.50	0.628	0.418	1.18	0.785	1.80	1.20	2.64	1.76	3.90	2.59	5.66	3.77
	10.0	0.597	0.397	1.12	0.745	1.71	1.14	2.51	1.67	3.70	2.46	5.36	3.57
	10.5	0.568	0.378	1.07	0.710	1.63	1.08	2.38	1.59	3.51	2.34	5.09	3.39
	11.0	0.542	0.361	1.02	0.677	1.55	1.03	2.27	1.51	3.35	2.23	4.85	3.23
	11.5	0.519	0.345	0.973	0.647	1.48	0.986	2.17	1.44	3.20	2.13	4.63	3.08
	12.0	0.497	0.331	0.932	0.620	1.42	0.944	2.08	1.38	3.06	2.04	4.43	2.95
	12.5	0.477	0.317	0.895	0.595	1.36	0.906	1.99	1.33	2.94	1.95	4.25	2.83
	13.0	0.459	0.305	0.860	0.572	1.31	0.871	1.92	1.27	2.82	1.88	4.08	2.71
	13.5	0.441	0.294	0.828	0.551	1.26	0.838	1.84	1.23	2.71	1.81	3.92	2.61
	14.0	0.426	0.283	0.798	0.531	1.21	0.808	1.78	1.18	2.62	1.74	3.78	2.51
	14.5	0.411	0.273	0.771	0.513	1.17	0.780	1.71	1.14	2.52	1.68	3.65	2.43
	15.0	0.397	0.264	0.745	0.496	1.13	0.754	1.66	1.10	2.44	1.62	3.52	2.34
Properties													
	$Z_x \times 10^3$, mm^3	18.98		32.98		49.87		71.60		99.09		135.3	
	L_p , m	0.534		0.626		0.729		0.847		0.940		1.05	
	L_r , m	2.54		2.77		2.88		3.03		3.28		3.54	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
IPEA Shapes

F_y = 235 MPa

Shape		IPEA 200		IPEA 220		IPEA 240		IPEA 270		IPEA 300		IPEA 330	
Design		$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	38.4	25.6	50.8	33.8	65.9	43.8	87.2	58.0	115	76.2	148	98.8
	1.00	38.4	25.6	50.8	33.8	65.9	43.8	87.2	58.0	115	76.2	148	98.8
	1.50	36.5	24.3	49.3	32.8	65.0	43.2	87.2	58.0	115	76.2	148	98.8
	2.00	33.9	22.5	46.0	30.6	61.1	40.7	82.9	55.2	111	74.0	146	97.0
	2.50	31.2	20.8	42.8	28.4	57.3	38.1	78.1	52.0	105	70.1	139	92.3
	3.00	28.5	19.0	39.5	26.3	53.5	35.6	73.3	48.8	99.4	66.2	131	87.5
	3.50	25.9	17.2	36.3	24.1	49.6	33.0	68.5	45.6	93.5	62.2	124	82.7
	4.00	22.9	15.2	33.0	22.0	45.8	30.5	63.7	42.4	87.6	58.3	117	77.9
	4.50	19.7	13.1	29.0	19.3	42.0	27.9	58.9	39.2	81.7	54.4	110	73.2
	5.00	17.3	11.5	25.4	16.9	37.0	24.6	53.8	35.8	75.8	50.5	103	68.4
	5.50	15.5	10.3	22.5	15.0	32.8	21.8	47.3	31.5	69.0	45.9	95.6	63.6
	6.00	14.0	9.29	20.3	13.5	29.5	19.6	42.2	28.1	61.2	40.7	86.4	57.5
	6.50	12.7	8.47	18.5	12.3	26.8	17.8	38.1	25.4	54.9	36.5	77.4	51.5
	7.00	11.7	7.80	16.9	11.3	24.5	16.3	34.7	23.1	49.8	33.2	70.1	46.7
	7.50	10.9	7.22	15.7	10.4	22.7	15.1	31.9	21.3	45.6	30.4	64.1	42.7
	8.00	10.1	6.73	14.6	9.70	21.1	14.0	29.6	19.7	42.1	28.0	59.1	39.3
	8.50	9.46	6.30	13.6	9.06	19.7	13.1	27.5	18.3	39.0	26.0	54.7	36.4
	9.00	8.90	5.92	12.8	8.51	18.5	12.3	25.8	17.1	36.4	24.2	51.0	34.0
	9.50	8.40	5.59	12.1	8.02	17.4	11.6	24.2	16.1	34.2	22.7	47.8	31.8
	10.0	7.95	5.29	11.4	7.59	16.4	10.9	22.8	15.2	32.2	21.4	45.0	29.9
	10.5	7.55	5.02	10.8	7.20	15.6	10.4	21.6	14.4	30.4	20.2	42.5	28.3
	11.0	7.19	4.78	10.3	6.85	14.8	9.87	20.5	13.7	28.8	19.2	40.2	26.8
	11.5	6.86	4.56	9.83	6.54	14.1	9.41	19.5	13.0	27.4	18.2	38.2	25.4
	12.0	6.56	4.37	9.39	6.25	13.5	9.00	18.6	12.4	26.1	17.4	36.4	24.2
	12.5	6.29	4.18	9.00	5.99	12.9	8.62	17.8	11.9	24.9	16.6	34.8	23.1
	13.0	6.04	4.02	8.64	5.75	12.4	8.27	17.1	11.4	23.9	15.9	33.3	22.1
	13.5	5.81	3.86	8.30	5.52	11.9	7.94	16.4	10.9	22.9	15.2	31.9	21.2
	14.0	5.59	3.72	7.99	5.32	11.5	7.65	15.8	10.5	22.0	14.6	30.6	20.4
	14.5	5.39	3.59	7.71	5.13	11.1	7.37	15.2	10.1	21.2	14.1	29.5	19.6
	15.0	5.21	3.47	7.44	4.95	10.7	7.12	14.7	9.76	20.4	13.6	28.4	18.9
Properties													
$Z_x \times 10^3$, mm^3		181.7		240.2		311.6		412.5		541.8		701.9	
L_p, m		1.14		1.26		1.38		1.55		1.71		1.82	
L_r, m		3.87		4.22		4.61		4.96		5.37		5.71	
LRFD	ASD	Note: C_b = 1.00.											
$\Phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
IPEA Shapes

F_y = 235 MPa

Shape		IPEA 360		IPEA 400		IPEA 450		IPEA 500		IPEA 550		IPEA 600	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	192	128	242	161	316	210	412	274	523	348	664	442
	1.00	192	128	242	161	316	210	412	274	523	348	664	442
	1.50	192	128	242	161	316	210	412	274	523	348	664	442
	2.00	191	127	242	161	316	210	412	274	523	348	664	442
	2.50	183	121	232	155	306	204	403	268	517	344	662	440
	3.00	174	116	222	148	293	195	386	257	496	330	636	423
	3.50	165	110	211	140	279	186	369	245	474	316	611	406
	4.00	157	104	200	133	265	177	351	234	453	302	585	389
	4.50	148	98.4	190	126	252	168	334	222	432	288	560	372
	5.00	139	92.6	179	119	238	158	317	211	411	274	534	355
	5.50	130	86.8	168	112	224	149	300	199	390	260	508	338
	6.00	122	81.0	158	105	211	140	283	188	369	246	483	321
	6.50	110	72.9	144	96.1	197	131	265	177	348	232	457	304
	7.00	99.0	65.9	130	86.5	177	118	244	162	327	218	432	287
	7.50	90.2	60.0	118	78.7	160	106	220	146	296	197	403	268
	8.00	82.9	55.2	108	72.1	146	97.3	201	134	270	179	366	244
	8.50	76.7	51.0	100	66.6	135	89.5	184	123	247	164	335	223
	9.00	71.3	47.5	92.9	61.8	125	82.9	170	113	228	152	309	206
	9.50	66.7	44.4	86.7	57.7	116	77.2	158	105	212	141	286	191
	10.0	62.6	41.7	81.4	54.1	109	72.3	148	98.4	198	132	267	178
	10.5	59.1	39.3	76.6	51.0	102	67.9	139	92.4	185	123	250	166
	11.0	55.9	37.2	72.4	48.2	96.3	64.0	131	87.0	174	116	235	156
	11.5	53.0	35.3	68.6	45.7	91.1	60.6	124	82.2	165	110	222	148
	12.0	50.5	33.6	65.2	43.4	86.5	57.5	117	78.0	156	104	210	140
	12.5	48.1	32.0	62.2	41.4	82.3	54.8	111	74.1	148	98.6	199	133
	13.0	46.0	30.6	59.4	39.5	78.5	52.3	106	70.7	141	93.9	190	126
	13.5	44.1	29.3	56.9	37.8	75.1	50.0	101	67.5	135	89.7	181	120
	14.0	42.3	28.2	54.6	36.3	72.0	47.9	97.2	64.7	129	85.8	173	115
	14.5	40.7	27.1	52.4	34.9	69.1	46.0	93.2	62.0	124	82.3	166	110
	15.0	39.2	26.1	50.5	33.6	66.4	44.2	89.6	59.6	119	79.0	159	106
Properties													
$Z_x \times 10^3$, mm^3		906.8		1144		1494		1946		2475		3141	
L_p, m		1.97		2.05		2.15		2.25		2.34		2.45	
L_r, m		6.09		6.30		6.50		6.78		7.06		7.40	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

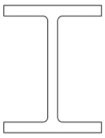
Available Moment vs. Unbraced Length, kN·m

IPEA Shapes

F_y = 275 MPa

Shape		**IPEA 80**		**IPEA 100**		**IPEA 120**		**IPEA 140**		**IPEA 160**		**IPEA 180**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	4.70	3.13	8.16	5.43	12.3	8.21	17.7	11.8	24.5	16.3	33.5	22.3
	1.00	4.15	2.76	7.43	4.95	11.5	7.65	16.9	11.3	23.9	15.9	33.3	22.2
	1.50	3.61	2.40	6.57	4.37	10.2	6.80	15.2	10.1	21.6	14.4	30.4	20.2
	2.00	3.08	2.05	5.70	3.79	8.93	5.94	13.4	8.91	19.3	12.9	27.5	18.3
	2.50	2.49	1.65	4.79	3.19	7.64	5.08	11.6	7.72	17.1	11.3	24.6	16.4
	3.00	2.05	1.36	3.91	2.60	6.17	4.10	9.50	6.32	14.6	9.68	21.7	14.4
	3.50	1.74	1.16	3.31	2.20	5.17	3.44	7.87	5.23	11.9	7.95	18.0	12.0
	4.00	1.51	1.01	2.87	1.91	4.46	2.97	6.72	4.47	10.1	6.75	15.2	10.1
	4.50	1.34	0.892	2.54	1.69	3.92	2.61	5.88	3.91	8.82	5.87	13.1	8.72
	5.00	1.20	0.801	2.27	1.51	3.50	2.33	5.22	3.48	7.81	5.20	11.6	7.69
	5.50	1.09	0.727	2.06	1.37	3.17	2.11	4.71	3.13	7.02	4.67	10.3	6.88
	6.00	1.00	0.665	1.88	1.25	2.89	1.92	4.28	2.85	6.37	4.24	9.35	6.22
	6.50	0.922	0.613	1.73	1.15	2.66	1.77	3.93	2.62	5.84	3.88	8.55	5.69
	7.00	0.855	0.569	1.61	1.07	2.46	1.64	3.63	2.42	5.39	3.58	7.87	5.24
	7.50	0.797	0.531	1.50	0.998	2.29	1.52	3.38	2.25	5.00	3.33	7.30	4.85
	8.00	0.747	0.497	1.40	0.934	2.14	1.43	3.16	2.10	4.67	3.11	6.80	4.53
	8.50	0.703	0.468	1.32	0.879	2.02	1.34	2.96	1.97	4.38	2.92	6.37	4.24
	9.00	0.664	0.441	1.25	0.829	1.90	1.26	2.79	1.86	4.13	2.75	6.00	3.99
	9.50	0.628	0.418	1.18	0.785	1.80	1.20	2.64	1.76	3.90	2.59	5.66	3.77
	10.0	0.597	0.397	1.12	0.745	1.71	1.14	2.51	1.67	3.70	2.46	5.36	3.57
	10.5	0.568	0.378	1.07	0.710	1.63	1.08	2.38	1.59	3.51	2.34	5.09	3.39
	11.0	0.542	0.361	1.02	0.677	1.55	1.03	2.27	1.51	3.35	2.23	4.85	3.23
	11.5	0.519	0.345	0.973	0.647	1.48	0.986	2.17	1.44	3.20	2.13	4.63	3.08
	12.0	0.497	0.331	0.932	0.620	1.42	0.944	2.08	1.38	3.06	2.04	4.43	2.95
	12.5	0.477	0.317	0.895	0.595	1.36	0.906	1.99	1.33	2.94	1.95	4.25	2.83
	13.0	0.459	0.305	0.860	0.572	1.31	0.871	1.92	1.27	2.82	1.88	4.08	2.71
	13.5	0.441	0.294	0.828	0.551	1.26	0.838	1.84	1.23	2.71	1.81	3.92	2.61
	14.0	0.426	0.283	0.798	0.531	1.21	0.808	1.78	1.18	2.62	1.74	3.78	2.51
	14.5	0.411	0.273	0.771	0.513	1.17	0.780	1.71	1.14	2.52	1.68	3.65	2.43
	15.0	0.397	0.264	0.745	0.496	1.13	0.754	1.66	1.10	2.44	1.62	3.52	2.34
Properties													
	$Z_x \times 10^3$, mm^3	18.98		32.98		49.87		71.60		99.09		135.3	
	L_p , m	0.494		0.579		0.674		0.783		0.869		0.973	
	L_r , m	2.20		2.41		2.52		2.68		2.90		3.15	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

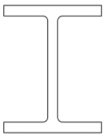


Available Moment vs. Unbraced Length, kN·m
IPEA Shapes

F_y = 275 MPa

Shape		IPEA 200		IPEA 220		IPEA 240		IPEA 270		IPEA 300		IPEA 330	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	45.0	29.9	59.4	39.6	77.1	51.3	102	67.9	134	89.2	174	116
	1.00	45.0	29.9	59.4	39.6	77.1	51.3	102	67.9	134	89.2	174	116
	1.50	41.8	27.8	56.6	37.6	74.8	49.8	101	67.4	134	89.2	174	116
	2.00	38.3	25.4	52.2	34.7	69.7	46.3	94.9	63.1	128	84.9	168	112
	2.50	34.7	23.1	47.9	31.8	64.5	42.9	88.5	58.9	120	79.7	158	105
	3.00	31.1	20.7	43.5	29.0	59.4	39.5	82.1	54.6	112	74.5	149	98.9
	3.50	27.3	18.2	39.2	26.1	54.3	36.1	75.7	50.4	104	69.3	139	92.6
	4.00	22.9	15.2	33.9	22.5	49.1	32.7	69.3	46.1	96.4	64.1	130	86.3
	4.50	19.7	13.1	29.0	19.3	42.4	28.2	62.3	41.5	88.6	58.9	120	79.9
	5.00	17.3	11.5	25.4	16.9	37.0	24.6	53.8	35.8	79.0	52.6	111	73.6
	5.50	15.5	10.3	22.5	15.0	32.8	21.8	47.3	31.5	69.0	45.9	97.6	64.9
	6.00	14.0	9.29	20.3	13.5	29.5	19.6	42.2	28.1	61.2	40.7	86.4	57.5
	6.50	12.7	8.47	18.5	12.3	26.8	17.8	38.1	25.4	54.9	36.5	77.4	51.5
	7.00	11.7	7.80	16.9	11.3	24.5	16.3	34.7	23.1	49.8	33.2	70.1	46.7
	7.50	10.9	7.22	15.7	10.4	22.7	15.1	31.9	21.3	45.6	30.4	64.1	42.7
	8.00	10.1	6.73	14.6	9.70	21.1	14.0	29.6	19.7	42.1	28.0	59.1	39.3
	8.50	9.46	6.30	13.6	9.06	19.7	13.1	27.5	18.3	39.0	26.0	54.7	36.4
	9.00	8.90	5.92	12.8	8.51	18.5	12.3	25.8	17.1	36.4	24.2	51.0	34.0
	9.50	8.40	5.59	12.1	8.02	17.4	11.6	24.2	16.1	34.2	22.7	47.8	31.8
	10.0	7.95	5.29	11.4	7.59	16.4	10.9	22.8	15.2	32.2	21.4	45.0	29.9
	10.5	7.55	5.02	10.8	7.20	15.6	10.4	21.6	14.4	30.4	20.2	42.5	28.3
	11.0	7.19	4.78	10.3	6.85	14.8	9.87	20.5	13.7	28.8	19.2	40.2	26.8
	11.5	6.86	4.56	9.83	6.54	14.1	9.41	19.5	13.0	27.4	18.2	38.2	25.4
	12.0	6.56	4.37	9.39	6.25	13.5	9.00	18.6	12.4	26.1	17.4	36.4	24.2
	12.5	6.29	4.18	9.00	5.99	12.9	8.62	17.8	11.9	24.9	16.6	34.8	23.1
	13.0	6.04	4.02	8.64	5.75	12.4	8.27	17.1	11.4	23.9	15.9	33.3	22.1
	13.5	5.81	3.86	8.30	5.52	11.9	7.94	16.4	10.9	22.9	15.2	31.9	21.2
	14.0	5.59	3.72	7.99	5.32	11.5	7.65	15.8	10.5	22.0	14.6	30.6	20.4
	14.5	5.39	3.59	7.71	5.13	11.1	7.37	15.2	10.1	21.2	14.1	29.5	19.6
	15.0	5.21	3.47	7.44	4.95	10.7	7.12	14.7	9.76	20.4	13.6	28.4	18.9
Properties													
$Z_x \times 10^3$, mm^3		181.7		240.2		311.6		412.5		541.8		701.9	
L_p, m		1.06		1.17		1.27		1.43		1.59		1.68	
L_r, m		3.44		3.75		4.10		4.43		4.81		5.12	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

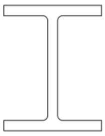


Available Moment vs. Unbraced Length, kN·m
IPEA Shapes

F_y = 275 MPa

Shape		**IPEA 360**		**IPEA 400**		**IPEA 450**		**IPEA 500**		**IPEA 550**		**IPEA 600**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	224	149	283	188	370	246	482	320	613	408	777	517
	1.00	224	149	283	188	370	246	482	320	613	408	777	517
	1.50	224	149	283	188	370	246	482	320	613	408	777	517
	2.00	220	147	280	186	369	246	482	320	613	408	777	517
	2.50	209	139	266	177	351	234	463	308	594	395	762	507
	3.00	197	131	252	168	333	222	440	293	566	377	728	484
	3.50	186	124	238	158	315	210	417	278	538	358	695	462
	4.00	174	116	224	149	297	198	395	263	511	340	661	440
	4.50	163	108	210	140	279	186	372	248	483	321	628	418
	5.00	151	101	196	130	261	174	350	233	456	303	594	395
	5.50	139	92.7	182	121	243	162	327	218	428	285	561	373
	6.00	123	81.7	162	108	222	148	305	203	400	266	527	351
	6.50	110	72.9	144	96.1	197	131	272	181	368	245	493	328
	7.00	99.0	65.9	130	86.5	177	118	244	162	328	218	447	298
	7.50	90.2	60.0	118	78.7	160	106	220	146	296	197	403	268
	8.00	82.9	55.2	108	72.1	146	97.3	201	134	270	179	366	244
	8.50	76.7	51.0	100	66.6	135	89.5	184	123	247	164	335	223
	9.00	71.3	47.5	92.9	61.8	125	82.9	170	113	228	152	309	206
	9.50	66.7	44.4	86.7	57.7	116	77.2	158	105	212	141	286	191
	10.0	62.6	41.7	81.4	54.1	109	72.3	148	98.4	198	132	267	178
	10.5	59.1	39.3	76.6	51.0	102	67.9	139	92.4	185	123	250	166
	11.0	55.9	37.2	72.4	48.2	96.3	64.0	131	87.0	174	116	235	156
	11.5	53.0	35.3	68.6	45.7	91.1	60.6	124	82.2	165	110	222	148
	12.0	50.5	33.6	65.2	43.4	86.5	57.5	117	78.0	156	104	210	140
	12.5	48.1	32.0	62.2	41.4	82.3	54.8	111	74.1	148	98.6	199	133
	13.0	46.0	30.6	59.4	39.5	78.5	52.3	106	70.7	141	93.9	190	126
	13.5	44.1	29.3	56.9	37.8	75.1	50.0	101	67.5	135	89.7	181	120
	14.0	42.3	28.2	54.6	36.3	72.0	47.9	97.2	64.7	129	85.8	173	115
	14.5	40.7	27.1	52.4	34.9	69.1	46.0	93.2	62.0	124	82.3	166	110
	15.0	39.2	26.1	50.5	33.6	66.4	44.2	89.6	59.6	119	79.0	159	106
Properties													
$Z_x \times 10^3$, mm^3		906.8		1144		1494		1946		2475		3141	
L_p , m		1.82		1.90		1.99		2.08		2.16		2.26	
L_r , m		5.47		5.66		5.86		6.12		6.37		6.68	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
IPEA Shapes

F_y = 355 MPa

Shape		IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	6.06	4.03	10.5	7.01	15.9	10.6	22.9	15.2	31.7	21.1	43.2	28.8
	1.00	5.05	3.36	9.13	6.08	14.2	9.47	21.1	14.0	29.9	19.9	41.9	27.9
	1.50	4.15	2.76	7.70	5.12	12.1	8.07	18.2	12.1	26.3	17.5	37.3	24.8
	2.00	3.18	2.12	6.20	4.13	10.0	6.67	15.4	10.2	22.6	15.1	32.6	21.7
	2.50	2.49	1.65	4.79	3.19	7.66	5.10	12.0	7.99	18.6	12.4	28.0	18.6
	3.00	2.05	1.36	3.91	2.60	6.17	4.10	9.50	6.32	14.6	9.68	22.2	14.8
	3.50	1.74	1.16	3.31	2.20	5.17	3.44	7.87	5.23	11.9	7.95	18.0	12.0
	4.00	1.51	1.01	2.87	1.91	4.46	2.97	6.72	4.47	10.1	6.75	15.2	10.1
	4.50	1.34	0.892	2.54	1.69	3.92	2.61	5.88	3.91	8.82	5.87	13.1	8.72
	5.00	1.20	0.801	2.27	1.51	3.50	2.33	5.22	3.48	7.81	5.20	11.6	7.69
	5.50	1.09	0.727	2.06	1.37	3.17	2.11	4.71	3.13	7.02	4.67	10.3	6.88
	6.00	1.00	0.665	1.88	1.25	2.89	1.92	4.28	2.85	6.37	4.24	9.35	6.22
	6.50	0.922	0.613	1.73	1.15	2.66	1.77	3.93	2.62	5.84	3.88	8.55	5.69
	7.00	0.855	0.569	1.61	1.07	2.46	1.64	3.63	2.42	5.39	3.58	7.87	5.24
	7.50	0.797	0.531	1.50	0.998	2.29	1.52	3.38	2.25	5.00	3.33	7.30	4.85
	8.00	0.747	0.497	1.40	0.934	2.14	1.43	3.16	2.10	4.67	3.11	6.80	4.53
	8.50	0.703	0.468	1.32	0.879	2.02	1.34	2.96	1.97	4.38	2.92	6.37	4.24
	9.00	0.664	0.441	1.25	0.829	1.90	1.26	2.79	1.86	4.13	2.75	6.00	3.99
	9.50	0.628	0.418	1.18	0.785	1.80	1.20	2.64	1.76	3.90	2.59	5.66	3.77
	10.0	0.597	0.397	1.12	0.745	1.71	1.14	2.51	1.67	3.70	2.46	5.36	3.57
	10.5	0.568	0.378	1.07	0.710	1.63	1.08	2.38	1.59	3.51	2.34	5.09	3.39
	11.0	0.542	0.361	1.02	0.677	1.55	1.03	2.27	1.51	3.35	2.23	4.85	3.23
	11.5	0.519	0.345	0.973	0.647	1.48	0.986	2.17	1.44	3.20	2.13	4.63	3.08
	12.0	0.497	0.331	0.932	0.620	1.42	0.944	2.08	1.38	3.06	2.04	4.43	2.95
	12.5	0.477	0.317	0.895	0.595	1.36	0.906	1.99	1.33	2.94	1.95	4.25	2.83
	13.0	0.459	0.305	0.860	0.572	1.31	0.871	1.92	1.27	2.82	1.88	4.08	2.71
	13.5	0.441	0.294	0.828	0.551	1.26	0.838	1.84	1.23	2.71	1.81	3.92	2.61
	14.0	0.426	0.283	0.798	0.531	1.21	0.808	1.78	1.18	2.62	1.74	3.78	2.51
	14.5	0.411	0.273	0.771	0.513	1.17	0.780	1.71	1.14	2.52	1.68	3.65	2.43
	15.0	0.397	0.264	0.745	0.496	1.13	0.754	1.66	1.10	2.44	1.62	3.52	2.34
Properties													
$Z_x \times 10^3$, mm^3		18.98		32.98		49.87		71.60		99.09		135.3	
L_p , m		0.434		0.510		0.593		0.689		0.764		0.856	
L_r , m		1.76		1.94		2.06		2.21		2.41		2.62	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
IPEA Shapes

F_y = 355 MPa

Shape		IPEA 200		IPEA 220		IPEA 240		IPEA 270		IPEA 300		IPEA 330	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	58.1	38.6	76.7	51.1	99.6	66.2	132	87.7	173	115	224	149
	1.00	57.3	38.1	76.7	51.1	99.6	66.2	132	87.7	173	115	224	149
	1.50	51.6	34.3	70.2	46.7	93.4	62.1	127	84.5	171	113	224	149
	2.00	45.9	30.6	63.4	42.2	85.2	56.7	117	77.8	158	105	209	139
	2.50	40.3	26.8	56.5	37.6	77.1	51.3	107	71.2	146	97.3	194	129
	3.00	33.8	22.5	49.6	33.0	68.9	45.9	96.9	64.5	134	89.1	179	119
	3.50	27.3	18.2	40.7	27.1	60.0	39.9	86.9	57.8	122	81.0	164	109
	4.00	22.9	15.2	33.9	22.5	49.7	33.1	74.0	49.2	110	72.9	149	99.4
	4.50	19.7	13.1	29.0	19.3	42.4	28.2	62.3	41.5	92.4	61.4	131	87.3
	5.00	17.3	11.5	25.4	16.9	37.0	24.6	53.8	35.8	79.0	52.6	112	74.6
	5.50	15.5	10.3	22.5	15.0	32.8	21.8	47.3	31.5	69.0	45.9	97.6	64.9
	6.00	14.0	9.29	20.3	13.5	29.5	19.6	42.2	28.1	61.2	40.7	86.4	57.5
	6.50	12.7	8.47	18.5	12.3	26.8	17.8	38.1	25.4	54.9	36.5	77.4	51.5
	7.00	11.7	7.80	16.9	11.3	24.5	16.3	34.7	23.1	49.8	33.2	70.1	46.7
	7.50	10.9	7.22	15.7	10.4	22.7	15.1	31.9	21.3	45.6	30.4	64.1	42.7
	8.00	10.1	6.73	14.6	9.70	21.1	14.0	29.6	19.7	42.1	28.0	59.1	39.3
	8.50	9.46	6.30	13.6	9.06	19.7	13.1	27.5	18.3	39.0	26.0	54.7	36.4
	9.00	8.90	5.92	12.8	8.51	18.5	12.3	25.8	17.1	36.4	24.2	51.0	34.0
	9.50	8.40	5.59	12.1	8.02	17.4	11.6	24.2	16.1	34.2	22.7	47.8	31.8
	10.0	7.95	5.29	11.4	7.59	16.4	10.9	22.8	15.2	32.2	21.4	45.0	29.9
	10.5	7.55	5.02	10.8	7.20	15.6	10.4	21.6	14.4	30.4	20.2	42.5	28.3
	11.0	7.19	4.78	10.3	6.85	14.8	9.87	20.5	13.7	28.8	19.2	40.2	26.8
	11.5	6.86	4.56	9.83	6.54	14.1	9.41	19.5	13.0	27.4	18.2	38.2	25.4
	12.0	6.56	4.37	9.39	6.25	13.5	9.00	18.6	12.4	26.1	17.4	36.4	24.2
	12.5	6.29	4.18	9.00	5.99	12.9	8.62	17.8	11.9	24.9	16.6	34.8	23.1
	13.0	6.04	4.02	8.64	5.75	12.4	8.27	17.1	11.4	23.9	15.9	33.3	22.1
	13.5	5.81	3.86	8.30	5.52	11.9	7.94	16.4	10.9	22.9	15.2	31.9	21.2
	14.0	5.59	3.72	7.99	5.32	11.5	7.65	15.8	10.5	22.0	14.6	30.6	20.4
	14.5	5.39	3.59	7.71	5.13	11.1	7.37	15.2	10.1	21.2	14.1	29.5	19.6
	15.0	5.21	3.47	7.44	4.95	10.7	7.12	14.7	9.76	20.4	13.6	28.4	18.9
Properties													
$Z_x \times 10^3$, mm^3		181.7		240.2		311.6		412.5		541.8		701.9	
L_p, m		0.932		1.03		1.12		1.26		1.40		1.48	
L_r, m		2.86		3.13		3.42		3.73		4.06		4.32	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
IPEA Shapes

F_y = 355 MPa

Shape		IPEA 360		IPEA 400		IPEA 450		IPEA 500		IPEA 550		IPEA 600	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	290	193	366	243	477	318	622	414	791	526	1000	668
	1.00	290	193	366	243	477	318	622	414	791	526	1000	668
	1.50	290	193	366	243	477	318	622	414	791	526	1000	668
	2.00	276	183	351	234	463	308	610	406	782	520	1000	667
	2.50	258	171	329	219	436	290	575	383	740	492	951	633
	3.00	240	159	307	204	408	271	540	359	697	464	900	599
	3.50	222	148	285	190	380	253	505	336	655	435	848	564
	4.00	204	136	263	175	352	234	471	313	612	407	796	530
	4.50	186	124	242	161	324	216	436	290	569	379	745	495
	5.00	161	107	214	142	296	197	401	267	527	350	693	461
	5.50	139	92.7	185	123	254	169	354	235	479	319	641	427
	6.00	123	81.7	162	108	222	148	308	205	417	277	570	379
	6.50	110	72.9	144	96.1	197	131	272	181	368	245	502	334
	7.00	99.0	65.9	130	86.5	177	118	244	162	328	218	447	298
	7.50	90.2	60.0	118	78.7	160	106	220	146	296	197	403	268
	8.00	82.9	55.2	108	72.1	146	97.3	201	134	270	179	366	244
	8.50	76.7	51.0	100	66.6	135	89.5	184	123	247	164	335	223
	9.00	71.3	47.5	92.9	61.8	125	82.9	170	113	228	152	309	206
	9.50	66.7	44.4	86.7	57.7	116	77.2	158	105	212	141	286	191
	10.0	62.6	41.7	81.4	54.1	109	72.3	148	98.4	198	132	267	178
	10.5	59.1	39.3	76.6	51.0	102	67.9	139	92.4	185	123	250	166
	11.0	55.9	37.2	72.4	48.2	96.3	64.0	131	87.0	174	116	235	156
	11.5	53.0	35.3	68.6	45.7	91.1	60.6	124	82.2	165	110	222	148
	12.0	50.5	33.6	65.2	43.4	86.5	57.5	117	78.0	156	104	210	140
	12.5	48.1	32.0	62.2	41.4	82.3	54.8	111	74.1	148	98.6	199	133
	13.0	46.0	30.6	59.4	39.5	78.5	52.3	106	70.7	141	93.9	190	126
	13.5	44.1	29.3	56.9	37.8	75.1	50.0	101	67.5	135	89.7	181	120
	14.0	42.3	28.2	54.6	36.3	72.0	47.9	97.2	64.7	129	85.8	173	115
	14.5	40.7	27.1	52.4	34.9	69.1	46.0	93.2	62.0	124	82.3	166	110
	15.0	39.2	26.1	50.5	33.6	66.4	44.2	89.6	59.6	119	79.0	159	106

Properties

	IPEA 360	IPEA 400	IPEA 450	IPEA 500	IPEA 550	IPEA 600
$Z_x \times 10^3$, mm^3	906.8	1144	1494	1946	2475	3141
L_p, m	1.60	1.67	1.75	1.83	1.90	1.99
L_r, m	4.62	4.80	4.98	5.21	5.43	5.70

LRFD	ASD	Note: C_b = 1.00.
$\phi_b = 0.90$	$\Omega_b = 1.67$	

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
IPEO Shapes

F_y = 235 MPa

Shape		**IPEO 100**		**IPEO 120**		**IPEO 140**		**IPEO 160**		**IPEO 180**		**IPEO 200**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	40.0	26.6	52.7	35.1	67.9	45.2	86.8	57.7	122	80.9	157	105
	1.00	40.0	26.6	52.7	35.1	67.9	45.2	86.8	57.7	122	80.9	157	105
	1.50	38.0	25.3	50.9	33.9	66.5	44.3	86.0	57.2	122	80.9	157	105
	2.00	35.6	23.7	48.0	32.0	63.0	41.9	81.9	54.5	117	77.9	154	103
	2.50	33.3	22.1	45.2	30.1	59.5	39.6	77.8	51.7	112	74.4	148	98.3
	3.00	30.9	20.6	42.3	28.1	56.0	37.3	73.7	49.0	106	70.8	141	93.9
	3.50	28.6	19.0	39.4	26.2	52.5	35.0	69.5	46.3	101	67.2	135	89.5
	4.00	26.2	17.5	36.6	24.3	49.0	32.6	65.4	43.5	95.7	63.7	128	85.1
	4.50	23.7	15.8	33.7	22.4	45.5	30.3	61.3	40.8	90.4	60.1	121	80.7
	5.00	21.0	14.0	30.3	20.2	42.0	28.0	57.2	38.0	85.0	56.6	115	76.4
	5.50	18.9	12.6	27.2	18.1	37.7	25.1	52.9	35.2	79.7	53.0	108	72.0
	6.00	17.2	11.5	24.7	16.4	34.1	22.7	47.8	31.8	74.0	49.2	102	67.6
	6.50	15.8	10.5	22.6	15.1	31.2	20.7	43.6	29.0	67.3	44.7	94.0	62.5
	7.00	14.6	9.70	20.9	13.9	28.7	19.1	40.1	26.7	61.7	41.0	85.8	57.1
	7.50	13.6	9.02	19.4	12.9	26.6	17.7	37.1	24.7	57.0	37.9	79.0	52.6
	8.00	12.7	8.43	18.1	12.0	24.8	16.5	34.6	23.0	53.0	35.3	73.2	48.7
	8.50	11.9	7.91	17.0	11.3	23.2	15.5	32.4	21.5	49.5	32.9	68.3	45.4
	9.00	11.2	7.45	16.0	10.6	21.9	14.5	30.4	20.3	46.5	30.9	63.9	42.5
	9.50	10.6	7.05	15.1	10.0	20.6	13.7	28.7	19.1	43.8	29.1	60.1	40.0
	10.0	10.0	6.68	14.3	9.52	19.6	13.0	27.2	18.1	41.4	27.6	56.8	37.8
	10.5	9.55	6.35	13.6	9.05	18.6	12.4	25.8	17.2	39.3	26.2	53.8	35.8
	11.0	9.10	6.06	13.0	8.63	17.7	11.8	24.6	16.4	37.4	24.9	51.1	34.0
	11.5	8.70	5.79	12.4	8.24	16.9	11.2	23.5	15.6	35.7	23.7	48.7	32.4
	12.0	8.33	5.54	11.9	7.89	16.2	10.8	22.5	14.9	34.1	22.7	46.5	30.9
	12.5	7.99	5.31	11.4	7.56	15.5	10.3	21.5	14.3	32.6	21.7	44.5	29.6
	13.0	7.67	5.11	10.9	7.26	14.9	9.90	20.7	13.7	31.3	20.8	42.6	28.4
	13.5	7.38	4.91	10.5	6.99	14.3	9.52	19.9	13.2	30.1	20.0	40.9	27.2
	14.0	7.12	4.73	10.1	6.73	13.8	9.17	19.1	12.7	29.0	19.3	39.4	26.2
	14.5	6.87	4.57	9.76	6.50	13.3	8.85	18.5	12.3	27.9	18.6	37.9	25.2
	15.0	6.63	4.41	9.43	6.28	12.8	8.55	17.8	11.9	27.0	17.9	36.6	24.4
Properties													
$Z_x \times 10^3$, mm^3		189.1		249.4		321.1		410.3		574.6		743.8	
L_p, m		1.07		1.18		1.30		1.41		1.59		1.77	
L_r, m		4.37		4.72		5.04		5.45		5.93		6.32	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
IPEO Shapes

F_y = 235 MPa

Shape		IPEO 220		IPEO 240		IPEO 270		IPEO 300		IPEO 330		IPEO 360		IPEO 400	
Design		$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	199	133	251	167	318	211	433	288	553	368	690	459	946	629
	1.00	199	133	251	167	318	211	433	288	553	368	690	459	946	629
	1.50	199	133	251	167	318	211	433	288	553	368	690	459	946	629
	2.00	197	131	250	167	318	211	433	288	553	368	690	459	946	629
	2.50	189	126	241	160	307	205	422	281	543	361	682	454	943	628
	3.00	181	121	231	154	295	197	407	270	523	348	658	438	914	608
	3.50	173	115	222	148	284	189	391	260	504	335	634	422	884	588
	4.00	165	110	212	141	272	181	375	250	484	322	610	406	854	568
	4.50	157	105	203	135	260	173	360	239	464	309	586	390	824	549
	5.00	149	99.4	193	128	248	165	344	229	445	296	562	374	795	529
	5.50	141	94.1	183	122	236	157	328	218	425	283	538	358	765	509
	6.00	133	88.8	174	116	224	149	313	208	405	270	514	342	735	489
	6.50	125	83.5	164	109	212	141	297	198	386	257	490	326	706	470
	7.00	115	76.7	154	103	200	133	281	187	366	244	466	310	676	450
	7.50	106	70.5	142	94.2	185	123	266	177	347	231	443	294	646	430
	8.00	98.0	65.2	131	87.0	171	113	245	163	322	214	417	277	617	410
	8.50	91.3	60.7	122	80.9	158	105	227	151	298	198	385	256	587	391
	9.00	85.4	56.8	114	75.6	148	98.3	211	140	277	184	357	238	550	366
	9.50	80.2	53.4	107	70.9	138	92.1	198	132	259	172	334	222	514	342
	10.0	75.7	50.4	100	66.8	130	86.7	186	124	243	162	313	208	482	321
	10.5	71.7	47.7	95.0	63.2	123	81.9	175	117	229	153	295	196	454	302
	11.0	68.0	45.3	90.1	60.0	117	77.6	166	111	217	144	279	185	429	285
	11.5	64.8	43.1	85.8	57.1	111	73.8	158	105	206	137	264	176	407	271
	12.0	61.8	41.1	81.8	54.4	106	70.3	150	100	196	130	251	167	387	257
	12.5	59.1	39.3	78.2	52.0	101	67.2	144	95.5	187	124	239	159	369	245
	13.0	56.7	37.7	74.9	49.8	96.7	64.3	137	91.4	179	119	229	152	352	234
	13.5	54.4	36.2	71.9	47.8	92.7	61.7	132	87.6	171	114	219	146	337	224
	14.0	52.3	34.8	69.1	46.0	89.1	59.3	126	84.1	164	109	210	140	324	215
	14.5	50.4	33.5	66.5	44.3	85.7	57.0	122	80.9	158	105	202	134	311	207
	15.0	48.6	32.3	64.1	42.7	82.6	55.0	117	78.0	152	101	194	129	299	199
Properties															
$Z_x \times 10^3$, mm^3		942.8		1186		1502		2046		2613		3263		4471	
L_p, m		1.87		1.98		2.07		2.16		2.25		2.34		2.46	
L_r, m		6.63		6.98		7.17		7.50		7.71		7.94		8.71	
LRFD	ASD	Note: C_b = 1.00.													
$\Phi_b = 0.90$	$\Omega_b = 1.67$														

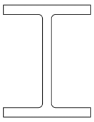
Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
IPEO Shapes

F_y = 275 MPa

Shape		IPEO 100		IPEO 120		IPEO 140		IPEO 160		IPEO 180		IPEO 200	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	46.8	31.1	61.7	41.1	79.5	52.9	102	67.6	142	94.6	184	122
	1.00	46.7	31.1	61.7	41.1	79.5	52.9	102	67.6	142	94.6	184	122
	1.50	43.5	29.0	58.5	38.9	76.6	51.0	99.3	66.1	142	94.3	184	122
	2.00	40.3	26.8	54.6	36.3	71.9	47.8	93.7	62.4	134	89.5	178	118
	2.50	37.1	24.7	50.7	33.7	67.1	44.7	88.1	58.6	127	84.7	169	112
	3.00	33.9	22.6	46.8	31.1	62.4	41.5	82.5	54.9	120	79.8	160	106
	3.50	30.7	20.4	42.9	28.5	57.6	38.3	76.9	51.2	113	75.0	151	100
	4.00	27.1	18.1	39.0	25.9	52.9	35.2	71.3	47.5	105	70.2	142	94.6
	4.50	23.7	15.8	34.3	22.8	47.8	31.8	65.7	43.7	98.2	65.4	133	88.6
	5.00	21.0	14.0	30.3	20.2	42.1	28.0	59.2	39.4	91.0	60.5	124	82.7
	5.50	18.9	12.6	27.2	18.1	37.7	25.1	52.9	35.2	82.2	54.7	115	76.8
	6.00	17.2	11.5	24.7	16.4	34.1	22.7	47.8	31.8	74.0	49.2	104	69.1
	6.50	15.8	10.5	22.6	15.1	31.2	20.7	43.6	29.0	67.3	44.7	94.0	62.5
	7.00	14.6	9.70	20.9	13.9	28.7	19.1	40.1	26.7	61.7	41.0	85.8	57.1
	7.50	13.6	9.02	19.4	12.9	26.6	17.7	37.1	24.7	57.0	37.9	79.0	52.6
	8.00	12.7	8.43	18.1	12.0	24.8	16.5	34.6	23.0	53.0	35.3	73.2	48.7
	8.50	11.9	7.91	17.0	11.3	23.2	15.5	32.4	21.5	49.5	32.9	68.3	45.4
	9.00	11.2	7.45	16.0	10.6	21.9	14.5	30.4	20.3	46.5	30.9	63.9	42.5
	9.50	10.6	7.05	15.1	10.0	20.6	13.7	28.7	19.1	43.8	29.1	60.1	40.0
	10.0	10.0	6.68	14.3	9.52	19.6	13.0	27.2	18.1	41.4	27.6	56.8	37.8
	10.5	9.55	6.35	13.6	9.05	18.6	12.4	25.8	17.2	39.3	26.2	53.8	35.8
	11.0	9.10	6.06	13.0	8.63	17.7	11.8	24.6	16.4	37.4	24.9	51.1	34.0
	11.5	8.70	5.79	12.4	8.24	16.9	11.2	23.5	15.6	35.7	23.7	48.7	32.4
	12.0	8.33	5.54	11.9	7.89	16.2	10.8	22.5	14.9	34.1	22.7	46.5	30.9
	12.5	7.99	5.31	11.4	7.56	15.5	10.3	21.5	14.3	32.6	21.7	44.5	29.6
	13.0	7.67	5.11	10.9	7.26	14.9	9.90	20.7	13.7	31.3	20.8	42.6	28.4
	13.5	7.38	4.91	10.5	6.99	14.3	9.52	19.9	13.2	30.1	20.0	40.9	27.2
	14.0	7.12	4.73	10.1	6.73	13.8	9.17	19.1	12.7	29.0	19.3	39.4	26.2
	14.5	6.87	4.57	9.76	6.50	13.3	8.85	18.5	12.3	27.9	18.6	37.9	25.2
	15.0	6.63	4.41	9.43	6.28	12.8	8.55	17.8	11.9	27.0	17.9	36.6	24.4
Properties													
$Z_x \times 10^3$, mm^3		189.1		249.4		321.1		410.3		574.6		743.8	
L_p, m		0.987		1.09		1.20		1.30		1.47		1.64	
L_r, m		3.82		4.13		4.42		4.78		5.22		5.59	
LRFD	ASD	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

Table D.6 Continued.

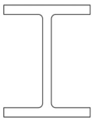


Available Moment vs. Unbraced Length, kN·m
IPEO Shapes

F_y = 275 MPa

Shape		IPEO 220		IPEO 240		IPEO 270		IPEO 300		IPEO 330		IPEO 360		IPEO 400	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	233	155	294	195	372	247	506	337	647	430	808	537	1110	736
	1.00	233	155	294	195	372	247	506	337	647	430	808	537	1110	736
	1.50	233	155	294	195	372	247	506	337	647	430	808	537	1110	736
	2.00	227	151	289	192	369	245	506	337	647	430	808	537	1110	736
	2.50	217	144	276	184	353	235	485	323	625	416	786	523	1090	724
	3.00	206	137	263	175	337	224	464	309	598	398	754	502	1050	698
	3.50	195	130	250	167	321	214	443	295	572	381	722	480	1010	671
	4.00	184	123	238	158	305	203	422	281	546	363	690	459	969	645
	4.50	174	116	225	149	289	192	402	267	520	346	658	438	929	618
	5.00	163	108	212	141	273	182	381	253	493	328	626	416	890	592
	5.50	152	101	199	132	257	171	360	239	467	311	594	395	850	565
	6.00	140	93.2	186	124	241	160	339	225	441	293	562	374	810	539
	6.50	126	84.1	170	113	223	148	318	211	415	276	530	353	770	512
	7.00	115	76.7	154	103	202	134	291	193	385	256	498	331	730	486
	7.50	106	70.5	142	94.2	185	123	266	177	351	233	455	302	691	459
	8.00	98.0	65.2	131	87.0	171	113	245	163	322	214	417	277	642	427
	8.50	91.3	60.7	122	80.9	158	105	227	151	298	198	385	256	593	394
	9.00	85.4	56.8	114	75.6	148	98.3	211	140	277	184	357	238	550	366
	9.50	80.2	53.4	107	70.9	138	92.1	198	132	259	172	334	222	514	342
	10.0	75.7	50.4	100	66.8	130	86.7	186	124	243	162	313	208	482	321
	10.5	71.7	47.7	95.0	63.2	123	81.9	175	117	229	153	295	196	454	302
	11.0	68.0	45.3	90.1	60.0	117	77.6	166	111	217	144	279	185	429	285
	11.5	64.8	43.1	85.8	57.1	111	73.8	158	105	206	137	264	176	407	271
	12.0	61.8	41.1	81.8	54.4	106	70.3	150	100	196	130	251	167	387	257
	12.5	59.1	39.3	78.2	52.0	101	67.2	144	95.5	187	124	239	159	369	245
	13.0	56.7	37.7	74.9	49.8	96.7	64.3	137	91.4	179	119	229	152	352	234
	13.5	54.4	36.2	71.9	47.8	92.7	61.7	132	87.6	171	114	219	146	337	224
	14.0	52.3	34.8	69.1	46.0	89.1	59.3	126	84.1	164	109	210	140	324	215
	14.5	50.4	33.5	66.5	44.3	85.7	57.0	122	80.9	158	105	202	134	311	207
	15.0	48.6	32.3	64.1	42.7	82.6	55.0	117	78.0	152	101	194	129	299	199
Properties															
$Z_x \times 10^3$, mm^3		942.8		1186		1502		2046		2613		3263		4471	
L_p , m		1.73		1.83		1.91		2.00		2.08		2.16		2.27	
L_r , m		5.87		6.18		6.36		6.66		6.86		7.07		7.73	
LRFD	ASD	Note: C_b = 1.00.													
$\phi_b = 0.90$	$\Omega_b = 1.67$														

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m
IPEO Shapes

F_y = 355 MPa

Shape		**IPEO 100**		**IPEO 120**		**IPEO 140**		**IPEO 160**		**IPEO 180**		**IPEO 200**	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	60.4	40.2	79.7	53.0	103	68.3	131	87.2	184	122	238	158
	1.00	59.0	39.3	79.2	52.7	103	68.3	131	87.2	184	122	238	158
	1.50	53.8	35.8	72.8	48.4	95.7	63.7	125	82.9	179	119	236	157
	2.00	48.5	32.3	66.4	44.2	88.0	58.6	115	76.8	167	111	222	148
	2.50	43.3	28.8	60.0	39.9	80.3	53.4	106	70.8	155	103	207	138
	3.00	38.1	25.3	53.6	35.6	72.6	48.3	97.3	64.7	143	95.5	193	129
	3.50	31.8	21.2	46.5	30.9	64.8	43.1	88.1	58.6	132	87.6	179	119
	4.00	27.1	18.1	39.4	26.2	55.3	36.8	78.2	52.0	120	79.8	165	110
	4.50	23.7	15.8	34.3	22.8	47.8	31.8	67.4	44.8	106	70.6	150	100
	5.00	21.0	14.0	30.3	20.2	42.1	28.0	59.2	39.4	92.6	61.6	132	87.7
	5.50	18.9	12.6	27.2	18.1	37.7	25.1	52.9	35.2	82.2	54.7	116	77.3
	6.00	17.2	11.5	24.7	16.4	34.1	22.7	47.8	31.8	74.0	49.2	104	69.1
	6.50	15.8	10.5	22.6	15.1	31.2	20.7	43.6	29.0	67.3	44.7	94.0	62.5
	7.00	14.6	9.70	20.9	13.9	28.7	19.1	40.1	26.7	61.7	41.0	85.8	57.1
	7.50	13.6	9.02	19.4	12.9	26.6	17.7	37.1	24.7	57.0	37.9	79.0	52.6
	8.00	12.7	8.43	18.1	12.0	24.8	16.5	34.6	23.0	53.0	35.3	73.2	48.7
	8.50	11.9	7.91	17.0	11.3	23.2	15.5	32.4	21.5	49.5	32.9	68.3	45.4
	9.00	11.2	7.45	16.0	10.6	21.9	14.5	30.4	20.3	46.5	30.9	63.9	42.5
	9.50	10.6	7.05	15.1	10.0	20.6	13.7	28.7	19.1	43.8	29.1	60.1	40.0
	10.0	10.0	6.68	14.3	9.52	19.6	13.0	27.2	18.1	41.4	27.6	56.8	37.8
	10.5	9.55	6.35	13.6	9.05	18.6	12.4	25.8	17.2	39.3	26.2	53.8	35.8
	11.0	9.10	6.06	13.0	8.63	17.7	11.8	24.6	16.4	37.4	24.9	51.1	34.0
	11.5	8.70	5.79	12.4	8.24	16.9	11.2	23.5	15.6	35.7	23.7	48.7	32.4
	12.0	8.33	5.54	11.9	7.89	16.2	10.8	22.5	14.9	34.1	22.7	46.5	30.9
	12.5	7.99	5.31	11.4	7.56	15.5	10.3	21.5	14.3	32.6	21.7	44.5	29.6
	13.0	7.67	5.11	10.9	7.26	14.9	9.90	20.7	13.7	31.3	20.8	42.6	28.4
	13.5	7.38	4.91	10.5	6.99	14.3	9.52	19.9	13.2	30.1	20.0	40.9	27.2
	14.0	7.12	4.73	10.1	6.73	13.8	9.17	19.1	12.7	29.0	19.3	39.4	26.2
	14.5	6.87	4.57	9.76	6.50	13.3	8.85	18.5	12.3	27.9	18.6	37.9	25.2
	15.0	6.63	4.41	9.43	6.28	12.8	8.55	17.8	11.9	27.0	17.9	36.6	24.4
Properties													
$Z_x \times 10^3$, mm^3		189.1		249.4		321.1		410.3		574.6		743.8	
L_p, m		0.869		0.961		1.06		1.14		1.29		1.44	
L_r, m		3.10		3.36		3.61		3.91		4.28		4.62	
LRFD	**ASD**	Note: C_b = 1.00.											
$\phi_b = 0.90$	$\Omega_b = 1.67$												

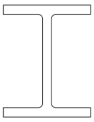
Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
IPEO Shapes

F_y = 355 MPa

Shape		IPEO 220		IPEO 240		IPEO 270		IPEO 300		IPEO 330		IPEO 360		IPEO 400	
Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	301	200	379	252	480	319	654	435	835	555	1040	694	1430	950
	1.00	301	200	379	252	480	319	654	435	835	555	1040	694	1430	950
	1.50	301	200	379	252	480	319	654	435	835	555	1040	694	1430	950
	2.00	285	189	363	241	464	309	638	424	821	546	1030	687	1430	950
	2.50	267	178	342	228	438	292	604	402	779	518	982	653	1370	908
	3.00	250	166	322	214	413	275	571	380	738	491	931	620	1300	866
	3.50	233	155	301	200	387	258	538	358	696	463	881	586	1240	824
	4.00	216	144	280	187	362	241	504	336	655	435	830	553	1180	782
	4.50	198	132	260	173	336	224	471	313	613	408	780	519	1110	740
	5.00	179	119	239	159	311	207	438	291	571	380	729	485	1050	698
	5.50	157	104	212	141	280	186	404	269	530	353	679	452	986	656
	6.00	140	93.2	188	125	248	165	359	239	477	318	623	415	922	614
	6.50	126	84.1	170	113	223	148	321	214	426	284	555	369	854	568
	7.00	115	76.7	154	103	202	134	291	193	385	256	500	333	769	512
	7.50	106	70.5	142	94.2	185	123	266	177	351	233	455	302	700	466
	8.00	98.0	65.2	131	87.0	171	113	245	163	322	214	417	277	642	427
	8.50	91.3	60.7	122	80.9	158	105	227	151	298	198	385	256	593	394
	9.00	85.4	56.8	114	75.6	148	98.3	211	140	277	184	357	238	550	366
	9.50	80.2	53.4	107	70.9	138	92.1	198	132	259	172	334	222	514	342
	10.0	75.7	50.4	100	66.8	130	86.7	186	124	243	162	313	208	482	321
	10.5	71.7	47.7	95.0	63.2	123	81.9	175	117	229	153	295	196	454	302
	11.0	68.0	45.3	90.1	60.0	117	77.6	166	111	217	144	279	185	429	285
	11.5	64.8	43.1	85.8	57.1	111	73.8	158	105	206	137	264	176	407	271
	12.0	61.8	41.1	81.8	54.4	106	70.3	150	100	196	130	251	167	387	257
	12.5	59.1	39.3	78.2	52.0	101	67.2	144	95.5	187	124	239	159	369	245
	13.0	56.7	37.7	74.9	49.8	96.7	64.3	137	91.4	179	119	229	152	352	234
	13.5	54.4	36.2	71.9	47.8	92.7	61.7	132	87.6	171	114	219	146	337	224
	14.0	52.3	34.8	69.1	46.0	89.1	59.3	126	84.1	164	109	210	140	324	215
	14.5	50.4	33.5	66.5	44.3	85.7	57.0	122	80.9	158	105	202	134	311	207
	15.0	48.6	32.3	64.1	42.7	82.6	55.0	117	78.0	152	101	194	129	299	199
Properties															
$Z_x \times 10^3$, mm^3		942.8		1186		1502		2046		2613		3263		4471	
L_p, m		1.52		1.61		1.68		1.76		1.83		1.90		2.00	
L_r, m		4.85		5.12		5.29		5.54		5.73		5.92		6.43	
LRFD	ASD	Note: C_b = 1.00.													
$\phi_b = 0.90$	$\Omega_b = 1.67$														

Table D.6 Continued.

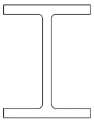


Available Moment vs. Unbraced Length, kN·m
IPN Shapes

F_y = 235 MPa

Shape		IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180		IPN 200	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	4.82	3.21	8.42	5.60	13.5	8.95	20.2	13.4	28.8	19.1	39.6	26.3	52.9	35.2
	1.00	4.40	2.92	7.83	5.21	12.7	8.48	19.4	12.9	28.0	18.7	39.0	25.9	52.6	35.0
	1.50	4.00	2.66	7.18	4.78	11.8	7.83	18.1	12.0	26.2	17.5	36.7	24.4	49.7	33.1
	2.00	3.60	2.39	6.53	4.35	10.8	7.19	16.7	11.1	24.4	16.3	34.4	22.9	46.8	31.2
	2.50	3.20	2.13	5.88	3.91	9.84	6.55	15.3	10.2	22.7	15.1	32.1	21.3	43.9	29.2
	3.00	2.77	1.85	5.23	3.48	8.87	5.90	14.0	9.31	20.9	13.9	29.8	19.8	41.0	27.3
	3.50	2.37	1.58	4.50	3.00	7.85	5.22	12.6	8.40	19.1	12.7	27.4	18.3	38.1	25.4
	4.00	2.07	1.38	3.93	2.61	6.83	4.54	11.1	7.40	17.2	11.5	25.1	16.7	35.2	23.4
	4.50	1.84	1.22	3.48	2.32	6.04	4.02	9.83	6.54	15.2	10.1	22.6	15.0	32.3	21.5
	5.00	1.65	1.10	3.13	2.08	5.42	3.61	8.81	5.86	13.6	9.06	20.2	13.4	29.0	19.3
	5.50	1.50	0.997	2.84	1.89	4.92	3.27	7.98	5.31	12.3	8.20	18.3	12.1	26.2	17.4
	6.00	1.37	0.913	2.60	1.73	4.50	3.00	7.30	4.86	11.3	7.50	16.7	11.1	23.9	15.9
	6.50	1.27	0.843	2.40	1.59	4.15	2.76	6.73	4.48	10.4	6.90	15.3	10.2	21.9	14.6
	7.00	1.18	0.782	2.22	1.48	3.85	2.56	6.24	4.15	9.62	6.40	14.2	9.45	20.3	13.5
	7.50	1.10	0.730	2.07	1.38	3.59	2.39	5.81	3.87	8.96	5.96	13.2	8.81	18.9	12.6
	8.00	1.03	0.684	1.94	1.29	3.36	2.24	5.45	3.62	8.39	5.58	12.4	8.24	17.7	11.8
	8.50	0.967	0.644	1.83	1.22	3.16	2.11	5.12	3.41	7.89	5.25	11.6	7.75	16.6	11.1
	9.00	0.913	0.608	1.73	1.15	2.99	1.99	4.83	3.22	7.44	4.95	11.0	7.31	15.7	10.4
	9.50	0.865	0.576	1.64	1.09	2.83	1.88	4.58	3.05	7.05	4.69	10.4	6.92	14.8	9.87
	10.0	0.822	0.547	1.55	1.03	2.69	1.79	4.35	2.89	6.69	4.45	9.87	6.57	14.1	9.37
	10.5	0.783	0.521	1.48	0.984	2.56	1.70	4.14	2.75	6.37	4.24	9.39	6.25	13.4	8.91
	11.0	0.747	0.497	1.41	0.939	2.44	1.62	3.95	2.63	6.08	4.04	8.96	5.96	12.8	8.50
	11.5	0.714	0.475	1.35	0.898	2.33	1.55	3.77	2.51	5.81	3.87	8.56	5.70	12.2	8.13
	12.0	0.685	0.455	1.29	0.861	2.24	1.49	3.62	2.41	5.57	3.70	8.20	5.46	11.7	7.78
	12.5	0.657	0.437	1.24	0.826	2.15	1.43	3.47	2.31	5.34	3.55	7.87	5.24	11.2	7.47
	13.0	0.632	0.420	1.19	0.794	2.06	1.37	3.34	2.22	5.13	3.42	7.57	5.03	10.8	7.18
	13.5	0.608	0.405	1.15	0.765	1.99	1.32	3.21	2.14	4.94	3.29	7.28	4.85	10.4	6.91
	14.0	0.587	0.390	1.11	0.737	1.92	1.27	3.10	2.06	4.77	3.17	7.02	4.67	10.0	6.66
	14.5	0.566	0.377	1.07	0.712	1.85	1.23	2.99	1.99	4.60	3.06	6.78	4.51	9.66	6.43
	15.0	0.547	0.364	1.03	0.688	1.79	1.19	2.89	1.92	4.45	2.96	6.55	4.36	9.34	6.21
								Properties							
$Z_x \times 10^3$, mm^3		22.80		39.80		63.60		95.40		136.0		187.0		250.0	
L_p, m		0.467		0.549		0.632		0.719		0.796		0.878		0.960	
L_r, m		2.89		3.13		3.40		3.69		3.99		4.28		4.60	
LRFD	**ASD**	Note: C_b = 1.00.													
$\phi_b = 0.90$	**$\Omega_b = 1.67$**														

Table D.6 Continued.

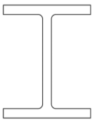


Available Moment vs. Unbraced Length, kN·m
IPN Shapes

F_y = 235 MPa

Shape		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300		IPN 320		IPN 340	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	68.5	45.6	87.1	58.0	109	72.3	134	88.9	161	107	193	129	228	152
	1.00	68.5	45.6	87.1	58.0	109	72.3	134	88.9	161	107	193	129	228	152
	1.50	65.3	43.4	84.0	55.9	106	70.3	131	87.1	159	106	191	127	227	151
	2.00	61.7	41.1	79.8	53.1	101	67.0	125	83.2	152	101	184	122	219	145
	2.50	58.2	38.7	75.6	50.3	95.7	63.7	119	79.3	145	96.6	176	117	210	140
	3.00	54.7	36.4	71.3	47.5	90.7	60.4	113	75.4	139	92.2	168	112	201	134
	3.50	51.1	34.0	67.1	44.6	85.8	57.1	108	71.5	132	87.7	161	107	192	128
	4.00	47.6	31.7	62.9	41.8	80.8	53.8	102	67.7	125	83.3	153	102	184	122
	4.50	44.1	29.3	58.6	39.0	75.8	50.5	95.9	63.8	118	78.8	145	96.6	175	116
	5.00	40.3	26.8	54.4	36.2	70.9	47.2	90.1	59.9	112	74.3	137	91.4	166	111
	5.50	36.4	24.2	49.6	33.0	65.9	43.9	84.2	56.0	105	69.9	130	86.3	157	105
	6.00	33.2	22.1	45.2	30.1	60.0	39.9	77.9	51.8	98.3	65.4	122	81.2	149	98.9
	6.50	30.5	20.3	41.5	27.6	55.1	36.6	71.4	47.5	90.5	60.2	114	75.8	140	93.0
	7.00	28.2	18.7	38.3	25.5	50.9	33.8	65.9	43.9	83.5	55.6	105	69.9	130	86.4
	7.50	26.2	17.4	35.7	23.7	47.3	31.5	61.3	40.8	77.5	51.6	97.5	64.9	120	80.1
	8.00	24.5	16.3	33.3	22.2	44.2	29.4	57.2	38.1	72.4	48.2	91.0	60.6	112	74.8
	8.50	23.0	15.3	31.3	20.8	41.5	27.6	53.7	35.7	67.9	45.2	85.3	56.8	105	70.1
	9.00	21.7	14.4	29.5	19.6	39.1	26.0	50.6	33.6	64.0	42.5	80.3	53.5	99.1	65.9
	9.50	20.5	13.7	27.9	18.6	36.9	24.6	47.8	31.8	60.4	40.2	75.9	50.5	93.6	62.3
	10.0	19.5	13.0	26.5	17.6	35.0	23.3	45.3	30.2	57.3	38.1	71.9	47.9	88.7	59.0
	10.5	18.5	12.3	25.2	16.7	33.3	22.2	43.1	28.7	54.5	36.2	68.4	45.5	84.3	56.1
	11.0	17.7	11.8	24.0	16.0	31.8	21.1	41.1	27.3	51.9	34.5	65.2	43.4	80.3	53.4
	11.5	16.9	11.2	22.9	15.3	30.3	20.2	39.2	26.1	49.6	33.0	62.2	41.4	76.7	51.0
	12.0	16.2	10.8	22.0	14.6	29.0	19.3	37.6	25.0	47.5	31.6	59.6	39.6	73.4	48.8
	12.5	15.5	10.3	21.1	14.0	27.9	18.5	36.0	24.0	45.5	30.3	57.1	38.0	70.4	46.8
	13.0	14.9	9.93	20.2	13.5	26.8	17.8	34.6	23.0	43.7	29.1	54.9	36.5	67.6	45.0
	13.5	14.4	9.55	19.5	13.0	25.8	17.1	33.3	22.2	42.1	28.0	52.8	35.1	65.0	43.3
	14.0	13.8	9.21	18.8	12.5	24.8	16.5	32.1	21.3	40.5	27.0	50.8	33.8	62.6	41.7
	14.5	13.4	8.89	18.1	12.0	24.0	15.9	31.0	20.6	39.1	26.0	49.1	32.6	60.4	40.2
	15.0	12.9	8.59	17.5	11.6	23.1	15.4	29.9	19.9	37.8	25.1	47.4	31.5	58.4	38.8
Properties															
	$Z_x \times 10^3$, mm^3	324.0		412.0		514.0		632.0		762.0		914.0		1080	
	L_p , m	1.04		1.13		1.19		1.26		1.31		1.37		1.44	
	L_r , m	4.91		5.24		5.55		5.84		6.12		6.41		6.68	
LRFD	ASD	Note: C_b = 1.00.													
$\phi_b = 0.90$	$\Omega_b = 1.67$														

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m

IPN Shapes

F_y = 235 MPa

Shape		**IPN 360**		**IPN 380**		**IPN 400**		**IPN 450**		**IPN 500**		**IPN 550**		**IPN 600**	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	270	180	313	209	363	241	508	338	685	456	897	597	1150	767
	1.00	270	180	313	209	363	241	508	338	685	456	897	597	1150	767
	1.50	270	179	313	209	363	241	508	338	685	456	897	597	1150	767
	2.00	260	173	304	202	353	235	500	333	682	454	897	597	1150	767
	2.50	250	166	293	195	341	227	484	322	662	441	876	583	1140	756
	3.00	240	160	282	187	328	219	469	312	643	428	852	567	1110	737
	3.50	230	153	271	180	316	210	453	301	623	415	828	551	1080	718
	4.00	221	147	260	173	304	202	437	291	604	402	803	535	1050	699
	4.50	211	140	249	166	292	194	422	281	585	389	779	519	1020	680
	5.00	201	134	238	158	280	186	406	270	565	376	755	503	993	661
	5.50	191	127	227	151	267	178	390	260	546	363	731	486	964	642
	6.00	181	121	216	144	255	170	375	249	526	350	707	470	936	622
	6.50	172	114	205	136	243	162	359	239	507	337	683	454	907	603
	7.00	162	108	194	129	231	153	343	228	487	324	659	438	878	584
	7.50	150	99.8	182	121	218	145	328	218	468	311	635	422	850	565
	8.00	140	93.1	170	113	204	136	312	208	448	298	611	406	821	546
	8.50	131	87.3	159	106	191	127	295	196	429	285	587	390	792	527
	9.00	123	82.1	150	99.5	180	120	277	184	410	272	563	374	764	508
	9.50	117	77.5	141	94.0	170	113	261	174	386	257	538	358	735	489
	10.0	110	73.5	134	89.0	161	107	247	165	365	243	510	339	706	470
	10.5	105	69.8	127	84.5	153	101	235	156	347	231	483	321	676	449
	11.0	99.9	66.5	121	80.5	145	96.6	223	149	330	219	459	306	642	427
	11.5	95.4	63.5	116	76.9	139	92.2	213	142	315	209	438	291	612	407
	12.0	91.3	60.7	111	73.5	133	88.2	204	136	301	200	418	278	584	389
	12.5	87.5	58.2	106	70.5	127	84.6	195	130	288	192	400	266	559	372
	13.0	84.1	55.9	102	67.7	122	81.2	187	125	276	184	384	255	536	357
	13.5	80.9	53.8	97.9	65.1	117	78.1	180	120	266	177	369	245	515	343
	14.0	77.9	51.8	94.3	62.7	113	75.2	174	115	256	170	355	236	495	330
	14.5	75.1	50.0	90.9	60.5	109	72.5	167	111	247	164	342	228	477	318
	15.0	72.6	48.3	87.8	58.4	105	70.1	162	108	238	158	330	220	461	306
Properties															
$Z_x \times 10^3$, mm^3		1276		1482		1714		2400		3240		4240		5452	
L_p , m		1.49		1.55		1.61		1.76		1.91		2.06		2.20	
L_r , m		7.02		7.34		7.59		8.32		9.06		9.58		10.4	
LRFD	**ASD**	Note: C_b = 1.00.													
$\phi_b = 0.90$	$\Omega_b = 1.67$														

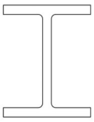
Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
IPN Shapes

F_y = 275 MPa

Shape		IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180		IPN 200	
Length		$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b	$\Phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	5.64	3.75	9.85	6.55	15.7	10.5	23.6	15.7	33.7	22.4	46.3	30.8	61.9	41.2
	1.00	5.01	3.34	8.97	5.97	14.6	9.73	22.4	14.9	32.4	21.5	45.1	30.0	61.0	40.6
	1.50	4.46	2.97	8.07	5.37	13.3	8.85	20.5	13.6	29.9	19.9	41.9	27.9	57.0	37.9
	2.00	3.91	2.60	7.17	4.77	12.0	7.96	18.6	12.4	27.4	18.2	38.7	25.8	53.0	35.3
	2.50	3.35	2.23	6.27	4.17	10.6	7.07	16.7	11.1	24.9	16.6	35.6	23.7	49.0	32.6
	3.00	2.77	1.85	5.29	3.52	9.24	6.15	14.9	9.90	22.5	15.0	32.4	21.5	45.0	29.9
	3.50	2.37	1.58	4.50	3.00	7.85	5.22	12.8	8.52	19.9	13.3	29.2	19.4	41.0	27.3
	4.00	2.07	1.38	3.93	2.61	6.83	4.54	11.1	7.40	17.2	11.5	25.6	17.1	37.0	24.6
	4.50	1.84	1.22	3.48	2.32	6.04	4.02	9.83	6.54	15.2	10.1	22.6	15.0	32.5	21.6
	5.00	1.65	1.10	3.13	2.08	5.42	3.61	8.81	5.86	13.6	9.06	20.2	13.4	29.0	19.3
	5.50	1.50	0.997	2.84	1.89	4.92	3.27	7.98	5.31	12.3	8.20	18.3	12.1	26.2	17.4
	6.00	1.37	0.913	2.60	1.73	4.50	3.00	7.30	4.86	11.3	7.50	16.7	11.1	23.9	15.9
	6.50	1.27	0.843	2.40	1.59	4.15	2.76	6.73	4.48	10.4	6.90	15.3	10.2	21.9	14.6
	7.00	1.18	0.782	2.22	1.48	3.85	2.56	6.24	4.15	9.62	6.40	14.2	9.45	20.3	13.5
	7.50	1.10	0.730	2.07	1.38	3.59	2.39	5.81	3.87	8.96	5.96	13.2	8.81	18.9	12.6
	8.00	1.03	0.684	1.94	1.29	3.36	2.24	5.45	3.62	8.39	5.58	12.4	8.24	17.7	11.8
	8.50	0.967	0.644	1.83	1.22	3.16	2.11	5.12	3.41	7.89	5.25	11.6	7.75	16.6	11.1
	9.00	0.913	0.608	1.73	1.15	2.99	1.99	4.83	3.22	7.44	4.95	11.0	7.31	15.7	10.4
	9.50	0.865	0.576	1.64	1.09	2.83	1.88	4.58	3.05	7.05	4.69	10.4	6.92	14.8	9.87
	10.0	0.822	0.547	1.55	1.03	2.69	1.79	4.35	2.89	6.69	4.45	9.87	6.57	14.1	9.37
	10.5	0.783	0.521	1.48	0.984	2.56	1.70	4.14	2.75	6.37	4.24	9.39	6.25	13.4	8.91
	11.0	0.747	0.497	1.41	0.939	2.44	1.62	3.95	2.63	6.08	4.04	8.96	5.96	12.8	8.50
	11.5	0.714	0.475	1.35	0.898	2.33	1.55	3.77	2.51	5.81	3.87	8.56	5.70	12.2	8.13
	12.0	0.685	0.455	1.29	0.861	2.24	1.49	3.62	2.41	5.57	3.70	8.20	5.46	11.7	7.78
	12.5	0.657	0.437	1.24	0.826	2.15	1.43	3.47	2.31	5.34	3.55	7.87	5.24	11.2	7.47
	13.0	0.632	0.420	1.19	0.794	2.06	1.37	3.34	2.22	5.13	3.42	7.57	5.03	10.8	7.18
	13.5	0.608	0.405	1.15	0.765	1.99	1.32	3.21	2.14	4.94	3.29	7.28	4.85	10.4	6.91
	14.0	0.587	0.390	1.11	0.737	1.92	1.27	3.10	2.06	4.77	3.17	7.02	4.67	10.0	6.66
	14.5	0.566	0.377	1.07	0.712	1.85	1.23	2.99	1.99	4.60	3.06	6.78	4.51	9.66	6.43
	15.0	0.547	0.364	1.03	0.688	1.79	1.19	2.89	1.92	4.45	2.96	6.55	4.36	9.34	6.21
Properties															
$Z_x \times 10^3$, mm³		22.80		39.80		63.60		95.40		136.0		187.0		250.0	
L_p , m		0.432		0.508		0.584		0.664		0.736		0.812		0.888	
L_r , m		2.48		2.69		2.93		3.18		3.45		3.71		3.99	
LRFD	ASD	Note: C_b = 1.00.													
$\Phi_b = 0.90$	$\Omega_b = 1.67$														

Table D.6 Continued.



Available Moment vs. Unbraced Length, kN·m

IPN Shapes

$F_y = 275$ MPa

Shape		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300		IPN 320		IPN 340	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	80.2	53.4	102	67.8	127	84.6	156	104	189	125	226	151	267	178
	1.00	79.8	53.1	102	67.8	127	84.6	156	104	189	125	226	151	267	178
	1.50	74.9	49.9	96.7	64.3	122	81.0	151	100	183	122	221	147	263	175
	2.00	70.1	46.6	90.9	60.5	115	76.5	143	95.2	174	116	211	140	251	167
	2.50	65.2	43.4	85.1	56.6	108	72.0	135	89.8	165	110	200	133	239	159
	3.00	60.4	40.2	79.3	52.7	101	67.4	127	84.5	156	104	190	126	227	151
	3.50	55.5	36.9	73.5	48.9	94.5	62.9	119	79.2	147	97.5	179	119	215	143
	4.00	50.7	33.7	67.7	45.0	87.7	58.3	111	73.9	137	91.4	168	112	203	135
	4.50	45.3	30.1	61.9	41.2	80.9	53.8	103	68.6	128	85.2	158	105	191	127
	5.00	40.3	26.8	55.1	36.7	73.4	48.8	95.0	63.2	119	79.1	147	98.0	179	119
	5.50	36.4	24.2	49.6	33.0	66.0	43.9	85.7	57.0	109	72.4	137	91.0	167	111
	6.00	33.2	22.1	45.2	30.1	60.0	39.9	77.9	51.8	98.8	65.7	124	82.8	154	102
	6.50	30.5	20.3	41.5	27.6	55.1	36.6	71.4	47.5	90.5	60.2	114	75.8	141	93.7
	7.00	28.2	18.7	38.3	25.5	50.9	33.8	65.9	43.9	83.5	55.6	105	69.9	130	86.4
	7.50	26.2	17.4	35.7	23.7	47.3	31.5	61.3	40.8	77.5	51.6	97.5	64.9	120	80.1
	8.00	24.5	16.3	33.3	22.2	44.2	29.4	57.2	38.1	72.4	48.2	91.0	60.6	112	74.8
	8.50	23.0	15.3	31.3	20.8	41.5	27.6	53.7	35.7	67.9	45.2	85.3	56.8	105	70.1
	9.00	21.7	14.4	29.5	19.6	39.1	26.0	50.6	33.6	64.0	42.5	80.3	53.5	99.1	65.9
	9.50	20.5	13.7	27.9	18.6	36.9	24.6	47.8	31.8	60.4	40.2	75.9	50.5	93.6	62.3
	10.0	19.5	13.0	26.5	17.6	35.0	23.3	45.3	30.2	57.3	38.1	71.9	47.9	88.7	59.0
	10.5	18.5	12.3	25.2	16.7	33.3	22.2	43.1	28.7	54.5	36.2	68.4	45.5	84.3	56.1
	11.0	17.7	11.8	24.0	16.0	31.8	21.1	41.1	27.3	51.9	34.5	65.2	43.4	80.3	53.4
	11.5	16.9	11.2	22.9	15.3	30.3	20.2	39.2	26.1	49.6	33.0	62.2	41.4	76.7	51.0
	12.0	16.2	10.8	22.0	14.6	29.0	19.3	37.6	25.0	47.5	31.6	59.6	39.6	73.4	48.8
	12.5	15.5	10.3	21.1	14.0	27.9	18.5	36.0	24.0	45.5	30.3	57.1	38.0	70.4	46.8
	13.0	14.9	9.93	20.2	13.5	26.8	17.8	34.6	23.0	43.7	29.1	54.9	36.5	67.6	45.0
	13.5	14.4	9.55	19.5	13.0	25.8	17.1	33.3	22.2	42.1	28.0	52.8	35.1	65.0	43.3
	14.0	13.8	9.21	18.8	12.5	24.8	16.5	32.1	21.3	40.5	27.0	50.8	33.8	62.6	41.7
	14.5	13.4	8.89	18.1	12.0	24.0	15.9	31.0	20.6	39.1	26.0	49.1	32.6	60.4	40.2
	15.0	12.9	8.59	17.5	11.6	23.1	15.4	29.9	19.9	37.8	25.1	47.4	31.5	58.4	38.8

Properties

	IPN 220	IPN 240	IPN 260	IPN 280	IPN 300	IPN 320	IPN 340
$Z_x \times 10^3$, mm^3	324.0	412.0	514.0	632.0	762.0	914.0	1080
L_p , m	0.959	1.04	1.10	1.16	1.22	1.27	1.33
L_r , m	4.26	4.55	4.82	5.07	5.31	5.56	5.80

LRFD	ASD	Note: C_b = 1.00.
$\phi_b = 0.90$	$\Omega_b = 1.67$	

Table D.6 Continued.

Available Moment vs. Unbraced Length, kN·m
IPN Shapes

F_y = 275 MPa

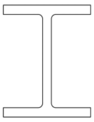
Shape		IPN 360		IPN 380		IPN 400		IPN 450		IPN 500		IPN 550		IPN 600	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	0.00	316	210	367	244	424	282	594	395	802	534	1050	698	1350	898
	1.00	316	210	367	244	424	282	594	395	802	534	1050	698	1350	898
	1.50	312	208	365	243	424	282	594	395	802	534	1050	698	1350	898
	2.00	299	199	350	233	407	271	578	385	789	525	1040	694	1350	898
	2.50	286	190	335	223	390	260	556	370	763	507	1010	672	1310	874
	3.00	272	181	320	213	373	248	535	356	736	490	977	650	1270	847
	3.50	259	172	305	203	357	237	513	342	709	472	944	628	1230	821
	4.00	245	163	290	193	340	226	492	327	683	454	911	606	1200	795
	4.50	232	154	275	183	323	215	470	313	656	436	878	584	1160	769
	5.00	218	145	260	173	306	204	449	299	629	419	845	562	1120	743
	5.50	205	136	244	163	290	193	427	284	603	401	812	540	1080	717
	6.00	191	127	229	153	273	182	406	270	576	383	779	518	1040	691
	6.50	176	117	213	142	256	170	384	256	549	365	746	497	999	665
	7.00	162	108	196	131	236	157	363	241	523	348	713	475	960	638
	7.50	150	99.8	182	121	219	146	339	225	496	330	680	453	920	612
	8.00	140	93.1	170	113	204	136	315	210	467	311	647	431	881	586
	8.50	131	87.3	159	106	191	127	295	196	437	291	611	406	842	560
	9.00	123	82.1	150	99.5	180	120	277	184	410	273	573	381	803	534
	9.50	117	77.5	141	94.0	170	113	261	174	386	257	539	359	755	502
	10.0	110	73.5	134	89.0	161	107	247	165	365	243	510	339	713	474
	10.5	105	69.8	127	84.5	153	101	235	156	347	231	483	321	676	449
	11.0	99.9	66.5	121	80.5	145	96.6	223	149	330	219	459	306	642	427
	11.5	95.4	63.5	116	76.9	139	92.2	213	142	315	209	438	291	612	407
	12.0	91.3	60.7	111	73.5	133	88.2	204	136	301	200	418	278	584	389
	12.5	87.5	58.2	106	70.5	127	84.6	195	130	288	192	400	266	559	372
	13.0	84.1	55.9	102	67.7	122	81.2	187	125	276	184	384	255	536	357
	13.5	80.9	53.8	97.9	65.1	117	78.1	180	120	266	177	369	245	515	343
	14.0	77.9	51.8	94.3	62.7	113	75.2	174	115	256	170	355	236	495	330
	14.5	75.1	50.0	90.9	60.5	109	72.5	167	111	247	164	342	228	477	318
	15.0	72.6	48.3	87.8	58.4	105	70.1	162	108	238	158	330	220	461	306

Properties

	IPN 360	IPN 380	IPN 400	IPN 450	IPN 500	IPN 550	IPN 600
$Z_x \times 10^3$, mm^3	1276	1482	1714	2400	3240	4240	5452
L_p , m	1.38	1.43	1.49	1.63	1.77	1.91	2.04
L_r , m	6.09	6.37	6.59	7.22	7.87	8.33	9.01

LRFD	ASD	
$\phi_b = 0.90$	$\Omega_b = 1.67$	Note: C_b = 1.00.

Table D.6 Continued.

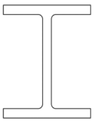


Available Moment vs. Unbraced Length, kN·m
IPN Shapes

F_y = 355 MPa

Shape		IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180		IPN 200	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	7.28	4.85	12.7	8.46	20.3	13.5	30.5	20.3	43.5	28.9	59.7	39.8	79.9	53.1
	1.00	6.13	4.08	11.0	7.35	18.1	12.1	27.9	18.5	40.5	27.0	56.7	37.7	77.0	51.2
	1.50	5.19	3.45	9.53	6.34	15.9	10.6	24.7	16.5	36.4	24.2	51.4	34.2	70.3	46.8
	2.00	4.23	2.82	8.02	5.33	13.7	9.09	21.6	14.4	32.3	21.5	46.1	30.7	63.7	42.4
	2.50	3.35	2.23	6.41	4.26	11.2	7.48	18.5	12.3	28.2	18.7	40.8	27.2	57.0	37.9
	3.00	2.77	1.85	5.29	3.52	9.24	6.15	15.1	10.1	23.6	15.7	35.4	23.5	50.3	33.5
	3.50	2.37	1.58	4.50	3.00	7.85	5.22	12.8	8.52	19.9	13.3	29.7	19.8	42.9	28.6
	4.00	2.07	1.38	3.93	2.61	6.83	4.54	11.1	7.40	17.2	11.5	25.6	17.1	37.0	24.6
	4.50	1.84	1.22	3.48	2.32	6.04	4.02	9.83	6.54	15.2	10.1	22.6	15.0	32.5	21.6
	5.00	1.65	1.10	3.13	2.08	5.42	3.61	8.81	5.86	13.6	9.06	20.2	13.4	29.0	19.3
	5.50	1.50	0.997	2.84	1.89	4.92	3.27	7.98	5.31	12.3	8.20	18.3	12.1	26.2	17.4
	6.00	1.37	0.913	2.60	1.73	4.50	3.00	7.30	4.86	11.3	7.50	16.7	11.1	23.9	15.9
	6.50	1.27	0.843	2.40	1.59	4.15	2.76	6.73	4.48	10.4	6.90	15.3	10.2	21.9	14.6
	7.00	1.18	0.782	2.22	1.48	3.85	2.56	6.24	4.15	9.62	6.40	14.2	9.45	20.3	13.5
	7.50	1.10	0.730	2.07	1.38	3.59	2.39	5.81	3.87	8.96	5.96	13.2	8.81	18.9	12.6
	8.00	1.03	0.684	1.94	1.29	3.36	2.24	5.45	3.62	8.39	5.58	12.4	8.24	17.7	11.8
	8.50	0.967	0.644	1.83	1.22	3.16	2.11	5.12	3.41	7.89	5.25	11.6	7.75	16.6	11.1
	9.00	0.913	0.608	1.73	1.15	2.99	1.99	4.83	3.22	7.44	4.95	11.0	7.31	15.7	10.4
	9.50	0.865	0.576	1.64	1.09	2.83	1.88	4.58	3.05	7.05	4.69	10.4	6.92	14.8	9.87
	10.0	0.822	0.547	1.55	1.03	2.69	1.79	4.35	2.89	6.69	4.45	9.87	6.57	14.1	9.37
	10.5	0.783	0.521	1.48	0.984	2.56	1.70	4.14	2.75	6.37	4.24	9.39	6.25	13.4	8.91
	11.0	0.747	0.497	1.41	0.939	2.44	1.62	3.95	2.63	6.08	4.04	8.96	5.96	12.8	8.50
	11.5	0.714	0.475	1.35	0.898	2.33	1.55	3.77	2.51	5.81	3.87	8.56	5.70	12.2	8.13
	12.0	0.685	0.455	1.29	0.861	2.24	1.49	3.62	2.41	5.57	3.70	8.20	5.46	11.7	7.78
	12.5	0.657	0.437	1.24	0.826	2.15	1.43	3.47	2.31	5.34	3.55	7.87	5.24	11.2	7.47
	13.0	0.632	0.420	1.19	0.794	2.06	1.37	3.34	2.22	5.13	3.42	7.57	5.03	10.8	7.18
	13.5	0.608	0.405	1.15	0.765	1.99	1.32	3.21	2.14	4.94	3.29	7.28	4.85	10.4	6.91
	14.0	0.587	0.390	1.11	0.737	1.92	1.27	3.10	2.06	4.77	3.17	7.02	4.67	10.0	6.66
	14.5	0.566	0.377	1.07	0.712	1.85	1.23	2.99	1.99	4.60	3.06	6.78	4.51	9.66	6.43
	15.0	0.547	0.364	1.03	0.688	1.79	1.19	2.89	1.92	4.45	2.96	6.55	4.36	9.34	6.21
Properties															
$Z_x \times 10^3$, mm^3		22.80		39.80		63.60		95.40		136.0		187.0		250.0	
L_p, m		0.380		0.447		0.514		0.585		0.648		0.714		0.781	
L_r, m		1.95		2.12		2.32		2.53		2.74		2.95		3.19	
LRFD	ASD	Note: C_b = 1.00.													
$\phi_b = 0.90$	$\Omega_b = 1.67$														

Table D.6 Continued.

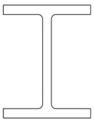


Available Moment vs. Unbraced Length, kN·m
IPN Shapes

F_y = 355 MPa

Shape		**IPN 220**		**IPN 240**		**IPN 260**		**IPN 280**		**IPN 300**		**IPN 320**		**IPN 340**	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
Unbraced Length (m)	**0.00**	104	68.9	132	87.6	164	109	202	134	243	162	292	194	345	230
	1.00	101	67.2	130	86.5	164	109	202	134	243	162	292	194	345	230
	1.50	92.9	61.8	120	80.1	152	101	189	126	230	153	279	185	332	221
	2.00	84.9	56.5	111	73.7	141	93.7	176	117	215	143	261	174	312	208
	2.50	76.8	51.1	101	67.3	130	86.2	163	108	200	133	244	162	292	194
	3.00	68.7	45.7	91.5	60.9	118	78.7	149	99.4	185	123	226	150	272	181
	3.50	60.2	40.1	81.9	54.5	107	71.2	136	90.6	169	113	208	139	252	168
	4.00	51.6	34.4	70.9	47.2	94.7	63.0	123	81.8	154	102	191	127	232	155
	4.50	45.3	30.1	62.0	41.2	82.6	55.0	108	71.6	137	91.0	173	115	213	141
	5.00	40.3	26.8	55.1	36.7	73.4	48.8	95.4	63.4	121	80.6	153	102	190	126
	5.50	36.4	24.2	49.6	33.0	66.0	43.9	85.7	57.0	109	72.4	137	91.2	170	113
	6.00	33.2	22.1	45.2	30.1	60.0	39.9	77.9	51.8	98.8	65.7	124	82.8	154	102
	6.50	30.5	20.3	41.5	27.6	55.1	36.6	71.4	47.5	90.5	60.2	114	75.8	141	93.7
	7.00	28.2	18.7	38.3	25.5	50.9	33.8	65.9	43.9	83.5	55.6	105	69.9	130	86.4
	7.50	26.2	17.4	35.7	23.7	47.3	31.5	61.3	40.8	77.5	51.6	97.5	64.9	120	80.1
	8.00	24.5	16.3	33.3	22.2	44.2	29.4	57.2	38.1	72.4	48.2	91.0	60.6	112	74.8
	8.50	23.0	15.3	31.3	20.8	41.5	27.6	53.7	35.7	67.9	45.2	85.3	56.8	105	70.1
	9.00	21.7	14.4	29.5	19.6	39.1	26.0	50.6	33.6	64.0	42.5	80.3	53.5	99.1	65.9
	9.50	20.5	13.7	27.9	18.6	36.9	24.6	47.8	31.8	60.4	40.2	75.9	50.5	93.6	62.3
	10.0	19.5	13.0	26.5	17.6	35.0	23.3	45.3	30.2	57.3	38.1	71.9	47.9	88.7	59.0
	10.5	18.5	12.3	25.2	16.7	33.3	22.2	43.1	28.7	54.5	36.2	68.4	45.5	84.3	56.1
	11.0	17.7	11.8	24.0	16.0	31.8	21.1	41.1	27.3	51.9	34.5	65.2	43.4	80.3	53.4
	11.5	16.9	11.2	22.9	15.3	30.3	20.2	39.2	26.1	49.6	33.0	62.2	41.4	76.7	51.0
	12.0	16.2	10.8	22.0	14.6	29.0	19.3	37.6	25.0	47.5	31.6	59.6	39.6	73.4	48.8
	12.5	15.5	10.3	21.1	14.0	27.9	18.5	36.0	24.0	45.5	30.3	57.1	38.0	70.4	46.8
	13.0	14.9	9.93	20.2	13.5	26.8	17.8	34.6	23.0	43.7	29.1	54.9	36.5	67.6	45.0
	13.5	14.4	9.55	19.5	13.0	25.8	17.1	33.3	22.2	42.1	28.0	52.8	35.1	65.0	43.3
	14.0	13.8	9.21	18.8	12.5	24.8	16.5	32.1	21.3	40.5	27.0	50.8	33.8	62.6	41.7
	14.5	13.4	8.89	18.1	12.0	24.0	15.9	31.0	20.6	39.1	26.0	49.1	32.6	60.4	40.2
	15.0	12.9	8.59	17.5	11.6	23.1	15.4	29.9	19.9	37.8	25.1	47.4	31.5	58.4	38.8
Properties															
$Z_x \times 10^3$, mm^3		324.0		412.0		514.0		632.0		762.0		914.0		1080	
L_p, m		0.844		0.919		0.969		1.02		1.07		1.12		1.17	
L_r, m		3.41		3.64		3.86		4.06		4.26		4.46		4.65	
LRFD	**ASD**	Note: C_b = 1.00.													
$\phi_b = 0.90$	**$\Omega_b = 1.67$**														

Table D.6 Continued.

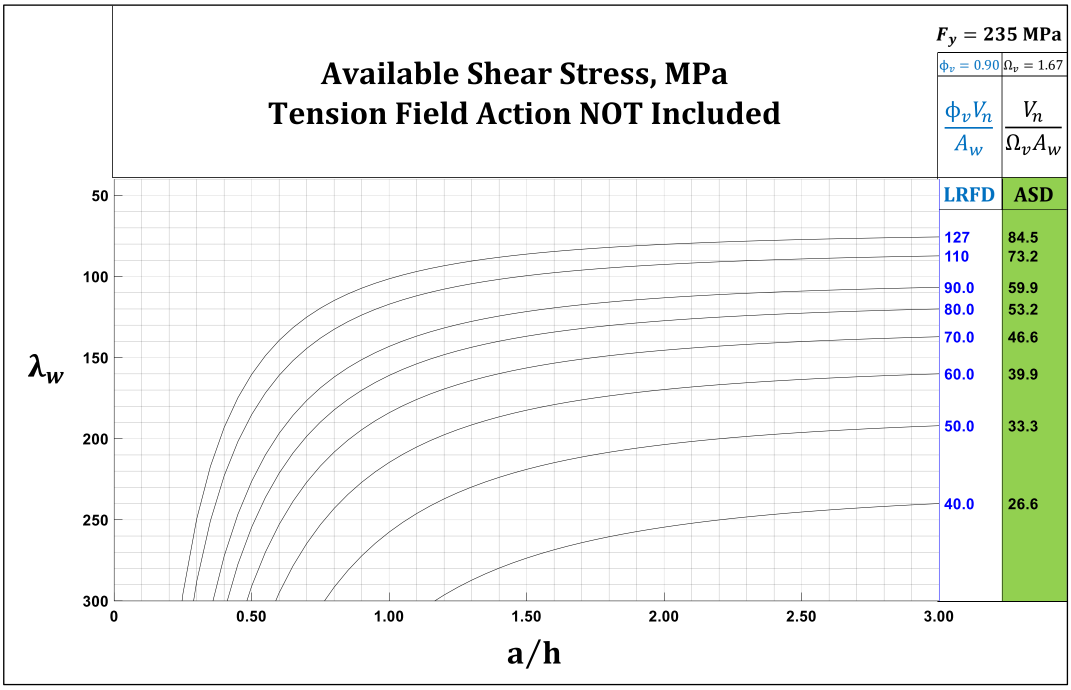


Available Moment vs. Unbraced Length, kN·m
IPN Shapes

F_y = 355 MPa

Shape		IPN 360		IPN 380		IPN 400		IPN 450		IPN 500		IPN 550		IPN 600	
Length		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
Unbraced Length (m)	**0.00**	408	271	473	315	548	364	767	510	1040	689	1350	901	1740	1160
	1.00	408	271	473	315	548	364	767	510	1040	689	1350	901	1740	1160
	1.50	395	263	462	307	537	357	762	507	1040	689	1350	901	1740	1160
	2.00	372	248	437	291	509	339	726	483	996	662	1320	878	1710	1140
	2.50	350	233	412	274	481	320	691	460	951	633	1270	842	1650	1100
	3.00	328	218	387	257	454	302	655	436	907	604	1210	805	1580	1050
	3.50	306	203	362	241	426	283	619	412	863	574	1160	769	1520	1010
	4.00	283	188	337	224	398	265	584	388	819	545	1100	733	1450	968
	4.50	261	174	312	207	370	246	548	365	775	515	1050	696	1390	925
	5.00	237	158	287	191	342	228	512	341	730	486	992	660	1320	881
	5.50	212	141	258	172	311	207	477	317	686	456	938	624	1260	838
	6.00	192	128	233	155	281	187	437	291	642	427	883	588	1190	795
	6.50	176	117	213	142	257	171	398	265	593	394	829	551	1130	752
	7.00	162	108	196	131	236	157	366	243	544	362	765	509	1060	708
	7.50	150	99.8	182	121	219	146	339	225	502	334	705	469	990	659
	8.00	140	93.1	170	113	204	136	315	210	467	311	655	436	918	611
	8.50	131	87.3	159	106	191	127	295	196	437	291	611	406	856	570
	9.00	123	82.1	150	99.5	180	120	277	184	410	273	573	381	802	534
	9.50	117	77.5	141	94.0	170	113	261	174	386	257	539	359	755	502
	10.0	110	73.5	134	89.0	161	107	247	165	365	243	510	339	713	474
	10.5	105	69.8	127	84.5	153	101	235	156	347	231	483	321	676	449
	11.0	99.9	66.5	121	80.5	145	96.6	223	149	330	219	459	306	642	427
	11.5	95.4	63.5	116	76.9	139	92.2	213	142	315	209	438	291	612	407
	12.0	91.3	60.7	111	73.5	133	88.2	204	136	301	200	418	278	584	389
	12.5	87.5	58.2	106	70.5	127	84.6	195	130	288	192	400	266	559	372
	13.0	84.1	55.9	102	67.7	122	81.2	187	125	276	184	384	255	536	357
	13.5	80.9	53.8	97.9	65.1	117	78.1	180	120	266	177	369	245	515	343
	14.0	77.9	51.8	94.3	62.7	113	75.2	174	115	256	170	355	236	495	330
	14.5	75.1	50.0	90.9	60.5	109	72.5	167	111	247	164	342	228	477	318
	15.0	72.6	48.3	87.8	58.4	105	70.1	162	108	238	158	330	220	461	306
Properties															
$Z_x \times 10^3$, mm^3		1276		1482		1714		2400		3240		4240		5452	
L_p , m		1.21		1.26		1.31		1.43		1.55		1.68		1.79	
L_r , m		4.88		5.10		5.28		5.79		6.30		6.69		7.23	
LRFD	**ASD**	Note: C_b = 1.00.													
$\phi_b = 0.90$	**$\Omega_b = 1.67$**														

Table D.7 Available shear stress.



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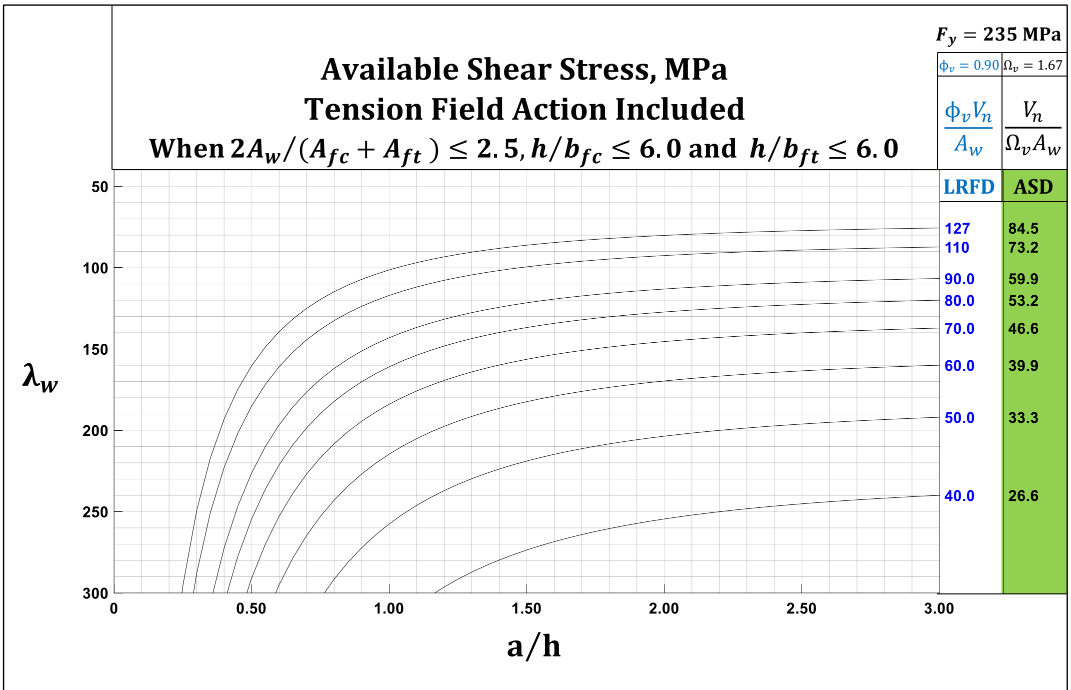

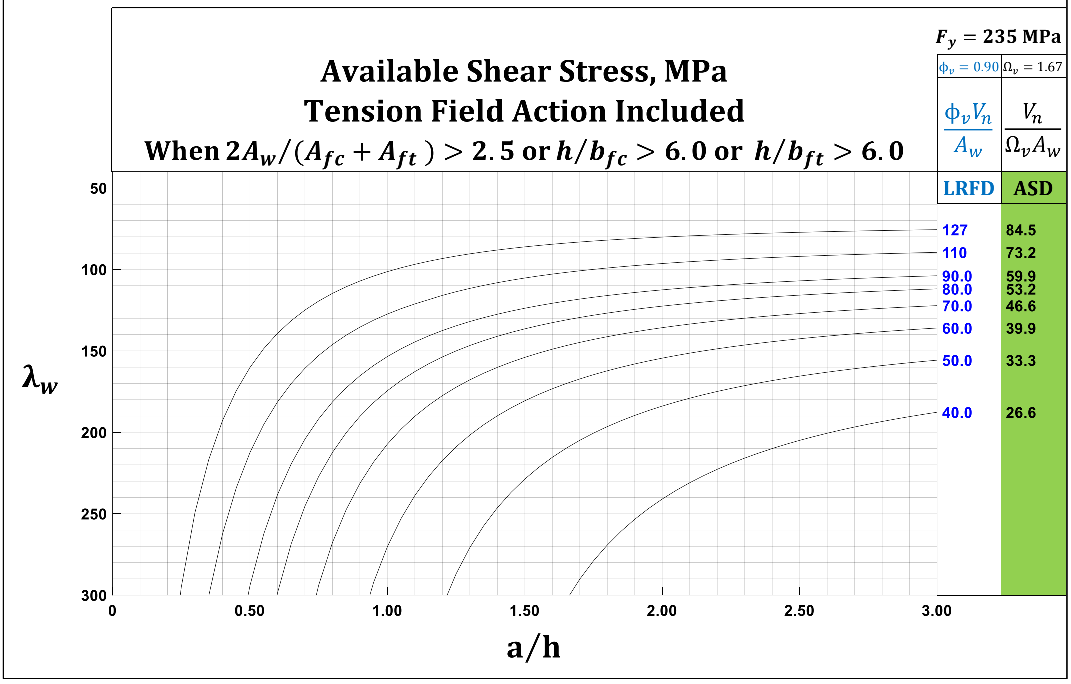

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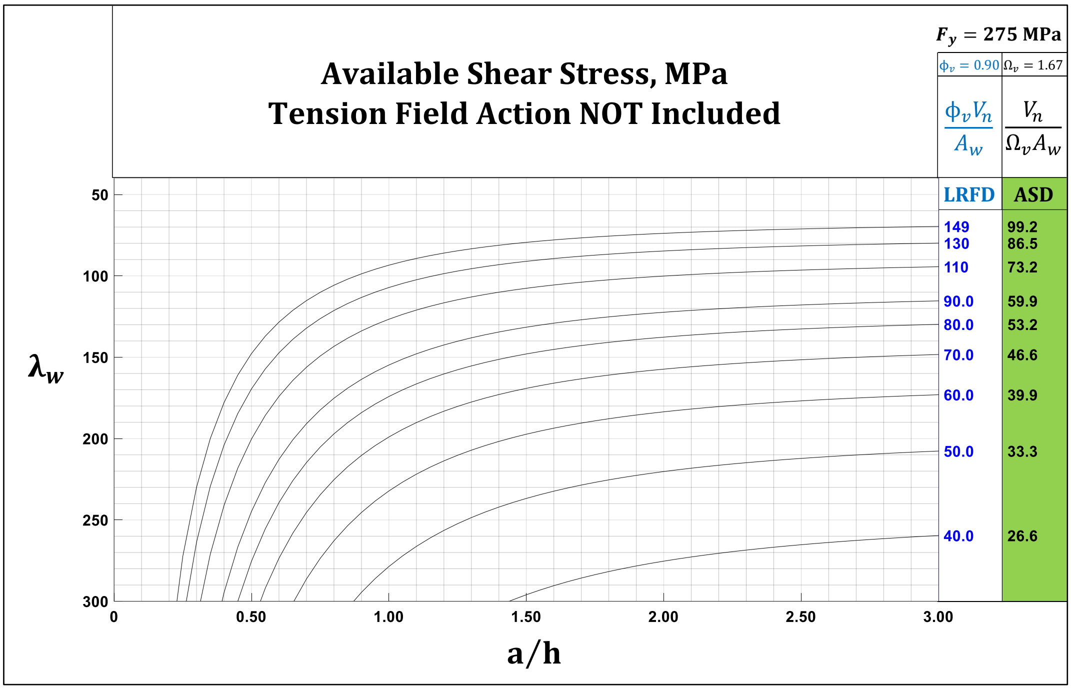

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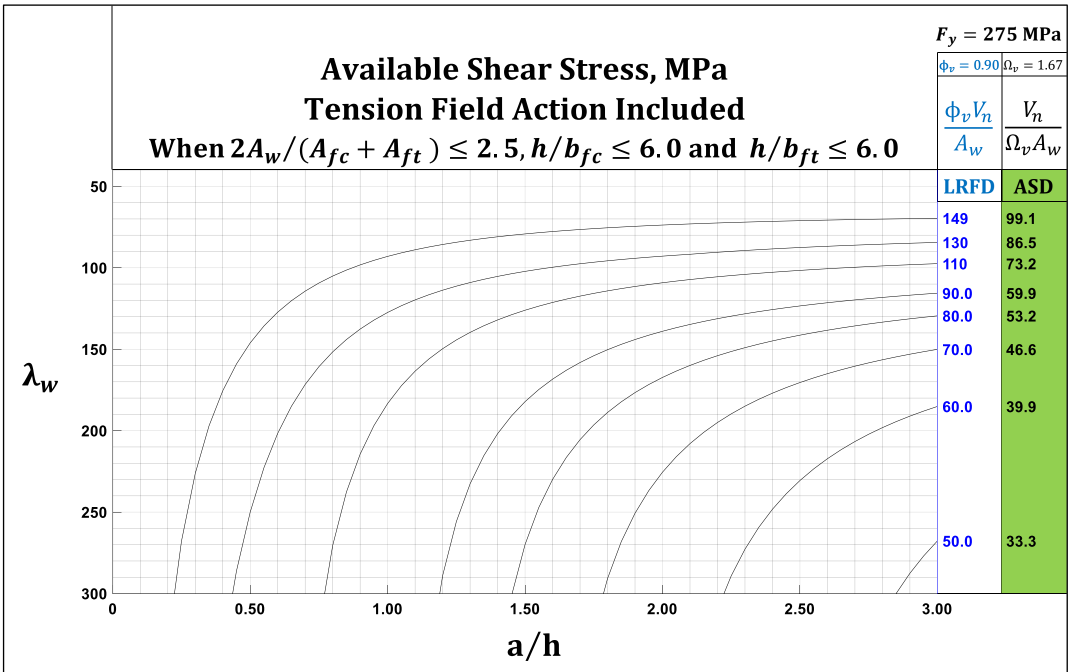

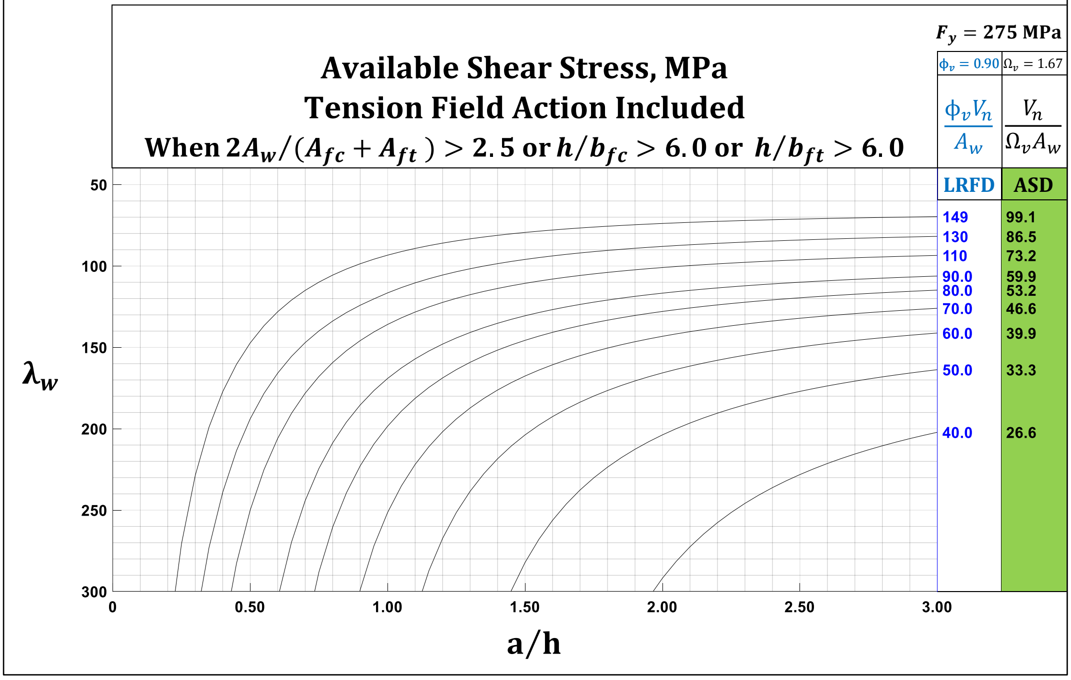

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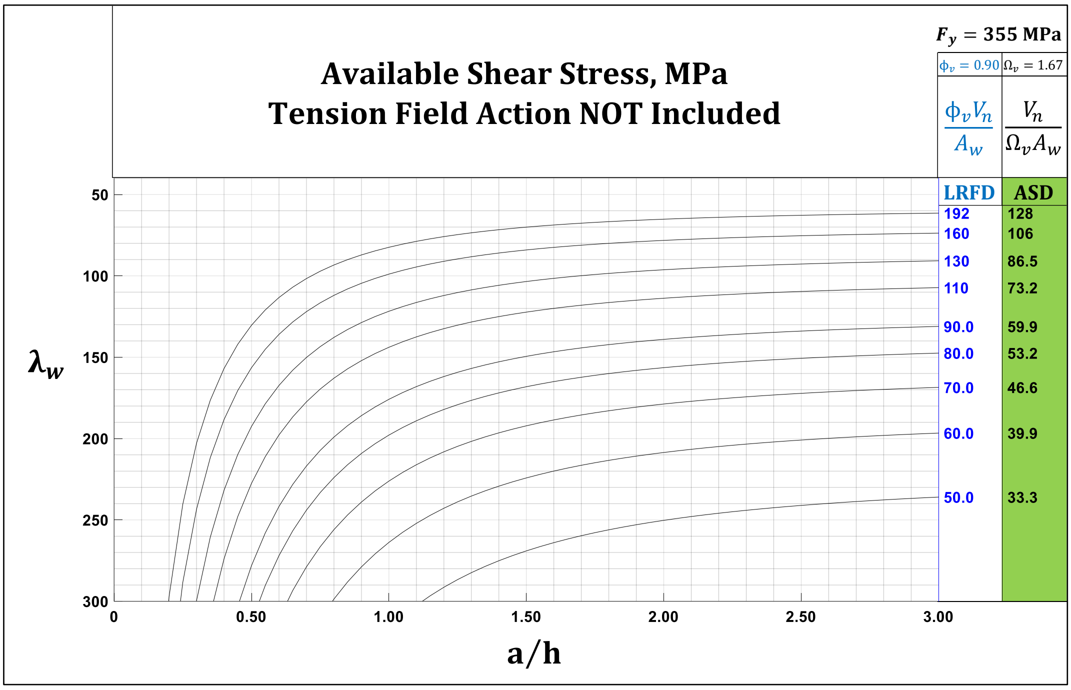

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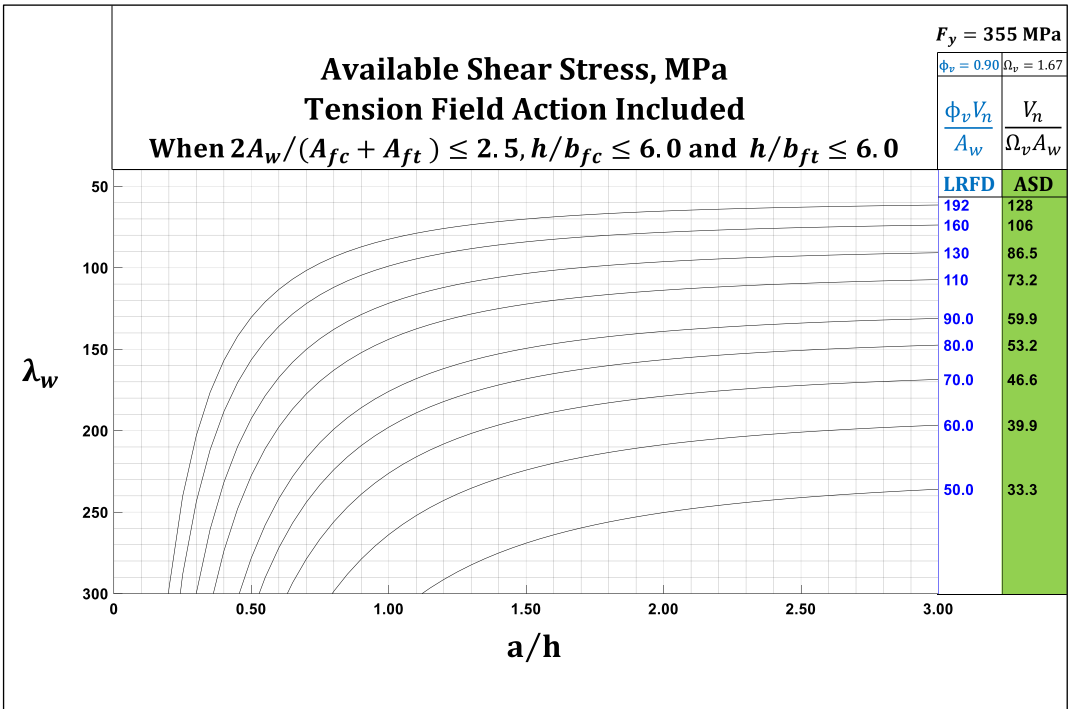

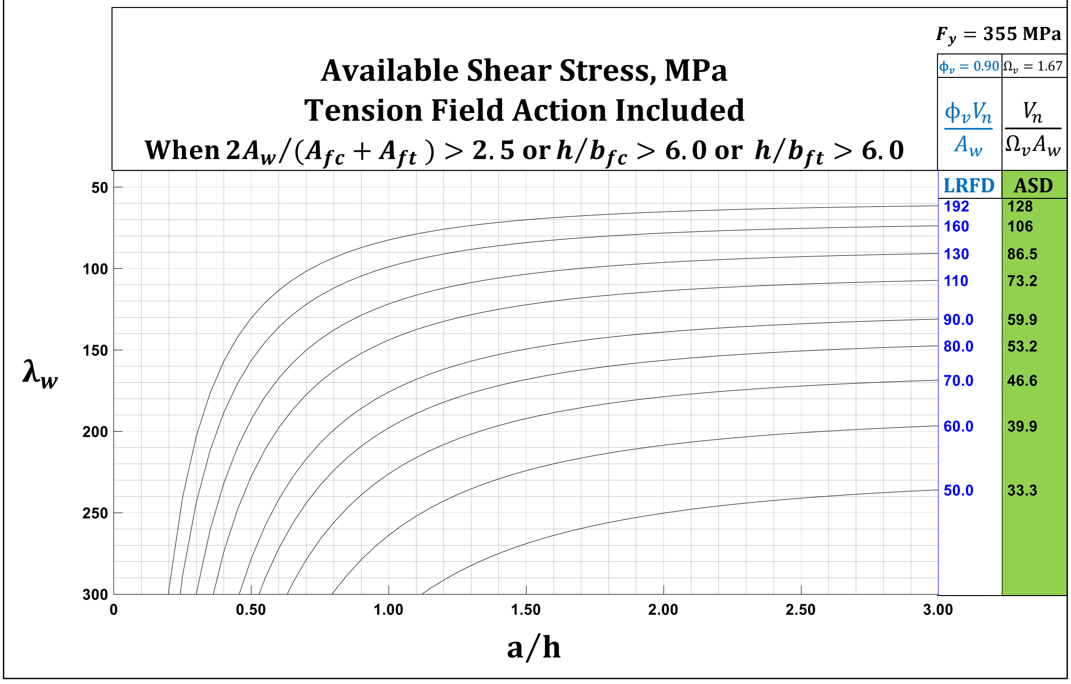

DESIGN TABLES FOR TURKISH STRUCTURAL STEEL CODE
VOLUME II

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

ZAID MOHAMMED H. AL NAHAWI

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
CIVIL ENGINEERING

SEPTEMBER 2020

Approval of the thesis:

DESIGN TABLES FOR TURKISH STRUCTURAL STEEL CODE

submitted by **ZAID MOHAMMED H. AL NAHAWI** in partial fulfillment of the requirements for the degree of **Master of Science in Civil Engineering, Middle East Technical University** by,

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Date: 24.09.2020

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name: Zaid Mohammed H. Al Nahawi

Signature:

ABSTRACT

DESIGN TABLES FOR TURKISH STRUCTURAL STEEL CODE

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Master of Science, Civil Engineering
Supervisor: Assoc. Prof. Dr. Ozan Cem Çelik
Co-Supervisor: Prof. Dr. Cem Topkaya

September 2020, 937 pages

Steel structures comprise a good share of the industrial construction in Turkey. Accordingly, developing systematic means for structural steel design would directly translate into reduced engineering time in a project. American Institute of Steel Construction (AISC) provides practicing engineers with a design manual to facilitate the design process. The design tables in this manual, however, cannot be used in Turkey. Turkish Structural Steel Code has recently been adopted from AISC Specification for Structural Steel Buildings but European not American steel sections are used in the Turkish steel construction industry. Hence, design tables developed for European steel sections would significantly aid the structural engineers in Turkey. The objective of this thesis is to develop a design manual similar to AISC Steel Construction Manual for commonly used European wide-flange steel sections used in the Turkish steel industry. The design manual will also serve as a reference that can be consulted to verify the engineering calculations in Turkey.

Keywords: Building Codes, Steel Structures, Structural Design, Structural Steel, Wide-Flange Sections

ÖZ

TÜRKİYE YAPISAL ÇELİK YÖNETMELİĞİ İÇİN TASARIM TABLOLARI

Al Nahawi, Zaid Mohammed H.
Yüksek Lisans, İnşaat Mühendisliği
Tez Yöneticisi: Doç. Dr. Ozan Cem Çelik
Ortak Tez Yöneticisi: Prof. Dr. Cem Topkaya

Eylül 2020, 937 sayfa

Türkiye'deki endüstriyel yapı stoğunun önemli bir bölümünü çelik yapısal sistemler oluşturmaktadır. Çelik yapı tasarımını sistematik bir şekilde yürüterek mühendislik hesapları için harcanan süre kısaltılabilir. Amerika Birleşik Devletleri'nde bulunan Çelik Yapılar Enstitüsü (AISC) mühendislik hesaplarını kolaylaştırmak amacıyla bir tasarım kılavuzu geliştirmiştir. Çevre ve Şehircilik Bakanlığı tarafından yayınlanan Çelik Yapıların Tasarım, Hesap ve Yapımına Dair Esaslar yönetmeliği AISC tarafından geliştirilen yönetmelik ile büyük ölçüde örtüşmektedir. Türkiye'de çelik yapı tasarımı için Avrupa profilleri kullanıldığından AISC tarafından geliştirilen kılavuzun ülkemizde kullanılması mümkün değildir. Bu tezin amacı ülkemizde çalışan çelik yapı tasarım mühendislerine yardımcı olacak bir tasarım kılavuzunun geliştirilmesidir. Bu sayede ülkemizde kullanılan profiller için tasarım esnasında faydalı olabilecek bilgiler tablolar halinde sunulabilecektir. Bu kılavuz aynı zamanda tasarım hesaplarının doğrulanması amacı ile de kullanılabilir.

Anahtar Kelimeler: Bina Yönetmelikleri, Çelik Yapılar, Geniş Başlıklı Profiller, Yapı Tasarımı, Yapısal Çelik

I dedicate this work to my family, my supervisor, my co-supervisor and Turkey.

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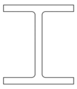
Table E.1 Available strength for members subject to combined forces.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces HD Shapes

F_y = 235 MPa

HD 260×54.1		HD 260×68.2		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172		Shape	HD 260×54.1[f]		HD 260×68.2		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1460	971	1840	1220	2500	1670	3080	2050	3810	2540	4640	3090	0.00	143	95.4	195	129	271	181	338	225	426	284	534	355
1440	959	1810	1210	2480	1650	3050	2030	3770	2510	4600	3060	1.00	143	95.4	195	129	271	181	338	225	426	284	534	355
1420	944	1790	1190	2440	1620	3000	2000	3720	2480	4540	3020	1.50	143	95.4	195	129	271	181	338	225	426	284	534	355
1390	924	1750	1170	2390	1590	2950	1960	3650	2430	4450	2960	2.00	143	95.4	195	129	271	181	338	225	426	284	534	355
1350	899	1710	1130	2330	1550	2870	1910	3560	2370	4350	2890	2.50	143	95.4	195	129	271	181	338	225	426	284	534	355
1310	869	1650	1100	2260	1500	2790	1850	3460	2300	4230	2810	3.00	143	95.4	195	129	271	181	338	225	426	284	534	355
1250	835	1590	1060	2170	1450	2690	1790	3340	2220	4090	2720	3.50	143	95.4	193	129	270	180	338	225	426	283	534	355
1200	797	1520	1010	2080	1390	2570	1710	3200	2130	3930	2610	4.00	143	95.4	190	126	267	177	334	222	422	281	530	353
1140	756	1450	962	1980	1320	2450	1630	3060	2030	3760	2500	4.50	143	95.3	186	124	263	175	330	220	418	278	526	350
1070	713	1370	910	1880	1250	2330	1550	2900	1930	3580	2380	5.00	140	93.1	183	122	259	172	326	217	414	276	522	347
1000	669	1290	855	1770	1180	2190	1460	2740	1820	3380	2250	5.50	137	91.0	179	119	255	170	323	215	410	273	518	345
936	623	1200	799	1650	1100	2060	1370	2580	1710	3190	2120	6.00	134	88.8	176	117	252	167	319	212	407	270	514	342
867	577	1120	742	1540	1020	1920	1280	2410	1600	2980	1990	6.50	130	86.7	172	114	248	165	315	210	403	268	510	339
798	531	1030	685	1420	948	1780	1180	2230	1490	2780	1850	7.00	127	84.6	169	112	244	162	311	207	399	265	506	337
730	485	946	629	1310	872	1640	1090	2070	1370	2580	1720	7.50	124	82.4	165	110	240	160	307	204	395	263	502	334
663	441	863	574	1200	798	1500	999	1900	1260	2380	1580	8.00	121	80.3	161	107	237	158	303	202	391	260	498	331
599	399	783	521	1090	725	1370	911	1730	1150	2180	1450	8.50	117	78.1	158	105	233	155	300	199	387	258	494	329
537	357	706	469	986	656	1240	825	1580	1050	1990	1320	9.00	114	76.0	154	103	229	153	296	197	383	255	490	326
482	320	633	421	885	589	1120	742	1420	946	1800	1200	9.50	111	73.9	151	100	225	150	292	194	379	252	486	323
435	289	572	380	799	531	1010	670	1280	854	1630	1080	10.0	108	71.7	147	97.9	222	148	288	192	375	250	482	321
394	262	518	345	724	482	913	608	1160	775	1480	983	10.5	105	69.6	144	95.6	218	145	284	189	372	247	478	318
359	239	472	314	660	439	832	554	1060	706	1350	896	11.0	101	67.4	140	93.2	214	143	281	187	368	245	474	315
329	219	432	288	604	402	761	507	971	646	1230	819	11.5	98.2	65.3	137	90.8	211	140	277	184	364	242	470	313
302	201	397	264	555	369	699	465	891	593	1130	753	12.0	94.1	62.6	133	88.5	207	138	273	182	360	239	466	310
278	185	366	243	511	340	644	429	822	547	1040	694	12.5	89.7	59.7	129	86.1	203	135	269	179	356	237	462	307
257	171	338	225	473	314	596	396	760	505	964	641	13.0	85.6	57.0	126	83.7	199	133	265	177	352	234	458	305
238	159	314	209	438	292	552	368	704	469	894	595	13.5	82.0	54.6	122	80.9	196	130	262	174	348	232	454	302
222	148	292	194	407	271	514	342	655	436	831	553	14.0	78.6	52.3	117	77.7	192	128	258	171	344	229	450	299
207	138	272	181	380	253	479	319	611	406	775	515	14.5	75.6	50.3	112	74.7	188	125	254	169	340	226	446	297
193	129	254	169	355	236	448	298	571	380	724	482	15.0	72.7	48.4	108	71.9	184	123	250	166	337	224	442	294

Properties

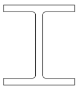
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1460	971	1840	1220	2500	1670	3080	2050	3810	2540	4640	3090
Available Strength in Tensile Rupture (A_e = $0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1400	931	1760	1170	2400	1600	2950	1970	3650	2430	4450	2960
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
224	149	264	176	367	244	472	315	608	405	736	491
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
63.9	42.5	91.00	60.5	127	84.7	159	106	201	134	252	168

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.48	11.7	3.34	13.3	3.38	16.9	3.42	20.4	3.47	25.0	3.54	30.2
Area, × 10^2 mm^2											
68.97		86.82		118.4		145.7		180.3		219.6	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
7981	2788	10450	3668	14920	5135	18910	6456	24330	8236	31310	10450
r_y, × 10 mm											
6.36		6.50		6.58		6.66		6.76		6.90	
r_x/r_y											
1.69		1.69		1.71		1.71		1.72		1.73	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 235 MPa

HD 320×74.2		HD 320×97.6		HD 320×127		HD 320×158		HD 320×198		HD 320×245		Shape	HD 320×74.2[f]		HD 320×97.6		HD 320×127		HD 320×158		HD 320×198		HD 320×245	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
2000	1330	2630	1750	3410	2270	4260	2830	5340	3550	6600	4390	**0.00**	240	160	344	229	455	302	575	382	736	490	938	624
1980	1320	2610	1740	3380	2250	4220	2810	5290	3520	6550	4360	**1.00**	240	160	344	229	455	302	575	382	736	490	938	624
1960	1300	2580	1720	3350	2230	4180	2780	5240	3490	6480	4310	**1.50**	240	160	344	229	455	302	575	382	736	490	938	624
1930	1280	2540	1690	3290	2190	4110	2740	5160	3440	6390	4250	**2.00**	240	160	344	229	455	302	575	382	736	490	938	624
1880	1250	2490	1660	3230	2150	4040	2690	5070	3370	6280	4180	**2.50**	240	160	344	229	455	302	575	382	736	490	938	624
1840	1220	2430	1620	3150	2100	3940	2620	4960	3300	6150	4090	**3.00**	240	160	344	229	455	302	575	382	736	490	938	624
1780	1180	2360	1570	3070	2040	3840	2550	4830	3210	5990	3990	**3.50**	240	160	344	229	455	302	575	382	736	490	938	624
1720	1140	2280	1520	2970	1970	3720	2470	4680	3110	5820	3870	**4.00**	240	160	343	228	453	302	574	382	736	490	938	624
1650	1100	2200	1460	2860	1900	3580	2380	4520	3010	5630	3740	**4.50**	240	160	337	224	447	298	568	378	730	486	933	621
1580	1050	2110	1400	2740	1830	3440	2290	4350	2890	5420	3610	**5.00**	240	160	331	220	441	294	562	374	724	481	927	616
1500	998	2010	1340	2620	1740	3290	2190	4160	2770	5200	3460	**5.50**	235	157	326	217	436	290	556	370	718	477	920	612
1420	945	1910	1270	2490	1660	3140	2090	3970	2640	4970	3310	**6.00**	230	153	320	213	430	286	550	366	712	473	914	608
1340	891	1810	1200	2360	1570	2980	1980	3770	2510	4730	3150	**6.50**	225	150	314	209	424	282	544	362	705	469	908	604
1260	835	1700	1130	2230	1480	2810	1870	3570	2370	4480	2980	**7.00**	220	147	309	205	418	278	538	358	699	465	901	600
1170	780	1600	1060	2090	1390	2640	1760	3360	2240	4240	2820	**7.50**	216	143	303	202	412	274	533	354	693	461	895	596
1090	724	1490	991	1960	1300	2470	1650	3150	2100	3980	2650	**8.00**	211	140	298	198	406	270	527	350	687	457	889	591
1010	670	1380	921	1820	1210	2310	1540	2950	1960	3730	2480	**8.50**	206	137	292	194	401	266	521	346	681	453	883	587
926	616	1280	853	1690	1120	2140	1430	2740	1830	3480	2320	**9.00**	201	134	286	191	395	263	515	342	675	449	876	583
848	564	1180	785	1560	1040	1980	1320	2540	1690	3240	2160	**9.50**	196	130	281	187	389	259	509	339	669	445	870	579
772	514	1080	720	1430	951	1820	1210	2350	1560	3000	2000	**10.0**	191	127	275	183	383	255	503	335	663	441	864	575
701	466	986	656	1310	869	1670	1110	2160	1440	2770	1840	**10.5**	186	124	270	179	377	251	497	331	657	437	858	571
638	425	899	598	1190	792	1520	1010	1970	1310	2540	1690	**11.0**	181	120	264	176	371	247	491	327	651	433	851	566
584	389	822	547	1090	725	1390	928	1800	1200	2320	1550	**11.5**	176	117	258	172	365	243	485	323	645	429	845	562
536	357	755	502	1000	665	1280	852	1660	1100	2130	1420	**12.0**	171	114	253	168	360	239	479	319	639	425	839	558
494	329	696	463	922	613	1180	785	1530	1020	1970	1310	**12.5**	166	111	247	164	354	235	473	315	633	421	833	554
457	304	643	428	852	567	1090	726	1410	939	1820	1210	**13.0**	161	107	241	161	348	231	467	311	627	417	826	550
424	282	597	397	790	526	1010	673	1310	871	1690	1120	**13.5**	154	102	236	157	342	228	461	307	621	413	820	546
394	262	555	369	735	489	941	626	1220	810	1570	1040	**14.0**	147	97.9	230	153	336	224	455	303	614	409	814	541
367	244	517	344	685	456	877	584	1130	755	1460	972	**14.5**	141	93.9	225	149	330	220	449	299	608	405	807	537
343	228	483	322	640	426	820	545	1060	705	1370	908	**15.0**	136	90.2	219	146	324	216	443	295	602	401	801	533

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2000	1330	2630	1750	3410	2270	4260	2830	5340	3550	6600	4390

Available Strength in Tensile Rupture (A_e = 0.75A_g), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1920	1280	2520	1680	3270	2180	4070	2720	5110	3410	6320	4210

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
340	226	393	262	519	346	675	450	871	580	1060	709

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
98.8	65.7	150	99.9	199	132	253	168	324	215	413	275

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
5.02	12.9	3.85	15.0	3.89	18.4	3.94	22.4	4.00	27.7	4.08	34.1

Area, × 10^2 mm^2

94.58	124.4	161.3	201.2	252.3	312.0

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
16450	4959	22930	6985	30820	9239	39640	11840	51900	15310	68130	19710

r_y, × 10 mm

7.24	7.49	7.57	7.67	7.79	7.95

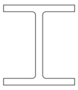
r_x/r_y

1.82	1.81	1.83	1.83	1.84	1.86

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 235 MPa

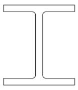
HD 320×300		HD 360×134		HD 360×147		HD 360×162		HD 360×179		HD 360×196		Shape		HD 320×300		HD 360×134		HD 360×147		HD 360×162		HD 360×179		HD 360×196	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
8080	5380	3610	2400	3970	2640	4360	2900	4830	3210	5290	3520	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	0.00	1170	777	542	361	600	399	664	442	736	490	812	540
8020	5340	3590	2390	3950	2630	4340	2890	4800	3190	5270	3500		1.00	1170	777	542	361	600	399	664	442	736	490	812	540
7940	5280	3560	2370	3920	2610	4310	2870	4770	3170	5230	3480		1.50	1170	777	542	361	600	399	664	442	736	490	812	540
7830	5210	3530	2350	3890	2590	4270	2840	4720	3140	5180	3450		2.00	1170	777	542	361	600	399	664	442	736	490	812	540
7700	5120	3480	2320	3840	2550	4210	2800	4670	3100	5120	3400		2.50	1170	777	542	361	600	399	664	442	736	490	812	540
7540	5010	3430	2280	3780	2510	4150	2760	4600	3060	5040	3350		3.00	1170	777	542	361	600	399	664	442	736	490	812	540
7350	4890	3370	2240	3710	2470	4080	2710	4510	3000	4950	3290		3.50	1170	777	542	361	600	399	664	442	736	490	812	540
7140	4750	3300	2190	3630	2420	3990	2660	4420	2940	4850	3230		4.00	1170	777	542	361	600	399	664	442	736	490	812	540
6910	4600	3220	2140	3550	2360	3900	2600	4320	2870	4740	3150		4.50	1160	774	542	361	600	399	664	442	736	490	812	540
6660	4430	3130	2080	3450	2300	3800	2530	4210	2800	4620	3070		5.00	1160	769	539	359	598	398	662	440	735	489	810	539
6390	4250	3040	2020	3350	2230	3690	2460	4090	2720	4490	2990		5.50	1150	765	532	354	590	393	654	435	727	484	802	534
6110	4070	2950	1960	3250	2160	3580	2380	3960	2640	4350	2890		6.00	1140	761	524	349	582	388	646	430	719	478	795	529
5830	3880	2840	1890	3140	2090	3450	2300	3830	2550	4200	2800		6.50	1140	757	517	344	575	382	639	425	711	473	787	523
5530	3680	2740	1820	3020	2010	3330	2210	3690	2450	4050	2700		7.00	1130	752	509	339	567	377	631	420	704	468	779	518
5230	3480	2630	1750	2900	1930	3200	2130	3540	2360	3900	2590		7.50	1120	748	501	334	559	372	623	415	696	463	771	513
4920	3270	2520	1670	2780	1850	3060	2040	3400	2260	3730	2480		8.00	1120	744	494	329	552	367	615	409	688	458	763	508
4620	3070	2400	1600	2650	1760	2930	1950	3250	2160	3570	2380		8.50	1110	739	486	324	544	362	608	404	680	453	756	503
4310	2870	2290	1520	2520	1680	2790	1850	3090	2060	3400	2260		9.00	1100	735	479	318	536	357	600	399	672	447	748	498
4020	2670	2170	1440	2400	1590	2650	1760	2940	1960	3240	2150		9.50	1100	731	471	313	529	352	592	394	665	442	740	492
3720	2480	2050	1370	2270	1510	2510	1670	2790	1850	3070	2040		10.0	1090	726	464	308	521	347	584	389	657	437	732	487
3440	2290	1940	1290	2140	1430	2370	1580	2630	1750	2900	1930		10.5	1090	722	456	303	513	342	577	384	649	432	724	482
3170	2110	1820	1210	2020	1340	2230	1490	2480	1650	2740	1820		11.0	1080	718	448	298	506	336	569	379	641	427	717	477
2900	1930	1710	1140	1890	1260	2100	1400	2330	1550	2570	1710		11.5	1070	714	441	293	498	331	561	373	634	422	709	472
2660	1770	1600	1070	1770	1180	1970	1310	2190	1460	2410	1610		12.0	1070	709	433	288	490	326	553	368	626	416	701	466
2450	1630	1490	995	1660	1100	1840	1220	2050	1360	2260	1500		12.5	1060	705	426	283	483	321	546	363	618	411	693	461
2270	1510	1390	925	1540	1020	1710	1140	1910	1270	2110	1400		13.0	1050	701	418	278	475	316	538	358	610	406	685	456
2100	1400	1290	857	1430	950	1590	1060	1770	1180	1960	1300		13.5	1050	696	411	273	467	311	530	353	602	401	678	451
1950	1300	1200	797	1330	884	1480	983	1640	1090	1820	1210		14.0	1040	692	403	268	460	306	522	348	595	396	670	446
1820	1210	1120	743	1240	824	1380	916	1530	1020	1700	1130		14.5	1030	688	395	263	452	301	515	342	587	390	662	441
1700	1130	1040	694	1160	770	1290	856	1430	953	1580	1050		15.0	1030	683	388	258	444	296	507	337	579	385	654	435

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
8080	5380	3610	2400	3970	2640	4360	2900	4830	3210	5290	3520
Available Strength in Tensile Rupture (A_e = $0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
7740	5160	3450	2300	3800	2540	4180	2790	4620	3080	5070	3380
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1430	952	562	375	624	416	683	455	778	519	860	573
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
511	340	262	174	290	193	321	213	356	237	393	261

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.12	41.4	4.83	17.8	4.84	19.1	4.87	20.7	4.89	22.5	4.91	24.5
Area, × 10^2 mm^2											
382.1		170.6		187.9		206.3		228.3		250.3	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
86900	24600	41510	15080	46290	16720	51540	18560	57440	20680	63630	22860
r_y, × 10 mm											
8.02		9.40		9.43		9.49		9.52		9.56	
r_x / r_y											
1.88		1.66		1.66		1.67		1.67		1.67	

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 235 MPa

HD 400×187		HD 400×216		HD 400×237		HD 400×262		HD 400×287		HD 400×314		Shape		HD 400×187		HD 400×216		HD 400×237		HD 400×262		HD 400×287		HD 400×314	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
5030	3340	5830	3880	6360	4230	7080	4710	7750	5150	8440	5620	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	**0.00**	770	512	901	600	991	659	1110	740	1230	818	1350	897
5000	3330	5800	3860	6330	4210	7040	4690	7710	5130	8400	5590		**1.00**	770	512	901	600	991	659	1110	740	1230	818	1350	897
4970	3310	5760	3830	6300	4190	7000	4660	7670	5100	8350	5560		**1.50**	770	512	901	600	991	659	1110	740	1230	818	1350	897
4930	3280	5710	3800	6240	4150	6940	4620	7600	5060	8290	5510		**2.00**	770	512	901	600	991	659	1110	740	1230	818	1350	897
4870	3240	5650	3760	6170	4110	6870	4570	7520	5010	8200	5460		**2.50**	770	512	901	600	991	659	1110	740	1230	818	1350	897
4810	3200	5580	3710	6090	4050	6780	4510	7430	4940	8100	5390		**3.00**	770	512	901	600	991	659	1110	740	1230	818	1350	897
4730	3150	5490	3650	6000	3990	6680	4440	7310	4870	7970	5310		**3.50**	770	512	901	600	991	659	1110	740	1230	818	1350	897
4640	3090	5390	3590	5890	3920	6560	4360	7190	4780	7840	5210		**4.00**	770	512	901	600	991	659	1110	740	1230	818	1350	897
4550	3020	5280	3510	5770	3840	6430	4280	7040	4690	7680	5110		**4.50**	770	512	901	600	991	659	1110	740	1230	818	1350	897
4440	2950	5160	3430	5640	3750	6280	4180	6890	4580	7510	5000		**5.00**	770	512	901	600	991	659	1110	740	1230	818	1350	897
4330	2880	5030	3350	5500	3660	6130	4080	6720	4470	7330	4880		**5.50**	765	509	897	597	987	656	1110	738	1230	816	1340	895
4200	2800	4890	3260	5350	3560	5960	3970	6540	4350	7140	4750		**6.00**	757	504	889	592	979	651	1100	732	1220	810	1340	890
4080	2710	4750	3160	5190	3450	5790	3850	6350	4230	6930	4610		**6.50**	749	499	881	586	971	646	1090	727	1210	805	1330	884
3940	2620	4590	3060	5020	3340	5600	3730	6150	4090	6720	4470		**7.00**	742	494	874	581	963	641	1080	722	1200	800	1320	879
3800	2530	4430	2950	4850	3230	5410	3600	5950	3960	6490	4320		**7.50**	734	488	866	576	956	636	1080	717	1190	795	1310	874
3660	2440	4270	2840	4670	3110	5220	3470	5730	3810	6260	4170		**8.00**	726	483	858	571	948	631	1070	711	1190	789	1310	868
3510	2340	4100	2730	4490	2990	5020	3340	5510	3670	6030	4010		**8.50**	719	478	850	566	940	625	1060	706	1180	784	1300	863
3360	2240	3930	2620	4300	2860	4810	3200	5290	3520	5780	3850		**9.00**	711	473	843	561	932	620	1050	701	1170	779	1290	858
3210	2140	3760	2500	4120	2740	4600	3060	5070	3370	5540	3690		**9.50**	703	468	835	555	924	615	1050	696	1160	774	1280	852
3060	2040	3590	2390	3930	2610	4400	2920	4840	3220	5290	3520		**10.0**	696	463	827	550	917	610	1040	690	1150	768	1270	847
2910	1940	3410	2270	3740	2490	4190	2790	4610	3070	5050	3360		**10.5**	688	458	819	545	909	605	1030	685	1150	763	1270	842
2760	1840	3240	2150	3550	2360	3980	2650	4380	2920	4800	3190		**11.0**	680	452	812	540	901	599	1020	680	1140	758	1260	836
2610	1740	3070	2040	3360	2240	3770	2510	4160	2770	4550	3030		**11.5**	672	447	804	535	893	594	1010	675	1130	753	1250	831
2460	1640	2900	1930	3180	2110	3570	2370	3930	2620	4310	2870		**12.0**	665	442	796	530	885	589	1010	669	1120	747	1240	826
2320	1540	2730	1820	2990	1990	3360	2240	3710	2470	4070	2710		**12.5**	657	437	788	525	878	584	998	664	1120	742	1230	821
2180	1450	2560	1710	2810	1870	3160	2110	3500	2330	3840	2550		**13.0**	649	432	781	519	870	579	990	659	1110	737	1230	815
2040	1360	2400	1600	2640	1760	2970	1980	3290	2190	3600	2400		**13.5**	642	427	773	514	862	574	983	654	1100	731	1220	810
1900	1260	2250	1500	2470	1640	2780	1850	3080	2050	3380	2250		**14.0**	634	422	765	509	854	568	975	649	1090	726	1210	805
1770	1180	2090	1390	2300	1530	2590	1730	2870	1910	3160	2100		**14.5**	626	417	757	504	846	563	967	643	1080	721	1200	799
1660	1100	1960	1300	2150	1430	2420	1610	2690	1790	2950	1960		**15.0**	618	411	750	499	839	558	959	638	1080	716	1190	794

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
5030	3340	5830	3880	6360	4230	7080	4710	7750	5150	8440	5620
Available Strength in Tensile Rupture (A_e = $0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
4810	3210	5580	3720	6090	4060	6780	4520	7420	4950	8080	5390
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
778	519	915	610	1010	675	1150	768	1250	835	1400	934
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
392	261	460	306	505	336	566	377	625	416	684	455

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
5.15	23.7	5.20	27.1	5.22	29.4	5.25	32.5	5.28	35.5	5.30	38.5
Area × 10^2, mm^2											
237.6		275.5		300.9		334.6		366.3		399.2	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
60180	23920	71140	28250	78780	31040	89410	35020	99710	38780	110200	42600
r_y, × 10 mm											
10.0		10.1		10.2		10.2		10.3		10.3	
r_x/r_y											
1.59		1.59		1.59		1.60		1.60		1.61	

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 235 MPa

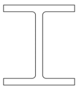
HD 400×347		HD 400×382		HD 400×421		HD 400×463		HD 400×509		HD 400×551		Shape	HD 400×347		HD 400×382		HD 400×421		HD 400×463		HD 400×509		HD 400×551	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
9350	6220	10300	6850	11400	7560	12500	8300	13700	9130	14800	9870	0.00	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
9310	6190	10300	6820	11300	7520	12400	8260	13700	9090	14800	9830	1.00	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
9250	6160	10200	6780	11200	7480	12300	8210	13600	9040	14700	9780	1.50	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
9180	6110	10100	6730	11200	7420	12300	8150	13500	8980	14600	9700	2.00	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
9080	6040	10000	6660	11000	7350	12100	8070	13400	8890	14400	9610	2.50	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
8970	5970	9890	6580	10900	7260	12000	7970	13200	8790	14300	9500	3.00	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
8840	5880	9750	6480	10800	7160	11800	7860	13000	8670	14100	9370	3.50	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
8690	5780	9580	6380	10600	7040	11600	7730	12800	8530	13900	9220	4.00	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
8520	5670	9400	6250	10400	6910	11400	7590	12600	8370	13600	9060	4.50	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
8340	5550	9200	6120	10200	6760	11200	7430	12300	8200	13300	8880	5.00	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
8140	5410	8980	5980	9930	6610	10900	7260	12100	8020	13100	8680	5.50	1510	1000	1680	1120	1880	1250	2090	1390	2330	1550	2550	1700
7930	5270	8750	5820	9680	6440	10600	7080	11800	7830	12700	8470	6.00	1500	998	1670	1110	1870	1240	2080	1380	2320	1550	2540	1690
7700	5130	8510	5660	9410	6260	10400	6890	11500	7620	12400	8250	6.50	1490	992	1670	1110	1860	1240	2070	1380	2320	1540	2530	1680
7470	4970	8250	5490	9130	6080	10100	6690	11100	7400	12100	8020	7.00	1480	987	1660	1100	1850	1230	2060	1370	2310	1540	2520	1680
7220	4810	7990	5310	8840	5880	9740	6480	10800	7180	11700	7780	7.50	1480	982	1650	1100	1840	1230	2050	1370	2300	1530	2510	1670
6970	4640	7710	5130	8540	5680	9420	6270	10400	6940	11300	7530	8.00	1470	976	1640	1090	1840	1220	2050	1360	2290	1520	2510	1670
6710	4470	7430	4940	8240	5480	9080	6040	10100	6700	10900	7270	8.50	1460	971	1630	1090	1830	1220	2040	1360	2280	1520	2500	1660
6450	4290	7140	4750	7920	5270	8740	5820	9700	6450	10500	7010	9.00	1450	965	1630	1080	1820	1210	2030	1350	2270	1510	2490	1660
6180	4110	6850	4550	7600	5060	8390	5580	9320	6200	10100	6740	9.50	1440	960	1620	1080	1810	1200	2020	1340	2260	1510	2480	1650
5910	3930	6550	4360	7280	4840	8040	5350	8940	5950	9720	6460	10.0	1430	955	1610	1070	1800	1200	2010	1340	2260	1500	2470	1640
5640	3750	6250	4160	6950	4630	7690	5120	8560	5690	9300	6190	10.5	1430	949	1600	1060	1790	1190	2000	1330	2250	1490	2460	1640
5370	3570	5960	3960	6630	4410	7330	4880	8170	5440	8890	5910	11.0	1420	944	1590	1060	1790	1190	2000	1330	2240	1490	2450	1630
5100	3390	5660	3770	6310	4190	6980	4640	7790	5180	8480	5640	11.5	1410	939	1580	1050	1780	1180	1990	1320	2230	1480	2440	1630
4830	3220	5370	3570	5980	3980	6630	4410	7400	4930	8060	5370	12.0	1400	933	1580	1050	1770	1180	1980	1320	2220	1480	2430	1620
4570	3040	5080	3380	5670	3770	6280	4180	7020	4670	7660	5090	12.5	1390	928	1570	1040	1760	1170	1970	1310	2210	1470	2430	1610
4310	2870	4790	3190	5350	3560	5940	3950	6650	4420	7250	4830	13.0	1390	923	1560	1040	1750	1170	1960	1300	2200	1470	2420	1610
4060	2700	4510	3000	5050	3360	5610	3730	6280	4180	6860	4560	13.5	1380	917	1550	1030	1740	1160	1950	1300	2190	1460	2410	1600
3810	2530	4240	2820	4750	3160	5280	3510	5920	3940	6470	4310	14.0	1370	912	1540	1030	1740	1150	1940	1290	2190	1450	2400	1600
3560	2370	3970	2640	4460	2960	4960	3300	5570	3710	6090	4050	14.5	1360	906	1540	1020	1730	1150	1940	1290	2180	1450	2390	1590
3330	2220	3710	2470	4160	2770	4640	3090	5220	3470	5720	3800	15.0	1350	901	1530	1020	1720	1140	1930	1280	2170	1440	2380	1580

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
9350	6220	10300	6850	11400	7560	12500	8300	13700	9130	14800	9870
Available Strength in Tensile Rupture (A_e = $0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
8950	5970	9860	6580	10900	7250	11900	7960	13100	8760	14200	9470
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1560	1040	1750	1170	1970	1310	2200	1460	2460	1640	2690	1800
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
768	511	853	567	949	632	1050	700	1170	781	1280	851

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
5.36	42.6	5.39	46.8	5.43	51.4	5.47	56.2	5.53	61.6	5.57	66.5
Area, × 10^2 mm^2											
442.0		487.1		537.1		589.5		649.0		701.4	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
124900	48100	141300	53600	159600	60100	180200	67000	204500	75400	226100	82490
r_y, × 10 mm											
10.4		10.5		10.6		10.7		10.8		10.9	
r_x / r_y											
1.61		1.62		1.63		1.64		1.65		1.65	

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 235 MPa

Shape	HD 400×592		HD 400×634		HD 400×677		HD 400×744		HD 400×818		HD 400×900	
Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
	Available Compressive Strength, kN											
Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	16000	10600	17100	11400	18300	12100	20100	13300	22100	14700	24300	16200
1.00	15900	10600	17000	11300	18200	12100	20000	13300	22000	14600	24200	16100
1.50	15800	10500	16900	11300	18100	12000	19900	13200	21900	14600	24100	16000
2.00	15700	10400	16800	11200	18000	12000	19700	13100	21700	14500	23900	15900
2.50	15600	10300	16700	11100	17800	11800	19600	13000	21500	14300	23700	15800
3.00	15400	10200	16500	11000	17600	11700	19400	12900	21300	14200	23500	15600
3.50	15200	10100	16300	10800	17400	11600	19100	12700	21000	14000	23200	15400
4.00	14900	9940	16000	10600	17100	11400	18800	12500	20700	13800	22900	15200
4.50	14700	9760	15700	10500	16800	11200	18500	12300	20400	13600	22500	15000
5.00	14400	9570	15400	10300	16500	11000	18200	12100	20000	13300	22100	14700
5.50	14100	9360	15100	10000	16200	10800	17800	11800	19600	13100	21700	14400
6.00	13700	9140	14700	9810	15800	10500	17400	11600	19200	12800	21200	14100
6.50	13400	8910	14400	9560	15400	10300	17000	11300	18800	12500	20800	13800
7.00	13000	8660	14000	9300	15000	9980	16500	11000	18300	12200	20200	13500
7.50	12600	8400	13600	9030	14600	9690	16100	10700	17800	11800	19700	13100
8.00	12200	8130	13100	8750	14100	9390	15600	10400	17300	11500	19100	12700
8.50	11800	7860	12700	8460	13700	9090	15100	10000	16700	11100	18600	12300
9.00	11400	7580	12300	8160	13200	8770	14600	9700	16200	10800	18000	11900
9.50	11000	7290	11800	7860	12700	8450	14100	9350	15600	10400	17300	11500
10.0	10500	7000	11300	7550	12200	8130	13500	9000	15000	10000	16700	11100
10.5	10100	6710	10900	7240	11700	7800	13000	8640	14500	9620	16100	10700
11.0	9640	6410	10400	6930	11200	7470	12500	8290	13900	9230	15500	10300
11.5	9200	6120	9940	6610	10700	7140	11900	7930	13300	8840	14800	9870
12.0	8760	5830	9480	6300	10200	6810	11400	7570	12700	8450	14200	9440
12.5	8320	5540	9010	6000	9740	6480	10800	7210	12100	8060	13600	9020
13.0	7890	5250	8550	5690	9250	6160	10300	6860	11500	7680	12900	8600
13.5	7470	4970	8100	5390	8770	5840	9780	6510	11000	7300	12300	8190
14.0	7050	4690	7660	5090	8300	5520	9270	6170	10400	6920	11700	7780
14.5	6640	4420	7220	4810	7840	5220	8760	5830	9850	6550	11100	7370
15.0	6250	4160	6800	4520	7390	4910	8270	5500	9310	6190	10500	6980

Shape	HD 400×592		HD 400×634		HD 400×677		HD 400×744		HD 400×818		HD 400×900	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	Available Flexural Strength, kN·m											
Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
1.00	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
1.50	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
2.00	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
2.50	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
3.00	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
3.50	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
4.00	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
4.50	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
5.00	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
5.50	2780	1850	3010	2000	3250	2160	3630	2420	4070	2710	4570	3040
6.00	2770	1840	3000	2000	3240	2160	3630	2410	4070	2710	4570	3040
6.50	2760	1840	2990	1990	3230	2150	3620	2410	4060	2700	4560	3030
7.00	2750	1830	2980	1980	3220	2140	3610	2400	4050	2690	4550	3030
7.50	2740	1830	2970	1980	3210	2140	3600	2390	4040	2690	4540	3020
8.00	2740	1820	2960	1970	3200	2130	3590	2390	4030	2680	4530	3010
8.50	2730	1810	2960	1970	3190	2130	3580	2380	4020	2680	4520	3010
9.00	2720	1810	2950	1960	3180	2120	3570	2370	4010	2670	4510	3000
9.50	2710	1800	2940	1950	3180	2110	3560	2370	4000	2660	4500	2990
10.0	2700	1800	2930	1950	3170	2110	3550	2360	3990	2660	4490	2990
10.5	2690	1790	2920	1940	3160	2100	3540	2360	3980	2650	4480	2980
11.0	2680	1780	2910	1940	3150	2090	3530	2350	3970	2640	4470	2970
11.5	2670	1780	2900	1930	3140	2090	3520	2340	3960	2640	4460	2970
12.0	2660	1770	2890	1920	3130	2080	3510	2340	3950	2630	4450	2960
12.5	2650	1770	2880	1920	3120	2080	3500	2330	3940	2620	4440	2950
13.0	2650	1760	2870	1910	3110	2070	3490	2320	3930	2620	4430	2950
13.5	2640	1750	2860	1910	3100	2060	3480	2320	3920	2610	4420	2940
14.0	2630	1750	2850	1900	3090	2060	3470	2310	3910	2600	4410	2930
14.5	2620	1740	2850	1890	3080	2050	3460	2300	3900	2600	4400	2920
15.0	2610	1740	2840	1890	3070	2040	3450	2300	3890	2590	4390	2920

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
16000	10600	17100	11400	18300	12100	20100	13300	22100	14700	24300	16200
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
15300	10200	16400	10900	17500	11700	19200	12800	21100	14100	23300	15500
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
2950	1970	3180	2120	3490	2320	3900	2600	4380	2920	4930	3290
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
1390	925	1510	1000	1620	1080	1810	1200	2020	1350	2270	1510

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
5.61	71.2	5.66	76.1	5.71	81.0	5.78	88.3	5.85	96.6	5.93	106
Area, × 10^2 mm^2											
754.9		808.0		863.4		948.1		1040.0		1150.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
250200	90170	274200	98250	299500	106900	342100	119900	392200	135500	450200	153300
r_y, × 10 mm											
10.9		11.0		11.1		11.3		11.4		11.6	
r_x / r_y											
1.67		1.67		1.67		1.69		1.70		1.71	

Table E.1 Continued.

Available Strength for Members Subject to Flexural, Axial, Shear, and Combined Forces
HD Shapes

F_y = 235 MPa

HD 400x990		HD 400x1086		Shape		HD 400×990		HD 400×1086	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN						Available Flexural Strength, kN·m			
LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD
26700	17800	29300	19500	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	**0.00**	5140	3420	5750	3830
26600	17700	29200	19400		**1.00**	5140	3420	5750	3830
26500	17600	29100	19300		**1.50**	5140	3420	5750	3830
26300	17500	28900	19200		**2.00**	5140	3420	5750	3830
26100	17400	28700	19100		**2.50**	5140	3420	5750	3830
25800	17200	28400	18900		**3.00**	5140	3420	5750	3830
25500	17000	28100	18700		**3.50**	5140	3420	5750	3830
25200	16800	27700	18400		**4.00**	5140	3420	5750	3830
24800	16500	27300	18200		**4.50**	5140	3420	5750	3830
24400	16200	26800	17900		**5.00**	5140	3420	5750	3830
23900	15900	26400	17500		**5.50**	5140	3420	5750	3830
23400	15600	25800	17200		**6.00**	5140	3420	5750	3830
22900	15200	25300	16800		**6.50**	5120	3410	5750	3820
22300	14900	24700	16400		**7.00**	5110	3400	5740	3820
21800	14500	24000	16000		**7.50**	5100	3400	5720	3810
21200	14100	23400	15600		**8.00**	5090	3390	5710	3800
20500	13700	22700	15100		**8.50**	5080	3380	5700	3790
19900	13200	22000	14700		**9.00**	5070	3370	5690	3790
19200	12800	21300	14200		**9.50**	5060	3370	5680	3780
18600	12400	20600	13700		**10.0**	5050	3360	5670	3770
17900	11900	19900	13200		**10.5**	5040	3350	5660	3760
17200	11400	19100	12700		**11.0**	5030	3350	5650	3760
16500	11000	18400	12200		**11.5**	5020	3340	5630	3750
15800	10500	17700	11800		**12.0**	5010	3330	5620	3740
15100	10100	16900	11300		**12.5**	5000	3320	5610	3730
14500	9620	16200	10800		**13.0**	4990	3320	5600	3730
13800	9170	15400	10300		**13.5**	4970	3310	5590	3720
13100	8720	14700	9790		**14.0**	4960	3300	5580	3710
12400	8280	14000	9310		**14.5**	4950	3300	5570	3700
11800	7850	13300	8840		**15.0**	4940	3290	5560	3700

Properties

Available Strength in Tensile Yielding, kN				Limiting Unbraced Lengths, m			
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	L_p	L_r	L_p	L_r
26700	17800	29300	19500	6.02	115	6.11	125
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN				Area, × 10^2 mm^2			
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	1262		1386	
25600	17000	28100	18700	Moment of Inertia, × 10^4 mm^4			
Available Strength in Shear, kN				I_x	I_y	I_x	I_y
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	518900	173400	595700	196200
5580	3720	6260	4170	r_y, × 10 mm			
Available Strength in Flexure about Y-Y axis, kN·m				11.7		11.9	
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	r_x / r_y			
2530	1680	2830	1880	1.73		1.74	

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

HD Shapes

F_y = 275 MPa

HD 260×54.1		HD 260×68.2		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172		Shape		HD 260×54.1[f]		HD 260×68.2[f]		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1710	1140	2150	1430	2930	1950	3610	2400	4460	2970	5440	3620	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	0.00	164	109	227	151	318	211	396	263	499	332	625	416
1680	1120	2120	1410	2890	1920	3560	2370	4410	2930	5370	3570		1.00	164	109	227	151	318	211	396	263	499	332	625	416
1650	1100	2080	1390	2840	1890	3500	2330	4340	2880	5290	3520		1.50	164	109	227	151	318	211	396	263	499	332	625	416
1610	1070	2030	1350	2780	1850	3420	2280	4240	2820	5180	3440		2.00	164	109	227	151	318	211	396	263	499	332	625	416
1560	1040	1970	1310	2690	1790	3320	2210	4120	2740	5030	3350		2.50	164	109	227	151	318	211	396	263	499	332	625	416
1500	998	1900	1260	2600	1730	3200	2130	3980	2650	4870	3240		3.00	164	109	227	151	318	211	396	263	499	332	625	416
1430	952	1810	1210	2480	1650	3070	2040	3820	2540	4680	3110		3.50	164	109	224	149	314	209	392	261	496	330	622	414
1360	902	1720	1150	2360	1570	2920	1940	3640	2420	4470	2970		4.00	164	109	219	146	308	205	387	258	490	326	617	410
1270	848	1620	1080	2230	1480	2760	1840	3450	2290	4240	2820		4.50	164	109	214	142	303	202	382	254	485	323	611	407
1190	792	1520	1010	2090	1390	2600	1730	3240	2160	4000	2660		5.00	160	106	209	139	298	198	377	251	479	319	606	403
1100	734	1420	942	1950	1300	2420	1610	3030	2020	3750	2500		5.50	155	103	204	136	293	195	371	247	474	315	600	399
1020	676	1310	870	1800	1200	2250	1490	2820	1880	3500	2330		6.00	151	100	199	133	288	191	366	244	469	312	594	395
928	618	1200	798	1660	1100	2070	1380	2600	1730	3240	2160		6.50	146	97.4	194	129	283	188	361	240	463	308	589	392
842	560	1090	727	1510	1010	1890	1260	2390	1590	2980	1980		7.00	142	94.5	189	126	277	185	355	237	458	305	583	388
759	505	989	658	1370	914	1720	1150	2180	1450	2730	1820		7.50	138	91.6	185	123	272	181	350	233	453	301	578	384
679	451	888	591	1240	823	1550	1030	1970	1310	2480	1650		8.00	133	88.7	180	120	267	178	345	229	447	298	572	381
602	400	791	526	1110	735	1390	927	1770	1180	2240	1490		8.50	129	85.8	175	116	262	174	340	226	442	294	567	377
537	357	706	469	986	656	1240	827	1580	1050	2010	1340		9.00	125	82.8	170	113	257	171	334	222	436	290	561	373
482	320	633	421	885	589	1120	742	1420	946	1800	1200		9.50	120	79.9	165	110	252	167	329	219	431	287	556	370
435	289	572	380	799	531	1010	670	1280	854	1630	1080		10.0	116	77.0	160	107	246	164	324	215	426	283	550	366
394	262	518	345	724	482	913	608	1160	775	1480	983		10.5	110	73.5	155	103	241	160	319	212	420	280	544	362
359	239	472	314	660	439	832	554	1060	706	1350	896		11.0	104	69.5	150	100	236	157	313	208	415	276	539	359
329	219	432	288	604	402	761	507	971	646	1230	819		11.5	99.0	65.8	146	96.8	231	154	308	205	409	272	533	355
302	201	397	264	555	369	699	465	891	593	1130	753		12.0	94.1	62.6	139	92.4	226	150	303	201	404	269	528	351
278	185	366	243	511	340	644	429	822	547	1040	694		12.5	89.7	59.7	133	88.2	220	147	297	198	399	265	522	347
257	171	338	225	473	314	596	396	760	505	964	641		13.0	85.6	57.0	127	84.4	215	143	292	194	393	262	517	344
238	159	314	209	438	292	552	368	704	469	894	595		13.5	82.0	54.6	122	80.9	210	140	287	191	388	258	511	340
222	148	292	194	407	271	514	342	655	436	831	553		14.0	78.6	52.3	117	77.7	205	136	282	187	383	255	506	336
207	138	272	181	380	253	479	319	611	406	775	515		14.5	75.6	50.3	112	74.7	200	133	276	184	377	251	500	333
193	129	254	169	355	236	448	298	571	380	724	482		15.0	72.7	48.4	108	71.9	193	128	271	180	372	247	494	329

Properties

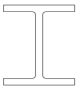
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1710	1140	2150	1430	2930	1950	3610	2400	4460	2970	5440	3620
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1670	1110	2100	1400	2860	1910	3520	2350	4360	2910	5310	3540
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
262	174	309	206	429	286	553	369	711	474	861	574
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
72.1	48.0	106	70.5	149	99.2	186	124	235	157	295	196

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.51	10.3	3.09	11.6	3.12	14.6	3.16	17.5	3.21	21.4	3.27	25.8
Area, × 10^2 mm^2											
68.97		86.82		118.4		145.7		180.3		219.6	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
7981	2788	10450	3668	14920	5135	18910	6456	24330	8236	31310	10450
r_y, × 10 mm											
6.36		6.50		6.58		6.66		6.76		6.90	
r_x/r_y											
1.69		1.69		1.71		1.71		1.72		1.73	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces HD Shapes

F_y = 275 MPa

HD 320×74.2		HD 320×97.6		HD 320×127		HD 320×158		HD 320×198		HD 320×245		Shape	HD 320×74.2^f		HD 320×97.6		HD 320×127		HD 320×158		HD 320×198		HD 320×245	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
2340	1560	3080	2050	3990	2660	4980	3310	6240	4150	7720	5140	0.00	274	183	403	268	532	354	673	448	861	573	1100	730
2310	1540	3050	2030	3950	2630	4930	3280	6180	4110	7650	5090	1.00	274	183	403	268	532	354	673	448	861	573	1100	730
2280	1520	3010	2000	3900	2600	4870	3240	6110	4070	7560	5030	1.50	274	183	403	268	532	354	673	448	861	573	1100	730
2240	1490	2950	1970	3830	2550	4790	3180	6010	4000	7440	4950	2.00	274	183	403	268	532	354	673	448	861	573	1100	730
2180	1450	2890	1920	3750	2490	4680	3110	5880	3910	7290	4850	2.50	274	183	403	268	532	354	673	448	861	573	1100	730
2120	1410	2800	1870	3640	2420	4550	3030	5730	3810	7110	4730	3.00	274	183	403	268	532	354	673	448	861	573	1100	730
2040	1360	2710	1800	3520	2340	4410	2930	5550	3690	6900	4590	3.50	274	183	403	268	532	354	673	448	861	573	1100	730
1960	1300	2610	1730	3390	2260	4250	2830	5350	3560	6660	4430	4.00	274	183	396	264	525	350	667	444	856	570	1090	728
1870	1240	2490	1660	3250	2160	4070	2710	5140	3420	6410	4260	4.50	274	183	388	258	517	344	659	438	848	564	1090	722
1770	1180	2370	1580	3100	2060	3890	2590	4910	3270	6130	4080	5.00	274	183	381	253	509	339	650	433	839	558	1080	716
1670	1110	2250	1500	2930	1950	3690	2450	4670	3110	5840	3890	5.50	268	179	373	248	501	333	642	427	831	553	1070	710
1570	1040	2120	1410	2770	1840	3490	2320	4420	2940	5540	3690	6.00	262	174	365	243	493	328	634	422	822	547	1060	705
1460	973	1980	1320	2600	1730	3280	2180	4160	2770	5230	3480	6.50	255	170	358	238	485	323	626	416	814	542	1050	699
1360	903	1850	1230	2420	1610	3060	2040	3900	2590	4910	3270	7.00	248	165	350	233	477	317	617	411	806	536	1040	693
1250	833	1720	1140	2250	1500	2850	1900	3640	2420	4600	3060	7.50	242	161	342	228	469	312	609	405	797	530	1030	687
1150	764	1580	1050	2080	1380	2640	1760	3380	2250	4280	2850	8.00	235	156	335	223	461	307	601	400	789	525	1020	682
1050	697	1450	967	1910	1270	2430	1620	3120	2080	3960	2640	8.50	228	152	327	217	453	301	593	394	780	519	1020	676
951	633	1330	883	1750	1160	2230	1480	2870	1910	3660	2430	9.00	221	147	319	212	445	296	585	389	772	514	1010	670
856	569	1210	802	1590	1060	2040	1350	2620	1750	3360	2230	9.50	215	143	311	207	436	290	576	383	764	508	998	664
772	514	1090	723	1440	958	1840	1230	2390	1590	3070	2040	10.0	208	138	304	202	428	285	568	378	755	502	990	659
701	466	986	656	1310	869	1670	1110	2160	1440	2790	1850	10.5	201	134	296	197	420	280	560	373	747	497	981	653
638	425	899	598	1190	792	1520	1010	1970	1310	2540	1690	11.0	195	130	288	192	412	274	552	367	738	491	972	647
584	389	822	547	1090	725	1390	928	1800	1200	2320	1550	11.5	187	125	281	187	404	269	543	362	730	486	964	641
536	357	755	502	1000	665	1280	852	1660	1100	2130	1420	12.0	178	118	273	182	396	264	535	356	722	480	955	636
494	329	696	463	922	613	1180	785	1530	1020	1970	1310	12.5	169	112	265	177	388	258	527	351	713	475	947	630
457	304	643	428	852	567	1090	726	1410	939	1820	1210	13.0	161	107	258	171	380	253	519	345	705	469	938	624
424	282	597	397	790	526	1010	673	1310	871	1690	1120	13.5	154	102	247	164	372	247	511	340	696	463	929	618
394	262	555	369	735	489	941	626	1220	810	1570	1040	14.0	147	97.9	237	158	364	242	502	334	688	458	921	612
367	244	517	344	685	456	877	584	1130	755	1460	972	14.5	141	93.9	227	151	356	237	494	329	680	452	912	607
343	228	483	322	640	426	820	545	1060	705	1370	908	15.0	136	90.2	219	146	348	231	486	323	671	447	903	601

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2340	1560	3080	2050	3990	2660	4980	3310	6240	4150	7720	5140

Available Strength in Tensile Rupture (A_e = 0.75A_g), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2290	1530	3010	2010	3900	2600	4870	3240	6100	4070	7550	5030

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
397	306	460	307	607	405	790	526	1020	679	1240	829

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
111	74.1	176	117	232	155	296	197	379	252	483	321

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
5.04	11.4	3.56	13.1	3.59	15.9	3.64	19.2	3.70	23.8	3.77	29.2

Area, × 10^2 mm^2

94.58	124.4	161.3	201.2	252.3	312.0

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
16450	4959	22930	6985	30820	9239	39640	11840	51900	15310	68130	19710

r_y, × 10 mm

7.24	7.49	7.57	7.67	7.79	7.95

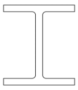
r_x/r_y

1.82	1.81	1.83	1.83	1.84	1.86

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 275 MPa

HD 320×300		HD 360×134		HD 360×147		HD 360×162		HD 360×179		HD 360×196		Shape		HD 320×300		HD 360×134[f]		HD 360×147		HD 360×162		HD 360×179		HD 360×196	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
9460	6290	4220	2810	4650	3090	5110	3400	5650	3760	6190	4120	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	**0.00**	1370	909	634	422	702	467	777	517	862	573	950	632
9370	6240	4190	2790	4620	3070	5070	3380	5610	3740	6160	4100		**1.00**	1370	909	634	422	702	467	777	517	862	573	950	632
9270	6170	4160	2770	4580	3050	5030	3350	5570	3710	6110	4060		**1.50**	1370	909	634	422	702	467	777	517	862	573	950	632
9120	6070	4110	2740	4530	3010	4980	3310	5510	3660	6040	4020		**2.00**	1370	909	634	422	702	467	777	517	862	573	950	632
8940	5950	4050	2700	4460	2970	4900	3260	5430	3610	5950	3960		**2.50**	1370	909	634	422	702	467	777	517	862	573	950	632
8720	5800	3980	2650	4380	2920	4820	3200	5330	3550	5850	3890		**3.00**	1370	909	634	422	702	467	777	517	862	573	950	632
8460	5630	3890	2590	4290	2860	4720	3140	5220	3470	5730	3810		**3.50**	1370	909	634	422	702	467	777	517	862	573	950	632
8180	5440	3800	2530	4190	2790	4600	3060	5100	3390	5590	3720		**4.00**	1360	907	634	422	702	467	777	517	862	573	950	632
7870	5240	3690	2460	4070	2710	4480	2980	4960	3300	5440	3620		**4.50**	1350	901	633	421	702	467	777	517	862	573	950	632
7540	5020	3580	2380	3950	2630	4340	2890	4810	3200	5280	3510		**5.00**	1350	895	623	414	691	460	766	510	851	567	940	625
7190	4780	3460	2300	3810	2540	4200	2790	4650	3090	5110	3400		**5.50**	1340	889	613	408	681	453	756	503	841	559	929	618
6820	4540	3330	2220	3670	2440	4040	2690	4480	2980	4920	3280		**6.00**	1330	883	602	401	670	446	745	496	830	552	918	611
6450	4290	3190	2130	3530	2350	3880	2580	4310	2860	4730	3150		**6.50**	1320	877	592	394	660	439	734	489	819	545	907	604
6060	4040	3060	2030	3370	2240	3720	2470	4120	2740	4530	3020		**7.00**	1310	871	582	387	649	432	724	482	809	538	897	597
5680	3780	2910	1940	3220	2140	3550	2360	3930	2620	4330	2880		**7.50**	1300	865	571	380	639	425	713	474	798	531	886	589
5290	3520	2770	1840	3060	2030	3370	2240	3740	2490	4120	2740		**8.00**	1290	860	561	373	628	418	702	467	787	524	875	582
4910	3270	2620	1740	2900	1930	3200	2130	3550	2360	3910	2600		**8.50**	1280	854	551	366	618	411	692	460	776	517	864	575
4540	3020	2470	1650	2730	1820	3020	2010	3360	2230	3690	2460		**9.00**	1270	848	540	359	607	404	681	453	766	509	854	568
4170	2780	2330	1550	2570	1710	2850	1890	3160	2100	3480	2320		**9.50**	1270	842	530	353	597	397	670	446	755	502	843	561
3820	2540	2180	1450	2410	1610	2670	1780	2970	1980	3270	2180		**10.0**	1260	836	520	346	586	390	660	439	744	495	832	554
3470	2310	2040	1360	2260	1500	2500	1660	2780	1850	3070	2040		**10.5**	1250	830	509	339	576	383	649	432	733	488	821	546
3160	2110	1900	1260	2100	1400	2330	1550	2590	1730	2860	1900		**11.0**	1240	824	499	332	565	376	639	425	723	481	811	539
2900	1930	1760	1170	1950	1300	2170	1440	2410	1610	2660	1770		**11.5**	1230	818	489	325	555	369	628	418	712	474	800	532
2660	1770	1630	1090	1810	1200	2010	1340	2240	1490	2470	1640		**12.0**	1220	812	478	318	544	362	617	411	701	467	789	525
2450	1630	1500	1000	1670	1110	1850	1230	2060	1370	2280	1520		**12.5**	1210	806	468	311	534	355	607	404	690	459	778	518
2270	1510	1390	925	1540	1020	1710	1140	1910	1270	2110	1400		**13.0**	1200	800	458	305	523	348	596	396	680	452	768	511
2100	1400	1290	857	1430	950	1590	1060	1770	1180	1960	1300		**13.5**	1190	794	447	298	513	341	585	389	669	445	757	503
1950	1300	1200	797	1330	884	1480	983	1640	1090	1820	1210		**14.0**	1180	788	437	291	502	334	575	382	658	438	746	496
1820	1210	1120	743	1240	824	1380	916	1530	1020	1700	1130		**14.5**	1180	782	427	284	492	327	564	375	648	431	735	489
1700	1130	1040	694	1160	770	1290	856	1430	953	1580	1050		**15.0**	1170	776	416	277	481	320	553	368	637	424	724	482

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
9460	6290	4220	2810	4650	3090	5110	3400	5650	3760	6190	4120

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
9240	6160	4130	2750	4540	3030	4990	3330	5520	3680	6050	4040

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1670	1110	658	439	731	487	799	533	911	607	1010	671

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
597	398	306	204	339	225	375	250	417	277	459	306

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.81	35.4	4.46	15.6	4.48	16.7	4.50	17.9	4.52	19.5	4.54	21.1

Area, × 10^2 mm^2

382.1	170.6	187.9	206.3	228.3	250.3

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
86900	24600	41510	15080	46290	16720	51540	18560	57440	20680	63630	22860

r_y, × 10 mm

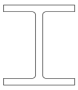
8.02	9.40	9.43	9.49	9.52	9.56

r_x / r_y

1.88	1.66	1.66	1.67	1.67	1.67

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 275 MPa

HD 400×187		HD 400×216		HD 400×237		HD 400×262		HD 400×287		HD 400×314		Shape	HD 400×187		HD 400×216		HD 400×237		HD 400×262		HD 400×287		HD 400×314	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
5880	3910	6820	4540	7450	4950	8280	5510	9070	6030	9880	6570	**0.00**	901	600	1050	702	1160	772	1300	866	1440	957	1580	1050
5850	3890	6780	4510	7410	4930	8240	5480	9020	6000	9830	6540	**1.00**	901	600	1050	702	1160	772	1300	866	1440	957	1580	1050
5800	3860	6730	4480	7350	4890	8180	5440	8950	5960	9760	6490	**1.50**	901	600	1050	702	1160	772	1300	866	1440	957	1580	1050
5750	3820	6670	4430	7280	4840	8100	5390	8870	5900	9670	6430	**2.00**	901	600	1050	702	1160	772	1300	866	1440	957	1580	1050
5670	3770	6580	4380	7190	4780	8000	5320	8760	5830	9550	6350	**2.50**	901	600	1050	702	1160	772	1300	866	1440	957	1580	1050
5580	3710	6480	4310	7080	4710	7880	5240	8630	5740	9410	6260	**3.00**	901	600	1050	702	1160	772	1300	866	1440	957	1580	1050
5480	3640	6360	4230	6950	4620	7730	5150	8470	5640	9240	6150	**3.50**	901	600	1050	702	1160	772	1300	866	1440	957	1580	1050
5360	3570	6230	4140	6800	4530	7580	5040	8300	5520	9050	6020	**4.00**	901	600	1050	702	1160	772	1300	866	1440	957	1580	1050
5230	3480	6080	4040	6640	4420	7400	4920	8110	5400	8850	5890	**4.50**	901	600	1050	702	1160	772	1300	866	1440	957	1580	1050
5090	3380	5920	3940	6470	4300	7200	4790	7900	5260	8620	5730	**5.00**	896	596	1050	699	1160	769	1300	864	1440	956	1580	1050
4930	3280	5740	3820	6280	4180	7000	4660	7670	5110	8370	5570	**5.50**	886	589	1040	692	1150	762	1290	857	1430	948	1560	1040
4770	3180	5560	3700	6080	4040	6780	4510	7440	4950	8120	5400	**6.00**	875	582	1030	685	1130	755	1280	850	1410	941	1550	1030
4600	3060	5360	3570	5870	3900	6540	4350	7180	4780	7840	5220	**6.50**	864	575	1020	678	1120	748	1270	842	1400	934	1540	1030
4430	2950	5160	3430	5650	3760	6300	4190	6920	4610	7560	5030	**7.00**	854	568	1010	671	1110	740	1260	835	1390	926	1530	1020
4240	2820	4950	3300	5420	3610	6050	4030	6650	4430	7270	4830	**7.50**	843	561	997	663	1100	733	1240	828	1380	919	1520	1010
4060	2700	4740	3150	5190	3450	5800	3860	6370	4240	6960	4630	**8.00**	833	554	986	656	1090	726	1230	821	1370	912	1510	1000
3870	2570	4520	3010	4950	3290	5540	3680	6090	4050	6660	4430	**8.50**	822	547	976	649	1080	719	1220	813	1360	905	1500	997
3680	2450	4300	2860	4710	3140	5270	3510	5800	3860	6350	4220	**9.00**	811	540	965	642	1070	712	1210	806	1350	897	1490	989
3490	2320	4080	2720	4470	2980	5010	3330	5520	3670	6030	4010	**9.50**	801	533	954	635	1060	705	1200	799	1340	890	1480	982
3290	2190	3860	2570	4230	2820	4740	3160	5230	3480	5720	3810	**10.0**	790	526	944	628	1050	697	1190	792	1330	883	1470	975
3100	2070	3640	2420	4000	2660	4480	2980	4940	3290	5410	3600	**10.5**	779	519	933	621	1040	690	1180	784	1320	875	1450	967
2920	1940	3430	2280	3760	2500	4220	2810	4660	3100	5100	3390	**11.0**	769	511	922	614	1030	683	1170	777	1300	868	1440	960
2730	1820	3220	2140	3530	2350	3960	2640	4380	2910	4800	3190	**11.5**	758	504	911	606	1020	676	1160	770	1290	861	1430	953
2550	1700	3010	2000	3300	2200	3710	2470	4100	2730	4500	2990	**12.0**	747	497	901	599	1010	669	1150	763	1280	854	1420	945
2380	1580	2810	1870	3080	2050	3470	2310	3830	2550	4210	2800	**12.5**	737	490	890	592	994	662	1140	755	1270	846	1410	938
2200	1470	2610	1730	2860	1910	3230	2150	3570	2380	3920	2610	**13.0**	726	483	879	585	983	654	1120	748	1260	839	1400	931
2040	1360	2420	1610	2660	1770	2990	1990	3320	2210	3640	2420	**13.5**	716	476	869	578	973	647	1110	741	1250	832	1390	923
1900	1260	2250	1500	2470	1640	2780	1850	3080	2050	3390	2250	**14.0**	705	469	858	571	962	640	1100	734	1240	824	1380	916
1770	1180	2090	1390	2300	1530	2590	1730	2870	1910	3160	2100	**14.5**	694	462	847	564	951	633	1090	726	1230	817	1370	909
1660	1100	1960	1300	2150	1430	2420	1610	2690	1790	2950	1960	**15.0**	684	455	836	557	940	626	1080	719	1220	810	1350	901

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
5880	3910	6820	4540	7450	4950	8280	5510	9070	6030	9880	6570
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
5750	3830	6660	4440	7280	4850	8090	5400	8860	5910	9660	6440
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
911	607	1070	714	1190	790	1350	898	1470	977	1640	1090
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
459	305	539	358	591	393	662	441	732	487	801	533

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.76	20.5	4.81	23.4	4.82	25.3	4.86	27.9	4.88	30.4	4.9	33
Area, × 10^2 mm^2											
237.6		275.5		300.9		334.6		366.3		399.2	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
60180	23920	71140	28250	78780	31040	89410	35020	99710	38780	110200	42600
r_y, × 10 mm											
10.0		10.1		10.2		10.2		10.3		10.3	
r_x/r_y											
1.59		1.59		1.59		1.60		1.60		1.61	

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 275 MPa

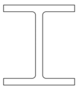
HD 400×347		HD 400×382		HD 400×421		HD 400×463		HD 400×509		HD 400×551		Shape	HD 400×347		HD 400×382		HD 400×421		HD 400×463		HD 400×509		HD 400×551	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
10900	7280	12100	8020	13300	8840	14600	9710	16100	10700	17400	11600	**0.00**	1770	1180	1970	1310	2200	1460	2440	1630	2730	1820	2980	1980
10900	7240	12000	7980	13200	8800	14500	9660	16000	10600	17300	11500	**1.00**	1770	1180	1970	1310	2200	1460	2440	1630	2730	1820	2980	1980
10800	7190	11900	7930	13100	8740	14400	9600	15900	10600	17200	11400	**1.50**	1770	1180	1970	1310	2200	1460	2440	1630	2730	1820	2980	1980
10700	7120	11800	7850	13000	8660	14300	9510	15700	10500	17000	11300	**2.00**	1770	1180	1970	1310	2200	1460	2440	1630	2730	1820	2980	1980
10600	7040	11700	7760	12900	8560	14100	9400	15600	10400	16800	11200	**2.50**	1770	1180	1970	1310	2200	1460	2440	1630	2730	1820	2980	1980
10400	6940	11500	7650	12700	8440	13900	9270	15400	10200	16600	11000	**3.00**	1770	1180	1970	1310	2200	1460	2440	1630	2730	1820	2980	1980
10200	6820	11300	7520	12500	8300	13700	9120	15100	10000	16300	10900	**3.50**	1770	1180	1970	1310	2200	1460	2440	1630	2730	1820	2980	1980
10000	6680	11100	7370	12200	8140	13400	8940	14800	9860	16000	10700	**4.00**	1770	1180	1970	1310	2200	1460	2440	1630	2730	1820	2980	1980
9810	6530	10800	7200	12000	7960	13200	8750	14500	9650	15700	10400	**4.50**	1770	1180	1970	1310	2200	1460	2440	1630	2730	1820	2980	1980
9570	6370	10600	7030	11700	7760	12800	8540	14200	9430	15300	10200	**5.00**	1770	1170	1970	1310	2200	1460	2440	1630	2730	1820	2980	1980
9300	6190	10300	6830	11400	7560	12500	8310	13800	9180	14900	9940	**5.50**	1750	1170	1960	1300	2190	1450	2430	1620	2720	1810	2970	1980
9020	6000	9960	6630	11000	7330	12100	8070	13400	8920	14500	9660	**6.00**	1740	1160	1950	1300	2180	1450	2420	1610	2710	1800	2960	1970
8720	5800	9640	6410	10700	7100	11700	7820	13000	8650	14100	9370	**6.50**	1730	1150	1940	1290	2160	1440	2410	1600	2700	1790	2950	1960
8410	5600	9300	6190	10300	6850	11300	7550	12600	8360	13600	9060	**7.00**	1720	1150	1930	1280	2150	1430	2400	1600	2680	1790	2940	1950
8090	5380	8950	5950	9920	6600	10900	7270	12100	8060	13100	8740	**7.50**	1710	1140	1910	1270	2140	1420	2390	1590	2670	1780	2930	1950
7760	5160	8590	5710	9520	6340	10500	6990	11700	7750	12600	8410	**8.00**	1700	1130	1900	1270	2130	1420	2380	1580	2660	1770	2910	1940
7430	4940	8220	5470	9120	6070	10100	6700	11200	7440	12100	8080	**8.50**	1690	1120	1890	1260	2120	1410	2360	1570	2650	1760	2900	1930
7090	4710	7850	5220	8720	5800	9630	6410	10700	7120	11600	7730	**9.00**	1680	1120	1880	1250	2110	1400	2350	1570	2640	1750	2890	1920
6740	4490	7470	4970	8310	5530	9180	6110	10200	6790	11100	7390	**9.50**	1670	1110	1870	1240	2090	1390	2340	1560	2620	1750	2880	1910
6400	4260	7100	4720	7900	5250	8730	5810	9730	6470	10600	7040	**10.0**	1650	1100	1860	1240	2080	1390	2330	1550	2610	1740	2860	1910
6060	4030	6720	4470	7490	4980	8290	5510	9240	6150	10100	6690	**10.5**	1640	1090	1850	1230	2070	1380	2320	1540	2600	1730	2850	1900
5720	3810	6350	4220	7080	4710	7840	5220	8750	5820	9530	6340	**11.0**	1630	1090	1830	1220	2060	1370	2310	1530	2590	1720	2840	1890
5380	3580	5980	3980	6670	4440	7400	4920	8270	5500	9020	6000	**11.5**	1620	1080	1820	1210	2050	1360	2290	1530	2580	1710	2830	1880
5060	3360	5620	3740	6280	4180	6970	4640	7800	5190	8510	5660	**12.0**	1610	1070	1810	1210	2040	1360	2280	1520	2560	1710	2820	1870
4730	3150	5270	3500	5890	3920	6540	4350	7330	4880	8010	5330	**12.5**	1600	1060	1800	1200	2030	1350	2270	1510	2550	1700	2800	1870
4420	2940	4920	3280	5510	3670	6130	4080	6880	4580	7520	5000	**13.0**	1590	1060	1790	1190	2010	1340	2260	1500	2540	1690	2790	1860
4110	2730	4580	3050	5140	3420	5730	3810	6440	4280	7040	4680	**13.5**	1580	1050	1780	1180	2000	1330	2250	1490	2530	1680	2780	1850
3820	2540	4260	2830	4780	3180	5320	3540	6000	3990	6560	4370	**14.0**	1570	1040	1770	1180	1990	1320	2230	1490	2520	1670	2770	1840
3560	2370	3970	2640	4460	2960	4960	3300	5590	3720	6120	4070	**14.5**	1550	1030	1760	1170	1980	1320	2220	1480	2500	1670	2750	1830
3330	2220	3710	2470	4160	2770	4640	3090	5220	3470	5720	3800	**15.0**	1540	1030	1740	1160	1970	1310	2210	1470	2490	1660	2740	1820

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
10900	7280	12100	8020	13300	8840	14600	9710	16100	10700	17400	11600
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
10700	7130	11800	7850	13000	8660	14300	9510	15700	10500	17000	11300
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1830	1220	2050	1360	2300	1530	2570	1710	2880	1920	3150	2100
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
898	598	998	664	1110	739	1230	820	1370	914	1500	996

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.95	36.5	4.98	40.0	5.02	44.0	5.06	48.1	5.12	52.7	5.15	56.9
Area, × 10^2 mm^2											
442.0		487.1		537.1		589.5		649.0		701.4	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
124900	48100	141300	53600	159600	60100	180200	67000	204500	75400	226100	82490
r_y, × 10 mm											
10.4		10.5		10.6		10.7		10.8		10.9	
r_x/r_y											
1.61		1.62		1.63		1.64		1.65		1.65	

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 275 MPa

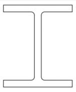
HD 400×592		HD 400×634		HD 400×677		HD 400×744		HD 400×818		HD 400×900		Shape	HD 400×592		HD 400×634		HD 400×677		HD 400×744		HD 400×818		HD 400×900	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
18700	12400	20000	13300	21400	14200	23500	15600	25800	17200	28400	18900	0.00	3250	2160	3520	2340	3800	2530	4250	2830	4770	3170	5350	3560
18600	12400	19900	13200	21300	14200	23400	15500	25700	17100	28300	18800	1.00	3250	2160	3520	2340	3800	2530	4250	2830	4770	3170	5350	3560
18500	12300	19800	13200	21100	14100	23200	15500	25600	17000	28200	18700	1.50	3250	2160	3520	2340	3800	2530	4250	2830	4770	3170	5350	3560
18300	12200	19600	13100	21000	14000	23000	15300	25400	16900	27900	18600	2.00	3250	2160	3520	2340	3800	2530	4250	2830	4770	3170	5350	3560
18100	12100	19400	12900	20700	13800	22800	15200	25100	16700	27700	18400	2.50	3250	2160	3520	2340	3800	2530	4250	2830	4770	3170	5350	3560
17900	11900	19200	12700	20500	13600	22500	15000	24800	16500	27300	18200	3.00	3250	2160	3520	2340	3800	2530	4250	2830	4770	3170	5350	3560
17600	11700	18900	12500	20200	13400	22200	14800	24400	16300	27000	17900	3.50	3250	2160	3520	2340	3800	2530	4250	2830	4770	3170	5350	3560
17300	11500	18500	12300	19800	13200	21800	14500	24000	16000	26500	17600	4.00	3250	2160	3520	2340	3800	2530	4250	2830	4770	3170	5350	3560
16900	11300	18100	12100	19400	12900	21400	14200	23600	15700	26000	17300	4.50	3250	2160	3520	2340	3800	2530	4250	2830	4770	3170	5350	3560
16500	11000	17700	11800	19000	12600	20900	13900	23100	15400	25500	17000	5.00	3250	2160	3520	2340	3800	2530	4250	2830	4770	3170	5350	3560
16100	10700	17300	11500	18500	12300	20400	13600	22500	15000	24900	16600	5.50	3240	2160	3510	2340	3790	2520	4250	2820	4760	3170	5350	3560
15700	10400	16800	11200	18000	12000	19900	13200	22000	14600	24300	16200	6.00	3230	2150	3500	2330	3780	2520	4230	2820	4750	3160	5340	3550
15200	10100	16300	10900	17500	11700	19300	12900	21400	14200	23600	15700	6.50	3220	2140	3490	2320	3770	2510	4220	2810	4740	3150	5320	3540
14700	9790	15800	10500	17000	11300	18700	12500	20700	13800	23000	15300	7.00	3210	2130	3470	2310	3750	2500	4210	2800	4720	3140	5310	3530
14200	9450	15300	10200	16400	10900	18100	12000	20100	13300	22200	14800	7.50	3190	2130	3460	2300	3740	2490	4190	2790	4710	3130	5290	3520
13700	9100	14700	9790	15800	10500	17500	11600	19400	12900	21500	14300	8.00	3180	2120	3450	2300	3730	2480	4180	2780	4700	3120	5280	3510
13100	8740	14100	9410	15200	10100	16800	11200	18700	12400	20700	13800	8.50	3170	2110	3440	2290	3720	2470	4170	2770	4680	3110	5270	3500
12600	8370	13600	9020	14600	9710	16200	10700	17900	11900	20000	13300	9.00	3160	2100	3420	2280	3700	2460	4150	2760	4670	3110	5250	3490
12000	8000	13000	8630	14000	9300	15500	10300	17200	11500	19200	12800	9.50	3140	2090	3410	2270	3690	2460	4140	2750	4650	3100	5240	3480
11500	7630	12400	8240	13300	8880	14800	9850	16500	11000	18400	12200	10.0	3130	2080	3400	2260	3680	2450	4130	2740	4640	3090	5220	3470
10900	7260	11800	7840	12700	8460	14100	9390	15700	10500	17600	11700	10.5	3120	2080	3390	2250	3660	2440	4110	2740	4630	3080	5210	3470
10400	6890	11200	7450	12100	8040	13400	8940	15000	9980	16800	11100	11.0	3110	2070	3370	2240	3650	2430	4100	2730	4610	3070	5190	3460
9800	6520	10600	7060	11500	7630	12800	8490	14300	9490	16000	10600	11.5	3090	2060	3360	2240	3640	2420	4090	2720	4600	3060	5180	3450
9250	6160	10000	6670	10800	7220	12100	8040	13500	9000	15200	10100	12.0	3080	2050	3350	2230	3630	2410	4070	2710	4590	3050	5170	3440
8710	5800	9460	6290	10200	6810	11400	7600	12800	8520	14400	9560	12.5	3070	2040	3340	2220	3610	2400	4060	2700	4570	3040	5150	3430
8190	5450	8900	5920	9640	6420	10800	7170	12100	8050	13600	9040	13.0	3060	2030	3320	2210	3600	2400	4050	2690	4560	3030	5140	3420
7680	5110	8350	5550	9060	6030	10100	6740	11400	7580	12800	8530	13.5	3040	2030	3310	2200	3590	2390	4030	2680	4540	3020	5120	3410
7170	4770	7820	5200	8490	5650	9510	6330	10700	7130	12100	8030	14.0	3030	2020	3300	2190	3570	2380	4020	2670	4530	3010	5110	3400
6680	4450	7280	4850	7930	5270	8890	5920	10000	6680	11300	7550	14.5	3020	2010	3280	2190	3560	2370	4010	2670	4520	3010	5090	3390
6240	4150	6810	4530	7410	4930	8310	5530	9390	6240	10600	7060	15.0	3010	2000	3270	2180	3550	2360	3990	2660	4500	3000	5080	3380

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
18700	12400	20000	13300	21400	14200	23500	15600	25800	17200	28400	18900
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
18300	12200	19500	13000	20900	13900	22900	15300	25200	16800	27800	18500
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
3450	2300	3720	2480	4080	2720	4570	3050	5130	3420	5770	3850
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
1630	1080	1760	1170	1900	1260	2120	1410	2370	1570	2650	1760

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
5.19	60.9	5.24	65.0	5.28	69.3	5.34	75.5	5.41	82.5	5.48	90.4
Area, × 10^2 mm^2											
754.9		808.0		863.4		948.1		1040.0		1150.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
250200	90170	274200	98250	299500	106900	342100	119900	392200	135500	450200	153300
r_y, × 10 mm											
10.9		11.0		11.1		11.3		11.4		11.6	
r_x/r_y											
1.67		1.67		1.67		1.69		1.70		1.71	

Table E.1 Continued.



Available Strength for Members Subject to Flexural, Axial, Shear, and Combined Forces
HD Shapes

F_y = 275 MPa

HD 400x990		HD 400x1086		Shape	HD 400×990		HD 400×1086	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN					Available Flexural Strength, kN·m			
LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD
31200	20800	34300	22800	0.00	6010	4000	6730	4480
31100	20700	34200	22700	1.00	6010	4000	6730	4480
30900	20600	34000	22600	1.50	6010	4000	6730	4480
30700	20400	33700	22500	2.00	6010	4000	6730	4480
30400	20200	33400	22200	2.50	6010	4000	6730	4480
30100	20000	33100	22000	3.00	6010	4000	6730	4480
29700	19700	32600	21700	3.50	6010	4000	6730	4480
29200	19400	32100	21400	4.00	6010	4000	6730	4480
28700	19100	31600	21000	4.50	6010	4000	6730	4480
28100	18700	30900	20600	5.00	6010	4000	6730	4480
27500	18300	30300	20200	5.50	6010	4000	6730	4480
26800	17800	29600	19700	6.00	6000	3990	6720	4470
26100	17400	28800	19200	6.50	5980	3980	6710	4460
25400	16900	28000	18700	7.00	5970	3970	6690	4450
24600	16400	27200	18100	7.50	5950	3960	6680	4440
23800	15800	26400	17500	8.00	5940	3950	6660	4430
23000	15300	25500	17000	8.50	5920	3940	6650	4420
22100	14700	24600	16400	9.00	5910	3930	6630	4410
21300	14200	23700	15700	9.50	5890	3920	6620	4400
20400	13600	22700	15100	10.0	5880	3910	6600	4390
19600	13000	21800	14500	10.5	5860	3900	6590	4380
18700	12400	20800	13900	11.0	5850	3890	6570	4370
17800	11900	19900	13200	11.5	5830	3880	6560	4360
16900	11300	19000	12600	12.0	5820	3870	6540	4350
16100	10700	18000	12000	12.5	5800	3860	6520	4340
15200	10100	17100	11400	13.0	5790	3850	6510	4330
14400	9590	16200	10800	13.5	5770	3840	6490	4320
13600	9040	15300	10200	14.0	5760	3830	6480	4310
12800	8510	14400	9600	14.5	5740	3820	6460	4300
12000	7990	13600	9040	15.0	5730	3810	6450	4290

Properties

Available Strength in Tensile Yielding, kN			
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
31200	20800	34300	22800
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN			
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
30500	20300	33500	22300
Available Strength in Shear, kN			
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
6520	4350	7320	4880
Available Strength in Flexure about Y-Y axis, kN·m			
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
2960	1970	3310	2200

Limiting Unbraced Lengths, m			
L_p	L_r	L_p	L_r
5.56	98.2	5.65	107
Area, × 10^2 mm^2			
1262		1386	
Moment of Inertia, × 10^4 mm^4			
I_x	I_y	I_x	I_y
518900	173400	595700	196200
$r_{y,}$ × 10 mm			
11.7		11.9	
r_x / r_y			
1.73		1.74	

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 355 MPa

HD 260×54.1^c		HD 260×68.2		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172		Shape	HD 260×54.1^f		HD 260×68.2^f		HD 260×93.0		HD 260×114		HD 260×142		HD 260×172	
ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	Design	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
2200	1470	2770	1850	3780	2520	4660	3100	5760	3830	7020	4670	**0.00**	202	135	284	189	410	273	511	340	644	428	806	537
2150	1430	2720	1810	3720	2470	4580	3050	5670	3770	6910	4590	**1.00**	202	135	284	189	410	273	511	340	644	428	806	537
2110	1400	2660	1770	3640	2420	4480	2980	5550	3690	6770	4500	**1.50**	202	135	284	189	410	273	511	340	644	428	806	537
2050	1360	2580	1720	3530	2350	4350	2890	5390	3590	6590	4380	**2.00**	202	135	284	189	410	273	511	340	644	428	806	537
1960	1310	2480	1650	3390	2260	4190	2790	5200	3460	6360	4230	**2.50**	202	135	284	189	410	273	511	340	644	428	806	537
1860	1240	2360	1570	3230	2150	4000	2660	4970	3300	6090	4050	**3.00**	202	135	284	189	406	270	507	338	641	426	804	535
1750	1170	2230	1480	3060	2030	3780	2520	4710	3130	5780	3850	**3.50**	202	135	281	187	397	264	498	332	631	420	795	529
1640	1090	2090	1390	2860	1910	3550	2360	4430	2940	5450	3620	**4.00**	202	135	273	182	388	258	489	326	622	414	785	523
1510	1010	1930	1290	2660	1770	3300	2200	4130	2750	5090	3390	**4.50**	202	134	265	176	379	252	480	320	613	408	776	516
1380	921	1780	1180	2450	1630	3050	2030	3820	2540	4730	3140	**5.00**	195	130	257	171	371	247	472	314	604	402	767	510
1260	835	1620	1080	2240	1490	2790	1850	3500	2330	4350	2890	**5.50**	188	125	249	166	362	241	463	308	595	396	757	504
1130	750	1460	972	2020	1350	2530	1680	3180	2120	3970	2640	**6.00**	181	120	241	160	353	235	454	302	586	390	748	498
1000	668	1310	869	1810	1210	2270	1510	2870	1910	3600	2390	**6.50**	174	115	233	155	344	229	445	296	577	384	738	491
885	589	1160	771	1610	1070	2030	1350	2570	1710	3230	2150	**7.00**	166	111	225	150	336	223	436	290	568	378	729	485
773	514	1020	676	1420	945	1790	1190	2280	1520	2880	1920	**7.50**	159	106	217	144	327	218	427	284	558	372	720	479
679	452	893	594	1250	830	1570	1050	2010	1330	2550	1690	**8.00**	152	101	209	139	318	212	418	278	549	366	710	472
602	400	791	526	1110	735	1390	927	1780	1180	2250	1500	**8.50**	144	96.1	200	133	310	206	409	272	540	359	701	466
537	357	706	469	986	656	1240	827	1580	1050	2010	1340	**9.00**	134	89.2	192	128	301	200	400	266	531	353	691	460
482	320	633	421	885	589	1120	742	1420	946	1800	1200	**9.50**	125	83.3	183	122	292	194	391	260	522	347	682	454
435	289	572	380	799	531	1010	670	1280	854	1630	1080	**10.0**	117	78.1	172	115	283	189	382	254	513	341	672	447
394	262	518	345	724	482	913	608	1160	775	1480	983	**10.5**	110	73.5	162	108	275	183	373	248	504	335	663	441
359	239	472	314	660	439	832	554	1060	706	1350	896	**11.0**	104	69.5	154	102	266	177	364	242	495	329	654	435
329	219	432	288	604	402	761	507	971	646	1230	819	**11.5**	99.0	65.8	146	97.1	257	171	355	236	485	323	644	429
302	201	397	264	555	369	699	465	891	593	1130	753	**12.0**	94.1	62.6	139	92.4	245	163	346	230	476	317	635	422
278	185	366	243	511	340	644	429	822	547	1040	694	**12.5**	89.7	59.7	133	88.2	235	156	337	225	467	311	625	416
257	171	338	225	473	314	596	396	760	505	964	641	**13.0**	85.6	57.0	127	84.4	225	150	328	219	458	305	616	410
238	159	314	209	438	292	552	368	704	469	894	595	**13.5**	82.0	54.6	122	80.9	216	144	320	213	449	299	607	404
222	148	292	194	407	271	514	342	655	436	831	553	**14.0**	78.6	52.3	117	77.7	208	138	309	205	440	293	597	397
207	138	272	181	380	253	479	319	611	406	775	515	**14.5**	75.6	50.3	112	74.7	200	133	298	198	431	287	588	391
193	129	254	169	355	236	448	298	571	380	724	482	**15.0**	72.7	48.4	108	71.9	193	128	287	191	422	281	578	385

Properties

Available Strength in Tensile Yielding, kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
2200	1470	2770	1850	3780	2520	4660	3100	5760	3830	7020	4670
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
1980	1320	2490	1660	3400	2260	4180	2790	5170	3450	6300	4200
Available Strength in Shear, kN											
ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v
338	225	399	266	554	369	714	476	918	612	1110	741
Available Strength in Flexure about Y-Y axis, kN·m											
ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b
86.7	57.7	130	86.8	192	128	240	160	304	202	381	253

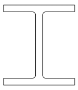
Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.48	8.41	2.72	9.33	2.75	11.5	2.78	13.7	2.82	16.7	2.88	20.1
Area, × 10^2 mm^2											
68.97		86.82		118.4		145.7		180.3		219.6	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
7981	2788	10450	3668	14920	5135	18910	6456	24330	8236	31310	10450
r_y, × 10 mm											
6.36		6.50		6.58		6.66		6.76		6.90	
r_x/r_y											
1.69		1.69		1.71		1.71		1.72		1.73	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 355 MPa

HD 320×74.2[c]		HD 320×97.6		HD 320×127		HD 320×158		HD 320×198		HD 320×245		Shape
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design
Available Compressive Strength, kN												
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending
3020	2010	3970	2640	5150	3430	6430	4280	8060	5360	9970	6630	**0.00**
2960	1970	3920	2610	5090	3380	6350	4220	7960	5300	9850	6550	**1.00**
2920	1940	3860	2570	5000	3330	6250	4160	7840	5220	9700	6460	**1.50**
2850	1900	3770	2510	4890	3250	6110	4060	7670	5100	9500	6320	**2.00**
2760	1840	3650	2430	4750	3160	5930	3950	7460	4960	9250	6160	**2.50**
2660	1770	3520	2340	4580	3050	5730	3810	7210	4800	8960	5960	**3.00**
2530	1690	3370	2240	4390	2920	5500	3660	6920	4610	8620	5730	**3.50**
2400	1600	3210	2130	4180	2780	5240	3490	6610	4400	8240	5480	**4.00**
2260	1500	3030	2020	3950	2630	4960	3300	6270	4170	7830	5210	**4.50**
2110	1400	2840	1890	3710	2470	4670	3110	5910	3930	7400	4920	**5.00**
1960	1300	2650	1760	3460	2300	4370	2900	5540	3690	6950	4630	**5.50**
1800	1200	2450	1630	3210	2140	4060	2700	5160	3430	6490	4320	**6.00**
1650	1100	2250	1500	2960	1970	3740	2490	4770	3180	6030	4010	**6.50**
1500	995	2060	1370	2710	1800	3430	2280	4390	2920	5560	3700	**7.00**
1350	896	1870	1240	2460	1640	3130	2080	4010	2670	5100	3390	**7.50**
1210	802	1680	1120	2220	1480	2830	1890	3640	2420	4650	3090	**8.00**
1070	711	1500	1000	1990	1330	2550	1700	3290	2190	4220	2810	**8.50**
954	634	1340	893	1780	1180	2280	1510	2940	1960	3790	2520	**9.00**
856	569	1200	802	1600	1060	2040	1360	2640	1760	3400	2260	**9.50**
772	514	1090	723	1440	958	1840	1230	2390	1590	3070	2040	**10.0**
701	466	986	656	1310	869	1670	1110	2160	1440	2790	1850	**10.5**
638	425	899	598	1190	792	1520	1010	1970	1310	2540	1690	**11.0**
584	389	822	547	1090	725	1390	928	1800	1200	2320	1550	**11.5**
536	357	755	502	1000	665	1280	852	1660	1100	2130	1420	**12.0**
494	329	696	463	922	613	1180	785	1530	1020	1970	1310	**12.5**
457	304	643	428	852	567	1090	726	1410	939	1820	1210	**13.0**
424	282	597	397	790	526	1010	673	1310	871	1690	1120	**13.5**
394	262	555	369	735	489	941	626	1220	810	1570	1040	**14.0**
367	244	517	344	685	456	877	584	1130	755	1460	972	**14.5**
343	228	483	322	640	426	820	545	1060	705	1370	908	**15.0**

Shape	HD 320×74.2[f]		HD 320×97.6[f]		HD 320×127		HD 320×158		HD 320×198		HD 320×245	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	Available Flexural Strength, kN·m											
Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	339	226	512	340	687	457	868	578	1110	740	1420	943
1.00	339	226	512	340	687	457	868	578	1110	740	1420	943
1.50	339	226	512	340	687	457	868	578	1110	740	1420	943
2.00	339	226	512	340	687	457	868	578	1110	740	1420	943
2.50	339	226	512	340	687	457	868	578	1110	740	1420	943
3.00	339	226	512	340	687	457	868	578	1110	740	1420	943
3.50	339	226	511	340	677	451	860	572	1100	735	1410	939
4.00	339	226	498	331	664	442	846	563	1090	725	1400	930
4.50	339	226	485	323	650	433	832	554	1080	716	1380	920
5.00	339	226	473	314	637	424	818	545	1060	706	1370	910
5.50	328	219	460	306	623	415	805	535	1050	697	1350	900
6.00	318	211	447	298	610	406	791	526	1030	688	1340	890
6.50	307	204	434	289	596	397	777	517	1020	678	1320	881
7.00	296	197	422	281	583	388	763	508	1000	669	1310	871
7.50	285	190	409	272	569	379	749	498	991	659	1290	861
8.00	274	182	396	264	555	370	735	489	976	650	1280	851
8.50	263	175	384	255	542	361	721	480	962	640	1260	842
9.00	253	168	371	247	528	351	707	470	948	631	1250	832
9.50	240	160	358	238	515	342	693	461	934	621	1240	822
10.0	225	149	346	230	501	333	679	452	919	612	1220	812
10.5	211	140	333	221	488	324	665	443	905	602	1210	803
11.0	198	132	316	210	474	315	651	433	891	593	1190	793
11.5	187	125	299	199	460	306	638	424	877	583	1180	783
12.0	178	118	284	189	447	297	624	415	862	574	1160	773
12.5	169	112	270	180	433	288	610	406	848	564	1150	764
13.0	161	107	258	172	415	276	596	396	834	555	1130	754
13.5	154	102	247	164	398	265	582	387	820	545	1120	744
14.0	147	97.9	237	158	383	255	568	378	806	536	1100	734
14.5	141	93.9	227	151	368	245	554	369	791	526	1090	724
15.0	136	90.2	219	146	355	236	540	359	777	517	1070	715

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
3020	2010	3970	2640	5150	3430	6430	4280	8060	5360	9970	6630

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2710	1810	3570	2380	4630	3080	5770	3850	7240	4830	8950	5970

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
513	342	594	396	784	523	1020	679	1320	877	1610	1070

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
134	89.2	221	147	300	200	381	254	489	325	623	415

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
5.02	9.37	3.46	10.6	3.16	12.6	3.2	15.1	3.25	18.5	3.32	22.7

Area, × 10^2 mm^2

94.58	124.4	161.3	201.2	252.3	312.0

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
16450	4959	22930	6985	30820	9239	39640	11840	51900	15310	68130	19710

r_y, × 10 mm

7.24	7.49	7.57	7.67	7.79	7.95

r_x/r_y

1.82	1.81	1.83	1.83	1.84	1.86

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HD Shapes

F_y = 355 MPa

HD 320×300		HD 360×134		HD 360×147		HD 360×162		HD 360×179		HD 360×196		Shape	HD 320×300		HD 360×134[f]		HD 360×147[f]		HD 360×162		HD 360×179		HD 360×196	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
12200	8120	5450	3630	6000	3990	6590	4390	7290	4850	8000	5320	**0.00**	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
12100	8030	5400	3600	5950	3960	6540	4350	7230	4810	7930	5280	**1.00**	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
11900	7910	5350	3560	5890	3920	6470	4300	7160	4760	7850	5220	**1.50**	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
11600	7750	5270	3510	5800	3860	6370	4240	7060	4690	7740	5150	**2.00**	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
11300	7550	5170	3440	5690	3790	6260	4160	6930	4610	7600	5050	**2.50**	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
11000	7310	5050	3360	5560	3700	6110	4070	6770	4500	7430	4940	**3.00**	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
10600	7040	4910	3270	5410	3600	5950	3960	6590	4380	7230	4810	**3.50**	1760	1170	794	528	899	598	1000	667	1110	740	1230	816
10100	6740	4760	3160	5240	3490	5770	3840	6390	4250	7010	4660	**4.00**	1740	1160	794	528	899	598	1000	666	1110	740	1230	815
9630	6410	4590	3050	5060	3370	5560	3700	6170	4100	6770	4500	**4.50**	1730	1150	794	528	887	590	984	655	1090	728	1210	803
9110	6060	4410	2930	4860	3230	5350	3560	5930	3940	6510	4330	**5.00**	1710	1140	782	520	870	579	966	643	1080	716	1190	791
8570	5700	4210	2800	4650	3090	5120	3410	5670	3770	6230	4150	**5.50**	1700	1130	765	509	852	567	948	631	1060	704	1170	779
8010	5330	4010	2670	4430	2950	4880	3250	5410	3600	5950	3960	**6.00**	1680	1120	748	498	835	556	931	619	1040	692	1150	767
7450	4950	3800	2530	4200	2790	4630	3080	5140	3420	5650	3760	**6.50**	1670	1110	732	487	818	544	913	607	1020	680	1140	755
6880	4580	3590	2390	3970	2640	4380	2910	4860	3230	5340	3550	**7.00**	1650	1100	715	475	800	532	895	596	1000	668	1120	743
6320	4210	3380	2250	3730	2480	4120	2740	4570	3040	5030	3350	**7.50**	1640	1090	698	464	783	521	878	584	986	656	1100	731
5770	3840	3160	2100	3490	2320	3860	2570	4290	2850	4720	3140	**8.00**	1620	1080	681	453	765	509	860	572	968	644	1080	719
5240	3490	2950	1960	3260	2170	3600	2400	4000	2660	4410	2930	**8.50**	1610	1070	664	442	748	498	842	560	950	632	1060	707
4730	3150	2730	1820	3020	2010	3350	2230	3720	2480	4100	2730	**9.00**	1590	1060	647	430	731	486	824	548	932	620	1040	695
4240	2820	2530	1680	2800	1860	3100	2060	3450	2290	3800	2530	**9.50**	1580	1050	630	419	713	475	807	537	914	608	1030	683
3830	2550	2330	1550	2570	1710	2860	1900	3180	2110	3510	2330	**10.0**	1560	1040	613	408	696	463	789	525	896	596	1010	671
3470	2310	2130	1420	2360	1570	2620	1750	2920	1940	3230	2150	**10.5**	1550	1030	596	397	678	451	771	513	878	584	990	659
3160	2110	1940	1290	2150	1430	2390	1590	2660	1770	2950	1960	**11.0**	1530	1020	579	385	661	440	753	501	860	572	972	647
2900	1930	1780	1180	1970	1310	2190	1460	2440	1620	2690	1790	**11.5**	1520	1010	562	374	644	428	736	489	842	560	954	635
2660	1770	1630	1090	1810	1200	2010	1340	2240	1490	2480	1650	**12.0**	1500	1000	545	363	626	417	718	478	824	548	936	623
2450	1630	1500	1000	1670	1110	1850	1230	2060	1370	2280	1520	**12.5**	1490	990	529	352	609	405	700	466	806	536	918	610
2270	1510	1390	925	1540	1020	1710	1140	1910	1270	2110	1400	**13.0**	1470	980	507	337	591	394	682	454	788	524	899	598
2100	1400	1290	857	1430	950	1590	1060	1770	1180	1960	1300	**13.5**	1460	970	483	322	574	382	665	442	770	512	881	586
1950	1300	1200	797	1330	884	1480	983	1640	1090	1820	1210	**14.0**	1440	960	462	307	549	365	647	430	752	500	863	574
1820	1210	1120	743	1240	824	1380	916	1530	1020	1700	1130	**14.5**	1430	950	442	294	526	350	627	417	734	488	845	562
1700	1130	1040	694	1160	770	1290	856	1430	953	1580	1050	**15.0**	1410	940	424	282	505	336	602	401	716	476	827	550

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
12200	8120	5450	3630	6000	3990	6590	4390	7290	4850	8000	5320

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
11000	7310	4890	3260	5390	3590	5920	3950	6550	4370	7180	4790

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
2160	1440	849	566	943	629	1030	687	1180	784	1300	866

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
771	513	377	251	432	288	484	322	538	358	593	395

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.35	27.5	3.93	12.7	3.94	13.5	3.96	14.4	3.98	15.5	3.99	16.7

Area, × 10^2 mm^2

382.1	170.6	187.9	206.3	228.3	250.3

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
86900	24600	41510	15080	46290	16720	51540	18560	57440	20680	63630	22860

r_y, × 10 mm

8.02	9.40	9.43	9.49	9.52	9.56

r_x/r_y

1.88	1.66	1.66	1.67	1.67	1.67

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces HD Shapes

F_y = 355 MPa

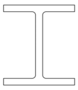
HD 400×187		HD 400×216		HD 400×237		HD 400×262		HD 400×287		HD 400×314		Shape	HD 400×187		HD 400×216		HD 400×237		HD 400×262		HD 400×287		HD 400×314	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
7590	5050	8800	5860	9610	6400	10700	7110	11700	7790	12800	8490	**0.00**	1160	774	1360	906	1500	996	1680	1120	1860	1240	2040	1350
7530	5010	8740	5810	9540	6350	10600	7060	11600	7730	12700	8430	**1.00**	1160	774	1360	906	1500	996	1680	1120	1860	1240	2040	1350
7460	4970	8660	5760	9460	6290	10500	7000	11500	7660	12600	8350	**1.50**	1160	774	1360	906	1500	996	1680	1120	1860	1240	2040	1350
7370	4900	8550	5690	9340	6210	10400	6910	11400	7570	12400	8250	**2.00**	1160	774	1360	906	1500	996	1680	1120	1860	1240	2040	1350
7240	4820	8410	5590	9190	6110	10200	6800	11200	7450	12200	8120	**2.50**	1160	774	1360	906	1500	996	1680	1120	1860	1240	2040	1350
7100	4720	8240	5480	9000	5990	10000	6670	11000	7300	12000	7960	**3.00**	1160	774	1360	906	1500	996	1680	1120	1860	1240	2040	1350
6930	4610	8050	5350	8790	5850	9790	6510	10700	7140	11700	7780	**3.50**	1160	774	1360	906	1500	996	1680	1120	1860	1240	2040	1350
6730	4480	7830	5210	8560	5690	9530	6340	10400	6950	11400	7580	**4.00**	1160	774	1360	906	1500	996	1680	1120	1860	1240	2040	1350
6520	4340	7590	5050	8290	5520	9240	6150	10100	6740	11100	7360	**4.50**	1150	767	1350	900	1490	990	1670	1110	1850	1230	2030	1350
6300	4190	7330	4880	8010	5330	8930	5940	9800	6520	10700	7110	**5.00**	1130	755	1330	888	1470	978	1650	1100	1830	1220	2010	1340
6050	4030	7050	4690	7710	5130	8600	5720	9440	6280	10300	6860	**5.50**	1120	743	1320	875	1450	966	1640	1090	1810	1210	1990	1330
5800	3860	6760	4500	7390	4920	8250	5490	9060	6030	9890	6580	**6.00**	1100	731	1300	863	1430	954	1620	1080	1790	1190	1970	1310
5530	3680	6460	4300	7060	4700	7890	5250	8670	5770	9470	6300	**6.50**	1080	719	1280	851	1410	941	1600	1060	1780	1180	1950	1300
5260	3500	6140	4090	6730	4470	7520	5000	8260	5500	9030	6010	**7.00**	1060	708	1260	839	1400	929	1580	1050	1760	1170	1940	1290
4980	3320	5830	3880	6380	4240	7130	4750	7850	5220	8580	5710	**7.50**	1050	696	1240	827	1380	917	1560	1040	1740	1160	1920	1280
4700	3130	5500	3660	6030	4010	6750	4490	7430	4940	8120	5400	**8.00**	1030	684	1230	815	1360	905	1540	1030	1720	1140	1900	1260
4420	2940	5180	3450	5680	3780	6360	4230	7000	4660	7660	5100	**8.50**	1010	672	1210	803	1340	893	1520	1010	1700	1130	1880	1250
4140	2760	4860	3230	5330	3540	5970	3970	6580	4380	7200	4790	**9.00**	992	660	1190	791	1320	881	1510	1000	1680	1120	1860	1240
3860	2570	4540	3020	4980	3310	5590	3720	6160	4100	6750	4490	**9.50**	974	648	1170	779	1310	869	1490	990	1660	1110	1840	1230
3590	2390	4230	2810	4640	3080	5210	3460	5750	3820	6300	4190	**10.0**	956	636	1150	767	1290	856	1470	977	1650	1090	1820	1210
3330	2210	3920	2610	4300	2860	4840	3220	5340	3560	5860	3900	**10.5**	939	625	1130	755	1270	844	1450	965	1630	1080	1810	1200
3070	2040	3620	2410	3980	2650	4480	2980	4950	3290	5430	3610	**11.0**	921	613	1120	743	1250	832	1430	953	1610	1070	1790	1190
2820	1870	3330	2220	3660	2430	4130	2740	4570	3040	5020	3340	**11.5**	903	601	1100	731	1230	820	1410	941	1590	1060	1770	1180
2590	1720	3060	2040	3360	2240	3790	2520	4200	2790	4610	3070	**12.0**	885	589	1080	719	1210	808	1400	928	1570	1050	1750	1160
2380	1590	2820	1880	3100	2060	3490	2320	3870	2570	4250	2830	**12.5**	867	577	1060	707	1200	796	1380	916	1550	1030	1730	1150
2200	1470	2610	1730	2860	1910	3230	2150	3580	2380	3930	2610	**13.0**	850	565	1040	695	1180	784	1360	904	1530	1020	1710	1140
2040	1360	2420	1610	2660	1770	2990	1990	3320	2210	3640	2420	**13.5**	832	553	1030	683	1160	771	1340	891	1520	1010	1690	1130
1900	1260	2250	1500	2470	1640	2780	1850	3080	2050	3390	2250	**14.0**	814	541	1010	671	1140	759	1320	879	1500	996	1670	1110
1770	1180	2090	1390	2300	1530	2590	1730	2870	1910	3160	2100	**14.5**	796	530	990	659	1120	747	1300	867	1480	984	1660	1100
1660	1100	1960	1300	2150	1430	2420	1610	2690	1790	2950	1960	**15.0**	778	518	972	647	1100	735	1280	854	1460	971	1640	1090

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
7590	5050	8800	5860	9610	6400	10700	7110	11700	7790	12800	8490
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
6820	4540	7900	5270	8630	5750	9600	6400	10500	7010	11500	7630
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1180	784	1380	921	1530	1020	1740	1160	1890	1260	2120	1410
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
593	394	695	463	763	507	855	569	945	629	1030	688

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.19	16.3	4.23	18.4	4.24	19.9	4.27	21.8	4.30	23.7	4.32	25.7
Area, × 10^2 mm^2											
237.6		275.5		300.9		334.6		366.3		399.2	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
60180	23920	71140	28250	78780	31040	89410	35020	99710	38780	110200	42600
r_y, × 10 mm											
10.0		10.1		10.2		10.2		10.3		10.3	
r_x/r_y											
1.59		1.59		1.59		1.60		1.60		1.61	

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

HD Shapes

F_y = 355 MPa

HD 400×347		HD 400×382		HD 400×421		HD 400×463		HD 400×509		HD 400×551		Shape	HD 400×347		HD 400×382		HD 400×421		HD 400×463		HD 400×509		HD 400×551	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
14100	9400	15600	10400	17200	11400	18800	12500	20700	13800	22400	14900	0.00	2280	1520	2540	1690	2840	1890	3160	2100	3520	2340	3850	2560
14000	9330	15500	10300	17000	11300	18700	12400	20600	13700	22300	14800	1.00	2280	1520	2540	1690	2840	1890	3160	2100	3520	2340	3850	2560
13900	9250	15300	10200	16900	11200	18600	12300	20400	13600	22100	14700	1.50	2280	1520	2540	1690	2840	1890	3160	2100	3520	2340	3850	2560
13700	9140	15100	10100	16700	11100	18300	12200	20200	13400	21800	14500	2.00	2280	1520	2540	1690	2840	1890	3160	2100	3520	2340	3850	2560
13500	9000	14900	9920	16500	10900	18100	12000	19900	13200	21500	14300	2.50	2280	1520	2540	1690	2840	1890	3160	2100	3520	2340	3850	2560
13300	8830	14600	9740	16200	10700	17700	11800	19600	13000	21200	14100	3.00	2280	1520	2540	1690	2840	1890	3160	2100	3520	2340	3850	2560
13000	8630	14300	9520	15800	10500	17400	11600	19200	12700	20700	13800	3.50	2280	1520	2540	1690	2840	1890	3160	2100	3520	2340	3850	2560
12600	8410	13900	9280	15400	10300	16900	11300	18700	12400	20200	13500	4.00	2280	1520	2540	1690	2840	1890	3160	2100	3520	2340	3850	2560
12300	8170	13500	9020	15000	9960	16500	11000	18200	12100	19700	13100	4.50	2280	1510	2540	1690	2830	1890	3150	2100	3520	2340	3850	2560
11900	7900	13100	8730	14500	9650	16000	10600	17600	11700	19100	12700	5.00	2260	1500	2520	1680	2810	1870	3130	2090	3500	2330	3830	2550
11500	7620	12700	8420	14000	9320	15400	10300	17000	11300	18500	12300	5.50	2240	1490	2500	1660	2800	1860	3110	2070	3480	2320	3810	2540
11000	7320	12200	8090	13500	8960	14800	9870	16400	10900	17800	11800	6.00	2220	1480	2480	1650	2780	1850	3090	2060	3460	2300	3790	2520
10500	7010	11700	7760	12900	8590	14200	9470	15800	10500	17100	11400	6.50	2200	1460	2460	1640	2760	1830	3070	2050	3440	2290	3770	2510
10100	6690	11100	7410	12300	8210	13600	9060	15100	10000	16400	10900	7.00	2180	1450	2440	1630	2740	1820	3050	2030	3420	2280	3750	2490
9570	6370	10600	7050	11800	7820	13000	8630	14400	9580	15600	10400	7.50	2160	1440	2430	1610	2720	1810	3040	2020	3400	2260	3730	2480
9070	6030	10000	6680	11200	7420	12300	8200	13700	9110	14900	9900	8.00	2140	1430	2410	1600	2700	1790	3020	2010	3380	2250	3710	2470
8570	5700	9490	6320	10600	7020	11700	7770	13000	8640	14100	9390	8.50	2120	1410	2390	1590	2680	1780	3000	1990	3360	2240	3690	2450
8060	5360	8940	5950	9950	6620	11000	7330	12300	8160	13400	8880	9.00	2110	1400	2370	1580	2660	1770	2980	1980	3340	2220	3670	2440
7560	5030	8390	5580	9350	6220	10400	6890	11600	7690	12600	8370	9.50	2090	1390	2350	1560	2640	1760	2960	1970	3320	2210	3650	2430
7070	4700	7850	5220	8760	5830	9710	6460	10800	7220	11800	7870	10.0	2070	1380	2330	1550	2620	1740	2940	1950	3300	2200	3630	2410
6590	4380	7320	4870	8180	5440	9070	6040	10200	6750	11100	7370	10.5	2050	1360	2310	1540	2600	1730	2920	1940	3280	2180	3600	2400
6110	4070	6800	4530	7610	5060	8450	5620	9470	6300	10300	6880	11.0	2030	1350	2290	1520	2580	1720	2900	1930	3260	2170	3580	2380
5660	3760	6300	4190	7050	4690	7840	5220	8800	5860	9620	6400	11.5	2010	1340	2270	1510	2560	1700	2880	1910	3240	2160	3560	2370
5200	3460	5800	3860	6500	4330	7250	4820	8160	5430	8920	5940	12.0	1990	1330	2250	1500	2540	1690	2860	1900	3220	2140	3540	2360
4790	3190	5340	3560	5990	3990	6680	4440	7520	5000	8230	5480	12.5	1970	1310	2230	1490	2520	1680	2840	1890	3200	2130	3520	2340
4430	2950	4940	3290	5540	3690	6180	4110	6950	4630	7610	5060	13.0	1950	1300	2210	1470	2500	1670	2820	1870	3180	2120	3500	2330
4110	2730	4580	3050	5140	3420	5730	3810	6450	4290	7060	4700	13.5	1940	1290	2190	1460	2480	1650	2800	1860	3160	2100	3480	2320
3820	2540	4260	2830	4780	3180	5320	3540	6000	3990	6560	4370	14.0	1920	1270	2180	1450	2460	1640	2780	1850	3140	2090	3460	2300
3560	2370	3970	2640	4460	2960	4960	3300	5590	3720	6120	4070	14.5	1900	1260	2160	1430	2440	1630	2760	1830	3120	2080	3440	2290
3330	2220	3710	2470	4160	2770	4640	3090	5220	3470	5720	3800	15.0	1880	1250	2140	1420	2430	1610	2740	1820	3100	2060	3420	2280

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
14100	9400	15600	10400	17200	11400	18800	12500	20700	13800	22400	14900

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
12700	8450	14000	9320	15400	10300	16900	11300	18600	12400	20100	13400

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
2360	1570	2640	1760	2970	1980	3320	2210	3710	2480	4070	2710

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
1160	771	1290	857	1430	954	1590	1060	1770	1180	1930	1290

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.36	28.4	4.38	31.1	4.42	34.1	4.45	37.3	4.50	40.8	4.53	44.1

Area, × 10^2 mm^2

442.0	487.1	537.1	589.5	649.0	701.4

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
124900	48100	141300	53600	159600	60100	180200	67000	204500	75400	226100	82490

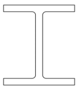
r_y, × 10 mm

10.4	10.5	10.6	10.7	10.8	10.9

r_x / r_y

1.61	1.62	1.63	1.64	1.65	1.65

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

HD Shapes

F_y = 355 MPa

HD 400×592		HD 400×634		HD 400×677		HD 400×744		HD 400×818		HD 400×900		Shape		HD 400×592		HD 400×634		HD 400×677		HD 400×744		HD 400×818		HD 400×900	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
24100	16000	25800	17200	27600	18400	30300	20200	33300	22200	36700	24400	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	0.00	4200	2790	4540	3020	4900	3260	5490	3650	6150	4090	6910	4600
24000	15900	25700	17100	27400	18200	30100	20000	33100	22000	36500	24300		1.00	4200	2790	4540	3020	4900	3260	5490	3650	6150	4090	6910	4600
23800	15800	25500	16900	27200	18100	29900	19900	32900	21900	36200	24100		1.50	4200	2790	4540	3020	4900	3260	5490	3650	6150	4090	6910	4600
23500	15600	25200	16800	26900	17900	29600	19700	32600	21700	35900	23900		2.00	4200	2790	4540	3020	4900	3260	5490	3650	6150	4090	6910	4600
23200	15400	24800	16500	26600	17700	29200	19400	32100	21400	35400	23600		2.50	4200	2790	4540	3020	4900	3260	5490	3650	6150	4090	6910	4600
22800	15200	24400	16200	26100	17400	28700	19100	31600	21000	34900	23200		3.00	4200	2790	4540	3020	4900	3260	5490	3650	6150	4090	6910	4600
22300	14900	23900	15900	25600	17000	28200	18700	31000	20700	34300	22800		3.50	4200	2790	4540	3020	4900	3260	5490	3650	6150	4090	6910	4600
21800	14500	23400	15600	25000	16700	27500	18300	30400	20200	33500	22300		4.00	4200	2790	4540	3020	4900	3260	5490	3650	6150	4090	6910	4600
21200	14100	22800	15200	24400	16200	26900	17900	29600	19700	32700	21800		4.50	4200	2790	4540	3020	4900	3260	5490	3650	6150	4090	6910	4600
20600	13700	22100	14700	23700	15800	26100	17400	28800	19200	31900	21200		5.00	4180	2780	4530	3010	4890	3250	5470	3640	6140	4090	6900	4590
19900	13300	21400	14200	23000	15300	25300	16800	28000	18600	31000	20600		5.50	4160	2770	4510	3000	4870	3240	5450	3630	6120	4070	6880	4570
19200	12800	20700	13700	22200	14700	24500	16300	27100	18000	30000	19900		6.00	4140	2750	4480	2980	4850	3220	5430	3610	6100	4060	6850	4560
18500	12300	19900	13200	21300	14200	23600	15700	26100	17400	28900	19200		6.50	4120	2740	4460	2970	4820	3210	5410	3600	6070	4040	6830	4540
17700	11800	19100	12700	20500	13600	22600	15100	25100	16700	27800	18500		7.00	4100	2730	4440	2950	4800	3200	5380	3580	6050	4030	6800	4530
16900	11300	18200	12100	19600	13000	21700	14400	24100	16000	26700	17800		7.50	4070	2710	4420	2940	4780	3180	5360	3570	6030	4010	6780	4510
16100	10700	17400	11600	18700	12400	20700	13800	23000	15300	25600	17000		8.00	4050	2700	4400	2930	4760	3170	5340	3550	6000	3990	6760	4500
15300	10200	16500	11000	17800	11800	19700	13100	21900	14600	24400	16200		8.50	4030	2680	4380	2910	4740	3150	5320	3540	5980	3980	6730	4480
14500	9630	15600	10400	16900	11200	18700	12400	20800	13900	23200	15500		9.00	4010	2670	4360	2900	4720	3140	5290	3520	5960	3960	6710	4460
13700	9090	14800	9830	15900	10600	17700	11800	19800	13100	22100	14700		9.50	3990	2660	4330	2880	4690	3120	5270	3510	5930	3950	6680	4450
12800	8550	13900	9250	15000	10000	16700	11100	18700	12400	20900	13900		10.0	3970	2640	4310	2870	4670	3110	5250	3490	5910	3930	6660	4430
12000	8010	13100	8680	14100	9390	15700	10500	17600	11700	19700	13100		10.5	3950	2630	4290	2860	4650	3090	5230	3480	5890	3920	6640	4420
11300	7490	12200	8120	13200	8800	14700	9810	16500	11000	18500	12300		11.0	3930	2610	4270	2840	4630	3080	5200	3460	5860	3900	6610	4400
10500	6970	11400	7580	12400	8220	13800	9180	15500	10300	17400	11600		11.5	3910	2600	4250	2830	4610	3060	5180	3450	5840	3890	6590	4380
9730	6480	10600	7050	11500	7650	12900	8560	14500	9630	16300	10800		12.0	3890	2590	4230	2810	4580	3050	5160	3430	5820	3870	6570	4370
8990	5980	9800	6520	10700	7100	12000	7960	13500	8970	15200	10100		12.5	3860	2570	4210	2800	4560	3040	5140	3420	5800	3860	6540	4350
8310	5530	9060	6030	9860	6560	11100	7360	12500	8310	14100	9400		13.0	3840	2560	4180	2780	4540	3020	5110	3400	5770	3840	6520	4340
7710	5130	8400	5590	9140	6080	10300	6830	11600	7710	13100	8720		13.5	3820	2540	4160	2770	4520	3010	5090	3390	5750	3830	6490	4320
7170	4770	7810	5200	8500	5660	9540	6350	10800	7170	12200	8110		14.0	3800	2530	4140	2760	4500	2990	5070	3370	5730	3810	6470	4300
6680	4450	7280	4850	7930	5270	8890	5920	10000	6680	11400	7560		14.5	3780	2520	4120	2740	4480	2980	5050	3360	5700	3790	6450	4290
6240	4150	6810	4530	7410	4930	8310	5530	9390	6240	10600	7060		15.0	3760	2500	4100	2730	4450	2960	5020	3340	5680	3780	6420	4270

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
24100	16000	25800	17200	27600	18400	30300	20200	33300	22200	36700	24400
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
21700	14400	23200	15500	24800	16500	27200	18100	29900	19900	33000	22000
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
4460	2970	4810	3200	5270	3510	5900	3930	6620	4420	7450	4970
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
2100	1400	2270	1510	2450	1630	2730	1820	3050	2030	3420	2280

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.57	47.2	4.61	50.4	4.65	53.7	4.70	58.5	4.76	64.0	4.82	70.1
Area, × 10^2 mm^2											
754.9		808.0		863.4		948.1		1040.0		1150.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
250200	90170	274200	98250	299500	106900	342100	119900	392200	135500	450200	153300
r_y, × 10 mm											
10.9		11.0		11.1		11.3		11.4		11.6	
r_x/r_y											
1.67		1.67		1.67		1.69		1.70		1.71	

Table E.1 Continued.

Available Strength for Members Subject to Flexural, Axial, Shear, and Combined Forces

HD Shapes

F_y = 355 MPa

HD 400x990		HD 400x1086		Shape		HD 400×990		HD 400×1086	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN						Available Flexural Strength, kN·m			
LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD
40300	26800	44300	29500	Effective length, L_c, m, with respect to the least radius of gyration, r_y, or unbraced length, L_b, m, for X-X axis bending	**0.00**	7760	5160	8690	5780
40100	26700	44000	29300		**1.00**	7760	5160	8690	5780
39800	26500	43800	29100		**1.50**	7760	5160	8690	5780
39400	26200	43400	28800		**2.00**	7760	5160	8690	5780
39000	25900	42800	28500		**2.50**	7760	5160	8690	5780
38400	25500	42200	28100		**3.00**	7760	5160	8690	5780
37700	25100	41500	27600		**3.50**	7760	5160	8690	5780
36900	24600	40700	27100		**4.00**	7760	5160	8690	5780
36100	24000	39800	26500		**4.50**	7760	5160	8690	5780
35200	23400	38800	25800		**5.00**	7750	5160	8690	5780
34200	22700	37700	25100		**5.50**	7730	5140	8670	5770
33100	22000	36600	24300		**6.00**	7700	5120	8640	5750
32000	21300	35400	23500		**6.50**	7680	5110	8610	5730
30800	20500	34100	22700		**7.00**	7650	5090	8590	5710
29600	19700	32800	21800		**7.50**	7630	5080	8560	5700
28400	18900	31500	21000		**8.00**	7600	5060	8540	5680
27100	18100	30200	20100		**8.50**	7580	5040	8510	5660
25900	17200	28800	19200		**9.00**	7550	5030	8490	5650
24600	16400	27400	18200		**9.50**	7530	5010	8460	5630
23300	15500	26000	17300		**10.0**	7500	4990	8430	5610
22000	14700	24600	16400		**10.5**	7480	4980	8410	5590
20800	13800	23300	15500		**11.0**	7450	4960	8380	5580
19500	13000	21900	14600		**11.5**	7430	4940	8360	5560
18300	12200	20600	13700		**12.0**	7400	4930	8330	5540
17100	11400	19300	12800		**12.5**	7380	4910	8310	5530
16000	10600	18000	12000		**13.0**	7350	4890	8280	5510
14800	9860	16800	11200		**13.5**	7330	4880	8250	5490
13800	9170	15600	10400		**14.0**	7310	4860	8230	5470
12800	8550	14500	9680		**14.5**	7280	4840	8200	5460
12000	7990	13600	9040		**15.0**	7260	4830	8180	5440

Properties

Available Strength in Tensile Yielding, kN			
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
40300	26800	44300	29500
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN			
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
36200	24100	39800	26500
Available Strength in Shear, kN			
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
8420	5620	9450	6300
Available Strength in Flexure about Y-Y axis, kN·m			
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
3820	2540	4270	2840

Limiting Unbraced Lengths, m			
L_p	L_r	L_p	L_r
4.90	76.1	4.97	82.9
Area, × 10^2 mm^2			
1262		1386	
Moment of Inertia, × 10^4 mm^4			
I_x	I_y	I_x	I_y
518900	173400	595700	196200
r_y, × 10 mm			
11.7		11.9	
r_x / r_y			
1.73		1.74	

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 235 MPa

HEA 100		HEA 120		HEA 140		HEA 160		HEA 180		HEA 200		Shape	HEA 100		HEA 120		HEA 140		HEA 160		HEA 180		HEA 200	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
449	299	536	357	665	442	820	546	957	637	1140	757	**0.00**	17.6	11.7	25.3	16.8	36.7	24.4	51.8	34.5	68.7	45.7	90.8	60.4
415	276	507	338	638	425	795	529	934	621	1120	742	**1.00**	17.6	11.7	25.3	16.8	36.7	24.4	51.8	34.5	68.7	45.7	90.8	60.4
376	250	474	315	607	404	764	508	906	603	1090	724	**1.50**	17.4	11.6	25.3	16.8	36.7	24.4	51.8	34.5	68.7	45.7	90.8	60.4
327	218	431	287	566	376	723	481	868	578	1050	699	**2.00**	16.9	11.2	24.7	16.4	36.3	24.2	51.8	34.5	68.7	45.7	90.8	60.4
274	182	381	253	517	344	674	448	822	547	1000	668	**2.50**	16.4	10.9	24.0	15.9	35.3	23.5	50.7	33.7	68.1	45.3	90.8	60.4
220	147	328	218	463	308	618	411	768	511	950	632	**3.00**	16.0	10.6	23.3	15.5	34.4	22.9	49.4	32.9	66.5	44.2	89.0	59.2
170	113	274	183	406	270	558	371	710	472	890	592	**3.50**	15.5	10.3	22.6	15.0	33.4	22.2	48.2	32.0	64.8	43.1	87.0	57.9
130	86.7	224	149	349	232	496	330	648	431	826	549	**4.00**	15.1	10.0	21.9	14.6	32.4	21.6	46.9	31.2	63.1	42.0	85.0	56.6
103	68.5	178	118	294	196	434	289	584	389	758	504	**4.50**	14.6	9.73	21.2	14.1	31.5	20.9	45.6	30.4	61.5	40.9	83.0	55.2
83.4	55.5	144	95.8	243	161	373	248	520	346	689	458	**5.00**	14.2	9.42	20.5	13.6	30.5	20.3	44.4	29.5	59.8	39.8	80.9	53.9
68.9	45.9	119	79.2	201	133	316	210	458	304	620	412	**5.50**	13.7	9.12	19.8	13.2	29.5	19.6	43.1	28.7	58.2	38.7	78.9	52.5
57.9	38.5	100	66.5	168	112	266	177	398	265	552	367	**6.00**	13.2	8.81	19.1	12.7	28.5	19.0	41.8	27.8	56.5	37.6	76.9	51.2
49.3	32.8	85.2	56.7	144	95.5	226	151	341	227	487	324	**6.50**	12.8	8.51	18.4	12.3	27.6	18.3	40.6	27.0	54.9	36.5	74.9	49.8
42.5	28.3	73.5	48.9	124	82.4	195	130	294	196	424	282	**7.00**	12.3	8.20	17.7	11.8	26.6	17.7	39.3	26.2	53.2	35.4	72.8	48.5
37.1	24.7	64.0	42.6	108	71.7	170	113	256	170	370	246	**7.50**	11.9	7.90	17.1	11.3	25.6	17.0	38.0	25.3	51.5	34.3	70.8	47.1
32.6	21.7	56.3	37.4	94.8	63.1	150	99.5	225	150	325	216	**8.00**	11.4	7.59	16.4	10.9	24.6	16.4	36.8	24.5	49.9	33.2	68.8	45.8
28.9	19.2	49.8	33.2	84.0	55.9	132	88.1	199	133	288	192	**8.50**	11.0	7.29	15.6	10.4	23.7	15.7	35.5	23.6	48.2	32.1	66.8	44.4
25.7	17.1	44.5	29.6	74.9	49.8	118	78.6	178	118	257	171	**9.00**	10.4	6.92	14.7	9.81	22.6	15.0	34.2	22.8	46.6	31.0	64.7	43.1
23.1	15.4	39.9	26.5	67.2	44.7	106	70.5	160	106	230	153	**9.50**	9.85	6.55	13.9	9.28	21.3	14.2	33.0	21.9	44.9	29.9	62.7	41.7
20.8	13.9	36.0	24.0	60.7	40.4	95.7	63.7	144	95.8	208	138	**10.0**	9.35	6.22	13.2	8.80	20.2	13.4	31.4	20.9	43.1	28.7	60.7	40.4
18.9	12.6	32.7	21.7	55.0	36.6	86.8	57.7	131	86.9	189	126	**10.5**	8.90	5.92	12.6	8.37	19.2	12.8	29.8	19.8	40.9	27.2	58.7	39.0
17.2	11.5	29.8	19.8	50.1	33.4	79.1	52.6	119	79.2	172	114	**11.0**	8.49	5.65	12.0	7.98	18.3	12.2	28.4	18.9	38.9	25.9	56.2	37.4
15.8	10.5	27.2	18.1	45.9	30.5	72.3	48.1	109	72.5	157	105	**11.5**	8.12	5.40	11.5	7.63	17.5	11.6	27.1	18.0	37.1	24.7	53.6	35.6
14.5	9.63	25.0	16.6	42.1	28.0	66.4	44.2	100	66.5	144	96.1	**12.0**	7.78	5.17	11.0	7.30	16.7	11.1	25.9	17.2	35.4	23.6	51.1	34.0
13.3	8.88	23.0	15.3	38.8	25.8	61.2	40.7	92.2	61.3	133	88.6	**12.5**	7.46	4.96	10.5	7.01	16.0	10.7	24.8	16.5	33.9	22.6	48.9	32.6
12.3	8.21	21.3	14.2	35.9	23.9	56.6	37.7	85.2	56.7	123	81.9	**13.0**	7.17	4.77	10.1	6.73	15.4	10.2	23.8	15.9	32.5	21.6	46.9	31.2
11.4	7.61	19.8	13.1	33.3	22.1	52.5	34.9	79.0	52.6	114	75.9	**13.5**	6.91	4.59	9.74	6.48	14.8	9.85	22.9	15.2	31.3	20.8	45.1	30.0
10.6	7.08	18.4	12.2	30.9	20.6	48.8	32.5	73.5	48.9	106	70.6	**14.0**	6.66	4.43	9.39	6.24	14.3	9.49	22.1	14.7	30.1	20.0	43.3	28.8
9.92	6.60	17.1	11.4	28.8	19.2	45.5	30.3	68.5	45.6	98.9	65.8	**14.5**	6.43	4.28	9.06	6.03	13.8	9.16	21.3	14.2	29.0	19.3	41.8	27.8
9.27	6.16	16.0	10.6	27.0	17.9	42.5	28.3	64.0	42.6	92.4	61.5	**15.0**	6.21	4.13	8.75	5.82	13.3	8.85	20.6	13.7	28.0	18.6	40.3	26.8

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
449	299	536	357	665	442	820	546	957	637	1140	757
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
430	287	513	342	636	424	785	523	916	611	1090	727
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
67.7	45.1	80.4	53.6	103	68.8	129	85.7	145	96.4	174	116
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
8.70	5.79	12.4	8.28	17.9	11.9	24.9	16.5	33.1	22	43.1	28.7

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.29	8.70	1.55	8.45	1.81	8.84	2.04	9.66	2.32	9.93	2.56	10.8
Area, × 10^2 mm^2											
21.24		25.34		31.42		38.77		45.25		53.83	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
349.2	133.8	606.2	230.9	1033	389.3	1673	615.6	2510	924.6	3692	1336
r_y, × 10 mm											
2.51		3.02		3.52		3.98		4.52		4.98	
r_x / r_y											
1.62		1.62		1.63		1.65		1.65		1.66	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 235 MPa

HEA 220		HEA 240		HEA 260		HEA 280		HEA 300		HEA 320		Shape	HEA 220		HEA 240		HEA 260		HEA 280		HEA 300		HEA 320	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1360	905	1630	1080	1840	1220	2060	1370	2380	1580	2630	1750	**0.00**	120	80.0	157	105	195	129	235	156	293	195	344	229
1340	891	1600	1070	1810	1210	2040	1350	2360	1570	2610	1740	**1.00**	120	80.0	157	105	195	129	235	156	293	195	344	229
1310	873	1580	1050	1790	1190	2010	1340	2330	1550	2580	1720	**1.50**	120	80.0	157	105	195	129	235	156	293	195	344	229
1270	848	1540	1020	1750	1170	1980	1310	2300	1530	2540	1690	**2.00**	120	80.0	157	105	195	129	235	156	293	195	344	229
1230	817	1490	992	1710	1130	1930	1280	2250	1500	2490	1660	**2.50**	120	80.0	157	105	195	129	235	156	293	195	344	229
1170	781	1430	955	1650	1100	1880	1250	2200	1460	2430	1620	**3.00**	119	79.4	157	105	195	129	235	156	293	195	344	229
1110	740	1370	913	1590	1060	1820	1210	2130	1420	2360	1570	**3.50**	117	77.7	155	103	193	129	235	156	293	195	344	229
1050	696	1300	866	1520	1010	1750	1160	2060	1370	2280	1520	**4.00**	114	76.1	152	101	190	126	232	154	291	194	343	228
976	649	1230	817	1450	962	1670	1110	1990	1320	2200	1460	**4.50**	112	74.4	149	99.1	186	124	228	151	286	190	337	224
903	601	1150	765	1370	910	1600	1060	1910	1270	2110	1400	**5.00**	109	72.7	146	97.1	183	122	223	149	281	187	331	220
828	551	1070	711	1290	855	1510	1010	1820	1210	2010	1340	**5.50**	107	71.0	143	95.1	179	119	219	146	277	184	326	217
754	501	987	657	1200	799	1430	949	1730	1150	1910	1270	**6.00**	104	69.4	140	93.1	176	117	215	143	272	181	320	213
680	453	906	603	1120	742	1340	891	1630	1090	1810	1200	**6.50**	102	67.7	137	91.1	172	114	211	140	267	178	314	209
609	405	825	549	1030	685	1250	832	1540	1020	1700	1130	**7.00**	99.2	66.0	134	89.1	169	112	207	138	262	174	309	205
541	360	746	496	946	629	1160	772	1440	961	1600	1060	**7.50**	96.7	64.3	131	87.1	165	110	203	135	257	171	303	202
476	316	670	446	863	574	1070	714	1350	897	1490	991	**8.00**	94.2	62.6	128	85.1	161	107	198	132	253	168	298	198
421	280	597	397	783	521	987	656	1250	833	1380	921	**8.50**	91.6	61.0	125	83.1	158	105	194	129	248	165	292	194
376	250	532	354	706	469	903	601	1160	771	1280	853	**9.00**	89.1	59.3	122	81.1	154	103	190	126	243	162	286	191
337	224	478	318	633	421	822	547	1070	710	1180	785	**9.50**	86.6	57.6	119	79.1	151	100	186	124	238	158	281	187
304	202	431	287	572	380	743	494	979	651	1080	720	**10.0**	84.1	55.9	116	77.1	147	97.9	182	121	233	155	275	183
276	184	391	260	518	345	673	448	892	593	986	656	**10.5**	81.5	54.3	113	75.1	144	95.6	177	118	229	152	270	179
252	167	356	237	472	314	614	408	813	541	899	598	**11.0**	79.0	52.6	110	73.1	140	93.2	173	115	224	149	264	176
230	153	326	217	432	288	561	374	744	495	822	547	**11.5**	76.5	50.9	107	71.1	137	90.8	169	112	219	146	258	172
211	141	299	199	397	264	516	343	683	454	755	502	**12.0**	73.0	48.6	104	69.1	133	88.5	165	110	214	143	253	168
195	130	276	184	366	243	475	316	629	419	696	463	**12.5**	69.8	46.4	101	67.1	129	86.1	161	107	209	139	247	164
180	120	255	170	338	225	439	292	582	387	643	428	**13.0**	66.9	44.5	96.9	64.5	126	83.7	156	104	205	136	241	161
167	111	236	157	314	209	407	271	540	359	597	397	**13.5**	64.2	42.7	92.9	61.8	122	80.9	152	101	200	133	236	157
155	103	220	146	292	194	379	252	502	334	555	369	**14.0**	61.7	41.0	89.3	59.4	117	77.7	147	97.9	195	130	230	153
145	96.3	205	136	272	181	353	235	468	311	517	344	**14.5**	59.4	39.5	85.9	57.2	112	74.7	141	94.1	190	127	225	149
135	90.0	192	127	254	169	330	220	437	291	483	322	**15.0**	57.3	38.1	82.8	55.1	108	71.9	136	90.5	185	123	219	146

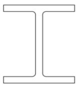
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1360	905	1630	1080	1840	1220	2060	1370	2380	1580	2630	1750
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1300	869	1560	1040	1760	1170	1970	1310	2280	1520	2520	1680
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
207	138	243	162	264	176	305	203	348	232	393	262
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
57.2	38.1	74.4	49.5	91	60.5	110	72.9	136	90.2	150	99.9

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
2.83	11.5	3.08	12.6	3.34	13.3	3.59	13.8	3.85	14.9	3.85	15.0
Area, × 10^2 mm^2											
64.34		76.84		86.82		97.26		113		124	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
5410	1955	7763	2769	104500	3668	13670	4763	18260	6310	22930	6985
r_y, × 10 mm											
5.51		6.00		6.50		7.00		7.49		7.49	
r_x/r_y											
1.66		1.68		1.69		1.69		1.70		1.81	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 235 MPa

HEA 340		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550		Shape		HEA 340		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550	
ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	Design		ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
2820	1880	3020	2010	3360	2240	3760	2500	4180	2780	4480	2980		**0.00**	391	260	442	294	542	361	680	453	835	556	978	650
2800	1860	2990	1990	3330	2220	3730	2480	4140	2750	4440	2950		**1.00**	391	260	442	294	542	361	680	453	835	556	978	650
2770	1840	2960	1970	3290	2190	3690	2450	4090	2720	4380	2920		**1.50**	391	260	442	294	542	361	680	453	835	556	978	650
2720	1810	2910	1940	3240	2160	3630	2410	4020	2680	4310	2870		**2.00**	391	260	442	294	542	361	680	453	835	556	978	650
2670	1780	2850	1900	3170	2110	3550	2360	3940	2620	4210	2800		**2.50**	391	260	442	294	542	361	680	453	835	556	978	650
2600	1730	2780	1850	3090	2060	3460	2300	3830	2550	4100	2730		**3.00**	391	260	442	294	542	361	680	453	835	556	978	650
2530	1680	2700	1800	3000	2000	3360	2230	3720	2470	3980	2640		**3.50**	391	260	442	294	542	361	680	453	835	556	978	650
2450	1630	2610	1740	2900	1930	3240	2160	3590	2390	3830	2550		**4.00**	389	259	439	292	537	358	674	448	826	550	964	642
2360	1570	2520	1670	2790	1860	3110	2070	3450	2290	3680	2450		**4.50**	383	255	431	287	528	351	661	440	810	539	945	628
2260	1500	2410	1600	2670	1780	2980	1980	3290	2190	3510	2340		**5.00**	376	250	424	282	518	345	649	432	794	528	925	615
2150	1430	2300	1530	2540	1690	2830	1890	3130	2080	3340	2220		**5.50**	370	246	417	277	509	339	636	423	778	518	905	602
2050	1360	2180	1450	2410	1600	2690	1790	2970	1970	3150	2100		**6.00**	363	242	409	272	499	332	624	415	762	507	885	589
1930	1290	2060	1370	2280	1510	2530	1690	2800	1860	2970	1970		**6.50**	357	237	402	267	490	326	611	407	746	497	865	576
1820	1210	1940	1290	2140	1420	2380	1580	2620	1740	2780	1850		**7.00**	350	233	394	262	480	320	599	398	731	486	845	562
1710	1140	1820	1210	2000	1330	2220	1480	2450	1630	2590	1720		**7.50**	344	229	387	257	471	313	586	390	715	475	825	549
1590	1060	1690	1130	1860	1240	2070	1370	2270	1510	2400	1600		**8.00**	337	224	380	253	461	307	574	382	699	465	805	536
1480	984	1570	1050	1720	1150	1910	1270	2100	1400	2220	1470		**8.50**	331	220	372	248	452	301	561	373	683	454	785	523
1370	910	1450	967	1590	1060	1760	1170	1930	1290	2030	1350		**9.00**	324	216	365	243	442	294	549	365	667	444	766	509
1260	837	1340	890	1460	971	1620	1070	1770	1180	1860	1240		**9.50**	318	211	357	238	433	288	536	357	651	433	746	496
1150	767	1220	815	1330	887	1470	981	1610	1070	1690	1120		**10.0**	311	207	350	233	423	282	524	348	635	422	726	483
1050	699	1110	741	1210	805	1340	889	1460	973	1530	1020		**10.5**	305	203	342	228	414	275	511	340	619	412	706	470
957	636	1020	675	1100	734	1220	810	1330	887	1390	928		**11.0**	298	198	335	223	404	269	499	332	603	401	686	456
875	582	929	618	1010	671	1110	741	1220	811	1280	849		**11.5**	292	194	328	218	395	263	486	323	587	391	666	443
804	535	853	567	927	617	1020	681	1120	745	1170	779		**12.0**	285	190	320	213	385	256	474	315	571	380	646	430
741	493	786	523	854	568	943	628	1030	687	1080	718		**12.5**	279	186	313	208	376	250	461	307	555	369	626	417
685	456	727	484	790	525	872	580	954	635	998	664		**13.0**	272	181	305	203	366	244	449	298	539	359	603	401
635	423	674	448	732	487	809	538	885	589	926	616		**13.5**	266	177	298	198	357	237	436	290	522	347	575	383
591	393	627	417	681	453	752	500	823	548	861	573		**14.0**	259	173	291	193	347	231	421	280	500	332	550	366
551	366	584	389	635	422	701	466	767	510	802	534		**14.5**	253	168	283	188	336	223	404	269	479	319	528	351
514	342	546	363	593	395	655	436	717	477	750	499		**15.0**	245	163	274	182	323	215	388	258	460	306	507	337

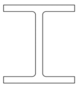
Properties

Available Strength in Tensile Yielding, kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
2820	1880	3020	2010	3360	2240	3760	2500	4180	2780	4480	2980
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
2700	1800	2890	1930	3220	2150	3600	2400	4000	2670	4290	2860
Available Strength in Shear, kN											
ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v
442	295	494	329	605	403	713	476	829	553	952	635
Available Strength in Flexure about Y-Y axis, kN·m											
ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b
160	106	170	113	185	123	204	136	224	149	234	156

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.83	14.8	3.81	14.7	3.77	14.3	3.74	13.8	3.72	13.4	3.67	12.8
Area, × 10^2 mm^2											
133.5		142.8		159.0		178.0		197.5		211.8	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
27690	7436	33090	7887	45070	8564	637720	9465	86970	10370	1E+05	10820
r_y, × 10 mm											
7.46		7.43		7.34		7.29		7.24		7.15	
r_x/r_y											
1.93		2.05		2.29		2.60		2.90		3.22	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 235 MPa

HEA 600		HEA 650		HEA 700		HEA 800^{c}		HEA 900^{c}		HEA 1000^{c}		Shape		HEA 600		HEA 650		HEA 700		HEA 800		HEA 900		HEA 1000	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
4790	3190	5110	3400	5510	3670	6040	4020	6780	4510	7330	4880	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
4740	3160	5060	3370	5450	3630	5940	3950	6530	4350	6870	4570		1.00	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
4680	3120	4990	3320	5380	3580	5870	3900	6450	4290	6780	4510		1.50	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
4600	3060	4900	3260	5280	3510	5770	3840	6340	4220	6660	4430		2.00	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
4500	2990	4790	3190	5150	3430	5630	3750	6190	4120	6500	4330		2.50	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
4380	2910	4660	3100	5010	3330	5460	3630	6020	4010	6320	4200		3.00	1130	753	1300	863	1490	990	1840	1220	2290	1520	2710	1800
4240	2820	4510	3000	4840	3220	5270	3500	5820	3870	6100	4060		3.50	1130	753	1300	863	1490	990	1830	1220	2270	1510	2670	1780
4080	2710	4340	2890	4650	3090	5050	3360	5600	3730	5860	3900		4.00	1110	741	1270	847	1450	967	1790	1190	2210	1470	2600	1730
3910	2600	4150	2760	4440	2950	4810	3200	5340	3550	5610	3730		4.50	1090	724	1240	828	1420	944	1740	1160	2140	1430	2520	1680
3730	2480	3950	2630	4220	2810	4560	3030	5050	3360	5330	3550		5.00	1060	708	1210	808	1380	921	1690	1130	2080	1390	2440	1630
3540	2350	3750	2490	3990	2660	4300	2860	4740	3160	5040	3360		5.50	1040	692	1190	789	1350	898	1640	1090	2020	1350	2370	1570
3340	2220	3530	2350	3750	2500	4030	2680	4430	2950	4700	3130		6.00	1020	676	1160	769	1310	875	1600	1060	1960	1300	2290	1520
3140	2090	3310	2200	3510	2340	3760	2500	4120	2740	4350	2900		6.50	992	660	1130	750	1280	851	1550	1030	1900	1260	2210	1470
2930	1950	3090	2060	3270	2180	3480	2320	3800	2530	4000	2660		7.00	967	644	1100	731	1250	828	1500	1000	1840	1220	2140	1420
2730	1810	2870	1910	3030	2010	3210	2130	3490	2320	3660	2440		7.50	943	628	1070	711	1210	805	1460	970	1780	1180	2060	1370
2520	1680	2650	1760	2790	1850	2940	1960	3190	2120	3330	2210		8.00	919	611	1040	692	1180	782	1410	939	1720	1140	1980	1320
2320	1540	2440	1620	2550	1700	2680	1780	2890	1920	3000	2000		8.50	895	595	1010	672	1140	759	1360	908	1660	1100	1910	1270
2130	1410	2230	1480	2330	1550	2430	1610	2600	1730	2690	1790		9.00	870	579	982	653	1110	736	1320	877	1590	1060	1830	1220
1940	1290	2020	1350	2100	1400	2180	1450	2340	1560	2410	1610		9.50	846	563	952	634	1070	713	1270	846	1530	1020	1750	1170
1750	1170	1830	1220	1900	1260	1970	1310	2110	1400	2180	1450		10.0	822	547	923	614	1040	690	1220	814	1470	979	1680	1110
1590	1060	1660	1100	1720	1150	1790	1190	1910	1270	1980	1310		10.5	798	531	894	595	1000	667	1180	783	1410	939	1570	1040
1450	964	1510	1010	1570	1040	1630	1080	1740	1160	1800	1200		11.0	773	514	865	575	967	644	1130	749	1320	879	1460	974
1330	882	1380	920	1440	955	1490	991	1600	1060	1650	1100		11.5	749	498	836	556	933	620	1060	704	1240	826	1370	913
1220	810	1270	845	1320	877	1370	910	1470	975	1510	1010		12.0	725	482	804	535	885	589	999	665	1170	779	1290	860
1120	747	1170	779	1220	809	1260	838	1350	898	1390	928		12.5	696	463	762	507	839	558	946	629	1110	736	1220	812
1040	691	1080	720	1120	748	1170	775	1250	831	1290	858		13.0	662	441	725	482	798	531	898	597	1050	699	1160	769
962	640	1000	668	1040	693	1080	719	1160	770	1200	795		13.5	632	420	691	460	760	506	854	568	998	664	1100	731
895	595	933	621	969	645	1000	668	1080	716	1110	740		14.0	604	402	661	439	726	483	815	542	952	633	1050	696
834	555	870	579	903	601	937	623	1000	668	1040	689		14.5	579	385	632	421	695	462	779	518	909	605	998	664
780	519	813	541	844	562	875	582	938	624	968	644		15.0	555	370	607	404	666	443	747	497	871	579	954	635

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
4790	3190	5110	3400	5510	3670	6040	4020	6780	4510	7330	4880
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
4590	3060	4890	3260	5280	3520	5790	3860	6490	4330	7020	4680
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1080	721	1220	812	1410	940	1670	1110	2010	1340	2300	1540
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
244	163	255	170	266	177	277	185	299	199	311	207

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.62	12.3	3.58	11.9	3.51	11.6	3.41	10.9	3.34	10.6	3.26	10.1
Area, × 10^2 mm^2											
226.5		241.6		260.5		285.8		320.5		346.8	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
141200	11270	175200	11720	215300	12180	303400	12640	422100	13550	553800	14000
r_y, × 10 mm											
7.05		6.97		6.84		6.65		6.50		6.35	
r_x/r_y											
3.54		3.86		4.20		4.90		5.58		6.29	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 275 MPa

HEA 100		HEA 120		HEA 140		HEA 160		HEA 180		HEA 200		Shape		HEA 100		HEA 120		HEA 140		HEA 160		HEA 180		HEA 200	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
526	350	627	417	778	517	960	638	1120	745	1330	886	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	20.5	13.7	29.6	19.7	42.9	28.6	60.7	40.4	80.4	53.5	106	70.7
479	319	588	391	742	494	925	615	1090	724	1300	866		1.00	20.5	13.7	29.6	19.7	42.9	28.6	60.7	40.4	80.4	53.5	106	70.7
427	284	543	361	700	465	883	588	1050	699	1260	841		1.50	20.2	13.4	29.4	19.6	42.9	28.6	60.7	40.4	80.4	53.5	106	70.7
363	242	486	323	644	429	828	551	999	665	1210	807		2.00	19.5	13.0	28.5	19.0	42.1	28.0	60.3	40.1	80.4	53.5	106	70.7
295	196	421	280	579	386	762	507	937	623	1150	765		2.50	18.9	12.6	27.5	18.3	40.7	27.1	58.5	38.9	78.8	52.4	106	70.2
229	152	353	235	509	339	689	458	866	576	1080	717		3.00	18.3	12.1	26.6	17.7	39.4	26.2	56.8	37.8	76.5	50.9	103	68.4
170	113	287	191	437	291	611	407	789	525	999	665		3.50	17.6	11.7	25.6	17.1	38.0	25.3	55.0	36.6	74.2	49.4	100	66.5
130	86.7	225	150	366	244	532	354	709	472	915	609		4.00	17.0	11.3	24.7	16.4	36.7	24.4	53.3	35.5	72.0	47.9	97.2	64.7
103	68.5	178	118	300	199	455	303	628	418	828	551		4.50	16.4	10.9	23.7	15.8	35.3	23.5	51.6	34.3	69.7	46.4	94.4	62.8
83.4	55.5	144	95.8	243	161	382	254	549	365	740	492		5.00	15.7	10.5	22.8	15.1	34.0	22.6	49.8	33.1	67.4	44.8	91.6	61.0
68.9	45.9	119	79.2	201	133	316	210	472	314	654	435		5.50	15.1	10.0	21.8	14.5	32.6	21.7	48.1	32.0	65.1	43.3	88.8	59.1
57.9	38.5	100	66.5	168	112	266	177	400	266	571	380		6.00	14.5	9.62	20.8	13.9	31.3	20.8	46.3	30.8	62.8	41.8	86.1	57.3
49.3	32.8	85.2	56.7	144	95.5	226	151	341	227	492	328		6.50	13.8	9.19	19.9	13.2	30.0	19.9	44.6	29.7	60.5	40.3	83.3	55.4
42.5	28.3	73.5	48.9	124	82.4	195	130	294	196	424	282		7.00	13.2	8.77	18.9	12.6	28.6	19.0	42.8	28.5	58.3	38.8	80.5	53.6
37.1	24.7	64.0	42.6	108	71.7	170	113	256	170	370	246		7.50	12.5	8.33	17.8	11.9	27.3	18.1	41.1	27.3	56.0	37.2	77.7	51.7
32.6	21.7	56.3	37.4	94.8	63.1	150	99.5	225	150	325	216		8.00	11.7	7.80	16.7	11.1	25.6	17.0	39.3	26.2	53.7	35.7	74.9	49.8
28.9	19.2	49.8	33.2	84.0	55.9	132	88.1	199	133	288	192		8.50	11.0	7.33	15.6	10.4	24.0	16.0	37.4	24.9	51.4	34.2	72.1	48.0
25.7	17.1	44.5	29.6	74.9	49.8	118	78.6	178	118	257	171		9.00	10.4	6.92	14.7	9.81	22.6	15.0	35.1	23.4	48.5	32.2	69.4	46.1
23.1	15.4	39.9	26.5	67.2	44.7	106	70.5	160	106	230	153		9.50	9.85	6.55	13.9	9.28	21.3	14.2	33.1	22.1	45.6	30.4	66.2	44.0
20.8	13.9	36.0	24.0	60.7	40.4	95.7	63.7	144	95.8	208	138		10.0	9.35	6.22	13.2	8.80	20.2	13.4	31.4	20.9	43.1	28.7	62.5	41.6
18.9	12.6	32.7	21.7	55.0	36.6	86.8	57.7	131	86.9	189	126		10.5	8.90	5.92	12.6	8.37	19.2	12.8	29.8	19.8	40.9	27.2	59.2	39.4
17.2	11.5	29.8	19.8	50.1	33.4	79.1	52.6	119	79.2	172	114		11.0	8.49	5.65	12.0	7.98	18.3	12.2	28.4	18.9	38.9	25.9	56.2	37.4
15.8	10.5	27.2	18.1	45.9	30.5	72.3	48.1	109	72.5	157	105		11.5	8.12	5.40	11.5	7.63	17.5	11.6	27.1	18.0	37.1	24.7	53.6	35.6
14.5	9.63	25.0	16.6	42.1	28.0	66.4	44.2	100	66.5	144	96.1		12.0	7.78	5.17	11.0	7.30	16.7	11.1	25.9	17.2	35.4	23.6	51.1	34.0
13.3	8.88	23.0	15.3	38.8	25.8	61.2	40.7	92.2	61.3	133	88.6		12.5	7.46	4.96	10.5	7.01	16.0	10.7	24.8	16.5	33.9	22.6	48.9	32.6
12.3	8.21	21.3	14.2	35.9	23.9	56.6	37.7	85.2	56.7	123	81.9		13.0	7.17	4.77	10.1	6.73	15.4	10.2	23.8	15.9	32.5	21.6	46.9	31.2
11.4	7.61	19.8	13.1	33.3	22.1	52.5	34.9	79.0	52.6	114	75.9		13.5	6.91	4.59	9.74	6.48	14.8	9.85	22.9	15.2	31.3	20.8	45.1	30.0
10.6	7.08	18.4	12.2	30.9	20.6	48.8	32.5	73.5	48.9	106	70.6		14.0	6.66	4.43	9.39	6.24	14.3	9.49	22.1	14.7	30.1	20.0	43.3	28.8
9.92	6.60	17.1	11.4	28.8	19.2	45.5	30.3	68.5	45.6	98.9	65.8		14.5	6.43	4.28	9.06	6.03	13.8	9.16	21.3	14.2	29.0	19.3	41.8	27.8
9.27	6.16	16.0	10.6	27.0	17.9	42.5	28.3	64.0	42.6	92.4	61.5		15.0	6.21	4.13	8.75	5.82	13.3	8.85	20.6	13.7	28.0	18.6	40.3	26.8

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
526	350	627	417	778	517	960	638	1120	745	1330	886
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
514	342	613	409	760	507	938	625	1090	730	1300	868
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
79.2	52.8	94.1	62.7	121	80.5	150	100	169	113	204	136
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
10.2	6.77	14.6	9.69	21.0	14.0	29.1	19.4	38.7	25.8	50.4	33.6

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.19	7.46	1.43	7.27	1.67	7.63	1.89	8.35	2.15	8.6	2.36	9.37
Area, × 10^2 mm^2											
21.24		25.34		31.42		38.77		45.25		53.83	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
349.2	133.8	606.2	230.9	1033	389.3	1673	615.6	2510	924.6	3692	1336
r_y, × 10 mm											
2.51		3.02		3.52		3.98		4.52		4.98	
r_x/r_y											
1.62		1.62		1.63		1.65		1.65		1.66	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 275 MPa

HEA 220		HEA 240		HEA 260		HEA 280		HEA 300		HEA 320		Shape	HEA 220		HEA 240		HEA 260^f		HEA 280^f		HEA 300^f		HEA 320	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1590	1060	1900	1270	2150	1430	2410	1600	2780	1850	3080	2050	0.00	141	93.6	184	123	227	151	272	181	339	225	403	268
1560	1040	1870	1240	2120	1410	2380	1580	2760	1830	3050	2030	1.00	141	93.6	184	123	227	151	272	181	339	225	403	268
1530	1010	1830	1220	2080	1390	2340	1560	2720	1810	3010	2000	1.50	141	93.6	184	123	227	151	272	181	339	225	403	268
1470	981	1780	1190	2030	1350	2300	1530	2670	1780	2950	1970	2.00	141	93.6	184	123	227	151	272	181	339	225	403	268
1410	940	1720	1140	1970	1310	2230	1490	2610	1740	2890	1920	2.50	141	93.6	184	123	227	151	272	181	339	225	403	268
1340	891	1640	1090	1900	1260	2160	1440	2540	1690	2800	1870	3.00	138	91.8	183	122	227	151	272	181	339	225	403	268
1260	837	1560	1040	1810	1210	2080	1380	2450	1630	2710	1800	3.50	135	89.5	179	119	224	149	272	181	339	225	403	268
1170	779	1470	976	1720	1150	1990	1320	2360	1570	2610	1730	4.00	131	87.2	175	116	219	146	267	178	336	224	396	264
1080	718	1370	911	1620	1080	1890	1260	2260	1500	2490	1660	4.50	128	84.9	171	114	214	142	262	174	330	219	388	258
985	655	1270	844	1520	1010	1790	1190	2150	1430	2370	1580	5.00	124	82.6	167	111	209	139	256	170	323	215	381	253
891	593	1170	775	1420	942	1680	1120	2030	1350	2250	1500	5.50	121	80.3	162	108	204	136	250	167	317	211	373	248
798	531	1060	706	1310	870	1570	1040	1920	1270	2120	1410	6.00	117	78.0	158	105	199	133	245	163	310	206	365	243
707	471	959	638	1200	798	1460	969	1790	1190	1980	1320	6.50	114	75.7	154	103	194	129	239	159	304	202	358	238
621	413	860	572	1090	727	1340	894	1670	1110	1850	1230	7.00	110	73.4	150	99.8	189	126	233	155	297	198	350	233
541	360	765	509	989	658	1230	820	1550	1030	1720	1140	7.50	107	71.1	146	97.1	185	123	227	151	290	193	342	228
476	316	673	448	888	591	1120	748	1430	953	1580	1050	8.00	103	68.8	142	94.3	180	120	222	147	284	189	335	223
421	280	597	397	791	526	1020	678	1310	874	1450	967	8.50	100	66.5	138	91.6	175	116	216	144	277	184	327	217
376	250	532	354	706	469	917	610	1200	798	1330	883	9.00	96.5	64.2	133	88.8	170	113	210	140	271	180	319	212
337	224	478	318	633	421	823	547	1090	725	1210	802	9.50	93.0	61.9	129	86.1	165	110	204	136	264	176	311	207
304	202	431	287	572	380	743	494	983	654	1090	723	10.0	89.6	59.6	125	83.3	160	107	199	132	257	171	304	202
276	184	391	260	518	345	673	448	892	593	986	656	10.5	84.8	56.4	121	80.6	155	103	193	128	251	167	296	197
252	167	356	237	472	314	614	408	813	541	899	598	11.0	80.5	53.5	117	77.8	150	100	187	125	244	163	288	192
230	153	326	217	432	288	561	374	744	495	822	547	11.5	76.6	50.9	111	73.9	146	96.8	182	121	238	158	281	187
211	141	299	199	397	264	516	343	683	454	755	502	12.0	73.0	48.6	106	70.5	139	92.4	176	117	231	154	273	182
195	130	276	184	366	243	475	316	629	419	696	463	12.5	69.8	46.4	101	67.3	133	88.2	168	112	225	149	265	177
180	120	255	170	338	225	439	292	582	387	643	428	13.0	66.9	44.5	96.9	64.5	127	84.4	160	107	218	145	258	171
167	111	236	157	314	209	407	271	540	359	597	397	13.5	64.2	42.7	92.9	61.8	122	80.9	153	102	209	139	247	164
155	103	220	146	292	194	379	252	502	334	555	369	14.0	61.7	41.0	89.3	59.4	117	77.7	147	97.9	200	133	237	158
145	96.3	205	136	272	181	353	235	468	311	517	344	14.5	59.4	39.5	85.9	57.2	112	74.7	141	94.1	192	128	227	151
135	90	192	127	254	169	330	220	437	291	483	322	15.0	57.3	38.1	82.8	55.1	108	71.9	136	90.5	185	123	219	146

Properties

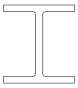
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1590	1060	1900	1270	2150	1430	2410	1600	2780	1850	3080	2050
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1560	1040	1860	1240	2100	1400	2350	1570	2720	1810	3010	2010
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
243	162	285	190	309	206	356	238	407	271	460	307
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
####	44.6	87.0	57.9	106	70.5	126	83.9	156	104	176	117

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
2.62	10.0	2.85	11.0	3.09	11.6	3.32	12.0	3.56	13.0	3.56	13.1
Area, × 10^2 mm^2											
64.34		76.84		86.82		97.26		113		124	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
5410	1955	7763	2769	104500	3668	13670	4763	18260	6310	22930	6985
r_y, × 10 mm											
5.51		6.00		6.50		7.00		7.49		7.49	
r_x/r_y											
1.66		1.68		1.69		1.69		1.70		1.81	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

^{f} Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 275 MPa

HEA 340		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550		Shape	HEA 340		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
3300	2200	3530	2350	3940	2620	4410	2930	4890	3250	5240	3490	0.00	458	305	517	344	634	422	796	530	977	650	1140	761
3270	2180	3500	2330	3890	2590	4360	2900	4830	3220	5180	3450	1.00	458	305	517	344	634	422	796	530	977	650	1140	761
3230	2150	3450	2300	3840	2560	4300	2860	4770	3170	5110	3400	1.50	458	305	517	344	634	422	796	530	977	650	1140	761
3170	2110	3390	2250	3770	2510	4220	2810	4680	3110	5010	3330	2.00	458	305	517	344	634	422	796	530	977	650	1140	761
3090	2060	3310	2200	3680	2450	4110	2740	4560	3030	4880	3250	2.50	458	305	517	344	634	422	796	530	977	650	1140	761
3010	2000	3210	2140	3570	2380	3990	2660	4420	2940	4730	3150	3.00	458	305	517	344	634	422	796	530	977	650	1140	761
2910	1930	3110	2070	3450	2290	3850	2560	4270	2840	4560	3030	3.50	458	305	517	344	634	422	795	529	975	648	1140	757
2790	1860	2980	1990	3310	2200	3700	2460	4090	2720	4370	2910	4.00	450	299	507	337	621	413	778	517	953	634	1110	739
2670	1780	2850	1900	3160	2100	3530	2350	3900	2600	4160	2770	4.50	441	293	497	331	608	404	761	506	931	620	1080	722
2540	1690	2710	1810	3000	2000	3350	2230	3700	2460	3940	2620	5.00	432	287	487	324	595	396	744	495	910	605	1060	704
2410	1600	2570	1710	2840	1890	3160	2100	3490	2320	3710	2470	5.50	423	282	477	317	582	387	727	483	888	591	1030	686
2270	1510	2420	1610	2670	1770	2970	1970	3280	2180	3480	2310	6.00	414	276	467	310	569	378	710	472	867	577	1000	668
2120	1410	2260	1500	2490	1660	2770	1840	3060	2030	3240	2150	6.50	405	270	457	304	556	370	693	461	845	562	977	650
1980	1320	2110	1400	2320	1540	2570	1710	2830	1890	3000	1990	7.00	397	264	446	297	543	361	676	449	823	548	950	632
1830	1220	1950	1300	2140	1420	2380	1580	2610	1740	2760	1840	7.50	388	258	436	290	530	353	659	438	802	533	923	614
1690	1120	1800	1200	1970	1310	2180	1450	2400	1600	2530	1680	8.00	379	252	426	284	517	344	642	427	780	519	897	597
1550	1030	1650	1100	1800	1200	1990	1330	2190	1460	2300	1530	8.50	370	246	416	277	504	335	625	416	758	505	870	579
1410	941	1500	999	1640	1090	1810	1210	1990	1320	2080	1380	9.00	361	240	406	270	491	327	608	404	737	490	843	561
1280	853	1360	905	1480	984	1630	1090	1790	1190	1870	1240	9.50	352	234	396	263	478	318	591	393	715	476	816	543
1160	770	1230	817	1330	888	1470	981	1610	1070	1690	1120	10.0	343	228	386	257	465	310	574	382	694	461	789	525
1050	699	1110	741	1210	805	1340	889	1460	973	1530	1020	10.5	334	223	375	250	452	301	557	370	672	447	762	507
957	636	1020	675	1100	734	1220	810	1330	887	1390	928	11.0	326	217	365	243	439	292	540	359	650	433	735	489
875	582	929	618	1010	671	1110	741	1220	811	1280	849	11.5	317	211	355	236	426	284	522	348	629	418	703	468
804	535	853	567	927	617	1020	681	1120	745	1170	779	12.0	308	205	345	230	413	275	505	336	603	401	666	443
741	493	786	523	854	568	943	628	1030	687	1080	718	12.5	299	199	335	223	400	266	482	321	573	381	633	421
685	456	727	484	790	525	872	580	954	635	998	664	13.0	290	193	323	215	382	254	460	306	546	363	603	401
635	423	674	448	732	487	809	538	885	589	926	616	13.5	277	184	309	206	365	243	440	292	522	347	575	383
591	393	627	417	681	453	752	500	823	548	861	573	14.0	266	177	296	197	350	233	421	280	500	332	550	366
551	366	584	389	635	422	701	466	767	510	802	534	14.5	255	170	285	189	336	223	404	269	479	319	528	351
514	342	546	363	593	395	655	436	717	477	750	499	15.0	245	163	274	182	323	215	388	258	460	306	507	337

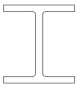
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2820	1880	3020	2010	3360	2240	3760	2500	4180	2780	4480	2980
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1800	2700	1930	2890	2150	3220	2400	3600	2670	4000	2860	4290
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
442	295	494	329	605	403	713	476	829	553	952	635
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
160	106	170	113	185	123	204	136	224	149	234	156

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.54	13.0	3.53	12.9	3.48	12.5	3.46	12.1	3.44	11.8	3.39	11.3
Area, × 10^2 mm^2											
133.5		142.8		159.0		178.0		197.5		211.8	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
27690	7436	33090	7887	45070	8564	637720	9465	86970	10370	111900	10820
r_y, × 10 mm											
7.46		7.43		7.34		7.29		7.24		7.15	
r_x/r_y											
1.93		2.05		2.29		2.60		2.90		3.22	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 275 MPa

HEA 600		HEA 650		HEA 700		HEA 800^c		HEA 900^c		HEA 1000^c		Shape	HEA 600		HEA 650		HEA 700		HEA 800		HEA 900		HEA 1000	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
5610	3730	5980	3980	6450	4290	7070	4710	7930	5280	8580	5710	0.00	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
5540	3690	5910	3930	6370	4240	6810	4530	7470	4970	7850	5220	1.00	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
5460	3630	5820	3870	6270	4170	6710	4460	7360	4900	7730	5140	1.50	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
5350	3560	5700	3790	6130	4080	6570	4370	7210	4800	7560	5030	2.00	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
5210	3470	5550	3690	5960	3970	6400	4260	7020	4670	7350	4890	2.50	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
5040	3360	5370	3570	5760	3830	6200	4130	6790	4520	7110	4730	3.00	1320	881	1520	1010	1740	1160	2150	1430	2680	1780	3170	2110
4860	3230	5160	3430	5530	3680	5980	3980	6530	4350	6830	4540	3.50	1310	874	1500	1000	1720	1140	2110	1400	2610	1740	3070	2050
4650	3090	4930	3280	5280	3510	5720	3810	6250	4160	6520	4340	4.00	1280	853	1460	974	1670	1110	2050	1360	2530	1680	2970	1980
4420	2940	4690	3120	5010	3330	5420	3600	5940	3950	6180	4110	4.50	1250	831	1430	948	1620	1080	1990	1320	2450	1630	2870	1910
4180	2780	4430	2950	4720	3140	5090	3380	5610	3730	5830	3880	5.00	1220	809	1390	922	1580	1050	1920	1280	2370	1570	2770	1840
3930	2620	4160	2770	4420	2940	4750	3160	5230	3480	5460	3640	5.50	1180	787	1350	896	1530	1020	1860	1240	2290	1520	2670	1780
3670	2440	3880	2580	4120	2740	4400	2930	4830	3210	5090	3390	6.00	1150	766	1310	870	1480	988	1800	1200	2200	1470	2570	1710
3410	2270	3600	2400	3810	2530	4050	2700	4430	2950	4660	3100	6.50	1120	744	1270	844	1440	957	1740	1160	2120	1410	2470	1640
3150	2100	3320	2210	3500	2330	3710	2470	4030	2680	4230	2810	7.00	1090	722	1230	818	1390	926	1680	1120	2040	1360	2370	1580
2900	1930	3040	2030	3200	2130	3370	2240	3650	2430	3810	2530	7.50	1050	701	1190	792	1350	895	1610	1070	1960	1310	2270	1510
2650	1760	2770	1850	2900	1930	3040	2020	3280	2180	3400	2260	8.00	1020	679	1150	766	1300	865	1550	1030	1880	1250	2170	1440
2400	1600	2510	1670	2620	1740	2730	1810	2920	1940	3020	2010	8.50	988	657	1110	740	1250	834	1490	992	1800	1200	2070	1370
2170	1440	2260	1500	2340	1560	2430	1620	2600	1730	2690	1790	9.00	955	635	1070	714	1210	803	1430	950	1720	1140	1960	1310
1940	1290	2030	1350	2100	1400	2180	1450	2340	1560	2410	1610	9.50	922	614	1030	688	1160	772	1370	909	1640	1090	1820	1210
1750	1170	1830	1220	1900	1260	1970	1310	2110	1400	2180	1450	10.0	890	592	996	663	1110	741	1290	857	1520	1010	1690	1120
1590	1060	1660	1100	1720	1150	1790	1190	1910	1270	1980	1310	10.5	857	570	957	637	1060	705	1200	800	1410	940	1570	1040
1450	964	1510	1010	1570	1040	1630	1080	1740	1160	1800	1200	11.0	821	546	902	600	994	661	1130	749	1320	879	1460	974
1330	882	1380	920	1440	955	1490	991	1600	1060	1650	1100	11.5	775	515	850	566	936	623	1060	704	1240	826	1370	913
1220	810	1270	845	1320	877	1370	910	1470	975	1510	1010	12.0	733	488	804	535	885	589	999	665	1170	779	1290	860
1120	747	1170	779	1220	809	1260	838	1350	898	1390	928	12.5	696	463	762	507	839	558	946	629	1110	736	1220	812
1040	691	1080	720	1120	748	1170	775	1250	831	1290	858	13.0	662	441	725	482	798	531	898	597	1050	699	1160	769
962	640	1000	668	1040	693	1080	719	1160	770	1200	795	13.5	632	420	691	460	760	506	854	568	998	664	1100	731
895	595	933	621	969	645	1000	668	1080	716	1110	740	14.0	604	402	661	439	726	483	815	542	952	633	1050	696
834	555	870	579	903	601	937	623	1000	668	1040	689	14.5	579	385	632	421	695	462	779	518	909	605	998	664
780	519	813	541	844	562	875	582	938	624	968	644	15.0	555	370	607	404	666	443	747	497	871	579	954	635

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
5610	3730	5980	3980	6450	4290	7070	4710	7930	5280	8580	5710
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
5480	3650	5840	3900	6300	4200	6910	4610	7750	5170	8390	5590
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1270	844	1430	950	1650	1100	1960	1300	2350	1570	2700	1800
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
286	190	298	198	311	207	325	216	350	233	364	242

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.35	10.9	3.31	10.6	3.25	10.4	3.16	9.79	3.09	9.5	3.01	9.13
Area, × 10^2 mm^2											
226.5		241.6		260.5		285.8		320.5		346.8	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
141200	11270	175200	11720	215300	12180	303400	12640	422100	13550	553800	14000
r_y, × 10 mm											
7.05		6.97		6.84		6.65		6.5		6.35	
r_x/r_y											
3.54		3.86		4.20		4.90		5.58		6.29	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 355 MPa

Available Compressive Strength, kN

Shape	HEA 100		HEA 120		HEA 140		HEA 160		HEA 180		HEA 200	
Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	679	452	810	539	1000	668	1240	824	1450	962	1720	1140
1.00	602	401	745	496	945	629	1180	786	1390	927	1670	1110
1.50	519	345	672	447	876	583	1110	741	1330	885	1610	1070
2.00	421	280	582	387	787	524	1020	681	1250	830	1520	1010
2.50	322	214	483	322	687	457	920	612	1150	764	1420	947
3.00	232	154	385	256	581	387	808	537	1040	690	1310	871
3.50	170	113	294	196	477	317	692	460	921	613	1190	789
4.00	130	86.7	225	150	379	252	579	385	802	533	1060	704
4.50	103	68.5	178	118	300	199	473	314	686	456	930	619
5.00	83.4	55.5	144	95.8	243	161	383	255	576	383	805	536
5.50	68.9	45.9	119	79.2	201	133	316	210	476	317	687	457
6.00	57.9	38.5	100	66.5	168	112	266	177	400	266	578	384
6.50	49.3	32.8	85.2	56.7	144	95.5	226	151	341	227	492	328
7.00	42.5	28.3	73.5	48.9	124	82.4	195	130	294	196	424	282
7.50	37.1	24.7	64.0	42.6	108	71.7	170	113	256	170	370	246
8.00	32.6	21.7	56.3	37.4	94.8	63.1	150	99.5	225	150	325	216
8.50	28.9	19.2	49.8	33.2	84.0	55.9	132	88.1	199	133	288	192
9.00	25.7	17.1	44.5	29.6	74.9	49.8	118	78.6	178	118	257	171
9.50	23.1	15.4	39.9	26.5	67.2	44.7	106	70.5	160	106	230	153
10.0	20.8	13.9	36.0	24.0	60.7	40.4	95.7	63.7	144	95.8	208	138
10.5	18.9	12.6	32.7	21.7	55.0	36.6	86.8	57.7	131	86.9	189	126
11.0	17.2	11.5	29.8	19.8	50.1	33.4	79.1	52.6	119	79.2	172	114
11.5	15.8	10.5	27.2	18.1	45.9	30.5	72.3	48.1	109	72.5	157	105
12.0	14.5	9.63	25.0	16.6	42.1	28.0	66.4	44.2	100	66.5	144	96.1
12.5	13.3	8.88	23.0	15.3	38.8	25.8	61.2	40.7	92.2	61.3	133	88.6
13.0	12.3	8.21	21.3	14.2	35.9	23.9	56.6	37.7	85.2	56.7	123	81.9
13.5	11.4	7.61	19.8	13.1	33.3	22.1	52.5	34.9	79.0	52.6	114	75.9
14.0	10.6	7.08	18.4	12.2	30.9	20.6	48.8	32.5	73.5	48.9	106	70.6
14.5	9.92	6.60	17.1	11.4	28.8	19.2	45.5	30.3	68.5	45.6	98.9	65.8
15.0	9.27	6.16	16.0	10.6	27.0	17.9	42.5	28.3	64.0	42.6	92.4	61.5

Available Flexural Strength, kN·m

Shape	HEA 100		HEA 120		HEA 140		HEA 160		HEA 180[f]		HEA 200[f]	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	26.5	17.6	38.2	25.4	55.4	36.9	78.3	52.1	103	68.3	134	89.1
1.00	26.5	17.6	38.2	25.4	55.4	36.9	78.3	52.1	103	68.3	134	89.1
1.50	25.6	17.0	37.4	24.9	55.3	36.8	78.3	52.1	103	68.3	134	89.1
2.00	24.5	16.3	35.8	23.8	53.0	35.3	76.3	50.8	103	68.3	134	89.1
2.50	23.4	15.6	34.2	22.7	50.8	33.8	73.4	48.8	99.1	66.0	133	88.7
3.00	22.3	14.9	32.6	21.7	48.5	32.3	70.5	46.9	95.3	63.4	129	85.6
3.50	21.3	14.1	30.9	20.6	46.3	30.8	67.5	44.9	91.5	60.9	124	82.5
4.00	20.2	13.4	29.3	19.5	44.0	29.3	64.6	43.0	87.7	58.4	119	79.5
4.50	19.1	12.7	27.7	18.4	41.7	27.8	61.7	41.0	83.9	55.8	115	76.4
5.00	18.0	12.0	26.1	17.4	39.5	26.3	58.8	39.1	80.1	53.3	110	73.3
5.50	17.0	11.3	24.5	16.3	37.2	24.8	55.8	37.1	76.3	50.8	106	70.2
6.00	15.8	10.5	22.6	15.0	34.9	23.2	52.9	35.2	72.5	48.2	101	67.1
6.50	14.5	9.65	20.7	13.8	32.0	21.3	50.0	33.2	68.7	45.7	96.2	64.0
7.00	13.4	8.94	19.2	12.7	29.5	19.6	46.3	30.8	64.6	43.0	91.6	60.9
7.50	12.5	8.33	17.8	11.9	27.4	18.2	42.8	28.5	59.6	39.6	87.0	57.9
8.00	11.7	7.80	16.7	11.1	25.6	17.0	39.9	26.6	55.3	36.8	80.7	53.7
8.50	11.0	7.33	15.6	10.4	24.0	16.0	37.4	24.9	51.7	34.4	75.2	50.0
9.00	10.4	6.92	14.7	9.81	22.6	15.0	35.1	23.4	48.5	32.2	70.4	46.8
9.50	9.85	6.55	13.9	9.28	21.3	14.2	33.1	22.1	45.6	30.4	66.2	44.0
10.0	9.35	6.22	13.2	8.80	20.2	13.4	31.4	20.9	43.1	28.7	62.5	41.6
10.5	8.90	5.92	12.6	8.37	19.2	12.8	29.8	19.8	40.9	27.2	59.2	39.4
11.0	8.49	5.65	12.0	7.98	18.3	12.2	28.4	18.9	38.9	25.9	56.2	37.4
11.5	8.12	5.40	11.5	7.63	17.5	11.6	27.1	18.0	37.1	24.7	53.6	35.6
12.0	7.78	5.17	11.0	7.30	16.7	11.1	25.9	17.2	35.4	23.6	51.1	34.0
12.5	7.46	4.96	10.5	7.01	16.0	10.7	24.8	16.5	33.9	22.6	48.9	32.6
13.0	7.17	4.77	10.1	6.73	15.4	10.2	23.8	15.9	32.5	21.6	46.9	31.2
13.5	6.91	4.59	9.74	6.48	14.8	9.85	22.9	15.2	31.3	20.8	45.1	30.0
14.0	6.66	4.43	9.39	6.24	14.3	9.49	22.1	14.7	30.1	20.0	43.3	28.8
14.5	6.43	4.28	9.06	6.03	13.8	9.16	21.3	14.2	29.0	19.3	41.8	27.8
15.0	6.21	4.13	8.75	5.82	13.3	8.85	20.6	13.7	28.0	18.6	40.3	26.8

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
526	350	627	417	778	517	960	638	1120	745	1330	886

Available Strength in Tensile Rupture (A_e = $0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
514	342	613	409	760	507	938	625	1090	730	1300	868

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
79.2	52.8	94.1	62.7	121	80.5	150	100	169	113	204	136

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
10.2	6.77	14.6	9.69	21.0	14.0	29.1	19.4	38.7	25.8	50.4	33.6

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.05	5.82	1.26	5.72	1.47	6.04	1.66	6.63	1.89	6.90	2.08	7.51

Area, × 10^2 mm^2

21.24	25.34	31.42	38.77	45.25	53.83

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
349.2	133.8	606.2	230.9	1033	389.3	1673	615.6	2510	924.6	3692	1336

r_y, × 10 mm

2.51	3.02	3.52	3.98	4.52	4.98

r_x/r_y

1.62	1.62	1.63	1.65	1.65	1.66

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 355 MPa

Available Compressive Strength, kN

Design: Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, m, for X-X axis bending	HEA 220		HEA 240		HEA 260		HEA 280		HEA 300		HEA 320	
	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	2060	1370	2460	1630	2770	1850	3110	2070	3590	2390	3970	2640
1.00	2010	1330	2400	1600	2720	1810	3060	2040	3550	2360	3920	2610
1.50	1940	1290	2340	1560	2660	1770	3000	2000	3490	2320	3860	2570
2.00	1860	1240	2260	1500	2580	1720	2920	1940	3410	2270	3770	2510
2.50	1760	1170	2150	1430	2480	1650	2820	1880	3310	2200	3650	2430
3.00	1640	1090	2030	1350	2360	1570	2710	1800	3190	2120	3520	2340
3.50	1520	1010	1900	1260	2230	1480	2570	1710	3050	2030	3370	2240
4.00	1380	920	1760	1170	2090	1390	2430	1620	2900	1930	3210	2130
4.50	1240	828	1610	1070	1930	1290	2280	1510	2740	1820	3030	2020
5.00	1110	736	1460	968	1780	1180	2120	1410	2570	1710	2840	1890
5.50	971	646	1300	868	1620	1080	1950	1300	2400	1590	2650	1760
6.00	842	560	1160	769	1460	972	1790	1190	2220	1480	2450	1630
6.50	720	479	1010	675	1310	869	1620	1080	2040	1360	2250	1500
7.00	621	413	880	585	1160	771	1460	974	1860	1240	2060	1370
7.50	541	360	766	510	1020	676	1310	871	1690	1120	1870	1240
8.00	476	316	673	448	893	594	1160	772	1520	1010	1680	1120
8.50	421	280	597	397	791	526	1030	684	1360	906	1500	1000
9.00	376	250	532	354	706	469	917	610	1210	808	1340	893
9.50	337	224	478	318	633	421	823	547	1090	725	1200	802
10.0	304	202	431	287	572	380	743	494	983	654	1090	723
10.5	276	184	391	260	518	345	673	448	892	593	986	656
11.0	252	167	356	237	472	314	614	408	813	541	899	598
11.5	230	153	326	217	432	288	561	374	744	495	822	547
12.0	211	141	299	199	397	264	516	343	683	454	755	502
12.5	195	130	276	184	366	243	475	316	629	419	696	463
13.0	180	120	255	170	338	225	439	292	582	387	643	428
13.5	167	111	236	157	314	209	407	271	540	359	597	397
14.0	155	103	220	146	292	194	379	252	502	334	555	369
14.5	145	96.3	205	136	272	181	353	235	468	311	517	344
15.0	135	90	192	127	254	169	330	220	437	291	483	322

Available Flexural Strength, kN·m

Design: Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, m, for X-X axis bending	HEA 220^f		HEA 240^f		HEA 260^f		HEA 280^f		HEA 300^f		HEA 320^f	
	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	141	93.6	184	123	227	151	272	181	339	225	403	268
1.00	141	93.6	184	123	227	151	272	181	339	225	403	268
1.50	141	93.6	184	123	227	151	272	181	339	225	403	268
2.00	141	93.6	184	123	227	151	272	181	339	225	403	268
2.50	141	93.6	184	123	227	151	272	181	339	225	403	268
3.00	138	91.8	183	122	227	151	272	181	339	225	403	268
3.50	135	89.5	179	119	224	149	272	181	339	225	403	268
4.00	131	87.2	175	116	219	146	267	178	336	224	396	264
4.50	128	84.9	171	114	214	142	262	174	330	219	388	258
5.00	124	82.6	167	111	209	139	256	170	323	215	381	253
5.50	121	80.3	162	108	204	136	250	167	317	211	373	248
6.00	117	78.0	158	105	199	133	245	163	310	206	365	243
6.50	114	75.7	154	103	194	129	239	159	304	202	358	238
7.00	110	73.4	150	99.8	189	126	233	155	297	198	350	233
7.50	107	71.1	146	97.1	185	123	227	151	290	193	342	228
8.00	103	68.8	142	94.3	180	120	222	147	284	189	335	223
8.50	100	66.5	138	91.6	175	116	216	144	277	184	327	217
9.00	96.5	64.2	133	88.8	170	113	210	140	271	180	319	212
9.50	93.0	61.9	129	86.1	165	110	204	136	264	176	311	207
10.0	89.6	59.6	125	83.3	160	107	199	132	257	171	304	202
10.5	84.8	56.4	121	80.6	155	103	193	128	251	167	296	197
11.0	80.5	53.5	117	77.8	150	100	187	125	244	163	288	192
11.5	76.6	50.9	111	73.9	146	96.8	182	121	238	158	281	187
12.0	73.0	48.6	106	70.5	139	92.4	176	117	231	154	273	182
12.5	69.8	46.4	101	67.3	133	88.2	168	112	225	149	265	177
13.0	66.9	44.5	96.9	64.5	127	84.4	160	107	218	145	258	171
13.5	64.2	42.7	92.9	61.8	122	80.9	153	102	209	139	247	164
14.0	61.7	41.0	89.3	59.4	117	77.7	147	97.9	200	133	237	158
14.5	59.4	39.5	85.9	57.2	112	74.7	141	94.1	192	128	227	151
15.0	57.3	38.1	82.8	55.1	108	71.9	136	90.5	185	123	219	146

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2060	1370	2460	1630	2770	1850	3110	2070	3590	2390	3970	2640

Available Strength in Tensile Rupture (A_e = 0.75A_g), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1850	1230	2200	1470	2490	1660	2790	1860	3230	2150	3570	2380

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
313	209	367	245	399	266	460	307	525	350	594	396

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
83.3	55.5	108	72.1	130	86.8	155	103	192	128	221	147

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
2.30	8.08	2.51	8.84	2.72	9.33	2.92	9.75	3.13	10.5	3.13	10.6

Area, × 10^2 mm^2

64.34	76.84	86.82	97.26	112.5	124.4

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
5410	1955	7763	2769	104500	3668	13670	4763	18260	6310	22930	6985

r_y, × 10 mm

5.51	6.00	6.50	7.00	7.49	7.49

r_x/r_y

1.66	1.68	1.69	1.69	1.70	1.81

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 355 MPa

HEA 340		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550		Shape		HEA 340^f		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
4270	2840	4560	3040	5080	3380	5690	3780	6310	4200	6770	4500	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, m, for X-X axis bending	0.00	590	393	667	444	819	545	1030	684	1260	839	1480	983
4210	2800	4500	2990	5010	3330	5610	3730	6220	4140	6670	4440		1.00	590	393	667	444	819	545	1030	684	1260	839	1480	983
4140	2750	4420	2940	4920	3280	5510	3670	6110	4060	6550	4360		1.50	590	393	667	444	819	545	1030	684	1260	839	1480	983
4040	2690	4320	2870	4800	3200	5370	3580	5960	3960	6380	4240		2.00	590	393	667	444	819	545	1030	684	1260	839	1480	983
3920	2610	4190	2790	4660	3100	5210	3460	5770	3840	6170	4110		2.50	590	393	667	444	819	545	1030	684	1260	839	1480	983
3780	2510	4040	2680	4480	2980	5010	3330	5550	3690	5930	3940		3.00	590	393	667	444	819	545	1030	684	1260	839	1480	982
3610	2400	3860	2570	4280	2850	4780	3180	5290	3520	5650	3760		3.50	580	386	654	435	800	532	1000	667	1230	817	1430	953
3440	2290	3670	2440	4060	2700	4530	3020	5010	3340	5350	3560		4.00	565	376	637	424	779	518	975	648	1190	794	1390	924
3240	2160	3460	2300	3830	2550	4270	2840	4720	3140	5020	3340		4.50	551	366	621	413	758	504	947	630	1160	771	1350	896
3040	2020	3240	2160	3580	2380	3990	2660	4410	2930	4680	3120		5.00	536	357	604	402	736	490	919	612	1120	747	1300	867
2830	1880	3020	2010	3330	2210	3710	2470	4090	2720	4330	2880		5.50	521	347	587	391	715	476	892	593	1090	724	1260	838
2620	1740	2790	1860	3070	2040	3420	2270	3760	2500	3980	2650		6.00	507	337	571	380	694	462	864	575	1050	701	1220	809
2410	1600	2560	1710	2820	1870	3130	2080	3440	2290	3630	2420		6.50	492	327	554	369	673	448	836	556	1020	677	1170	781
2200	1460	2340	1560	2560	1700	2840	1890	3120	2080	3290	2190		7.00	477	318	537	357	652	434	808	538	983	654	1130	752
1990	1330	2120	1410	2310	1540	2560	1710	2810	1870	2960	1970		7.50	463	308	521	346	630	419	781	519	948	631	1090	723
1790	1190	1910	1270	2080	1380	2300	1530	2520	1670	2640	1750		8.00	448	298	504	335	609	405	753	501	913	607	1040	694
1600	1070	1700	1130	1850	1230	2040	1360	2230	1490	2330	1550		8.50	434	288	487	324	588	391	725	483	878	584	1000	666
1430	951	1520	1010	1650	1100	1820	1210	1990	1320	2080	1390		9.00	419	279	471	313	567	377	698	464	843	561	957	637
1280	853	1360	905	1480	984	1630	1090	1790	1190	1870	1240		9.50	404	269	454	302	546	363	670	446	808	537	906	603
1160	770	1230	817	1330	888	1470	981	1610	1070	1690	1120		10.0	390	259	437	291	524	349	639	425	761	507	845	562
1050	699	1110	741	1210	805	1340	889	1460	973	1530	1020		10.5	375	250	419	279	496	330	600	399	714	475	792	527
957	636	1020	675	1100	734	1220	810	1330	887	1390	928		11.0	354	236	396	263	468	311	565	376	673	448	745	496
875	582	929	618	1010	671	1110	741	1220	811	1280	849		11.5	335	223	375	249	443	295	535	356	636	423	703	468
804	535	853	567	927	617	1020	681	1120	745	1170	779		12.0	319	212	356	237	420	280	507	337	603	401	666	443
741	493	786	523	854	568	943	628	1030	687	1080	718		12.5	303	202	339	225	400	266	482	321	573	381	633	421
685	456	727	484	790	525	872	580	954	635	998	664		13.0	290	193	323	215	382	254	460	306	546	363	603	401
635	423	674	448	732	487	809	538	885	589	926	616		13.5	277	184	309	206	365	243	440	292	522	347	575	383
591	393	627	417	681	453	752	500	823	548	861	573		14.0	266	177	296	197	350	233	421	280	500	332	550	366
551	366	584	389	635	422	701	466	767	510	802	534		14.5	255	170	285	189	336	223	404	269	479	319	528	351
514	342	546	363	593	395	655	436	717	477	750	499		15.0	245	163	274	182	323	215	388	258	460	306	507	337

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
4270	2840	4560	3040	5080	3380	5690	3780	6310	4200	6770	4500
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
3830	2550	4100	2730	4560	3040	5110	3400	5670	3780	6080	4050
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
668	445	746	497	914	609	1080	719	1250	835	1440	959
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
241	160	256	171	279	186	308	205	338	225	354	235

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.12	10.5	3.10	10.4	3.07	10.2	3.05	9.90	3.02	9.70	2.99	9.35
Area, × 10^2 mm^2											
133.5		142.8		159.0		178.0		197.5		211.8	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
27690	7436	33090	7887	45070	8564	637720	9465	86970	10370	111900	10820
r_y, × 10 mm											
7.46		7.43		7.34		7.29		7.24		7.15	
r_x/r_y											
1.93		2.05		2.29		2.60		2.90		3.22	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEA Shapes

F_y = 355 MPa

HEA 340		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550		Shape	HEA 340^f		HEA 360		HEA 400		HEA 450		HEA 500		HEA 550	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
4270	2840	4560	3040	5080	3380	5690	3780	6310	4200	6770	4500	**0.00**	590	393	667	444	819	545	1030	684	1260	839	1480	983
4210	2800	4500	2990	5010	3330	5610	3730	6220	4140	6670	4440	**1.00**	590	393	667	444	819	545	1030	684	1260	839	1480	983
4140	2750	4420	2940	4920	3280	5510	3670	6110	4060	6550	4360	**1.50**	590	393	667	444	819	545	1030	684	1260	839	1480	983
4040	2690	4320	2870	4800	3200	5370	3580	5960	3960	6380	4240	**2.00**	590	393	667	444	819	545	1030	684	1260	839	1480	983
3920	2610	4190	2790	4660	3100	5210	3460	5770	3840	6170	4110	**2.50**	590	393	667	444	819	545	1030	684	1260	839	1480	983
3780	2510	4040	2680	4480	2980	5010	3330	5550	3690	5930	3940	**3.00**	590	393	667	444	819	545	1030	684	1260	839	1480	982
3610	2400	3860	2570	4280	2850	4780	3180	5290	3520	5650	3760	**3.50**	580	386	654	435	800	532	1000	667	1230	817	1430	953
3440	2290	3670	2440	4060	2700	4530	3020	5010	3340	5350	3560	**4.00**	565	376	637	424	779	518	975	648	1190	794	1390	924
3240	2160	3460	2300	3830	2550	4270	2840	4720	3140	5020	3340	**4.50**	551	366	621	413	758	504	947	630	1160	771	1350	896
3040	2020	3240	2160	3580	2380	3990	2660	4410	2930	4680	3120	**5.00**	536	357	604	402	736	490	919	612	1120	747	1300	867
2830	1880	3020	2010	3330	2210	3710	2470	4090	2720	4330	2880	**5.50**	521	347	587	391	715	476	892	593	1090	724	1260	838
2620	1740	2790	1860	3070	2040	3420	2270	3760	2500	3980	2650	**6.00**	507	337	571	380	694	462	864	575	1050	701	1220	809
2410	1600	2560	1710	2820	1870	3130	2080	3440	2290	3630	2420	**6.50**	492	327	554	369	673	448	836	556	1020	677	1170	781
2200	1460	2340	1560	2560	1700	2840	1890	3120	2080	3290	2190	**7.00**	477	318	537	357	652	434	808	538	983	654	1130	752
1990	1330	2120	1410	2310	1540	2560	1710	2810	1870	2960	1970	**7.50**	463	308	521	346	630	419	781	519	948	631	1090	723
1790	1190	1910	1270	2080	1380	2300	1530	2520	1670	2640	1750	**8.00**	448	298	504	335	609	405	753	501	913	607	1040	694
1600	1070	1700	1130	1850	1230	2040	1360	2230	1490	2330	1550	**8.50**	434	288	487	324	588	391	725	483	878	584	1000	666
1430	951	1520	1010	1650	1100	1820	1210	1990	1320	2080	1390	**9.00**	419	279	471	313	567	377	698	464	843	561	957	637
1280	853	1360	905	1480	984	1630	1090	1790	1190	1870	1240	**9.50**	404	269	454	302	546	363	670	446	808	537	906	603
1160	770	1230	817	1330	888	1470	981	1610	1070	1690	1120	**10.0**	390	259	437	291	524	349	639	425	761	507	845	562
1050	699	1110	741	1210	805	1340	889	1460	973	1530	1020	**10.5**	375	250	419	279	496	330	600	399	714	475	792	527
957	636	1020	675	1100	734	1220	810	1330	887	1390	928	**11.0**	354	236	396	263	468	311	565	376	673	448	745	496
875	582	929	618	1010	671	1110	741	1220	811	1280	849	**11.5**	335	223	375	249	443	295	535	356	636	423	703	468
804	535	853	567	927	617	1020	681	1120	745	1170	779	**12.0**	319	212	356	237	420	280	507	337	603	401	666	443
741	493	786	523	854	568	943	628	1030	687	1080	718	**12.5**	303	202	339	225	400	266	482	321	573	381	633	421
685	456	727	484	790	525	872	580	954	635	998	664	**13.0**	290	193	323	215	382	254	460	306	546	363	603	401
635	423	674	448	732	487	809	538	885	589	926	616	**13.5**	277	184	309	206	365	243	440	292	522	347	575	383
591	393	627	417	681	453	752	500	823	548	861	573	**14.0**	266	177	296	197	350	233	421	280	500	332	550	366
551	366	584	389	635	422	701	466	767	510	802	534	**14.5**	255	170	285	189	336	223	404	269	479	319	528	351
514	342	546	363	593	395	655	436	717	477	750	499	**15.0**	245	163	274	182	323	215	388	258	460	306	507	337

Properties

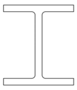
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
4270	2840	4560	3040	5080	3380	5690	3780	6310	4200	6770	4500
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
3830	2550	4100	2730	4560	3040	5110	3400	5670	3780	6080	4050
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
668	445	746	497	914	609	1080	719	1250	835	1440	959
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
241	160	256	171	279	186	308	205	338	225	354	235

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.12	10.5	3.10	10.4	3.07	10.2	3.05	9.90	3.02	9.70	2.99	9.35
Area, × 10^2 mm^2											
133.5		142.8		159.0		178.0		197.5		211.8	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
27690	7436	33090	7887	45070	8564	637720	9465	86970	10370	111900	10820
r_y, × 10 mm											
7.46		7.43		7.34		7.29		7.24		7.15	
r_x/r_y											
1.93		2.05		2.29		2.60		2.90		3.22	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[f] Shape exceeds compact limit for flexure; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEB Shapes

F_y = 235 MPa

HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200		Shape		HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200	
ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	Design		ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
551	366	719	479	909	605	1150	763	1380	918	1650	1100	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	22.0	14.7	34.9	23.2	51.9	34.5	74.9	49.8	102	67.7	136	90.4
509	339	682	454	874	581	1110	741	1350	897	1620	1080		1.00	22.0	14.7	34.9	23.2	51.9	34.5	74.9	49.8	102	67.7	136	90.4
462	308	638	425	832	554	1070	713	1310	870	1580	1050		1.50	21.8	14.5	34.9	23.2	51.9	34.5	74.9	49.8	102	67.7	136	90.4
403	268	581	387	778	517	1020	676	1250	835	1530	1020		2.00	21.4	14.2	34.3	22.8	51.6	34.3	74.9	49.8	102	67.7	136	90.4
339	225	516	343	713	474	949	631	1190	791	1460	973		2.50	20.9	13.9	33.6	22.4	50.6	33.6	73.7	49.1	101	67.4	136	90.4
273	182	446	296	640	426	873	581	1110	741	1390	923		3.00	20.4	13.6	32.9	21.9	49.5	33.0	72.4	48.2	99.6	66.2	134	89.3
212	141	375	249	564	375	791	526	1030	685	1300	866		3.50	19.9	13.3	32.2	21.4	48.5	32.3	71.1	47.3	97.8	65.1	132	87.8
162	108	307	204	488	325	706	470	942	627	1210	806		4.00	19.5	12.9	31.4	20.9	47.5	31.6	69.7	46.4	96.1	63.9	130	86.4
128	85.3	245	163	413	275	620	413	851	566	1120	742		4.50	19.0	12.6	30.7	20.4	46.5	30.9	68.4	45.5	94.4	62.8	128	85.0
104	69.1	198	132	343	228	537	357	760	506	1020	677		5.00	18.5	12.3	30.0	19.9	45.5	30.3	67.1	44.6	92.6	61.6	126	83.6
85.8	57.1	164	109	284	189	458	305	671	446	919	611		5.50	18.0	12.0	29.3	19.5	44.5	29.6	65.7	43.7	90.9	60.5	123	82.1
72.1	48.0	138	91.7	238	159	385	256	585	389	822	547		6.00	17.5	11.7	28.5	19.0	43.4	28.9	64.4	42.8	89.2	59.3	121	80.7
61.5	40.9	117	78.1	203	135	328	218	503	334	728	484		6.50	17.1	11.4	27.8	18.5	42.4	28.2	63.1	42.0	87.4	58.2	119	79.3
53.0	35.3	101	67.4	175	116	283	188	433	288	638	425		7.00	16.6	11.0	27.1	18.0	41.4	27.6	61.7	41.1	85.7	57.0	117	77.8
46.2	30.7	88.2	58.7	153	101	246	164	377	251	556	370		7.50	16.1	10.7	26.4	17.5	40.4	26.9	60.4	40.2	84.0	55.9	115	76.4
40.6	27.0	77.5	51.6	134	89.2	217	144	332	221	489	325		8.00	15.6	10.4	25.6	17.1	39.4	26.2	59.0	39.3	82.3	54.7	113	75.0
35.9	23.9	68.7	45.7	119	79.0	192	128	294	196	433	288		8.50	15.1	10.1	24.9	16.6	38.4	25.5	57.7	38.4	80.5	53.6	111	73.5
32.1	21.3	61.3	40.8	106	70.5	171	114	262	174	386	257		9.00	14.7	9.76	24.2	16.1	37.3	24.8	56.4	37.5	78.8	52.4	108	72.1
28.8	19.1	55.0	36.6	95.1	63.2	154	102	235	157	346	231		9.50	14.2	9.44	23.5	15.6	36.3	24.2	55.0	36.6	77.1	51.3	106	70.7
26.0	17.3	49.6	33.0	85.8	57.1	139	92.2	212	141	313	208		10.0	13.7	9.12	22.8	15.1	35.3	23.5	53.7	35.7	75.3	50.1	104	69.2
23.6	15.7	45.0	29.9	77.8	51.8	126	83.7	193	128	284	189		10.5	13.2	8.78	22.0	14.7	34.3	22.8	52.4	34.8	73.6	49.0	102	67.8
21.5	14.3	41.0	27.3	70.9	47.2	115	76.2	175	117	258	172		11.0	12.6	8.38	21.3	14.2	33.3	22.1	51.0	33.9	71.9	47.8	99.8	66.4
19.6	13.1	37.5	25.0	64.9	43.2	105	69.7	161	107	236	157		11.5	12.0	8.01	20.4	13.5	32.3	21.5	49.7	33.1	70.1	46.7	97.6	65.0
18.0	12.0	34.5	22.9	59.6	39.6	96.3	64.1	147	98.1	217	144		12.0	11.5	7.68	19.5	13.0	31.0	20.6	48.4	32.2	68.4	45.5	95.5	63.5
16.6	11.1	31.8	21.1	54.9	36.5	88.7	59.0	136	90.4	200	133		12.5	11.1	7.37	18.7	12.4	29.7	19.8	47.0	31.3	66.7	44.4	93.3	62.1
15.4	10.2	29.4	19.5	50.8	33.8	82.0	54.6	126	83.6	185	123		13.0	10.6	7.08	18.0	12.0	28.6	19.0	45.5	30.3	65.0	43.2	91.2	60.7
14.2	9.48	27.2	18.1	47.1	31.3	76.1	50.6	116	77.5	172	114		13.5	10.2	6.82	17.3	11.5	27.5	18.3	43.8	29.1	63.2	42.1	89.0	59.2
13.2	8.82	25.3	16.8	43.8	29.1	70.7	47.1	108	72.1	160	106		14.0	9.88	6.57	16.7	11.1	26.5	17.6	42.2	28.1	60.9	40.5	86.9	57.8
12.4	8.22	23.6	15.7	40.8	27.1	65.9	43.9	101	67.2	149	99.0		14.5	9.54	6.35	16.1	10.7	25.6	17.0	40.7	27.1	58.8	39.1	84.7	56.4
11.5	7.68	22.1	14.7	38.1	25.4	61.6	41.0	94.4	62.8	139	92.5		15.0	9.22	6.13	15.6	10.4	24.7	16.4	39.3	26.2	56.8	37.8	81.9	54.5

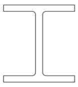
Properties

Available Strength in Tensile Yielding, kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
551	366	719	479	909	605	1150	763	1380	918	1650	1100
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
527	352	689	459	870	580	1100	732	1320	881	1580	1050
Available Strength in Shear, kN											
ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v
84.6	56.4	110	73.3	138	92.1	180	120	216	144	254	169
Available Strength in Flexure about Y-Y axis, kN·m											
ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b
10.9	7.24	17.1	11.4	25.3	16.9	36.0	23.9	48.9	32.5	64.7	43.00

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.30	10.4	1.57	11.0	1.84	11.7	2.08	12.8	2.35	13.6	2.60	14.6
Area, × 10^2 mm^2											
26.04		34.01		42.96		54.25		65.25		78.08	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
449.5	167.3	864.4	317.5	1509	549.7	2492	889.2	3831	1363	5696	2003
r_y, × 10 mm											
2.53		3.06		3.58		4.05		4.57		5.07	
r_x/r_y											
1.64		1.65		1.66		1.67		1.68		1.68	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEB Shapes

F_y = 235 MPa

HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320		Shape	HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1930	1280	2240	1490	2500	1670	2780	1850	3150	2100	3410	2270	0.00	175	116	223	148	271	181	324	216	395	263	455	302
1900	1260	2210	1470	2480	1650	2750	1830	3130	2080	3380	2250	1.00	175	116	223	148	271	181	324	216	395	263	455	302
1860	1240	2170	1450	2440	1620	2720	1810	3090	2060	3350	2230	1.50	175	116	223	148	271	181	324	216	395	263	455	302
1810	1200	2120	1410	2390	1590	2670	1780	3050	2030	3290	2190	2.00	175	116	223	148	271	181	324	216	395	263	455	302
1740	1160	2060	1370	2330	1550	2610	1740	2990	1990	3230	2150	2.50	175	116	223	148	271	181	324	216	395	263	455	302
1670	1110	1990	1320	2260	1500	2540	1690	2920	1940	3150	2100	3.00	174	116	223	148	271	181	324	216	395	263	455	302
1580	1050	1900	1260	2170	1450	2460	1640	2840	1890	3070	2040	3.50	172	114	220	147	270	180	324	216	395	263	455	302
1490	993	1810	1200	2080	1390	2370	1580	2740	1830	2970	1970	4.00	169	112	217	144	267	177	321	214	394	262	453	302
1390	928	1710	1140	1980	1320	2270	1510	2650	1760	2860	1900	4.50	166	111	214	142	263	175	317	211	389	259	447	298
1290	860	1600	1060	1880	1250	2170	1440	2540	1690	2740	1830	5.00	164	109	211	140	259	172	312	208	384	256	441	294
1190	791	1490	992	1770	1180	2060	1370	2430	1610	2620	1740	5.50	161	107	208	138	255	170	308	205	379	252	436	290
1080	722	1380	918	1650	1100	1950	1290	2310	1540	2490	1660	6.00	158	105	205	136	252	167	304	202	374	249	430	286
982	653	1270	844	1540	1020	1830	1220	2190	1450	2360	1570	6.50	156	104	201	134	248	165	299	199	369	245	424	282
881	586	1160	771	1420	948	1710	1140	2060	1370	2230	1480	7.00	153	102	198	132	244	162	295	196	364	242	418	278
785	522	1050	699	1310	872	1590	1060	1940	1290	2090	1390	7.50	150	100	195	130	240	160	290	193	359	239	412	274
693	461	946	629	1200	798	1470	980	1810	1200	1960	1300	8.00	148	98.3	192	128	237	158	286	190	354	235	406	270
613	408	845	562	1090	725	1360	903	1690	1120	1820	1210	8.50	145	96.6	189	126	233	155	282	187	349	232	401	266
547	364	754	501	986	656	1250	828	1560	1040	1690	1120	9.00	142	94.8	186	123	229	153	277	184	344	229	395	263
491	327	676	450	885	589	1140	756	1440	959	1560	1040	9.50	140	93.0	182	121	225	150	273	181	338	225	389	259
443	295	610	406	799	531	1030	685	1320	881	1430	951	10.0	137	91.3	179	119	222	148	268	179	333	222	383	255
402	267	554	368	724	482	933	621	1210	805	1310	869	10.5	135	89.5	176	117	218	145	264	176	328	218	377	251
366	244	505	336	660	439	850	566	1100	734	1190	792	11.0	132	87.8	173	115	214	143	260	173	323	215	371	247
335	223	462	307	604	402	778	518	1010	671	1090	725	11.5	129	86.0	170	113	211	140	255	170	318	212	365	243
308	205	424	282	555	369	715	475	927	617	1000	665	12.0	127	84.2	167	111	207	138	251	167	313	208	360	239
284	189	391	260	511	340	659	438	854	568	922	613	12.5	124	82.5	164	109	203	135	246	164	308	205	354	235
262	174	361	240	473	314	609	405	790	525	852	567	13.0	121	80.7	160	107	199	133	242	161	303	202	348	231
243	162	335	223	438	292	565	376	732	487	790	526	13.5	119	79.0	157	105	196	130	237	158	298	198	342	228
226	150	311	207	407	271	525	349	681	453	735	489	14.0	116	77.2	154	102	192	128	233	155	293	195	336	224
211	140	290	193	380	253	489	326	635	422	685	456	14.5	113	75.5	151	100	188	125	229	152	288	192	330	220
197	131	271	181	355	236	457	304	593	395	640	426	15.0	111	73.7	148	98.3	184	123	224	149	283	188	324	216

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1930	1280	2240	1490	2500	1670	2780	1850	3150	2100	3410	2270
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1840	1230	2150	1430	2400	1600	2660	1770	3020	2010	3270	2180
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
295	196	338	226	367	244	415	276	465	310	519	346
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
83.3	55.4	105	70.1	127	84.7	152	101	184	122	199	132

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
2.87	15.4	3.12	16.4	3.38	16.9	3.64	17.3	3.89	18.4	3.89	18.4
Area, × 10^2 mm^2											
91.04		106.0		118.4		131.4		149.1		161.3	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
8091	2843	11260	3923	14920	5135	19270	6595	25170	8653	30820	9239
r_y, × 10 mm											
5.59		6.08		6.58		7.09		7.58		7.57	
r_x/r_y											
1.69		1.70		1.71		1.71		1.71		1.83	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEB Shapes

F_y = 235 MPa

HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550		Shape	HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
3610	2400	3820	2540	4180	2780	4610	3070	5050	3360	5370	3580	**0.00**	509	339	567	378	684	455	842	560	1020	678	1180	787
3580	2380	3790	2520	4150	2760	4570	3040	5000	3330	5320	3540	**1.00**	509	339	567	378	684	455	842	560	1020	678	1180	787
3540	2360	3740	2490	4100	2730	4520	3000	4940	3290	5260	3500	**1.50**	509	339	567	378	684	455	842	560	1020	678	1180	787
3490	2320	3690	2450	4030	2680	4440	2960	4860	3230	5170	3440	**2.00**	509	339	567	378	684	455	842	560	1020	678	1180	787
3420	2280	3610	2400	3950	2630	4350	2890	4760	3170	5060	3370	**2.50**	509	339	567	378	684	455	842	560	1020	678	1180	787
3340	2220	3530	2350	3850	2560	4240	2820	4640	3080	4930	3280	**3.00**	509	339	567	378	684	455	842	560	1020	678	1180	787
3250	2160	3430	2280	3740	2490	4120	2740	4500	2990	4770	3180	**3.50**	509	339	567	378	684	455	842	560	1020	678	1180	787
3140	2090	3310	2200	3620	2410	3970	2640	4340	2890	4600	3060	**4.00**	507	338	565	376	680	452	836	556	1010	672	1170	778
3030	2010	3190	2120	3480	2320	3820	2540	4170	2770	4420	2940	**4.50**	501	333	557	371	670	446	823	548	993	661	1150	764
2900	1930	3060	2040	3330	2220	3660	2430	3990	2650	4220	2810	**5.00**	494	329	550	366	660	439	810	539	977	650	1130	751
2770	1840	2920	1940	3180	2110	3480	2320	3790	2520	4010	2670	**5.50**	487	324	542	361	650	433	797	531	960	639	1110	737
2630	1750	2770	1850	3010	2010	3300	2200	3590	2390	3790	2520	**6.00**	481	320	534	356	640	426	785	522	944	628	1090	723
2490	1660	2620	1750	2850	1900	3120	2070	3390	2250	3570	2370	**6.50**	474	315	527	350	631	420	772	513	927	617	1070	709
2350	1560	2470	1640	2680	1780	2930	1950	3180	2120	3340	2220	**7.00**	467	311	519	345	621	413	759	505	911	606	1050	696
2200	1470	2320	1540	2510	1670	2740	1820	2970	1980	3120	2070	**7.50**	460	306	511	340	611	407	746	496	894	595	1030	682
2060	1370	2160	1440	2340	1550	2550	1690	2760	1840	2890	1920	**8.00**	454	302	504	335	601	400	733	488	878	584	1000	668
1920	1270	2010	1340	2170	1440	2360	1570	2550	1700	2670	1780	**8.50**	447	297	496	330	591	394	720	479	862	573	984	655
1770	1180	1860	1240	2000	1330	2180	1450	2350	1560	2450	1630	**9.00**	440	293	488	325	582	387	707	471	845	562	963	641
1640	1090	1710	1140	1840	1220	2000	1330	2160	1430	2240	1490	**9.50**	434	288	481	320	572	380	694	462	829	551	943	627
1500	999	1570	1050	1680	1120	1820	1210	1960	1310	2040	1350	**10.0**	427	284	473	315	562	374	682	453	812	540	922	614
1370	911	1430	953	1530	1020	1660	1100	1780	1190	1850	1230	**10.5**	420	280	465	310	552	367	669	445	796	530	902	600
1250	830	1300	868	1390	928	1510	1000	1620	1080	1680	1120	**11.0**	413	275	458	305	542	361	656	436	779	519	881	586
1140	760	1190	794	1280	849	1380	918	1490	988	1540	1020	**11.5**	407	271	450	300	533	354	643	428	763	508	860	572
1050	698	1100	729	1170	780	1270	843	1360	908	1410	940	**12.0**	400	266	442	294	523	348	630	419	747	497	840	559
966	643	1010	672	1080	719	1170	777	1260	837	1300	867	**12.5**	393	262	435	289	513	341	617	411	730	486	819	545
893	594	934	621	999	664	1080	718	1160	774	1200	801	**13.0**	386	257	427	284	503	335	604	402	714	475	799	531
828	551	866	576	926	616	1000	666	1080	717	1120	743	**13.5**	380	253	420	279	493	328	591	393	697	464	778	518
770	512	805	536	861	573	931	619	1000	667	1040	691	**14.0**	373	248	412	274	484	322	579	385	681	453	757	504
718	478	751	500	803	534	868	577	934	622	968	644	**14.5**	366	244	404	269	474	315	566	376	664	442	737	490
671	446	702	467	750	499	811	540	873	581	905	602	**15.0**	360	239	397	264	464	309	553	368	648	431	708	471

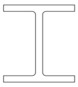
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
3610	2400	3820	2540	4180	2780	4610	3070	5050	3360	5370	3580
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
3460	2310	3660	2440	4010	2670	4410	2940	4830	3220	5150	3430
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
575	384	635	423	761	508	888	592	1020	682	1160	776
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
208	139	218	145	233	155	253	169	273	182	284	189

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.87	18.0	3.85	17.7	3.80	16.9	3.76	16.0	3.73	15.4	3.68	14.5
Area, × 10^2 mm^2											
170.9		180.6		197.8		218.0		238.6		254.1	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
36660	9690	43190	10140	57680	10820	79890	11720	107200	12620	136700	13080
r_y, × 10 mm											
7.53		7.49		7.40		7.33		7.27		7.17	
r_x/r_y											
1.95		2.06		2.31		2.61		2.91		3.24	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEB Shapes

F_y = 235 MPa

HEB 600		HEB 650		HEB 700		HEB 800		HEB 900		HEB 1000 [c]		Shape	HEB 600		HEB 650		HEB 700		HEB 800		HEB 900		HEB 1000	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
5710	3800	6060	4030	6480	4310	7070	4700	7850	5220	8460	5630	**0.00**	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
5650	3760	5990	3990	6410	4270	6990	4650	7760	5160	8260	5490	**1.00**	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
5580	3720	5920	3940	6330	4210	6890	4590	7650	5090	8150	5420	**1.50**	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
5490	3650	5810	3870	6210	4130	6760	4500	7490	4990	8000	5320	**2.00**	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
5370	3570	5680	3780	6070	4040	6590	4390	7300	4860	7810	5200	**2.50**	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
5220	3470	5520	3680	5890	3920	6390	4250	7070	4700	7580	5040	**3.00**	1360	904	1550	1030	1760	1170	2160	1440	2660	1770	3140	2090
5060	3360	5340	3560	5690	3790	6160	4100	6810	4530	7280	4840	**3.50**	1360	904	1550	1030	1760	1170	2160	1430	2640	1760	3110	2070
4870	3240	5140	3420	5470	3640	5910	3930	6510	4330	6960	4630	**4.00**	1340	892	1520	1010	1730	1150	2110	1400	2580	1710	3020	2010
4670	3110	4930	3280	5230	3480	5640	3750	6200	4120	6600	4390	**4.50**	1320	875	1490	993	1690	1120	2060	1370	2510	1670	2940	1960
4450	2960	4690	3120	4980	3310	5350	3560	5860	3900	6230	4140	**5.00**	1290	858	1460	973	1650	1100	2010	1340	2450	1630	2860	1900
4230	2810	4450	2960	4710	3130	5040	3350	5510	3670	5840	3890	**5.50**	1260	841	1430	952	1620	1080	1960	1300	2380	1580	2780	1850
3990	2660	4190	2790	4430	2950	4730	3150	5160	3430	5440	3620	**6.00**	1240	825	1400	932	1580	1050	1910	1270	2320	1540	2690	1790
3750	2500	3940	2620	4150	2760	4410	2930	4790	3190	5040	3360	**6.50**	1210	808	1370	912	1540	1030	1860	1240	2250	1500	2610	1740
3510	2330	3670	2440	3860	2570	4090	2720	4430	2950	4640	3090	**7.00**	1190	791	1340	891	1510	1000	1810	1200	2190	1450	2530	1680
3260	2170	3410	2270	3580	2380	3770	2510	4070	2710	4250	2830	**7.50**	1160	774	1310	871	1470	979	1760	1170	2120	1410	2440	1630
3020	2010	3150	2100	3300	2190	3460	2300	3720	2470	3860	2570	**8.00**	1140	757	1280	851	1440	955	1710	1140	2060	1370	2360	1570
2780	1850	2900	1930	3020	2010	3150	2100	3380	2250	3490	2320	**8.50**	1110	740	1250	831	1400	931	1660	1100	1990	1320	2280	1520
2550	1700	2650	1760	2760	1830	2860	1900	3050	2030	3130	2080	**9.00**	1090	724	1220	810	1360	906	1610	1070	1930	1280	2200	1460
2330	1550	2410	1600	2500	1660	2570	1710	2730	1820	2810	1870	**9.50**	1060	707	1190	790	1330	882	1560	1040	1860	1240	2110	1410
2110	1400	2180	1450	2250	1500	2320	1550	2470	1640	2540	1690	**10.0**	1040	690	1160	770	1290	858	1510	1010	1800	1190	2030	1350
1910	1270	1980	1320	2040	1360	2110	1400	2240	1490	2300	1530	**10.5**	1010	673	1130	749	1250	834	1460	973	1730	1150	1950	1300
1740	1160	1800	1200	1860	1240	1920	1280	2040	1360	2100	1390	**11.0**	986	656	1100	729	1220	809	1410	940	1670	1110	1850	1230
1590	1060	1650	1100	1700	1130	1760	1170	1870	1240	1920	1280	**11.5**	961	639	1070	709	1180	785	1360	906	1590	1060	1740	1150
1460	974	1510	1010	1560	1040	1610	1070	1710	1140	1760	1170	**12.0**	936	623	1030	688	1140	761	1300	868	1500	998	1640	1090
1350	898	1390	928	1440	959	1490	989	1580	1050	1620	1080	**12.5**	910	606	1000	668	1110	737	1240	824	1420	946	1550	1030
1250	830	1290	858	1330	887	1370	915	1460	971	1500	999	**13.0**	885	589	974	648	1060	708	1180	784	1350	899	1470	979
1160	770	1200	796	1240	823	1270	848	1350	901	1390	926	**13.5**	860	572	936	623	1020	676	1120	747	1290	857	1400	932
1080	716	1110	740	1150	765	1190	789	1260	837	1290	861	**14.0**	830	552	896	596	972	647	1070	715	1230	819	1340	890
1000	667	1040	690	1070	713	1110	735	1170	781	1210	803	**14.5**	797	530	859	572	932	620	1030	684	1180	784	1280	851
937	624	969	644	1000	666	1030	687	1100	729	1130	750	**15.0**	766	510	826	549	895	596	987	657	1130	752	1230	815

Properties

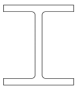
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
5710	3800	6060	4030	6480	4310	7070	4700	7850	5220	8460	5630
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
5470	3650	5800	3870	6200	4140	6770	4510	7520	5010	8100	5400
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1310	874	1470	978	1680	1120	1970	1320	2350	1570	2680	1790
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
294	196	305	203	316	210	328	219	351	233	363	241

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.64	13.8	3.59	13.2	3.53	12.8	3.43	11.8	3.35	11.3	3.28	10.7
Area, × 10^2 mm^2											
270.0		286.3		306.4		334.2		371.3		400.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
171000	13530	210600	13980	256900	14400	359100	14900	494100	15820	644700	16820
r_y, × 10 mm											
7.08		6.99		6.87		6.68		6.53		6.38	
r_x / r_y											
3.56		3.88		4.22		4.91		5.59		6.29	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

HEB Shapes

F_y = 275 MPa

HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200		Shape	HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
644	429	842	560	1060	707	1340	893	1610	1070	1930	1290	**0.00**	25.8	17.2	40.9	27.2	60.7	40.4	87.6	58.3	119	79.3	159	106
588	391	791	526	1020	676	1300	862	1570	1040	1890	1260	**1.00**	25.8	17.2	40.9	27.2	60.7	40.4	87.6	58.3	119	79.3	159	106
525	349	732	487	960	639	1240	825	1520	1010	1840	1220	**1.50**	25.4	16.9	40.8	27.1	60.7	40.4	87.6	58.3	119	79.3	159	106
448	298	656	437	886	590	1160	775	1440	961	1760	1170	**2.00**	24.7	16.5	39.8	26.5	59.9	39.8	87.3	58.1	119	79.3	159	106
365	243	570	379	800	532	1080	715	1360	902	1680	1120	**2.50**	24.1	16.0	38.8	25.8	58.5	38.9	85.5	56.9	118	78.2	158	105
284	189	481	320	706	470	975	649	1260	836	1580	1050	**3.00**	23.4	15.6	37.8	25.1	57.1	38.0	83.6	55.6	115	76.6	155	103
212	141	393	261	609	405	869	578	1150	763	1460	974	**3.50**	22.7	15.1	36.8	24.5	55.7	37.0	81.8	54.4	113	75.0	153	101
162	108	310	206	513	342	760	506	1030	687	1340	894	**4.00**	22.1	14.7	35.8	23.8	54.3	36.1	79.9	53.2	110	73.4	150	99.5
128	85.3	245	163	423	282	654	435	918	610	1220	812	**4.50**	21.4	14.3	34.8	23.1	52.9	35.2	78.1	51.9	108	71.8	147	97.5
104	69.1	198	132	343	228	552	367	804	535	1100	729	**5.00**	20.8	13.8	33.8	22.5	51.4	34.2	76.2	50.7	106	70.3	144	95.5
85.8	57.1	164	109	284	189	458	305	694	462	973	647	**5.50**	20.1	13.4	32.8	21.8	50.0	33.3	74.4	49.5	103	68.7	141	93.5
72.1	48.0	138	91.7	238	159	385	256	590	392	854	568	**6.00**	19.4	12.9	31.8	21.2	48.6	32.4	72.5	48.3	101	67.1	138	91.6
61.5	40.9	117	78.1	203	135	328	218	503	334	740	492	**6.50**	18.8	12.5	30.8	20.5	47.2	31.4	70.7	47.0	98.4	65.5	135	89.6
53.0	35.3	101	67.4	175	116	283	188	433	288	638	425	**7.00**	18.1	12.1	29.8	19.8	45.8	30.5	68.8	45.8	96.0	63.9	132	87.6
46.2	30.7	88.2	58.7	153	101	246	164	377	251	556	370	**7.50**	17.5	11.6	28.8	19.2	44.4	29.5	67.0	44.6	93.6	62.3	129	85.6
40.6	27	77.5	51.6	134	89.2	217	144	332	221	489	325	**8.00**	16.8	11.2	27.8	18.5	43.0	28.6	65.1	43.3	91.2	60.7	126	83.6
35.9	23.9	68.7	45.7	119	79.0	192	128	294	196	433	288	**8.50**	16.1	10.7	26.8	17.8	41.6	27.7	63.3	42.1	88.8	59.1	123	81.7
32.1	21.3	61.3	40.8	106	70.5	171	114	262	174	386	257	**9.00**	15.4	10.3	25.8	17.2	40.2	26.7	61.4	40.9	86.4	57.5	120	79.7
28.8	19.1	55.0	36.6	95.1	63.2	154	102	235	157	346	231	**9.50**	14.6	9.72	24.7	16.4	38.8	25.8	59.6	39.6	84.0	55.9	117	77.7
26.0	17.3	49.6	33	85.8	57.1	139	92.2	212	141	313	208	**10.0**	13.9	9.23	23.5	15.6	37.4	24.9	57.7	38.4	81.6	54.3	114	75.7
23.6	15.7	45.0	29.9	77.8	51.8	126	83.7	193	128	284	189	**10.5**	13.2	8.78	22.3	14.9	35.5	23.6	55.9	37.2	79.2	52.7	111	73.7
21.5	14.3	41.0	27.3	70.9	47.2	115	76.2	175	117	258	172	**11.0**	12.6	8.38	21.3	14.2	33.9	22.5	54.0	35.9	76.9	51.1	108	71.8
19.6	13.1	37.5	25.0	64.9	43.2	105	69.7	161	107	236	157	**11.5**	12.0	8.01	20.4	13.5	32.4	21.5	51.6	34.3	74.5	49.5	105	69.8
18.0	12.0	34.5	22.9	59.6	39.6	96.3	64.1	147	98.1	217	144	**12.0**	11.5	7.68	19.5	13.0	31.0	20.6	49.4	32.9	71.5	47.5	102	67.8
16.6	11.1	31.8	21.1	54.9	36.5	88.7	59.0	136	90.4	200	133	**12.5**	11.1	7.37	18.7	12.4	29.7	19.8	47.4	31.5	68.5	45.6	98.9	65.8
15.4	10.2	29.4	19.5	50.8	33.8	82.0	54.6	126	83.6	185	123	**13.0**	10.6	7.08	18.0	12.0	28.6	19.0	45.5	30.3	65.8	43.8	95.0	63.2
14.2	9.48	27.2	18.1	47.1	31.3	76.1	50.6	116	77.5	172	114	**13.5**	10.2	6.82	17.3	11.5	27.5	18.3	43.8	29.1	63.3	42.1	91.4	60.8
13.2	8.82	25.3	16.8	43.8	29.1	70.7	47.1	108	72.1	160	106	**14.0**	9.88	6.57	16.7	11.1	26.5	17.6	42.2	28.1	60.9	40.5	88.0	58.5
12.4	8.22	23.6	15.7	40.8	27.1	65.9	43.9	101	67.2	149	99.0	**14.5**	9.54	6.35	16.1	10.7	25.6	17.0	40.7	27.1	58.8	39.1	84.8	56.4
11.5	7.68	22.1	14.7	38.1	25.4	61.6	41.0	94.4	62.8	139	92.5	**15.0**	9.22	6.13	15.6	10.4	24.7	16.4	39.3	26.2	56.8	37.8	81.9	54.5

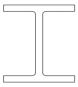
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
644	429	842	560	1060	707	1340	893	1610	1070	1930	1290
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
630	420	823	548	1040	693	1310	875	1580	1050	1890	1260
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
99.0	66.0	129	85.8	162	108	211	141	252	168	297	198
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
12.7	8.47	20.0	13.3	29.7	19.7	42.1	28.0	57.2	38.0	75.7	50.4

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.20	8.92	1.45	9.41	1.70	10.0	1.92	11.0	2.17	11.6	2.41	12.5
Area, × 10^2 mm^2											
26.04		34.01		42.96		54.25		65.25		78.08	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
449.5	167.3	864.4	317.5	1509	549.7	2492	889.2	3831	1363	5696	2003
r_y, × 10 mm											
2.53		3.06		3.58		4.05		4.57		5.07	
r_x/r_y											
1.64		1.65		1.66		1.67		1.68		1.68	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEB Shapes

F_y = 275 MPa

HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320		Shape	HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
2250	1500	2620	1750	2930	1950	3250	2160	3690	2460	3990	2660	**0.00**	205	136	261	173	318	211	380	253	463	308	532	354
2210	1470	2580	1720	2890	1920	3210	2140	3650	2430	3950	2630	**1.00**	205	136	261	173	318	211	380	253	463	308	532	354
2160	1440	2530	1680	2840	1890	3170	2110	3610	2400	3900	2600	**1.50**	205	136	261	173	318	211	380	253	463	308	532	354
2090	1390	2460	1640	2780	1850	3100	2070	3540	2360	3830	2550	**2.00**	205	136	261	173	318	211	380	253	463	308	532	354
2010	1330	2380	1580	2690	1790	3020	2010	3460	2300	3750	2490	**2.50**	205	136	261	173	318	211	380	253	463	308	532	354
1900	1270	2280	1510	2600	1730	2930	1950	3370	2240	3640	2420	**3.00**	202	134	260	173	318	211	380	253	463	308	532	354
1790	1190	2160	1440	2480	1650	2820	1880	3260	2170	3520	2340	**3.50**	198	132	255	170	314	209	378	252	463	308	532	354
1670	1110	2040	1360	2360	1570	2700	1800	3140	2090	3390	2260	**4.00**	195	130	251	167	308	205	372	247	457	304	525	350
1540	1030	1910	1270	2230	1480	2570	1710	3000	2000	3250	2160	**4.50**	191	127	247	164	303	202	366	243	450	299	517	344
1410	940	1770	1180	2090	1390	2430	1620	2860	1910	3100	2060	**5.00**	188	125	242	161	298	198	360	239	443	295	509	339
1280	853	1630	1080	1950	1300	2290	1520	2710	1810	2930	1950	**5.50**	184	122	238	158	293	195	354	235	436	290	501	333
1150	766	1490	989	1800	1200	2140	1430	2560	1700	2770	1840	**6.00**	180	120	233	155	288	191	348	231	429	285	493	328
1020	681	1350	896	1660	1100	1990	1330	2400	1600	2600	1730	**6.50**	177	117	229	152	283	188	341	227	422	281	485	323
903	601	1210	806	1510	1010	1840	1230	2240	1490	2420	1610	**7.00**	173	115	225	150	277	185	335	223	415	276	477	317
788	524	1080	719	1370	914	1690	1130	2090	1390	2250	1500	**7.50**	169	113	220	147	272	181	329	219	408	271	469	312
693	461	954	635	1240	823	1550	1030	1930	1280	2080	1380	**8.00**	166	110	216	144	267	178	323	215	401	267	461	307
613	408	845	562	1110	735	1410	936	1770	1180	1910	1270	**8.50**	162	108	212	141	262	174	317	211	394	262	453	301
547	364	754	501	986	656	1270	846	1620	1080	1750	1160	**9.00**	158	105	207	138	257	171	311	207	387	258	445	296
491	327	676	450	885	589	1140	759	1480	982	1590	1060	**9.50**	155	103	203	135	252	167	305	203	380	253	436	290
443	295	610	406	799	531	1030	685	1330	888	1440	958	**10.0**	151	100	199	132	246	164	299	199	373	248	428	285
402	267	554	368	724	482	933	621	1210	805	1310	869	**10.5**	147	98	194	129	241	160	293	195	366	244	420	280
366	244	505	336	660	439	850	566	1100	734	1190	792	**11.0**	144	95.6	190	126	236	157	287	191	359	239	412	274
335	223	462	307	604	402	778	518	1010	671	1090	725	**11.5**	140	93.1	185	123	231	154	281	187	352	234	404	269
308	205	424	282	555	369	715	475	927	617	1000	665	**12.0**	136	90.7	181	120	226	150	275	183	345	230	396	264
284	189	391	260	511	340	659	438	854	568	922	613	**12.5**	133	88.2	177	118	220	147	268	179	338	225	388	258
262	174	361	240	473	314	609	405	790	525	852	567	**13.0**	129	85.8	172	115	215	143	262	175	331	220	380	253
243	162	335	223	438	292	565	376	732	487	790	526	**13.5**	125	82.8	168	112	210	140	256	170	324	216	372	247
226	150	311	207	407	271	525	349	681	453	735	489	**14.0**	120	79.7	164	109	205	136	250	166	317	211	364	242
211	140	290	193	380	253	489	326	635	422	685	456	**14.5**	116	76.9	158	105	200	133	244	162	310	206	356	237
197	131	271	181	355	236	457	304	593	395	640	426	**15.0**	112	74.2	152	101	193	128	238	158	303	202	348	231

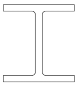
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2250	1500	2620	1750	2930	1950	3250	2160	3690	2460	3990	2660
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2200	1470	2560	1710	2860	1910	3180	2120	3610	2400	3900	2600
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
345	230	396	264	429	286	485	323	545	363	607	405
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
97.5	64.9	123	82.1	149	99.2	178	118	215	143	232	155

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
2.65	13.2	2.89	14.1	3.12	14.6	3.37	15	3.6	15.9	3.59	15.9
Area, × 10^2 mm^2											
91.04		106.0		118.4		131.4		149.1		161.3	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
8091	2843	11260	3923	14920	5135	19270	6595	25170	8653	30820	9239
r_y, × 10 mm											
5.59		6.08		6.58		7.09		7.58		7.57	
r_x/r_y											
1.69		1.70		1.71		1.71		1.71		1.83	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

HEB Shapes

F_y = 275 MPa

HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550		Shape	HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
4230	2810	4470	2970	4900	3260	5400	3590	5910	3930	6290	4180	**0.00**	596	397	664	442	800	532	986	656	1190	793	1380	921
4190	2790	4420	2940	4840	3220	5340	3550	5840	3890	6220	4140	**1.00**	596	397	664	442	800	532	986	656	1190	793	1380	921
4130	2750	4370	2910	4780	3180	5270	3500	5760	3830	6130	4080	**1.50**	596	397	664	442	800	532	986	656	1190	793	1380	921
4060	2700	4290	2850	4690	3120	5170	3440	5650	3760	6010	4000	**2.00**	596	397	664	442	800	532	986	656	1190	793	1380	921
3970	2640	4190	2790	4580	3050	5040	3350	5510	3670	5860	3900	**2.50**	596	397	664	442	800	532	986	656	1190	793	1380	921
3860	2570	4070	2710	4450	2960	4890	3260	5350	3560	5680	3780	**3.00**	596	397	664	442	800	532	986	656	1190	793	1380	921
3730	2480	3940	2620	4300	2860	4720	3140	5160	3430	5470	3640	**3.50**	596	397	664	442	800	532	985	655	1190	791	1380	917
3590	2390	3790	2520	4130	2750	4540	3020	4950	3290	5250	3490	**4.00**	588	391	655	436	787	523	967	643	1170	776	1350	898
3430	2290	3620	2410	3950	2630	4330	2880	4720	3140	5000	3330	**4.50**	579	385	644	429	773	514	949	632	1140	761	1320	880
3270	2180	3450	2290	3750	2500	4110	2740	4480	2980	4740	3150	**5.00**	570	379	634	422	760	506	932	620	1120	746	1290	861
3100	2060	3260	2170	3550	2360	3890	2590	4230	2810	4460	2970	**5.50**	560	373	623	414	746	497	914	608	1100	731	1270	842
2920	1940	3070	2050	3340	2220	3650	2430	3970	2640	4180	2780	**6.00**	551	367	612	407	733	488	896	596	1080	716	1240	824
2740	1820	2880	1920	3120	2080	3410	2270	3710	2470	3890	2590	**6.50**	542	360	602	400	719	479	879	585	1050	701	1210	805
2560	1700	2690	1790	2910	1930	3170	2110	3440	2290	3610	2400	**7.00**	532	354	591	393	706	470	861	573	1030	687	1180	786
2370	1580	2490	1660	2690	1790	2930	1950	3170	2110	3320	2210	**7.50**	523	348	581	386	692	461	843	561	1010	672	1150	767
2190	1460	2300	1530	2480	1650	2690	1790	2910	1940	3040	2020	**8.00**	514	342	570	379	679	452	826	549	987	657	1130	749
2010	1340	2110	1400	2270	1510	2460	1640	2660	1770	2770	1840	**8.50**	505	336	560	372	665	443	808	538	964	642	1100	730
1840	1220	1930	1280	2070	1370	2240	1490	2420	1610	2510	1670	**9.00**	495	330	549	365	652	434	790	526	942	627	1070	711
1670	1110	1750	1160	1870	1240	2020	1350	2180	1450	2260	1500	**9.50**	486	323	538	358	638	425	773	514	919	612	1040	693
1510	1000	1580	1050	1690	1120	1820	1210	1960	1310	2040	1350	**10.0**	477	317	528	351	625	416	755	502	897	597	1010	674
1370	911	1430	953	1530	1020	1660	1100	1780	1190	1850	1230	**10.5**	468	311	517	344	611	407	737	491	874	582	985	655
1250	830	1300	868	1390	928	1510	1000	1620	1080	1680	1120	**11.0**	458	305	507	337	598	398	720	479	852	567	957	636
1140	760	1190	794	1280	849	1380	918	1490	988	1540	1020	**11.5**	449	299	496	330	584	389	702	467	829	552	928	618
1050	698	1100	729	1170	780	1270	843	1360	908	1410	940	**12.0**	440	293	486	323	571	380	684	455	807	537	900	599
966	643	1010	672	1080	719	1170	777	1260	837	1300	867	**12.5**	430	286	475	316	557	371	666	443	784	522	872	580
893	594	934	621	999	664	1080	718	1160	774	1200	801	**13.0**	421	280	465	309	544	362	649	432	762	507	837	557
828	551	866	576	926	616	1000	666	1080	717	1120	743	**13.5**	412	274	454	302	530	353	631	420	737	490	800	533
770	512	805	536	861	573	931	619	1000	667	1040	691	**14.0**	403	268	443	295	517	344	612	407	707	470	767	510
718	478	751	500	803	534	868	577	934	622	968	644	**14.5**	393	262	433	288	504	335	588	392	679	452	737	490
671	446	702	467	750	499	811	540	873	581	905	602	**15.0**	384	256	422	281	486	323	566	377	653	435	708	471

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
4230	2810	4470	2970	4900	3260	5400	3590	5910	3930	6290	4180
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
4130	2760	4370	2910	4780	3190	5270	3520	5770	3850	6150	4100
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
673	449	743	495	891	594	1040	693	1200	798	1360	908
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
244	162	255	170	273	182	297	197	320	213	332	221

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.57	15.6	3.56	15.3	3.51	14.6	3.48	13.9	3.45	13.4	3.40	12.7
Area, × 10^2 mm^2											
170.9		180.6		197.8		218.0		238.6		254.1	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
36660	9690	43190	10140	57680	10820	79890	11720	107200	12620	136700	13080
r_y, × 10 mm											
7.53		7.49		7.40		7.33		7.27		7.17	
r_x/r_y											
1.95		2.06		2.31		2.61		2.91		3.24	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEB Shapes

F_y = 275 MPa

HEB 600		HEB 650		HEB 700		HEB 800		HEB 900^c		HEB 1000^c		Shape	HEB 600		HEB 650		HEB 700		HEB 800		HEB 900		HEB 1000	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
6680	4450	7090	4710	7580	5050	8270	5500	9190	6110	9900	6590	**0.00**	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
6610	4390	7000	4660	7490	4980	8160	5430	9000	5990	9430	6270	**1.00**	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
6510	4330	6900	4590	7380	4910	8030	5340	8870	5900	9290	6180	**1.50**	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
6380	4240	6760	4490	7220	4800	7850	5220	8690	5780	9090	6050	**2.00**	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
6210	4130	6580	4380	7020	4670	7620	5070	8440	5610	8840	5880	**2.50**	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
6020	4000	6360	4230	6790	4510	7350	4890	8130	5410	8550	5690	**3.00**	1590	1060	1810	1210	2060	1370	2530	1680	3110	2070	3680	2450
5790	3860	6120	4070	6520	4340	7050	4690	7770	5170	8210	5470	**3.50**	1580	1050	1800	1200	2040	1360	2490	1660	3040	2030	3570	2380
5550	3690	5850	3900	6220	4140	6710	4460	7380	4910	7840	5220	**4.00**	1550	1030	1760	1170	1990	1320	2420	1610	2960	1970	3470	2310
5280	3510	5560	3700	5900	3930	6350	4220	6970	4640	7410	4930	**4.50**	1510	1010	1710	1140	1940	1290	2360	1570	2870	1910	3360	2230
5000	3320	5260	3500	5570	3700	5970	3970	6530	4340	6920	4600	**5.00**	1480	983	1670	1110	1890	1260	2290	1520	2780	1850	3250	2160
4700	3130	4940	3290	5220	3470	5570	3710	6080	4040	6420	4270	**5.50**	1440	960	1630	1090	1840	1220	2220	1480	2700	1790	3140	2090
4400	2920	4610	3070	4860	3230	5170	3440	5620	3740	5910	3930	**6.00**	1410	937	1590	1060	1790	1190	2160	1430	2610	1740	3030	2010
4090	2720	4280	2850	4500	2990	4760	3170	5160	3430	5400	3600	**6.50**	1370	914	1550	1030	1740	1160	2090	1390	2520	1680	2920	1940
3780	2510	3950	2630	4140	2750	4360	2900	4700	3130	4910	3260	**7.00**	1340	891	1510	1000	1690	1130	2020	1350	2440	1620	2810	1870
3470	2310	3620	2410	3780	2520	3970	2640	4260	2830	4420	2940	**7.50**	1310	869	1470	975	1640	1090	1960	1300	2350	1560	2700	1800
3170	2110	3300	2200	3440	2290	3580	2380	3830	2550	3960	2630	**8.00**	1270	846	1420	948	1590	1060	1890	1260	2260	1510	2590	1720
2880	1920	2990	1990	3110	2070	3220	2140	3410	2270	3510	2340	**8.50**	1240	823	1380	920	1550	1030	1820	1210	2180	1450	2480	1650
2600	1730	2690	1790	2780	1850	2870	1910	3050	2030	3130	2080	**9.00**	1200	800	1340	893	1500	995	1760	1170	2090	1390	2370	1580
2340	1550	2410	1610	2500	1660	2570	1710	2730	1820	2810	1870	**9.50**	1170	777	1300	865	1450	963	1690	1120	2000	1330	2260	1500
2110	1400	2180	1450	2250	1500	2320	1550	2470	1640	2540	1690	**10.0**	1130	754	1260	838	1400	930	1620	1080	1920	1270	2110	1400
1910	1270	1980	1320	2040	1360	2110	1400	2240	1490	2300	1530	**10.5**	1100	731	1220	810	1350	897	1560	1040	1800	1190	1970	1310
1740	1160	1800	1200	1860	1240	1920	1280	2040	1360	2100	1390	**11.0**	1060	708	1180	783	1300	864	1460	973	1680	1120	1850	1230
1590	1060	1650	1100	1700	1130	1760	1170	1870	1240	1920	1280	**11.5**	1030	685	1130	755	1240	825	1380	917	1590	1060	1740	1150
1460	974	1510	1010	1560	1040	1610	1070	1710	1140	1760	1170	**12.0**	996	663	1080	719	1170	781	1300	868	1500	998	1640	1090
1350	898	1390	928	1440	959	1490	989	1580	1050	1620	1080	**12.5**	950	632	1030	684	1120	743	1240	824	1420	946	1550	1030
1250	830	1290	858	1330	887	1370	915	1460	971	1500	999	**13.0**	907	603	980	652	1060	708	1180	784	1350	899	1470	979
1160	770	1200	796	1240	823	1270	848	1350	901	1390	926	**13.5**	867	577	936	623	1020	676	1120	747	1290	857	1400	932
1080	716	1110	740	1150	765	1190	789	1260	837	1290	861	**14.0**	830	552	896	596	972	647	1070	715	1230	819	1340	890
1000	667	1040	690	1070	713	1110	735	1170	781	1210	803	**14.5**	797	530	859	572	932	620	1030	684	1180	784	1280	851
937	624	969	644	1000	666	1030	687	1100	729	1130	750	**15.0**	766	510	826	549	895	596	987	657	1130	752	1230	815

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
6680	4450	7090	4710	7580	5050	8270	5500	9190	6110	9900	6590
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
6530	4350	6920	4620	7410	4940	8080	5390	8980	5990	9680	6450
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1530	1020	1720	1140	1960	1310	2310	1540	2750	1830	3140	2090
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
344	229	357	237	370	246	384	256	410	273	425	283

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.36	12.1	3.32	11.6	3.26	11.3	3.17	10.5	3.10	10.1	3.03	9.62
Area, × 10^2 mm^2											
270.0		286.3		306.4		334.2		371.3		400.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
171000	13530	210600	13980	256900	14400	359100	14900	494100	15820	644700	16820
r_y, × 10 mm											
7.08		6.99		6.87		6.68		6.53		6.38	
r_x / r_y											
3.56		3.88		4.22		4.91		5.59		6.29	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEB Shapes

F_y = 355 MPa

HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200		Shape		HEB 100		HEB 120		HEB 140		HEB 160		HEB 180		HEB 200	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
832	554	1090	723	1370	913	1730	1150	2080	1390	2490	1660	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	**0.00**	33.3	22.2	52.8	35.1	78.4	52.2	113	75.3	154	102	205	137
740	492	1000	667	1290	861	1660	1100	2010	1340	2420	1610		**1.00**	33.3	22.2	52.8	35.1	78.4	52.2	113	75.3	154	102	205	137
639	425	907	603	1200	800	1560	1040	1920	1280	2340	1550		**1.50**	32.3	21.5	52.0	34.6	78.4	52.2	113	75.3	154	102	205	137
520	346	788	524	1090	722	1440	960	1800	1200	2220	1480		**2.00**	31.2	20.7	50.3	33.5	76.0	50.6	111	74.0	153	102	205	137
399	265	657	437	951	633	1300	866	1660	1110	2080	1380		**2.50**	30.1	20.0	48.6	32.4	73.6	49.0	108	71.9	149	99.1	201	134
289	192	527	351	809	538	1150	763	1510	1000	1920	1280		**3.00**	28.9	19.3	46.9	31.2	71.2	47.4	105	69.8	145	96.4	196	131
212	141	405	269	668	445	988	657	1340	892	1740	1160		**3.50**	27.8	18.5	45.2	30.1	68.8	45.8	102	67.7	141	93.8	191	127
162	108	310	206	536	357	832	553	1170	779	1560	1040		**4.00**	26.7	17.8	43.5	29.0	66.5	44.2	98.6	65.6	137	91.1	186	124
128	85.3	245	163	424	282	684	455	1000	669	1380	917		**4.50**	25.6	17.0	41.9	27.8	64.1	42.6	95.5	63.5	133	88.4	181	121
104	69.1	198	132	343	228	555	369	847	563	1200	798		**5.00**	24.4	16.3	40.2	26.7	61.7	41.0	92.4	61.4	129	85.7	176	117
85.8	57.1	164	109	284	189	458	305	702	467	1030	684		**5.50**	23.3	15.5	38.5	25.6	59.3	39.5	89.2	59.4	125	83.0	171	114
72.1	48.0	138	91.7	238	159	385	256	590	392	869	578		**6.00**	22.2	14.8	36.8	24.5	56.9	37.9	86.1	57.3	121	80.3	166	111
61.5	40.9	117	78.1	203	135	328	218	503	334	740	492		**6.50**	21.1	14.0	35.1	23.3	54.5	36.3	82.9	55.2	117	77.6	161	107
53.0	35.3	101	67.4	175	116	283	188	433	288	638	425		**7.00**	19.9	13.2	33.4	22.2	52.1	34.7	79.8	53.1	113	74.9	156	104
46.2	30.7	88.2	58.7	153	101	246	164	377	251	556	370		**7.50**	18.6	12.3	31.5	20.9	49.8	33.1	76.7	51.0	108	72.2	151	101
40.6	27.0	77.5	51.6	134	89.2	217	144	332	221	489	325		**8.00**	17.4	11.6	29.5	19.6	47.1	31.3	73.5	48.9	104	69.5	146	97.2
35.9	23.9	68.7	45.7	119	79.0	192	128	294	196	433	288		**8.50**	16.3	10.9	27.7	18.4	44.2	29.4	70.4	46.8	100	66.8	141	93.8
32.1	21.3	61.3	40.8	106	70.5	171	114	262	174	386	257		**9.00**	15.4	10.3	26.1	17.4	41.7	27.7	66.5	44.3	96.3	64.1	136	90.5
28.8	19.1	55.0	36.6	95.1	63.2	154	102	235	157	346	231		**9.50**	14.6	9.72	24.7	16.4	39.4	26.2	62.9	41.8	91.3	60.7	131	87.1
26.0	17.3	49.6	33.0	85.8	57.1	139	92.2	212	141	313	208		**10.0**	13.9	9.23	23.5	15.6	37.4	24.9	59.6	39.7	86.5	57.5	125	83.4
23.6	15.7	45.0	29.9	77.8	51.8	126	83.7	193	128	284	189		**10.5**	13.2	8.78	22.3	14.9	35.5	23.6	56.7	37.7	82.1	54.7	119	79.1
21.5	14.3	41.0	27.3	70.9	47.2	115	76.2	175	117	258	172		**11.0**	12.6	8.38	21.3	14.2	33.9	22.5	54.0	35.9	78.2	52.1	113	75.3
19.6	13.1	37.5	25.0	64.9	43.2	105	69.7	161	107	236	157		**11.5**	12.0	8.01	20.4	13.5	32.4	21.5	51.6	34.3	74.7	49.7	108	71.9
18.0	12.0	34.5	22.9	59.6	39.6	96.3	64.1	147	98.1	217	144		**12.0**	11.5	7.68	19.5	13.0	31.0	20.6	49.4	32.9	71.5	47.5	103	68.7
16.6	11.1	31.8	21.1	54.9	36.5	88.7	59.0	136	90.4	200	133		**12.5**	11.1	7.37	18.7	12.4	29.7	19.8	47.4	31.5	68.5	45.6	99.0	65.9
15.4	10.2	29.4	19.5	50.8	33.8	82.0	54.6	126	83.6	185	123		**13.0**	10.6	7.08	18.0	12.0	28.6	19.0	45.5	30.3	65.8	43.8	95.0	63.2
14.2	9.48	27.2	18.1	47.1	31.3	76.1	50.6	116	77.5	172	114		**13.5**	10.2	6.82	17.3	11.5	27.5	18.3	43.8	29.1	63.3	42.1	91.4	60.8
13.2	8.82	25.3	16.8	43.8	29.1	70.7	47.1	108	72.1	160	106		**14.0**	9.88	6.57	16.7	11.1	26.5	17.6	42.2	28.1	60.9	40.5	88.0	58.5
12.4	8.22	23.6	15.7	40.8	27.1	65.9	43.9	101	67.2	149	99.0		**14.5**	9.54	6.35	16.1	10.7	25.6	17.0	40.7	27.1	58.8	39.1	84.8	56.4
11.5	7.68	22.1	14.7	38.1	25.4	61.6	41.0	94.4	62.8	139	92.5		**15.0**	9.22	6.13	15.6	10.4	24.7	16.4	39.3	26.2	56.8	37.8	81.9	54.5

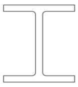
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
832	554	1090	723	1370	913	1730	1150	2080	1390	2490	1660
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
747	498	976	650	1230	822	1560	1040	1870	1250	2240	1490
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
128	85.2	166	111	209	139	273	182	326	217	383	256
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
16.4	10.9	25.9	17.2	38.3	25.5	54.3	36.1	73.8	49.1	97.7	65.0

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.06	6.93	1.28	7.34	1.50	7.82	1.69	8.62	1.91	9.14	2.12	9.85
Area, × 10^2 mm^2											
26.04		34.01		42.96		54.25		65.25		78.08	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
449.5	167.3	864.4	317.5	1509	549.7	2492	889.2	3831	1363	5696	2003
r_y, × 10 mm											
2.53		3.06		3.58		4.05		4.57		5.07	
r_x/r_y											
1.64		1.65		1.66		1.67		1.68		1.68	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEB Shapes

F_y = 355 MPa

HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320		Shape	HEB 220		HEB 240		HEB 260		HEB 280		HEB 300		HEB 320	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
2910	1940	3390	2250	3780	2520	4200	2790	4760	3170	5150	3430	0.00	264	176	336	224	410	273	490	326	597	397	687	457
2840	1890	3320	2210	3720	2470	4140	2750	4700	3130	5090	3380	1.00	264	176	336	224	410	273	490	326	597	397	687	457
2760	1830	3240	2150	3640	2420	4060	2700	4630	3080	5000	3330	1.50	264	176	336	224	410	273	490	326	597	397	687	457
2640	1760	3120	2080	3530	2350	3950	2630	4520	3010	4890	3250	2.00	264	176	336	224	410	273	490	326	597	397	687	457
2500	1660	2980	1980	3390	2260	3820	2540	4390	2920	4750	3160	2.50	262	174	336	224	410	273	490	326	597	397	687	457
2340	1560	2820	1880	3230	2150	3670	2440	4230	2820	4580	3050	3.00	256	170	330	219	406	270	489	326	597	397	687	457
2170	1440	2640	1760	3060	2030	3490	2330	4060	2700	4390	2920	3.50	250	166	322	214	397	264	479	319	589	392	677	451
1980	1320	2450	1630	2860	1910	3300	2200	3860	2570	4180	2780	4.00	244	162	315	210	388	258	469	312	578	384	664	442
1790	1190	2240	1490	2660	1770	3100	2060	3650	2430	3950	2630	4.50	237	158	308	205	379	252	459	305	566	376	650	433
1590	1060	2040	1350	2450	1630	2890	1920	3430	2280	3710	2470	5.00	231	154	300	200	371	247	448	298	554	369	637	424
1400	934	1830	1220	2240	1490	2670	1780	3210	2130	3460	2300	5.50	225	150	293	195	362	241	438	292	542	361	623	415
1220	813	1630	1080	2020	1350	2450	1630	2970	1980	3210	2140	6.00	219	146	285	190	353	235	428	285	531	353	610	406
1050	698	1430	953	1810	1210	2230	1480	2740	1820	2960	1970	6.50	213	142	278	185	344	229	418	278	519	345	596	397
905	602	1250	829	1610	1070	2020	1340	2510	1670	2710	1800	7.00	207	137	271	180	336	223	407	271	507	337	583	388
788	524	1090	722	1420	945	1810	1200	2280	1520	2460	1640	7.50	200	133	263	175	327	218	397	264	495	330	569	379
693	461	954	635	1250	830	1610	1070	2060	1370	2220	1480	8.00	194	129	256	170	318	212	387	257	484	322	555	370
613	408	845	562	1110	735	1420	948	1850	1230	1990	1330	8.50	188	125	249	165	310	206	377	251	472	314	542	361
547	364	754	501	986	656	1270	845	1650	1100	1780	1180	9.00	182	121	241	160	301	200	367	244	460	306	528	351
491	327	676	450	885	589	1140	759	1480	984	1600	1060	9.50	176	117	234	156	292	194	356	237	448	298	515	342
443	295	610	406	799	531	1030	685	1330	888	1440	958	10.0	169	113	226	151	283	189	346	230	437	291	501	333
402	267	554	368	724	482	933	621	1210	805	1310	869	10.5	163	108	219	146	275	183	336	223	425	283	488	324
366	244	505	336	660	439	850	566	1100	734	1190	792	11.0	155	103	212	141	266	177	326	217	413	275	474	315
335	223	462	307	604	402	778	518	1010	671	1090	725	11.5	148	98.2	202	135	257	171	315	210	401	267	460	306
308	205	424	282	555	369	715	475	927	617	1000	665	12.0	141	93.8	193	129	245	163	304	202	390	259	447	297
284	189	391	260	511	340	659	438	854	568	922	613	12.5	135	89.8	185	123	235	156	290	193	378	251	433	288
262	174	361	240	473	314	609	405	790	525	852	567	13.0	130	86.2	177	118	225	150	278	185	362	241	415	276
243	162	335	223	438	292	565	376	732	487	790	526	13.5	125	82.8	170	113	216	144	267	177	347	231	398	265
226	150	311	207	407	271	525	349	681	453	735	489	14.0	120	79.7	164	109	208	138	256	170	334	222	383	255
211	140	290	193	380	253	489	326	635	422	685	456	14.5	116	76.9	158	105	200	133	247	164	321	214	368	245
197	131	271	181	355	236	457	304	593	395	640	426	15.0	112	74.2	152	101	193	128	238	158	309	206	355	236

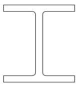
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2910	1940	3390	2250	3780	2520	4200	2790	4760	3170	5150	3430
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2610	1740	3040	2030	3400	2260	3770	2510	4280	2850	4630	3080
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
445	297	511	341	554	369	626	417	703	469	784	523
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
126	83.7	159	106	192	128	229	153	278	185	300	200

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
2.34	10.4	2.54	11.1	2.75	11.5	2.96	11.9	3.17	12.6	3.16	12.6
Area, × 10^2 mm^2											
91.04		106.0		118.4		131.4		149.1		161.3	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
8091	2843	11260	3923	14920	5135	19270	6595	25170	8653	30820	9239
r_y, × 10 mm											
5.59		6.08		6.58		7.09		7.58		7.57	
r_x/r_y											
1.69		1.70		1.71		1.71		1.71		1.83	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEB Shapes

F_y = 355 MPa

HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550		Shape	HEB 340		HEB 360		HEB 400		HEB 450		HEB 500		HEB 550	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
5460	3630	5770	3840	6320	4200	6970	4630	7620	5070	8120	5400	**0.00**	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
5390	3580	5690	3790	6230	4150	6870	4570	7520	5000	8000	5320	**1.00**	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
5300	3530	5600	3720	6130	4080	6750	4490	7380	4910	7860	5230	**1.50**	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
5180	3450	5470	3640	5980	3980	6590	4380	7200	4790	7660	5090	**2.00**	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
5030	3340	5310	3530	5800	3860	6380	4250	6970	4640	7410	4930	**2.50**	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
4850	3220	5110	3400	5580	3720	6140	4090	6710	4460	7120	4730	**3.00**	769	512	857	570	1030	687	1270	846	1540	1020	1790	1190
4640	3090	4900	3260	5340	3550	5870	3900	6400	4260	6790	4510	**3.50**	758	505	844	562	1010	675	1250	829	1500	1000	1740	1160
4420	2940	4660	3100	5070	3370	5570	3700	6070	4040	6420	4270	**4.00**	743	494	826	550	992	660	1220	810	1470	976	1690	1130
4170	2780	4400	2930	4780	3180	5240	3490	5710	3800	6040	4020	**4.50**	727	484	809	538	969	645	1190	790	1430	951	1650	1100
3920	2610	4130	2750	4480	2980	4910	3260	5340	3550	5630	3750	**5.00**	712	474	791	526	947	630	1160	771	1390	926	1600	1070
3650	2430	3850	2560	4170	2770	4560	3030	4950	3300	5210	3470	**5.50**	696	463	773	515	924	615	1130	751	1360	902	1560	1030
3390	2250	3560	2370	3850	2560	4210	2800	4570	3040	4790	3190	**6.00**	681	453	756	503	902	600	1100	732	1320	877	1510	1000
3120	2070	3270	2180	3540	2350	3850	2560	4180	2780	4370	2910	**6.50**	665	442	738	491	879	585	1070	712	1280	852	1460	973
2850	1900	2990	1990	3220	2140	3510	2330	3790	2520	3960	2640	**7.00**	649	432	720	479	857	570	1040	693	1240	827	1420	943
2590	1720	2710	1800	2920	1940	3170	2110	3420	2280	3560	2370	**7.50**	634	422	703	467	834	555	1010	673	1210	803	1370	912
2330	1550	2440	1630	2620	1740	2840	1890	3060	2040	3180	2120	**8.00**	618	411	685	456	812	540	982	654	1170	778	1320	881
2090	1390	2180	1450	2340	1550	2530	1680	2720	1810	2820	1870	**8.50**	603	401	667	444	789	525	953	634	1130	753	1280	851
1860	1240	1950	1300	2080	1390	2250	1500	2430	1610	2510	1670	**9.00**	587	391	649	432	767	510	924	615	1090	728	1230	820
1670	1110	1750	1160	1870	1240	2020	1350	2180	1450	2260	1500	**9.50**	572	380	632	420	744	495	894	595	1060	703	1190	789
1510	1000	1580	1050	1690	1120	1820	1210	1960	1310	2040	1350	**10.0**	556	370	614	409	722	480	865	575	1020	679	1140	759
1370	911	1430	953	1530	1020	1660	1100	1780	1190	1850	1230	**10.5**	541	360	596	397	699	465	836	556	983	654	1090	722
1250	830	1300	868	1390	928	1510	1000	1620	1080	1680	1120	**11.0**	525	349	579	385	677	450	806	536	939	625	1020	681
1140	760	1190	794	1280	849	1380	918	1490	988	1540	1020	**11.5**	510	339	561	373	654	435	769	512	890	592	970	645
1050	698	1100	729	1170	780	1270	843	1360	908	1410	940	**12.0**	494	329	543	362	626	417	732	487	846	563	921	613
966	643	1010	672	1080	719	1170	777	1260	837	1300	867	**12.5**	477	317	521	347	597	397	697	464	806	536	877	583
893	594	934	621	999	664	1080	718	1160	774	1200	801	**13.0**	456	303	498	332	571	380	667	443	770	512	837	557
828	551	866	576	926	616	1000	666	1080	717	1120	743	**13.5**	437	291	478	318	547	364	638	425	737	490	800	533
770	512	805	536	861	573	931	619	1000	667	1040	691	**14.0**	420	279	459	305	525	349	612	407	707	470	767	510
718	478	751	500	803	534	868	577	934	622	968	644	**14.5**	404	269	441	293	505	336	588	392	679	452	737	490
671	446	702	467	750	499	811	540	873	581	905	602	**15.0**	389	259	425	283	486	323	566	377	653	435	708	471

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
5460	3630	5770	3840	6320	4200	6970	4630	7620	5070	8120	5400
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
4900	3270	5180	3450	5670	3780	6250	4170	6840	4560	7290	4860
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
869	579	959	639	1150	767	1340	895	1540	1030	1760	1170
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
315	210	330	219	353	235	383	255	413	275	428	285

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.15	12.4	3.13	12.2	3.09	11.7	3.06	11.2	3.04	10.8	3.00	10.3
Area, × 10^2 mm^2											
170.9		180.6		197.8		218.0		238.6		254.1	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
36660	9690	43190	10140	57680	10820	79890	11720	107200	12620	136700	13080
$r_{y,}$ × 10 mm											
7.53		7.49		7.40		7.33		7.27		7.17	
r_x / r_y											
1.95		2.06		2.31		2.61		2.91		3.24	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEB Shapes

F_y = 355 MPa

HEB 600		HEB 650		HEB 700		HEB 800^c		HEB 900^c		HEB 1000^c		Shape		HEB 600		HEB 650		HEB 700		HEB 800		HEB 900		HEB 1000	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
8630	5740	9150	6090	9790	6510	10700	7100	11900	7890	12800	8500	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
8500	5650	9010	5990	9630	6410	10300	6860	11200	7450	11700	7780		1.00	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
8340	5550	8840	5880	9440	6280	10100	6730	11000	7300	11500	7630		1.50	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
8120	5400	8600	5720	9180	6110	9860	6560	10700	7110	11100	7420		2.00	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
7850	5230	8310	5530	8860	5900	9540	6350	10300	6870	10800	7160		2.50	2050	1370	2340	1560	2660	1770	3270	2170	4020	2670	4750	3160
7540	5010	7960	5300	8480	5640	9160	6090	9900	6590	10300	6850		3.00	2050	1360	2330	1550	2640	1760	3220	2150	3940	2620	4630	3080
7180	4780	7570	5040	8050	5360	8680	5780	9420	6270	9780	6510		3.50	1990	1330	2260	1500	2560	1700	3120	2070	3810	2530	4460	2970
6780	4510	7150	4760	7580	5050	8150	5420	8900	5920	9220	6130		4.00	1940	1290	2190	1460	2480	1650	3010	2000	3670	2440	4290	2860
6360	4230	6700	4450	7090	4720	7590	5050	8300	5520	8620	5740		4.50	1880	1250	2130	1420	2400	1600	2910	1930	3530	2350	4120	2740
5930	3940	6220	4140	6570	4370	7000	4660	7630	5080	8000	5320		5.00	1820	1210	2060	1370	2320	1550	2800	1860	3400	2260	3950	2630
5480	3640	5740	3820	6040	4020	6410	4260	6950	4630	7300	4860		5.50	1770	1180	1990	1330	2240	1490	2700	1790	3260	2170	3780	2510
5020	3340	5250	3500	5510	3670	5820	3870	6280	4180	6570	4370		6.00	1710	1140	1930	1280	2160	1440	2590	1720	3120	2080	3610	2400
4570	3040	4770	3170	4990	3320	5240	3480	5630	3740	5850	3890		6.50	1660	1100	1860	1240	2090	1390	2480	1650	2990	1990	3440	2290
4130	2750	4300	2860	4480	2980	4670	3110	4990	3320	5160	3440		7.00	1600	1060	1790	1190	2010	1330	2380	1580	2850	1900	3260	2170
3710	2470	3850	2560	3990	2660	4130	2750	4390	2920	4510	3000		7.50	1540	1030	1730	1150	1930	1280	2270	1510	2710	1810	3090	2060
3290	2190	3410	2270	3520	2340	3630	2420	3850	2560	3960	2640		8.00	1490	990	1660	1100	1850	1230	2170	1440	2580	1710	2920	1940
2920	1940	3020	2010	3120	2070	3220	2140	3410	2270	3510	2340		8.50	1430	953	1590	1060	1770	1180	2060	1370	2430	1620	2680	1790
2600	1730	2690	1790	2780	1850	2870	1910	3050	2030	3130	2080		9.00	1380	915	1520	1010	1690	1120	1930	1280	2230	1490	2460	1640
2340	1550	2410	1610	2500	1660	2570	1710	2730	1820	2810	1870		9.50	1320	878	1460	970	1590	1060	1790	1190	2070	1370	2270	1510
2110	1400	2180	1450	2250	1500	2320	1550	2470	1640	2540	1690		10.0	1260	836	1360	908	1490	989	1660	1110	1920	1280	2110	1400
1910	1270	1980	1320	2040	1360	2110	1400	2240	1490	2300	1530		10.5	1180	786	1280	852	1390	928	1560	1040	1800	1190	1970	1310
1740	1160	1800	1200	1860	1240	1920	1280	2040	1360	2100	1390		11.0	1110	741	1210	802	1310	873	1460	973	1680	1120	1850	1230
1590	1060	1650	1100	1700	1130	1760	1170	1870	1240	1920	1280		11.5	1050	700	1140	758	1240	825	1380	917	1590	1060	1740	1150
1460	974	1510	1010	1560	1040	1610	1070	1710	1140	1760	1170		12.0	999	665	1080	719	1170	781	1300	868	1500	998	1640	1090
1350	898	1390	928	1440	959	1490	989	1580	1050	1620	1080		12.5	950	632	1030	684	1120	743	1240	824	1420	946	1550	1030
1250	830	1290	858	1330	887	1370	915	1460	971	1500	999		13.0	907	603	980	652	1060	708	1180	784	1350	899	1470	979
1160	770	1200	796	1240	823	1270	848	1350	901	1390	926		13.5	867	577	936	623	1020	676	1120	747	1290	857	1400	932
1080	716	1110	740	1150	765	1190	789	1260	837	1290	861		14.0	830	552	896	596	972	647	1070	715	1230	819	1340	890
1000	667	1040	690	1070	713	1110	735	1170	781	1210	803		14.5	797	530	859	572	932	620	1030	684	1180	784	1280	851
937	624	969	644	1000	666	1030	687	1100	729	1130	750		15.0	766	510	826	549	895	596	987	657	1130	752	1230	815

Properties

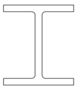
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
8630	5740	9150	6090	9790	6510	10700	7100	11900	7890	12800	8500
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
7750	5160	8210	5480	8790	5860	9590	6390	10700	7100	11500	7650
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1980	1320	2220	1480	2530	1690	2980	1990	3550	2360	4050	2700
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
444	296	460	306	478	318	496	330	530	352	548	365

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
2.96	9.90	2.92	9.56	2.87	9.30	2.79	8.75	2.73	8.44	2.67	8.12
Area, × 10^2 mm^2											
270.0		286.3		306.4		334.2		371.3		400.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
171000	13530	210600	13980	256900	14400	359100	14900	494100	15820	644700	16820
$r_{y,}$ × 10 mm											
7.08		6.99		6.87		6.68		6.53		6.38	
r_x / r_y											
3.56		3.88		4.22		4.91		5.59		6.29	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 235 MPa

HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200		Shape	HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1130	749	1400	935	1700	1130	2050	1370	2400	1590	2780	1850	**0.00**	49.9	33.2	74.2	49.3	104	69.5	143	94.9	187	124	240	160
1050	701	1340	891	1650	1090	2000	1330	2340	1560	2730	1810	**1.00**	49.9	33.2	74.2	49.3	104	69.5	143	94.9	187	124	240	160
970	645	1260	840	1570	1050	1930	1280	2280	1520	2670	1770	**1.50**	49.8	33.1	74.2	49.3	104	69.5	143	94.9	187	124	240	160
863	574	1160	774	1480	985	1840	1220	2200	1460	2580	1720	**2.00**	49.2	32.7	73.6	49.0	104	69.4	143	94.9	187	124	240	160
744	495	1050	696	1370	911	1730	1150	2090	1390	2480	1650	**2.50**	48.6	32.4	72.8	48.4	103	68.6	142	94.3	187	124	240	160
620	412	919	611	1240	827	1600	1070	1970	1310	2360	1570	**3.00**	48.1	32.0	72.0	47.9	102	67.9	140	93.4	185	123	239	159
499	332	788	524	1110	738	1470	976	1830	1220	2230	1480	**3.50**	47.5	31.6	71.2	47.3	101	67.2	139	92.4	183	122	236	157
389	259	660	439	972	647	1320	880	1690	1120	2080	1390	**4.00**	46.9	31.2	70.3	46.8	99.8	66.4	137	91.4	181	120	234	156
308	205	540	359	838	557	1180	783	1540	1020	1930	1280	**4.50**	46.4	30.9	69.5	46.3	98.7	65.7	136	90.5	179	119	232	154
249	166	437	291	709	472	1030	687	1390	922	1770	1180	**5.00**	45.8	30.5	68.7	45.7	97.6	64.9	134	89.5	177	118	230	153
206	137	361	240	590	392	895	595	1240	822	1610	1070	**5.50**	45.2	30.1	67.9	45.2	96.5	64.2	133	88.5	176	117	227	151
173	115	304	202	496	330	762	507	1090	725	1460	969	**6.00**	44.7	29.7	67.1	44.6	95.3	63.4	132	87.6	174	116	225	150
147	98.1	259	172	422	281	649	432	950	632	1300	866	**6.50**	44.1	29.3	66.2	44.1	94.2	62.7	130	86.6	172	114	223	148
127	84.6	223	148	364	242	560	373	820	545	1150	767	**7.00**	43.5	29.0	65.4	43.5	93.1	61.9	129	85.6	170	113	220	147
111	73.7	194	129	317	211	488	325	714	475	1010	672	**7.50**	43.0	28.6	64.6	43.0	92.0	61.2	127	84.6	168	112	218	145
97.3	64.7	171	114	279	185	429	285	628	418	888	591	**8.00**	42.4	28.2	63.8	42.4	90.9	60.5	126	83.7	166	111	216	144
86.2	57.3	151	101	247	164	380	253	556	370	786	523	**8.50**	41.8	27.8	63.0	41.9	89.7	59.7	124	82.7	164	109	214	142
76.9	51.2	135	89.8	220	147	339	225	496	330	701	467	**9.00**	41.3	27.5	62.1	41.3	88.6	59.0	123	81.7	163	108	211	141
69.0	45.9	121	80.6	198	132	304	202	445	296	630	419	**9.50**	40.7	27.1	61.3	40.8	87.5	58.2	121	80.8	161	107	209	139
62.3	41.4	109	72.7	178	119	274	183	402	267	568	378	**10.0**	40.1	26.7	60.5	40.3	86.4	57.5	120	79.8	159	106	207	138
56.5	37.6	99.1	66.0	162	108	249	166	364	242	515	343	**10.5**	39.6	26.3	59.7	39.7	85.3	56.7	118	78.8	157	104	204	136
51.5	34.2	90.3	60.1	147	98.1	227	151	332	221	470	312	**11.0**	39.0	26.0	58.9	39.2	84.1	56.0	117	77.9	155	103	202	135
47.1	31.3	82.6	55.0	135	89.7	207	138	304	202	430	286	**11.5**	38.4	25.6	58.1	38.6	83.0	55.2	116	76.9	153	102	200	133
43.2	28.8	75.9	50.5	124	82.4	191	127	279	186	395	263	**12.0**	37.9	25.2	57.2	38.1	81.9	54.5	114	75.9	151	101	198	131
39.9	26.5	69.9	46.5	114	76.0	176	117	257	171	364	242	**12.5**	37.3	24.8	56.4	37.5	80.8	53.8	113	75.0	150	99.6	195	130
36.8	24.5	64.7	43.0	106	70.2	162	108	238	158	336	224	**13.0**	36.7	24.4	55.6	37.0	79.7	53.0	111	74.0	148	98.3	193	128
34.2	22.7	60.0	39.9	97.9	65.1	151	100	220	147	312	207	**13.5**	36.2	24.1	54.8	36.4	78.5	52.3	110	73.0	146	97.1	191	127
31.8	21.1	55.8	37.1	91.0	60.6	140	93.1	205	136	290	193	**14.0**	35.6	23.7	54.0	35.9	77.4	51.5	108	72.1	144	95.9	189	125
29.6	19.7	52.0	34.6	84.8	56.5	131	86.8	191	127	270	180	**14.5**	35.0	23.3	53.1	35.4	76.3	50.8	107	71.1	142	94.6	186	124
27.7	18.4	48.6	32.3	79.3	52.8	122	81.1	179	119	253	168	**15.0**	34.5	22.9	52.3	34.8	75.2	50.0	105	70.1	140	93.4	184	122

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1130	749	1400	935	1700	1130	2050	1370	2400	1590	2780	1850

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1080	719	1340	897	1630	1090	1970	1310	2290	1530	2660	1770

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
203	135	247	165	293	196	355	237	409	273	465	310

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
24.6	16.4	36.3	24.1	50.9	33.8	68.8	45.8	89.9	59.8	115	76.4

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.41	20.6	1.67	20.9	1.94	21.4	2.19	22.4	2.45	23.0	2.71	23.9

Area, × 10^2 mm^2

53.24	66.41	80.56	97.05	113.3	131.3

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1143	399.2	2018	702.8	3291	1144	5098	1759	7483	2580	10640	3651

r_y, × 10 mm

2.74	3.25	3.77	4.26	4.77	5.27

r_x/r_y

1.69	1.70	1.70	1.70	1.70	1.71

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 235 MPa

HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320		Shape	HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
3160	2100	4220	2810	4640	3090	5080	3380	6410	4270	6600	4390	**0.00**	300	200	448	298	534	355	627	417	862	574	938	624
3110	2070	4170	2770	4600	3060	5030	3350	6360	4230	6550	4360	**1.00**	300	200	448	298	534	355	627	417	862	574	938	624
3060	2030	4110	2730	4540	3020	4980	3310	6300	4190	6480	4310	**1.50**	300	200	448	298	534	355	627	417	862	574	938	624
2980	1980	4020	2670	4450	2960	4900	3260	6210	4130	6390	4250	**2.00**	300	200	448	298	534	355	627	417	862	574	938	624
2880	1920	3910	2600	4350	2890	4800	3190	6110	4060	6280	4180	**2.50**	300	200	448	298	534	355	627	417	862	574	938	624
2760	1840	3780	2520	4230	2810	4680	3110	5980	3980	6150	4090	**3.00**	300	200	448	298	534	355	627	417	862	574	938	624
2630	1750	3640	2420	4090	2720	4540	3020	5830	3880	5990	3990	**3.50**	297	198	446	297	534	355	627	417	862	574	938	624
2490	1660	3470	2310	3930	2610	4390	2920	5660	3770	5820	3870	**4.00**	294	196	443	295	530	353	625	416	862	574	938	624
2340	1560	3300	2190	3760	2500	4230	2810	5480	3640	5630	3740	**4.50**	292	194	439	292	526	350	621	413	858	571	933	621
2180	1450	3110	2070	3580	2380	4050	2690	5280	3510	5420	3610	**5.00**	289	192	436	290	522	347	616	410	853	567	927	616
2020	1340	2920	1940	3380	2250	3860	2570	5070	3370	5200	3460	**5.50**	286	190	433	288	518	345	611	407	847	564	920	612
1850	1230	2720	1810	3190	2120	3660	2440	4840	3220	4970	3310	**6.00**	283	189	429	286	514	342	607	404	842	560	914	608
1690	1120	2520	1680	2980	1990	3460	2300	4610	3070	4730	3150	**6.50**	281	187	426	283	510	339	602	401	836	556	908	604
1530	1010	2320	1540	2780	1850	3250	2160	4380	2910	4480	2980	**7.00**	278	185	422	281	506	337	597	397	831	553	901	600
1370	911	2120	1410	2580	1720	3050	2030	4140	2750	4240	2820	**7.50**	275	183	419	279	502	334	593	394	825	549	895	596
1220	811	1930	1290	2380	1580	2840	1890	3890	2590	3980	2650	**8.00**	272	181	416	277	498	331	588	391	820	545	889	591
1080	719	1750	1160	2180	1450	2630	1750	3650	2430	3730	2480	**8.50**	269	179	412	274	494	329	583	388	814	542	883	587
963	641	1570	1040	1990	1320	2430	1620	3410	2270	3480	2320	**9.00**	267	177	409	272	490	326	579	385	809	538	876	583
865	575	1410	936	1800	1200	2230	1490	3170	2110	3240	2160	**9.50**	264	176	405	270	486	323	574	382	803	534	870	579
780	519	1270	845	1630	1080	2040	1360	2940	1960	3000	2000	**10.0**	261	174	402	267	482	321	569	379	798	531	864	575
708	471	1150	766	1480	983	1860	1240	2720	1810	2770	1840	**10.5**	258	172	399	265	478	318	564	376	792	527	858	571
645	429	1050	698	1350	896	1690	1130	2500	1660	2540	1690	**11.0**	256	170	395	263	474	315	560	372	787	523	851	566
590	393	960	639	1230	819	1550	1030	2290	1520	2320	1550	**11.5**	253	168	392	261	470	313	555	369	781	520	845	562
542	361	882	587	1130	753	1420	947	2100	1400	2130	1420	**12.0**	250	166	388	258	466	310	550	366	776	516	839	558
499	332	813	541	1040	694	1310	873	1930	1290	1970	1310	**12.5**	247	164	385	256	462	307	546	363	770	513	833	554
462	307	751	500	964	641	1210	807	1790	1190	1820	1210	**13.0**	244	163	382	254	458	305	541	360	765	509	826	550
428	285	697	464	894	595	1120	748	1660	1100	1690	1120	**13.5**	242	161	378	252	454	302	536	357	759	505	820	546
398	265	648	431	831	553	1050	696	1540	1030	1570	1040	**14.0**	239	159	375	249	450	299	532	354	754	502	814	541
371	247	604	402	775	515	975	649	1440	956	1460	972	**14.5**	236	157	371	247	446	297	527	351	748	498	807	537
347	231	564	375	724	482	911	606	1340	894	1370	908	**15.0**	233	155	368	245	442	294	522	347	743	494	801	533

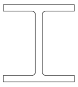
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
3160	2100	4220	2810	4640	3090	5080	3380	6410	4270	6600	4390
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
3030	2020	4040	2690	4450	2960	4860	3240	6140	4090	6320	4210
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
525	350	685	457	736	491	809	539	1010	671	1060	709
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
144	95.5	213	142	252	168	295	197	405	269	413	275

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
2.97	24.6	3.28	29.9	3.54	30.2	3.80	30.4	4.11	35.7	4.08	34.1
Area, × 10^2 mm^2											
149.4		199.6		219.6		240.2		303.1		312.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
14600	5012	24290	8153	31310	10450	39550	13160	59200	19400	68130	19710
r_y, × 10 mm											
5.79		6.39		6.90		7.40		8.00		7.95	
r_x/r_y											
1.71		1.73		1.73		1.73		1.75		1.86	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 235 MPa

HEM 340		HEM 360		HEM 400		HEM 450		HEM 500		HEM 550		Shape	HEM 340		HEM 360		HEM 400		HEM 450		HEM 500		HEM 550	
ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	Design	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
6680	4440	6740	4490	6890	4580	7090	4720	7280	4840	7500	4990	**0.00**	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
6630	4410	6690	4450	6830	4550	7030	4680	7220	4800	7430	4940	**1.00**	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
6560	4360	6620	4400	6760	4500	6960	4630	7140	4750	7340	4880	**1.50**	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
6470	4300	6530	4340	6660	4430	6850	4560	7030	4670	7220	4810	**2.00**	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
6350	4230	6410	4260	6540	4350	6720	4470	6890	4580	7080	4710	**2.50**	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
6220	4140	6270	4170	6390	4250	6560	4370	6720	4470	6900	4590	**3.00**	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
6060	4030	6100	4060	6220	4140	6380	4250	6530	4340	6690	4450	**3.50**	998	664	1060	702	1180	784	1340	891	1500	998	1680	1120
5880	3910	5920	3940	6020	4010	6180	4110	6310	4200	6470	4300	**4.00**	998	664	1060	702	1180	783	1340	889	1490	994	1670	1110
5680	3780	5720	3810	5810	3870	5950	3960	6070	4040	6220	4140	**4.50**	992	660	1050	697	1170	777	1320	880	1480	983	1650	1100
5470	3640	5500	3660	5580	3720	5710	3800	5820	3870	5950	3960	**5.00**	984	655	1040	692	1160	770	1310	872	1460	972	1630	1080
5250	3490	5270	3510	5340	3560	5460	3630	5550	3700	5670	3770	**5.50**	977	650	1030	686	1150	763	1300	863	1440	961	1600	1070
5010	3330	5030	3350	5090	3390	5200	3460	5280	3510	5380	3580	**6.00**	970	646	1020	681	1140	756	1280	854	1430	950	1580	1050
4770	3170	4780	3180	4830	3210	4920	3270	4990	3320	5080	3380	**6.50**	963	641	1020	676	1130	750	1270	845	1410	939	1560	1040
4520	3010	4530	3010	4560	3040	4640	3090	4700	3120	4770	3170	**7.00**	956	636	1010	670	1120	743	1260	836	1390	927	1540	1030
4260	2840	4270	2840	4290	2860	4360	2900	4400	2930	4460	2970	**7.50**	949	631	999	665	1110	736	1240	828	1380	916	1520	1010
4010	2670	4010	2670	4020	2680	4080	2710	4110	2730	4150	2760	**8.00**	942	627	991	659	1100	729	1230	819	1360	905	1500	998
3750	2500	3750	2490	3750	2500	3800	2530	3810	2540	3850	2560	**8.50**	935	622	983	654	1090	723	1220	810	1340	894	1480	984
3500	2330	3490	2320	3490	2320	3520	2340	3530	2350	3550	2360	**9.00**	928	617	975	649	1080	716	1200	801	1330	883	1460	970
3250	2160	3240	2150	3230	2150	3250	2160	3250	2160	3260	2170	**9.50**	920	612	967	643	1070	709	1190	792	1310	872	1440	956
3010	2000	2990	1990	2970	1980	2990	1990	2970	1980	2980	1980	**10.0**	913	608	959	638	1060	702	1180	784	1290	860	1420	941
2770	1840	2750	1830	2730	1820	2730	1820	2710	1800	2710	1800	**10.5**	906	603	951	633	1050	696	1160	775	1280	849	1390	927
2540	1690	2520	1670	2490	1650	2490	1660	2470	1640	2470	1640	**11.0**	899	598	943	627	1040	689	1150	766	1260	838	1370	913
2320	1540	2300	1530	2280	1510	2280	1510	2260	1500	2260	1500	**11.5**	892	593	935	622	1030	682	1140	757	1240	827	1350	899
2130	1420	2110	1410	2090	1390	2090	1390	2070	1380	2070	1380	**12.0**	885	589	927	617	1020	675	1120	748	1230	816	1330	885
1970	1310	1950	1300	1930	1280	1930	1280	1910	1270	1910	1270	**12.5**	878	584	919	611	1000	669	1110	740	1210	804	1310	871
1820	1210	1800	1200	1780	1180	1780	1190	1770	1180	1770	1170	**13.0**	871	579	911	606	995	662	1100	731	1190	793	1290	857
1680	1120	1670	1110	1650	1100	1650	1100	1640	1090	1640	1090	**13.5**	863	575	903	601	985	655	1090	722	1180	782	1270	843
1570	1040	1550	1030	1540	1020	1540	1020	1520	1010	1520	1010	**14.0**	856	570	895	595	974	648	1070	713	1160	771	1250	829
1460	972	1450	964	1430	952	1430	953	1420	945	1420	944	**14.5**	849	565	887	590	964	642	1060	705	1140	760	1230	815
1360	908	1350	900	1340	890	1340	890	1330	883	1330	882	**15.0**	842	560	879	585	954	635	1050	696	1130	749	1200	801

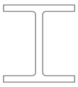
Properties

Available Strength in Tensile Yielding, kN											
6680	4440	6740	4490	6890	4580	7090	4720	7280	4840	7500	4990
Available Strength in Tensile Rupture (A$_e$ = 0.75A_g), kN											
6390	4260	6460	4300	6600	4400	6970	4530	6970	4650	7180	4780
Available Strength in Shear, kN											
ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v
1120	744	1170	780	1280	853	1420	944	1550	1030	1690	1130
Available Strength in Flexure about Y-Y axis, kN·m											
ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b
413	275	411	273	409	272	410	273	409	272	410	273

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
4.06	32.0	4.02	30.1	3.95	26.9	3.90	23.8	3.83	21.3	3.77	19.2
Area, × 10^2 mm^2											
315.8		318.8		325.8		335.4		344.3		354.4	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
76370	19710	84870	1952	104100	19340	131500	19340	161900	19150	198000	19160
r_y, × 10 mm											
7.90		7.83		7.70		7.59		7.46		7.35	
r_x/r_y											
1.97		2.08		2.32		2.61		2.91		3.22	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 235 MPa

HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000		Shape		HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
7690	5120	7900	5260	8100	5390	8550	5690	8960	5960	9390	6250	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
7620	5070	7830	5210	8020	5340	8460	5630	8860	5890	9280	6180		1.00	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
7530	5010	7730	5140	7920	5270	8350	5550	8730	5810	9150	6080		1.50	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
7400	4930	7600	5060	7780	5180	8190	5450	8560	5690	8960	5960		2.00	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
7250	4820	7430	4950	7600	5060	7990	5320	8340	5550	8720	5800		2.50	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
7060	4700	7240	4810	7390	4920	7760	5160	8080	5380	8430	5610		3.00	1860	1230	2040	1360	2230	1480	2640	1760	3050	2030	3500	2330
6840	4550	7010	4660	7150	4760	7490	4980	7790	5180	8110	5400		3.50	1860	1230	2040	1360	2230	1480	2640	1760	3040	2020	3470	2310
6600	4390	6760	4500	6890	4580	7190	4790	7460	4960	7760	5160		4.00	1840	1220	2020	1340	2200	1460	2590	1720	2970	1980	3390	2250
6340	4220	6480	4310	6600	4390	6870	4570	7110	4730	7370	4900		4.50	1810	1210	1990	1320	2160	1440	2540	1690	2900	1930	3300	2200
6060	4030	6190	4120	6290	4180	6530	4340	6730	4480	6960	4630		5.00	1790	1190	1960	1300	2120	1410	2480	1650	2840	1890	3210	2140
5760	3830	5880	3910	5960	3970	6170	4100	6340	4220	6540	4350		5.50	1760	1170	1930	1280	2090	1390	2430	1620	2770	1840	3130	2080
5450	3630	5550	3700	5620	3740	5790	3860	5930	3950	6100	4060		6.00	1740	1150	1890	1260	2050	1360	2380	1580	2700	1800	3040	2020
5140	3420	5220	3480	5280	3510	5420	3600	5530	3680	5660	3770		6.50	1710	1140	1860	1240	2010	1340	2330	1550	2630	1750	2960	1970
4820	3200	4890	3250	4930	3280	5040	3350	5110	3400	5220	3480		7.00	1680	1120	1830	1220	1970	1310	2280	1520	2570	1710	2870	1910
4490	2990	4550	3030	4580	3050	4660	3100	4710	3130	4790	3190		7.50	1660	1100	1800	1200	1940	1290	2230	1480	2500	1660	2790	1850
4170	2780	4220	2810	4230	2820	4280	2850	4310	2870	4360	2900		8.00	1630	1090	1770	1180	1900	1260	2170	1450	2430	1620	2700	1800
3860	2570	3890	2590	3890	2590	3920	2610	3920	2610	3950	2630		8.50	1610	1070	1740	1160	1860	1240	2120	1410	2360	1570	2610	1740
3550	2360	3570	2380	3560	2370	3560	2370	3550	2360	3550	2360		9.00	1580	1050	1710	1130	1820	1210	2070	1380	2290	1530	2530	1680
3250	2160	3260	2170	3240	2160	3220	2140	3190	2120	3190	2120		9.50	1550	1030	1670	1110	1780	1190	2020	1340	2230	1480	2440	1630
2950	1970	2960	1970	2930	1950	2900	1930	2870	1910	2880	1920		10.0	1530	1020	1640	1090	1750	1160	1970	1310	2160	1440	2360	1570
2680	1780	2680	1790	2660	1770	2630	1750	2610	1730	2610	1740		10.5	1500	999	1610	1070	1710	1140	1920	1270	2090	1390	2270	1510
2440	1620	2450	1630	2420	1610	2400	1600	2380	1580	2380	1580		11.0	1480	982	1580	1050	1670	1110	1860	1240	2020	1350	2190	1450
2230	1490	2240	1490	2220	1480	2200	1460	2170	1450	2180	1450		11.5	1450	965	1550	1030	1630	1090	1810	1210	1960	1300	2090	1390
2050	1360	2060	1370	2040	1350	2020	1340	2000	1330	2000	1330		12.0	1420	947	1520	1010	1600	1060	1760	1170	1890	1260	1970	1310
1890	1260	1890	1260	1880	1250	1860	1240	1840	1220	1840	1230		12.5	1400	930	1490	988	1560	1040	1710	1140	1810	1200	1870	1250
1750	1160	1750	1170	1740	1150	1720	1140	1700	1130	1700	1130		13.0	1370	913	1450	967	1520	1010	1660	1100	1720	1140	1780	1180
1620	1080	1620	1080	1610	1070	1590	1060	1580	1050	1580	1050		13.5	1350	895	1420	946	1480	987	1600	1070	1640	1090	1700	1130
1510	1000	1510	1000	1500	995	1480	986	1470	976	1470	977		14.0	1320	878	1390	925	1450	962	1530	1020	1570	1040	1620	1080
1400	935	1410	937	1390	928	1380	919	1370	910	1370	911		14.5	1290	861	1360	904	1410	937	1470	979	1500	1000	1550	1030
1310	873	1320	875	1300	867	1290	859	1280	850	1280	851		15.0	1270	843	1330	883	1370	912	1410	941	1450	961	1490	990

Properties

Available Strength in Tensile Yielding, kN											
7690	5120	7900	5260	8100	5390	8550	5690	8960	5960	9390	6250
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
7360	4910	7570	5040	7760	5170	8190	5460	8580	5720	9000	6000
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1840	1220	1980	1320	2120	1410	2410	1610	2690	1800	2980	1990
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
408	272	409	272	408	271	408	272	408	271	410	273

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.71	17.6	3.66	16.3	3.60	15.1	3.49	13.5	3.39	12.2	3.31	11.4
Area, × 10^2 mm^2											
363.7		373.3		383.0		404.3		423.6		444.2	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
237400	18980	281700	18980	329300	18800	442600	18630	5740400	18450	722300	18460
r_y, × 10 mm											
7.22		7.13		7.01		6.79		6.60		6.45	
r_x/r_y											
3.54		3.85		4.18		4.87		5.56		6.25	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 275 MPa

HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200		Shape	HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1320	877	1640	1090	1990	1330	2400	1600	2800	1870	3250	2160	**0.00**	58.4	38.8	86.8	57.7	122	81.3	167	111	219	145	281	187
1220	811	1560	1030	1910	1270	2330	1550	2730	1820	3180	2120	**1.00**	58.4	38.8	86.8	57.7	122	81.3	167	111	219	145	281	187
1110	736	1450	966	1820	1210	2230	1490	2650	1760	3100	2060	**1.50**	58.0	38.6	86.8	57.7	122	81.3	167	111	219	145	281	187
966	643	1320	877	1690	1130	2110	1410	2530	1680	2990	1990	**2.00**	57.3	38.1	85.7	57.0	122	80.9	167	111	219	145	281	187
811	540	1160	774	1540	1030	1960	1310	2390	1590	2850	1900	**2.50**	56.5	37.6	84.6	56.3	120	79.9	165	110	217	145	281	187
655	436	1000	665	1380	917	1800	1200	2230	1480	2690	1790	**3.00**	55.7	37.1	83.5	55.5	118	78.8	163	108	215	143	278	185
508	338	836	556	1210	803	1620	1080	2050	1360	2510	1670	**3.50**	54.9	36.5	82.4	54.8	117	77.8	161	107	212	141	275	183
389	259	680	452	1030	688	1440	956	1860	1240	2320	1550	**4.00**	54.2	36.0	81.2	54.0	115	76.8	159	106	210	140	271	181
308	205	540	359	869	578	1250	834	1670	1110	2120	1410	**4.50**	53.4	35.5	80.1	53.3	114	75.7	157	104	207	138	268	179
249	166	437	291	714	475	1080	716	1480	983	1920	1280	**5.00**	52.6	35.0	79.0	52.5	112	74.7	155	103	205	136	265	176
206	137	361	240	590	392	907	604	1290	859	1720	1150	**5.50**	51.8	34.5	77.8	51.8	111	73.7	153	102	202	134	262	174
173	115	304	202	496	330	762	507	1110	742	1530	1020	**6.00**	51.0	34.0	76.7	51.0	109	72.7	151	100	200	133	259	172
147	98.1	259	172	422	281	649	432	951	632	1340	890	**6.50**	50.3	33.4	75.6	50.3	108	71.6	149	99.1	197	131	256	170
127	84.6	223	148	364	242	560	373	820	545	1160	771	**7.00**	49.5	32.9	74.5	49.5	106	70.6	147	97.8	194	129	253	168
111	73.7	194	129	317	211	488	325	714	475	1010	672	**7.50**	48.7	32.4	73.3	48.8	105	69.6	145	96.5	192	128	249	166
97.3	64.7	171	114	279	185	429	285	628	418	888	591	**8.00**	47.9	31.9	72.2	48.0	103	68.5	143	95.1	189	126	246	164
86.2	57.3	151	101	247	164	380	253	556	370	786	523	**8.50**	47.1	31.4	71.1	47.3	101	67.5	141	93.8	187	124	243	162
76.9	51.2	135	89.8	220	147	339	225	496	330	701	467	**9.00**	46.4	30.8	69.9	46.5	99.9	66.5	139	92.4	184	123	240	160
69.0	45.9	121	80.6	198	132	304	202	445	296	630	419	**9.50**	45.6	30.3	68.8	45.8	98.4	65.5	137	91.1	182	121	237	158
62.3	41.4	109	72.7	178	119	274	183	402	267	568	378	**10.0**	44.8	29.8	67.7	45.0	96.8	64.4	135	89.8	179	119	234	155
56.5	37.6	99.1	66.0	162	108	249	166	364	242	515	343	**10.5**	44.0	29.3	66.6	44.3	95.3	63.4	133	88.4	177	117	230	153
51.5	34.2	90.3	60.1	147	98.1	227	151	332	221	470	312	**11.0**	43.2	28.8	65.4	43.5	93.8	62.4	131	87.1	174	116	227	151
47.1	31.3	82.6	55.0	135	89.7	207	138	304	202	430	286	**11.5**	42.5	28.2	64.3	42.8	92.2	61.4	129	85.8	171	114	224	149
43.2	28.8	75.9	50.5	124	82.4	191	127	279	186	395	263	**12.0**	41.7	27.7	63.2	42.0	90.7	60.3	127	84.4	169	112	221	147
39.9	26.5	69.9	46.5	114	76.0	176	117	257	171	364	242	**12.5**	40.9	27.2	62.0	41.3	89.1	59.3	125	83.1	166	111	218	145
36.8	24.5	64.7	43.0	106	70.2	162	108	238	158	336	224	**13.0**	40.1	26.7	60.9	40.5	87.6	58.3	123	81.8	164	109	215	143
34.2	22.7	60.0	39.9	97.9	65.1	151	100	220	147	312	207	**13.5**	39.3	26.2	59.8	39.8	86.0	57.2	121	80.4	161	107	212	141
31.8	21.1	55.8	37.1	91.0	60.6	140	93.1	205	136	290	193	**14.0**	38.6	25.7	58.6	39.0	84.5	56.2	119	79.1	159	106	208	139
29.6	19.7	52.0	34.6	84.8	56.5	131	86.8	191	127	270	180	**14.5**	37.8	25.1	57.5	38.3	82.9	55.2	117	77.7	156	104	205	137
27.7	18.4	48.6	32.3	79.3	52.8	122	81.1	179	119	253	168	**15.0**	37.0	24.6	56.4	37.5	81.4	54.2	115	76.4	154	102	202	134

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1320	877	1640	1090	1990	1330	2400	1600	2800	1870	3250	2160

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1290	858	1610	1070	1950	1300	2350	1560	2740	1830	3180	2120

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
238	158	289	193	343	229	416	277	479	319	545	363

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
28.8	19.2	42.5	28.3	59.5	39.6	80.6	53.6	105	70.0	134	89.4

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.30	17.6	1.54	17.9	1.79	18.3	2.02	19.2	2.26	19.7	2.50	20.5

Area, × 10^2 mm^2

53.24	66.41	80.56	97.05	113.3	131.3

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1143	399.2	2018	702.8	3291	1144	5098	1759	7483	2580	10640	3651

r_y, × 10 mm

2.74	3.25	3.77	4.26	4.77	5.27

r_x/r_y

1.69	1.70	1.70	1.70	1.70	1.71

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 275 MPa

HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320		Shape	HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
3700	2460	4940	3290	5440	3620	5940	3960	7500	4990	7720	5140	Effective length, L_c m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	351	234	524	349	625	416	734	488	1010	672	1100	730
3630	2420	4870	3240	5370	3570	5880	3910	7430	4950	7650	5090		1.00	351	234	524	349	625	416	734	488	1010	672	1100	730
3560	2370	4780	3180	5290	3520	5800	3860	7350	4890	7560	5030		1.50	351	234	524	349	625	416	734	488	1010	672	1100	730
3450	2290	4670	3100	5180	3440	5700	3790	7230	4810	7440	4950		2.00	351	234	524	349	625	416	734	488	1010	672	1100	730
3320	2210	4520	3010	5030	3350	5560	3700	7090	4710	7290	4850		2.50	351	234	524	349	625	416	734	488	1010	672	1100	730
3160	2100	4340	2890	4870	3240	5400	3590	6910	4600	7110	4730		3.00	349	232	524	349	625	416	734	488	1010	672	1100	730
2990	1990	4150	2760	4680	3110	5220	3470	6710	4460	6900	4590		3.50	345	230	520	346	622	414	734	488	1010	672	1100	730
2800	1860	3930	2620	4470	2970	5010	3340	6480	4310	6660	4430		4.00	342	227	515	343	617	410	728	484	1010	669	1090	728
2600	1730	3700	2460	4240	2820	4790	3190	6240	4150	6410	4260		4.50	338	225	510	339	611	407	721	480	999	664	1090	722
2390	1590	3460	2300	4000	2660	4560	3030	5970	3970	6130	4080		5.00	334	222	505	336	606	403	715	476	991	659	1080	716
2180	1450	3210	2130	3750	2500	4310	2870	5690	3790	5840	3890		5.50	330	220	501	333	600	399	708	471	983	654	1070	710
1980	1320	2950	1970	3500	2330	4050	2700	5400	3600	5540	3690		6.00	326	217	496	330	594	395	702	467	976	649	1060	705
1770	1180	2700	1800	3240	2160	3790	2520	5100	3400	5230	3480		6.50	322	215	491	327	589	392	695	463	968	644	1050	699
1580	1050	2450	1630	2980	1980	3530	2350	4800	3190	4910	3270		7.00	319	212	487	324	583	388	689	458	961	639	1040	693
1390	923	2210	1470	2730	1820	3270	2170	4490	2990	4600	3060		7.50	315	209	482	321	578	384	682	454	953	634	1030	687
1220	811	1980	1320	2480	1650	3010	2000	4190	2790	4280	2850		8.00	311	207	477	317	572	381	676	450	945	629	1020	682
1080	719	1760	1170	2240	1490	2750	1830	3880	2580	3960	2640		8.50	307	204	472	314	567	377	669	445	938	624	1020	676
963	641	1570	1040	2010	1340	2510	1670	3590	2390	3660	2430		9.00	303	202	468	311	561	373	663	441	930	619	1010	670
865	575	1410	936	1800	1200	2270	1510	3300	2190	3360	2230		9.50	299	199	463	308	556	370	656	437	923	614	998	664
780	519	1270	845	1630	1080	2050	1360	3020	2010	3070	2040		10.0	296	197	458	305	550	366	650	432	915	609	990	659
708	471	1150	766	1480	983	1860	1240	2740	1820	2790	1850		10.5	292	194	454	302	544	362	643	428	908	604	981	653
645	429	1050	698	1350	896	1690	1130	2500	1660	2540	1690		11.0	288	192	449	299	539	359	637	424	900	599	972	647
590	393	960	639	1230	819	1550	1030	2290	1520	2320	1550		11.5	284	189	444	296	533	355	631	419	892	594	964	641
542	361	882	587	1130	753	1420	947	2100	1400	2130	1420		12.0	280	186	440	292	528	351	624	415	885	589	955	636
499	332	813	541	1040	694	1310	873	1930	1290	1970	1310		12.5	276	184	435	289	522	347	618	411	877	584	947	630
462	307	751	500	964	641	1210	807	1790	1190	1820	1210		13.0	273	181	430	286	517	344	611	407	870	579	938	624
428	285	697	464	894	595	1120	748	1660	1100	1690	1120		13.5	269	179	425	283	511	340	605	402	862	574	929	618
398	265	648	431	831	553	1050	696	1540	1030	1570	1040		14.0	265	176	421	280	506	336	598	398	854	568	921	612
371	247	604	402	775	515	975	649	1440	956	1460	972		14.5	261	174	416	277	500	333	592	394	847	563	912	607
347	231	564	375	724	482	911	606	1340	894	1370	908		15.0	257	171	411	274	494	329	585	389	839	558	903	601

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
3700	2460	4940	3290	5440	3620	5940	3960	7500	4990	7720	5140

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
3610	2410	4830	3220	5310	3540	5810	3870	7330	4890	7550	5030

Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
614	409	802	535	861	574	946	631	1180	785	1240	829

Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
168	112	249	166	295	196	346	230	473	315	483	321

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
2.75	21.0	3.03	25.6	3.27	25.8	3.51	26.0	4.11	30.5	3.77	29.2

Area, × 10^2 mm^2					
149.4	199.6	219.6	240.2	303.1	312.0

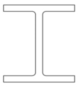
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
14600	5012	24290	8153	31310	10450	39550	13160	59200	19400	68130	19710

r_y, × 10 mm					
5.79	6.39	6.90	7.40	8.00	7.95

r_x / r_y					
1.71	1.73	1.73	1.73	1.75	1.86

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 275 MPa

HEM 340		HEM 360		HEM 400		HEM 450		HEM 500		HEM 550		Shape
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design
Available Compressive Strength, kN												
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending
7820	5200	7890	5250	8060	5360	8300	5520	8520	5670	8770	5840	**0.00**
7740	5150	7820	5200	7980	5310	8220	5470	8430	5610	8680	5770	**1.00**
7650	5090	7720	5140	7890	5250	8110	5400	8320	5540	8560	5700	**1.50**
7530	5010	7600	5050	7750	5160	7970	5300	8170	5440	8400	5590	**2.00**
7370	4910	7430	4950	7580	5050	7790	5180	7980	5310	8200	5460	**2.50**
7190	4780	7240	4820	7380	4910	7580	5040	7750	5160	7960	5300	**3.00**
6970	4640	7020	4670	7150	4760	7330	4880	7490	4990	7690	5110	**3.50**
6730	4480	6780	4510	6890	4580	7060	4700	7210	4790	7380	4910	**4.00**
6470	4300	6510	4330	6610	4400	6760	4500	6890	4590	7050	4690	**4.50**
6190	4120	6220	4140	6310	4200	6450	4290	6560	4360	6700	4460	**5.00**
5890	3920	5920	3940	5990	3980	6110	4070	6210	4130	6330	4210	**5.50**
5580	3710	5600	3730	5660	3770	5770	3840	5840	3890	5950	3960	**6.00**
5270	3500	5280	3510	5320	3540	5410	3600	5470	3640	5560	3700	**6.50**
4940	3290	4950	3290	4980	3310	5060	3360	5100	3390	5170	3440	**7.00**
4620	3070	4620	3070	4640	3090	4700	3130	4730	3140	4780	3180	**7.50**
4300	2860	4290	2860	4300	2860	4340	2890	4360	2900	4400	2920	**8.00**
3980	2650	3970	2640	3960	2640	4000	2660	4000	2660	4020	2680	**8.50**
3670	2440	3650	2430	3640	2420	3660	2430	3650	2430	3660	2430	**9.00**
3360	2240	3340	2230	3320	2210	3330	2220	3310	2200	3310	2200	**9.50**
3070	2040	3050	2030	3010	2000	3010	2000	2990	1990	2980	1980	**10.0**
2790	1850	2760	1840	2730	1820	2730	1820	2710	1800	2710	1800	**10.5**
2540	1690	2520	1670	2490	1650	2490	1660	2470	1640	2470	1640	**11.0**
2320	1540	2300	1530	2280	1510	2280	1510	2260	1500	2260	1500	**11.5**
2130	1420	2110	1410	2090	1390	2090	1390	2070	1380	2070	1380	**12.0**
1970	1310	1950	1300	1930	1280	1930	1280	1910	1270	1910	1270	**12.5**
1820	1210	1800	1200	1780	1180	1780	1190	1770	1180	1770	1170	**13.0**
1680	1120	1670	1110	1650	1100	1650	1100	1640	1090	1640	1090	**13.5**
1570	1040	1550	1030	1540	1020	1540	1020	1520	1010	1520	1010	**14.0**
1460	972	1450	964	1430	952	1430	953	1420	945	1420	944	**14.5**
1360	908	1350	900	1340	890	1340	890	1330	883	1330	882	**15.0**

Shape	HEM 340		HEM 360		HEM 400		HEM 450		HEM 500		HEM 550	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	Available Flexural Strength, kN·m											
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
1.00	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
1.50	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
2.00	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
2.50	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
3.00	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
3.50	1170	777	1230	822	1380	917	1570	1040	1760	1170	1960	1310
4.00	1160	774	1230	817	1370	911	1550	1030	1730	1150	1930	1290
4.50	1150	767	1220	810	1360	902	1530	1020	1710	1140	1900	1270
5.00	1140	761	1210	803	1340	892	1520	1010	1690	1120	1880	1250
5.50	1130	754	1200	795	1330	883	1500	996	1660	1110	1850	1230
6.00	1120	747	1180	788	1310	874	1480	984	1640	1090	1820	1210
6.50	1110	741	1170	780	1300	864	1460	972	1620	1080	1790	1190
7.00	1100	734	1160	773	1280	855	1440	960	1600	1060	1760	1170
7.50	1090	728	1150	766	1270	846	1420	948	1570	1050	1730	1150
8.00	1080	721	1140	758	1260	836	1410	936	1550	1030	1700	1130
8.50	1070	715	1130	751	1240	827	1390	923	1530	1010	1670	1110
9.00	1060	708	1120	743	1230	818	1370	911	1500	999	1640	1090
9.50	1050	702	1110	736	1210	808	1350	899	1480	984	1610	1070
10.0	1040	695	1100	729	1200	799	1330	887	1460	969	1580	1050
10.5	1030	689	1080	721	1190	790	1310	875	1430	953	1560	1030
11.0	1030	682	1070	714	1170	780	1300	863	1410	938	1530	1020
11.5	1020	675	1060	706	1160	771	1280	850	1390	922	1500	996
12.0	1010	669	1050	699	1140	761	1260	838	1360	907	1470	976
12.5	996	662	1040	692	1130	752	1240	826	1340	891	1440	957
13.0	986	656	1030	684	1120	743	1220	814	1320	876	1410	938
13.5	976	649	1020	677	1100	733	1210	802	1290	860	1380	918
14.0	966	643	1010	669	1090	724	1190	790	1270	845	1350	899
14.5	956	636	995	662	1070	715	1170	778	1250	829	1320	880
15.0	946	630	984	655	1060	705	1150	765	1220	814	1290	860

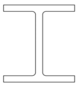
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
7820	5200	7890	5250	8060	5360	8300	5520	8520	5670	8770	5840
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
7640	5090	7710	5140	7880	5250	8110	5410	8330	5550	8570	5710
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1310	871	1370	912	1500	998	1660	1100	1820	1210	1980	1320
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
483	322	481	320	479	318	480	319	478	318	479	319

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.75	27.4	3.72	25.8	3.65	23.0	3.60	20.4	3.54	18.3	3.49	16.6
Area, × 10^2 mm^2											
315.8		318.8		325.8		335.4		344.3		354.4	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
76370	19710	84870	1952	104100	19340	131500	19340	161900	19150	198000	19160
r_y, × 10 mm											
7.90		7.83		7.70		7.59		7.46		7.35	
r_x/r_y											
1.97		2.08		2.32		2.61		2.91		3.22	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 275 MPa

HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000 [c]		Shape		HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
9000	5990	9250	6150	9480	6310	10000	6660	10500	6980	11000	7310	Effective length, L_c m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	**0.00**	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
8900	5920	9140	6080	9370	6230	9880	6570	10300	6880	10800	7170		**1.00**	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
8780	5840	9010	6000	9230	6140	9730	6470	10200	6770	10600	7070		**1.50**	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
8610	5730	8830	5880	9040	6010	9510	6330	9940	6610	10400	6920		**2.00**	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
8390	5580	8610	5730	8800	5860	9250	6150	9640	6420	10100	6700		**2.50**	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
8140	5420	8340	5550	8520	5670	8930	5940	9290	6180	9690	6450		**3.00**	2170	1440	2390	1590	2610	1740	3090	2060	3570	2380	4100	2730
7850	5220	8040	5350	8200	5450	8570	5700	8900	5920	9260	6160		**3.50**	2170	1440	2380	1580	2590	1720	3050	2030	3510	2330	4000	2660
7530	5010	7700	5120	7840	5220	8170	5440	8460	5630	8790	5850		**4.00**	2130	1420	2340	1550	2540	1690	2980	1980	3420	2270	3890	2590
7180	4780	7330	4880	7450	4960	7750	5150	7990	5320	8280	5510		**4.50**	2090	1390	2290	1530	2490	1660	2910	1940	3320	2210	3770	2510
6810	4530	6940	4620	7050	4690	7290	4850	7500	4990	7740	5150		**5.00**	2060	1370	2250	1500	2440	1620	2840	1890	3230	2150	3660	2430
6420	4270	6540	4350	6620	4400	6830	4540	6990	4650	7190	4790		**5.50**	2020	1350	2210	1470	2380	1590	2770	1840	3140	2090	3540	2360
6020	4000	6120	4070	6180	4110	6350	4220	6480	4310	6640	4420		**6.00**	1990	1320	2160	1440	2330	1550	2700	1800	3050	2030	3430	2280
5610	3730	5700	3790	5740	3820	5860	3900	5960	3960	6080	4050		**6.50**	1950	1300	2120	1410	2280	1520	2630	1750	2960	1970	3310	2210
5200	3460	5270	3510	5300	3530	5380	3580	5440	3620	5530	3680		**7.00**	1920	1270	2080	1380	2230	1480	2560	1700	2870	1910	3200	2130
4800	3190	4850	3230	4860	3240	4910	3270	4940	3290	5000	3320		**7.50**	1880	1250	2030	1350	2180	1450	2490	1660	2780	1850	3090	2050
4400	2930	4440	2950	4440	2950	4450	2960	4450	2960	4480	2980		**8.00**	1840	1230	1990	1320	2130	1420	2420	1610	2690	1790	2970	1980
4010	2670	4040	2690	4020	2680	4010	2670	3980	2650	3990	2650		**8.50**	1810	1200	1950	1300	2080	1380	2350	1560	2600	1730	2860	1900
3640	2420	3650	2430	3620	2410	3590	2390	3550	2360	3550	2360		**9.00**	1770	1180	1900	1270	2020	1350	2280	1520	2510	1670	2740	1820
3270	2180	3280	2180	3250	2160	3220	2140	3190	2120	3190	2120		**9.50**	1740	1150	1860	1240	1970	1310	2210	1470	2410	1610	2630	1750
2950	1970	2960	1970	2930	1950	2900	1930	2870	1910	2880	1920		**10.0**	1700	1130	1820	1210	1920	1280	2140	1420	2320	1550	2510	1670
2680	1780	2680	1790	2660	1770	2630	1750	2610	1730	2610	1740		**10.5**	1660	1110	1770	1180	1870	1240	2070	1380	2230	1490	2360	1570
2440	1620	2450	1630	2420	1610	2400	1600	2380	1580	2380	1580		**11.0**	1630	1080	1730	1150	1820	1210	2000	1330	2130	1420	2220	1480
2230	1490	2240	1490	2220	1480	2200	1460	2170	1450	2180	1450		**11.5**	1590	1060	1690	1120	1770	1180	1930	1280	2010	1340	2090	1390
2050	1360	2060	1370	2040	1350	2020	1340	2000	1330	2000	1330		**12.0**	1560	1040	1640	1090	1720	1140	1850	1230	1900	1270	1970	1310
1890	1260	1890	1260	1880	1250	1860	1240	1840	1220	1840	1230		**12.5**	1520	1010	1600	1070	1660	1110	1760	1170	1810	1200	1870	1250
1750	1160	1750	1170	1740	1150	1720	1140	1700	1130	1700	1130		**13.0**	1490	988	1560	1040	1610	1070	1680	1110	1720	1140	1780	1180
1620	1080	1620	1080	1610	1070	1590	1060	1580	1050	1580	1050		**13.5**	1450	964	1510	1010	1550	1030	1600	1070	1640	1090	1700	1130
1510	1000	1510	1000	1500	995	1480	986	1470	976	1470	977		**14.0**	1410	940	1470	979	1490	989	1530	1020	1570	1040	1620	1080
1400	935	1410	937	1390	928	1380	919	1370	910	1370	911		**14.5**	1380	917	1420	943	1430	950	1470	979	1500	1000	1550	1030
1310	873	1320	875	1300	867	1290	859	1280	850	1280	851		**15.0**	1340	893	1360	908	1370	914	1410	941	1450	961	1490	990

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
9000	5990	9250	6150	9480	6310	10000	6660	10500	6980	11000	7310
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
8800	5860	9040	6030	9260	6180	9780	6520	10200	6830	10700	7160
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
2150	1430	2310	1540	2480	1650	2820	1880	3150	2100	3490	2330
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
478	318	479	319	477	318	478	318	477	318	480	319

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.43	15.2	3.38	14.1	3.33	13.2	3.22	11.8	3.13	10.8	3.06	10.1
Area, × 10^2 mm^2											
363.7		373.3		383.0		404.3		423.6		444.2	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
237400	18980	281700	18980	329300	18800	442600	18630	5740400	18450	722300	18460
r_y, × 10 mm											
7.22		7.13		7.01		6.79		6.60		6.45	
r_x/r_y											
3.54		3.85		4.18		4.87		5.56		6.25	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 355 MPa

HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200		Shape	HEM 100		HEM 120		HEM 140		HEM 160		HEM 180		HEM 200	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1700	1130	2120	1410	2570	1710	3100	2060	3620	2410	4200	2790	**0.00**	75.3	50.1	112	74.5	158	105	216	143	282	188	363	241
1540	1020	1980	1310	2440	1620	2970	1980	3500	2330	4080	2720	**1.00**	75.3	50.1	112	74.5	158	105	216	143	282	188	363	241
1360	903	1810	1200	2280	1520	2820	1880	3360	2240	3950	2630	**1.50**	74.4	49.5	111	74.2	158	105	216	143	282	188	363	241
1140	758	1600	1060	2080	1390	2630	1750	3170	2110	3760	2500	**2.00**	73.1	48.6	110	72.9	156	103	214	142	282	188	363	241
909	605	1360	904	1850	1230	2390	1590	2940	1960	3540	2360	**2.50**	71.8	47.8	108	71.6	153	102	211	140	278	185	359	239
690	459	1120	743	1600	1060	2130	1420	2690	1790	3290	2190	**3.00**	70.5	46.9	106	70.4	150	100	207	138	274	182	354	236
508	338	886	590	1350	895	1870	1240	2410	1610	3010	2000	**3.50**	69.2	46.0	104	69.1	148	98.3	204	136	269	179	349	232
389	259	683	454	1100	734	1600	1060	2130	1420	2720	1810	**4.00**	67.8	45.1	102	67.8	145	96.5	200	133	265	176	343	228
308	205	540	359	881	586	1340	891	1850	1230	2420	1610	**4.50**	66.5	44.3	100	66.6	143	94.8	197	131	261	173	338	225
249	166	437	291	714	475	1100	730	1580	1050	2130	1420	**5.00**	65.2	43.4	98.1	65.3	140	93.1	194	129	256	170	333	221
206	137	361	240	590	392	907	604	1330	883	1850	1230	**5.50**	63.9	42.5	96.2	64.0	137	91.3	190	127	252	168	327	218
173	115	304	202	496	330	762	507	1120	742	1580	1050	**6.00**	62.6	41.6	94.3	62.8	135	89.6	187	124	248	165	322	214
147	98.1	259	172	422	281	649	432	951	632	1340	895	**6.50**	61.3	40.8	92.4	61.5	132	87.9	183	122	243	162	317	211
127	84.6	223	148	364	242	560	373	820	545	1160	771	**7.00**	60.0	39.9	90.5	60.2	129	86.1	180	120	239	159	311	207
111	73.7	194	129	317	211	488	325	714	475	1010	672	**7.50**	58.6	39.0	88.6	59.0	127	84.4	177	118	235	156	306	204
97.3	64.7	171	114	279	185	429	285	628	418	888	591	**8.00**	57.3	38.1	86.7	57.7	124	82.7	173	115	230	153	301	200
86.2	57.3	151	101	247	164	380	253	556	370	786	523	**8.50**	56.0	37.3	84.8	56.4	122	80.9	170	113	226	150	295	197
76.9	51.2	135	89.8	220	147	339	225	496	330	701	467	**9.00**	54.7	36.4	82.9	55.2	119	79.2	167	111	222	147	290	193
69	45.9	121	80.6	198	132	304	202	445	296	630	419	**9.50**	53.4	35.5	81.0	53.9	116	77.5	163	109	217	145	285	189
62.3	41.4	109	72.7	178	119	274	183	402	267	568	378	**10.0**	52.1	34.7	79.1	52.6	114	75.7	160	106	213	142	279	186
56.5	37.6	99.1	66	162	108	249	166	364	242	515	343	**10.5**	50.8	33.8	77.2	51.4	111	74.0	156	104	209	139	274	182
51.5	34.2	90.3	60.1	147	98.1	227	151	332	221	470	312	**11.0**	49.5	32.9	75.3	50.1	109	72.2	153	102	204	136	269	179
47.1	31.3	82.6	55	135	89.7	207	138	304	202	430	286	**11.5**	48.1	32.0	73.4	48.8	106	70.5	150	99.5	200	133	263	175
43.2	28.8	75.9	50.5	124	82.4	191	127	279	186	395	263	**12.0**	46.8	31.2	71.5	47.6	103	68.8	146	97.2	196	130	258	172
39.9	26.5	69.9	46.5	114	76	176	117	257	171	364	242	**12.5**	45.5	30.3	69.6	46.3	101	67.0	143	95.0	191	127	253	168
36.8	24.5	64.7	43	106	70.2	162	108	238	158	336	224	**13.0**	44.2	29.4	67.7	45.0	98.1	65.3	139	92.7	187	124	247	165
34.2	22.7	60	39.9	97.9	65.1	151	100	220	147	312	207	**13.5**	42.9	28.5	65.8	43.8	95.5	63.6	136	90.5	183	122	242	161
31.8	21.1	55.8	37.1	91	60.6	140	93.1	205	136	290	193	**14.0**	41.4	27.5	63.7	42.4	92.9	61.8	133	88.2	178	119	237	157
29.6	19.7	52	34.6	84.8	56.5	131	86.8	191	127	270	180	**14.5**	40.0	26.6	61.5	40.9	89.9	59.8	129	85.9	174	116	231	154
27.7	18.4	48.6	32.3	79.3	52.8	122	81.1	179	119	253	168	**15.0**	38.6	25.7	59.5	39.6	86.9	57.8	125	83.5	170	113	226	150

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1700	1130	2120	1410	2570	1710	3100	2060	3620	2410	4200	2790
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1530	1020	1910	1270	2310	1540	2780	1860	3250	2170	3770	2510
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
307	204	373	249	443	295	537	358	618	412	703	469
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
37.2	24.7	54.8	36.5	76.8	51.1	104	69.2	136	90.4	174	115

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.14	13.6	1.36	13.8	1.57	14.2	1.78	14.9	1.99	15.3	2.2	15.9
Area, × 10^2 mm^2											
53.24		66.41		80.56		97.05		113.3		131.3	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1143	399.2	2018	702.8	3291	1144	5098	1759	7483	2580	10640	3651
r_y, × 10 mm											
2.74		3.25		3.77		4.26		4.77		5.27	
r_x/r_y											
1.69		1.70		1.70		1.70		1.70		1.71	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 355 MPa

HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320		Shape	HEM 220		HEM 240		HEM 260		HEM 280		HEM 300		HEM 320	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
4770	3180	6380	4240	7020	4670	7670	5110	9680	6440	9970	6630	0.00	453	302	676	450	806	537	948	630	1300	867	1420	943
4670	3110	6260	4170	6910	4590	7570	5040	9570	6370	9850	6550	1.00	453	302	676	450	806	537	948	630	1300	867	1420	943
4540	3020	6120	4070	6770	4500	7440	4950	9430	6270	9700	6460	1.50	453	302	676	450	806	537	948	630	1300	867	1420	943
4360	2900	5920	3940	6590	4380	7260	4830	9240	6150	9500	6320	2.00	453	302	676	450	806	537	948	630	1300	867	1420	943
4150	2760	5680	3780	6360	4230	7040	4690	9000	5990	9250	6160	2.50	452	301	676	450	806	537	948	630	1300	867	1420	943
3900	2590	5400	3590	6090	4050	6780	4510	8710	5800	8960	5960	3.00	446	297	671	447	804	535	948	630	1300	867	1420	943
3630	2410	5090	3390	5780	3850	6490	4310	8380	5580	8620	5730	3.50	439	292	663	441	795	529	939	625	1300	864	1410	939
3330	2220	4750	3160	5450	3620	6160	4100	8020	5340	8240	5480	4.00	433	288	655	436	785	523	928	617	1290	856	1400	930
3030	2020	4390	2920	5090	3390	5810	3870	7630	5080	7830	5210	4.50	426	284	647	431	776	516	917	610	1270	847	1380	920
2720	1810	4020	2680	4730	3140	5440	3620	7220	4800	7400	4920	5.00	420	279	639	425	767	510	906	603	1260	839	1370	910
2420	1610	3650	2430	4350	2890	5060	3370	6780	4510	6950	4630	5.50	413	275	631	420	757	504	895	595	1250	830	1350	900
2130	1420	3280	2180	3970	2640	4680	3110	6340	4220	6490	4320	6.00	407	271	623	415	748	498	884	588	1230	821	1340	890
1850	1230	2930	1950	3600	2390	4290	2860	5890	3920	6030	4010	6.50	400	266	615	409	738	491	873	581	1220	813	1320	881
1590	1060	2580	1720	3230	2150	3910	2600	5440	3620	5560	3700	7.00	394	262	607	404	729	485	862	573	1210	804	1310	871
1390	923	2260	1500	2880	1920	3540	2360	5000	3320	5100	3390	7.50	387	258	599	399	720	479	851	566	1200	796	1290	861
1220	811	1980	1320	2550	1690	3180	2120	4560	3040	4650	3090	8.00	381	253	591	393	710	472	840	559	1180	787	1280	851
1080	719	1760	1170	2250	1500	2840	1890	4140	2750	4220	2810	8.50	374	249	583	388	701	466	829	551	1170	779	1260	842
963	641	1570	1040	2010	1340	2530	1680	3730	2480	3790	2520	9.00	368	245	575	383	691	460	818	544	1160	770	1250	832
865	575	1410	936	1800	1200	2270	1510	3350	2230	3400	2260	9.50	361	240	567	378	682	454	807	537	1140	762	1240	822
780	519	1270	845	1630	1080	2050	1360	3020	2010	3070	2040	10.0	355	236	559	372	672	447	796	529	1130	753	1220	812
708	471	1150	766	1480	983	1860	1240	2740	1820	2790	1850	10.5	348	232	552	367	663	441	785	522	1120	744	1210	803
645	429	1050	698	1350	896	1690	1130	2500	1660	2540	1690	11.0	342	227	544	362	654	435	774	515	1110	736	1190	793
590	393	960	639	1230	819	1550	1030	2290	1520	2320	1550	11.5	335	223	536	356	644	429	763	508	1090	727	1180	783
542	361	882	587	1130	753	1420	947	2100	1400	2130	1420	12.0	329	219	528	351	635	422	752	500	1080	719	1160	773
499	332	813	541	1040	694	1310	873	1930	1290	1970	1310	12.5	322	214	520	346	625	416	741	493	1070	710	1150	764
462	307	751	500	964	641	1210	807	1790	1190	1820	1210	13.0	316	210	512	340	616	410	730	486	1050	702	1130	754
428	285	697	464	894	595	1120	748	1660	1100	1690	1120	13.5	309	206	504	335	607	404	719	478	1040	693	1120	744
398	265	648	431	831	553	1050	696	1540	1030	1570	1040	14.0	303	201	496	330	597	397	708	471	1030	685	1100	734
371	247	604	402	775	515	975	649	1440	956	1460	972	14.5	296	197	488	325	588	391	697	464	1020	676	1090	724
347	231	564	375	724	482	911	606	1340	894	1370	908	15.0	290	193	480	319	578	385	686	456	1000	667	1070	715

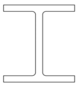
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
4770	3180	6380	4240	7020	4670	7670	5110	9680	6440	9970	6630
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
4290	2860	5730	3820	6300	4200	6890	4590	8700	5800	8950	5970
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
792	528	1040	690	1110	741	1220	814	1520	1010	1610	1070
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
217	144	321	214	381	253	446	297	611	407	623	415

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
2.42	16.4	2.67	19.9	2.88	20.1	3.09	20.2	4.11	23.7	3.32	22.7
Area, × 10^2 mm^2											
149.4		199.6		219.6		240.2		303.1		312.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
14600	5012	24290	8153	31310	10450	39550	13160	59200	19400	68130	19710
r_y, × 10 mm											
5.79		6.39		6.90		7.40		8.00		7.95	
r_x/r_y											
1.71		1.73		1.73		1.73		1.75		1.86	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 355 MPa

HEM 340		HEM 360		HEM 400		HEM 450		HEM 500		HEM 550		Shape	HEM 340		HEM 360		HEM 400		HEM 450		HEM 500		HEM 550	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
10100	6710	10200	6780	10400	6930	10700	7130	11000	7320	11300	7530	**0.00**	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
9970	6630	10100	6690	10300	6840	10600	7040	10900	7220	11200	7430	**1.00**	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
9820	6530	9910	6590	10100	6730	10400	6920	10700	7100	11000	7300	**1.50**	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
9610	6400	9700	6450	9890	6580	10200	6770	10400	6930	10700	7130	**2.00**	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
9360	6230	9430	6280	9620	6400	9880	6570	10100	6730	10400	6910	**2.50**	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
9050	6020	9120	6070	9290	6180	9530	6340	9740	6480	9990	6650	**3.00**	1510	1000	1590	1060	1780	1180	2020	1350	2270	1510	2530	1690
8700	5790	8760	5830	8910	5930	9130	6080	9320	6200	9550	6350	**3.50**	1500	998	1590	1050	1770	1180	2000	1330	2240	1490	2490	1660
8320	5530	8370	5570	8500	5650	8690	5780	8860	5890	9060	6030	**4.00**	1480	987	1570	1040	1740	1160	1970	1310	2200	1460	2440	1630
7900	5260	7940	5290	8050	5360	8220	5470	8360	5570	8540	5680	**4.50**	1470	976	1550	1030	1720	1140	1940	1290	2160	1440	2390	1590
7460	4970	7490	4990	7580	5040	7730	5140	7840	5220	7990	5320	**5.00**	1450	965	1530	1020	1700	1130	1910	1270	2120	1410	2350	1560
7010	4660	7030	4670	7090	4720	7220	4800	7310	4860	7430	4940	**5.50**	1430	954	1510	1000	1670	1110	1880	1250	2080	1380	2300	1530
6540	4350	6550	4360	6590	4380	6690	4450	6760	4500	6860	4560	**6.00**	1420	943	1490	992	1650	1100	1850	1230	2040	1360	2250	1500
6060	4030	6060	4030	6090	4050	6170	4110	6210	4130	6280	4180	**6.50**	1400	932	1470	980	1620	1080	1820	1210	2000	1330	2200	1460
5590	3720	5580	3710	5590	3720	5650	3760	5670	3770	5720	3810	**7.00**	1380	921	1450	967	1600	1060	1790	1190	1960	1310	2150	1430
5120	3410	5110	3400	5100	3390	5140	3420	5140	3420	5170	3440	**7.50**	1370	910	1430	954	1580	1050	1750	1170	1920	1280	2100	1400
4660	3100	4640	3090	4620	3070	4640	3090	4630	3080	4640	3090	**8.00**	1350	899	1420	942	1550	1030	1720	1150	1880	1250	2050	1370
4220	2810	4200	2790	4160	2770	4170	2770	4130	2750	4130	2750	**8.50**	1330	888	1400	929	1530	1020	1690	1130	1840	1230	2000	1330
3790	2520	3760	2500	3720	2470	3720	2470	3690	2450	3680	2450	**9.00**	1320	876	1380	917	1500	1000	1660	1110	1810	1200	1950	1300
3400	2260	3370	2240	3330	2220	3340	2220	3310	2200	3310	2200	**9.50**	1300	865	1360	904	1480	985	1630	1090	1770	1180	1910	1270
3070	2040	3050	2030	3010	2000	3010	2000	2990	1990	2980	1980	**10.0**	1280	854	1340	892	1460	969	1600	1060	1730	1150	1860	1240
2790	1850	2760	1840	2730	1820	2730	1820	2710	1800	2710	1800	**10.5**	1270	843	1320	879	1430	954	1570	1040	1690	1120	1810	1200
2540	1690	2520	1670	2490	1650	2490	1660	2470	1640	2470	1640	**11.0**	1250	832	1300	867	1410	938	1540	1020	1650	1100	1760	1170
2320	1540	2300	1530	2280	1510	2280	1510	2260	1500	2260	1500	**11.5**	1230	821	1280	854	1390	922	1510	1000	1610	1070	1710	1140
2130	1420	2110	1410	2090	1390	2090	1390	2070	1380	2070	1380	**12.0**	1220	810	1270	842	1360	906	1480	982	1570	1040	1660	1100
1970	1310	1950	1300	1930	1280	1930	1280	1910	1270	1910	1270	**12.5**	1200	799	1250	829	1340	890	1450	962	1530	1020	1610	1070
1820	1210	1800	1200	1780	1180	1780	1190	1770	1180	1770	1170	**13.0**	1180	788	1230	817	1310	874	1410	941	1490	992	1560	1040
1680	1120	1670	1110	1650	1100	1650	1100	1640	1090	1640	1090	**13.5**	1170	777	1210	804	1290	859	1380	921	1450	966	1500	1000
1570	1040	1550	1030	1540	1020	1540	1020	1520	1010	1520	1010	**14.0**	1150	765	1190	792	1270	843	1350	900	1410	940	1440	960
1460	972	1450	964	1430	952	1430	953	1420	945	1420	944	**14.5**	1130	754	1170	779	1240	827	1320	880	1370	912	1390	924
1360	908	1350	900	1340	890	1340	890	1330	883	1330	882	**15.0**	1120	743	1150	766	1220	811	1290	859	1320	879	1340	890

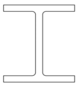
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
10100	6710	10200	6780	10400	6930	10700	7130	11000	7320	11300	7530
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
9060	6040	9150	6100	9350	6230	9620	6410	9880	6580	10200	6780
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1690	1120	1770	1180	1930	1290	2140	1430	2340	1560	2560	1710
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
624	415	620	413	618	411	620	412	617	411	619	412

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.30	21.3	3.27	20.1	3.22	18.0	3.17	16.0	3.12	14.4	3.07	13.1
Area, × 10^2 mm^2											
315.8		318.8		325.8		335.4		344.3		354.4	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
76370	19710	84870	1952	104100	19340	131500	19340	161900	19150	198000	19160
r_y, × 10 mm											
7.90		7.83		7.70		7.59		7.46		7.35	
r_x/r_y											
1.97		2.08		2.32		2.61		2.91		3.22	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
HEM Shapes

F_y = 355 MPa

HEM 600		HEM 650		HEM 700		HEM 800		HEM 900^c		HEM 1000^c		Shape	HEM 600		HEM 650		HEM 700		HEM 800		HEM 900		HEM 1000	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
11600	7730	11900	7940	12200	8140	12900	8590	13500	9000	14200	9440	**0.00**	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
11500	7620	11800	7830	12100	8020	12700	8460	13200	8790	13400	8900	**1.00**	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
11200	7480	11500	7680	11800	7870	12500	8280	13000	8630	13100	8730	**1.50**	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
11000	7300	11300	7490	11500	7660	12100	8050	12600	8400	12800	8490	**2.00**	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
10600	7060	10900	7240	11100	7400	11700	7760	12100	8080	12300	8200	**2.50**	2800	1860	3090	2050	3370	2240	3990	2660	4610	3070	5290	3520
10200	6790	10500	6950	10700	7090	11200	7420	11600	7710	11800	7860	**3.00**	2800	1860	3080	2050	3360	2230	3950	2630	4540	3020	5180	3450
9740	6480	9960	6630	10100	6750	10600	7040	11000	7290	11200	7470	**3.50**	2740	1830	3010	2000	3270	2180	3840	2550	4400	2930	5000	3330
9220	6140	9420	6270	9580	6370	9950	6620	10300	6830	10600	7050	**4.00**	2680	1790	2940	1960	3190	2120	3730	2480	4250	2830	4820	3210
8670	5770	8850	5890	8970	5970	9280	6170	9540	6350	9840	6550	**4.50**	2630	1750	2870	1910	3100	2060	3610	2400	4110	2730	4640	3090
8100	5390	8250	5490	8340	5550	8590	5710	8790	5850	9030	6010	**5.00**	2570	1710	2800	1860	3020	2010	3500	2330	3960	2640	4460	2970
7510	5000	7630	5080	7700	5120	7880	5240	8020	5340	8210	5460	**5.50**	2510	1670	2720	1810	2930	1950	3380	2250	3820	2540	4280	2850
6910	4600	7010	4660	7050	4690	7180	4770	7270	4830	7400	4920	**6.00**	2450	1630	2650	1760	2850	1890	3270	2180	3670	2440	4100	2730
6310	4200	6390	4250	6410	4260	6480	4310	6520	4340	6610	4400	**6.50**	2390	1590	2580	1720	2760	1840	3160	2100	3520	2340	3920	2610
5730	3810	5780	3850	5780	3840	5800	3860	5800	3860	5850	3890	**7.00**	2330	1550	2510	1670	2680	1780	3040	2020	3380	2250	3740	2490
5160	3430	5190	3450	5170	3440	5160	3430	5110	3400	5120	3410	**7.50**	2270	1510	2440	1620	2590	1720	2930	1950	3230	2150	3560	2370
4610	3070	4620	3080	4580	3050	4540	3020	4490	2990	4500	2990	**8.00**	2210	1470	2360	1570	2510	1670	2810	1870	3090	2050	3380	2250
4090	2720	4100	2730	4060	2700	4020	2670	3980	2650	3990	2650	**8.50**	2150	1430	2290	1530	2420	1610	2700	1800	2940	1960	3190	2120
3650	2430	3650	2430	3620	2410	3590	2390	3550	2360	3550	2360	**9.00**	2090	1390	2220	1480	2340	1560	2590	1720	2790	1860	2930	1950
3270	2180	3280	2180	3250	2160	3220	2140	3190	2120	3190	2120	**9.50**	2030	1350	2150	1430	2250	1500	2470	1640	2590	1720	2720	1810
2950	1970	2960	1970	2930	1950	2900	1930	2870	1910	2880	1920	**10.0**	1970	1310	2080	1380	2170	1440	2330	1550	2410	1610	2530	1680
2680	1780	2680	1790	2660	1770	2630	1750	2610	1730	2610	1740	**10.5**	1910	1270	2010	1330	2080	1390	2180	1450	2260	1500	2360	1570
2440	1620	2450	1630	2420	1610	2400	1600	2380	1580	2380	1580	**11.0**	1850	1230	1930	1290	1980	1320	2060	1370	2130	1420	2220	1480
2230	1490	2240	1490	2220	1480	2200	1460	2170	1450	2180	1450	**11.5**	1790	1190	1850	1230	1870	1250	1950	1300	2010	1340	2090	1390
2050	1360	2060	1370	2040	1350	2020	1340	2000	1330	2000	1330	**12.0**	1730	1150	1760	1170	1780	1180	1850	1230	1900	1270	1970	1310
1890	1260	1890	1260	1880	1250	1860	1240	1840	1220	1840	1230	**12.5**	1650	1100	1680	1120	1700	1130	1760	1170	1810	1200	1870	1250
1750	1160	1750	1170	1740	1150	1720	1140	1700	1130	1700	1130	**13.0**	1580	1050	1600	1070	1620	1080	1680	1110	1720	1140	1780	1180
1620	1080	1620	1080	1610	1070	1590	1060	1580	1050	1580	1050	**13.5**	1510	1010	1540	1020	1550	1030	1600	1070	1640	1090	1700	1130
1510	1000	1510	1000	1500	995	1480	986	1470	976	1470	977	**14.0**	1450	967	1470	981	1490	989	1530	1020	1570	1040	1620	1080
1400	935	1410	937	1390	928	1380	919	1370	910	1370	911	**14.5**	1400	930	1420	943	1430	950	1470	979	1500	1000	1550	1030
1310	873	1320	875	1300	867	1290	859	1280	850	1280	851	**15.0**	1350	896	1360	908	1370	914	1410	941	1450	961	1490	990

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
11600	7730	11900	7940	12200	8140	12900	8590	13500	9000	14200	9440

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
10400	6960	10700	7150	11000	7320	11600	7730	12200	8100	12700	8500

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
2770	1850	2990	1990	3200	2140	3640	2430	4070	2710	4510	3010

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
617	410	619	412	616	410	617	410	616	410	620	412

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
3.02	12.1	2.98	11.3	2.93	10.7	2.84	9.68	2.76	8.97	2.69	8.48

Area, × 10^2 mm^2

363.7	373.3	383.0	404.3	423.6	444.2

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
237400	18980	281700	18980	329300	18800	442600	18630	5740400	18450	722300	18460

r_y, × 10 mm

7.22	7.13	7.01	6.79	6.60	6.45

r_x/r_y

3.54	3.85	4.18	4.87	5.56	6.25

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPE Shapes

F_y = 235 MPa

Shape	IPE 80		IPE 100		IPE 120		IPE 140		IPE 160		IPE 180	
	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
Design	Available Compressive Strength, kN											
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	162	108	218	145	279	186	347	231	425	283	507	337
1.00	103	68.4	158	105	220	147	289	193	367	244	450	299
1.50	58.3	38.8	105	70.0	164	109	230	153	305	203	388	258
2.00	32.8	21.8	61.8	41.1	108	72.0	167	111	236	157	315	210
2.50	21.0	14.0	39.6	26.3	69.2	46.1	112	74.2	169	113	241	161
3.00	14.6	9.70	27.5	18.3	48.1	32.0	77.4	51.5	118	78.3	174	116
3.50	10.7	7.13	20.2	13.4	35.3	23.5	56.9	37.9	86.5	57.6	128	85.2
4.00	8.20	5.46	15.5	10.3	27.0	18.0	43.6	29.0	66.2	44.1	98.0	65.2
4.50	6.48	4.31	12.2	8.12	21.4	14.2	34.4	22.9	52.3	34.8	77.4	51.5
5.00	5.25	3.49	9.89	6.58	17.3	11.5	27.9	18.5	42.4	28.2	62.7	41.7
5.50	4.34	2.89	8.17	5.44	14.3	9.52	23.0	15.3	35.0	23.3	51.8	34.5
6.00	3.65	2.43	6.87	4.57	12.0	8.00	19.4	12.9	29.4	19.6	43.6	29.0
6.50	3.11	2.07	5.85	3.89	10.2	6.81	16.5	11.0	25.1	16.7	37.1	24.7
7.00	2.68	1.78	5.05	3.36	8.83	5.88	14.2	9.46	21.6	14.4	32.0	21.3
7.50	2.33	1.55	4.40	2.92	7.69	5.12	12.4	8.24	18.8	12.5	27.9	18.5
8.00	2.05	1.36	3.86	2.57	6.76	4.50	10.9	7.24	16.6	11.0	24.5	16.3
8.50	1.82	1.21	3.42	2.28	5.99	3.98	9.65	6.42	14.7	9.76	21.7	14.4
9.00	1.62	1.08	3.05	2.03	5.34	3.55	8.60	5.72	13.1	8.70	19.4	12.9
9.50	1.45	0.967	2.74	1.82	4.79	3.19	7.72	5.14	11.7	7.81	17.4	11.6
10.0	1.31	0.873	2.47	1.64	4.33	2.88	6.97	4.64	10.6	7.05	15.7	10.4
10.5	1.19	0.792	2.24	1.49	3.92	2.61	6.32	4.21	9.61	6.40	14.2	9.46
11.0	1.08	0.722	2.04	1.36	3.58	2.38	5.76	3.83	8.76	5.83	13.0	8.62
11.5	0.992	0.660	1.87	1.24	3.27	2.18	5.27	3.51	8.01	5.33	11.9	7.89
12.0	0.911	0.606	1.72	1.14	3.01	2.00	4.84	3.22	7.36	4.90	10.9	7.25
12.5	0.840	0.559	1.58	1.05	2.77	1.84	4.46	2.97	6.78	4.51	10.0	6.68
13.0	0.777	0.517	1.46	0.973	2.56	1.70	4.12	2.74	6.27	4.17	9.28	6.17
13.5	0.720	0.479	1.36	0.903	2.37	1.58	3.82	2.54	5.81	3.87	8.60	5.72
14.0	0.670	0.445	1.26	0.839	2.21	1.47	3.56	2.37	5.41	3.60	8.00	5.32
14.5	0.624	0.415	1.18	0.782	2.06	1.37	3.31	2.21	5.04	3.35	7.46	4.96
15.0	0.583	0.388	1.10	0.731	1.92	1.28	3.10	2.06	4.71	3.13	6.97	4.64

Shape	IPE 80		IPE 100		IPE 120		IPE 140		IPE 160		IPE 180	
	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Design	Available Flexural Strength, kN·m											
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	4.91	3.27	8.34	5.55	12.8	8.55	18.7	12.4	26.2	17.4	35.2	23.4
1.00	4.53	3.02	7.86	5.23	12.3	8.21	18.3	12.2	26.0	17.3	35.2	23.4
1.50	4.12	2.74	7.21	4.80	11.4	7.56	16.9	11.2	24.2	16.1	33.1	22.0
2.00	3.71	2.47	6.56	4.36	10.4	6.90	15.5	10.3	22.4	14.9	30.8	20.5
2.50	3.30	2.19	5.90	3.93	9.39	6.25	14.1	9.41	20.6	13.7	28.5	19.0
3.00	2.86	1.91	5.25	3.49	8.41	5.60	12.8	8.50	18.8	12.5	26.2	17.4
3.50	2.44	1.62	4.51	3.00	7.32	4.87	11.4	7.57	17.0	11.3	23.9	15.9
4.00	2.13	1.41	3.92	2.61	6.33	4.21	9.78	6.51	14.9	9.93	21.6	14.3
4.50	1.88	1.25	3.47	2.31	5.58	3.71	8.59	5.71	13.1	8.68	18.8	12.5
5.00	1.69	1.13	3.11	2.07	5.00	3.32	7.66	5.10	11.6	7.72	16.6	11.1
5.50	1.54	1.02	2.82	1.88	4.52	3.01	6.92	4.60	10.5	6.96	14.9	9.93
6.00	1.41	0.936	2.58	1.72	4.13	2.75	6.31	4.20	9.52	6.34	13.5	9.01
6.50	1.30	0.863	2.38	1.58	3.80	2.53	5.80	3.86	8.74	5.82	12.4	8.26
7.00	1.20	0.801	2.21	1.47	3.52	2.34	5.37	3.57	8.08	5.38	11.5	7.62
7.50	1.12	0.747	2.06	1.37	3.28	2.18	5.00	3.32	7.52	5.00	10.6	7.08
8.00	1.05	0.700	1.93	1.28	3.07	2.05	4.67	3.11	7.03	4.68	9.94	6.61
8.50	0.989	0.658	1.81	1.21	2.89	1.92	4.39	2.92	6.60	4.39	9.32	6.20
9.00	0.934	0.622	1.71	1.14	2.73	1.81	4.14	2.76	6.22	4.14	8.78	5.84
9.50	0.885	0.589	1.62	1.08	2.58	1.72	3.92	2.61	5.88	3.91	8.30	5.52
10.0	0.840	0.559	1.54	1.02	2.45	1.63	3.72	2.47	5.58	3.71	7.87	5.23
10.5	0.800	0.532	1.47	0.975	2.33	1.55	3.54	2.35	5.31	3.53	7.48	4.98
11.0	0.764	0.508	1.40	0.930	2.23	1.48	3.37	2.25	5.06	3.37	7.13	4.74
11.5	0.730	0.486	1.34	0.890	2.13	1.42	3.23	2.15	4.84	3.22	6.81	4.53
12.0	0.700	0.466	1.28	0.852	2.04	1.36	3.09	2.06	4.63	3.08	6.52	4.34
12.5	0.672	0.447	1.23	0.818	1.96	1.30	2.96	1.97	4.44	2.95	6.25	4.16
13.0	0.646	0.430	1.18	0.787	1.88	1.25	2.85	1.90	4.27	2.84	6.00	3.99
13.5	0.622	0.414	1.14	0.757	1.81	1.20	2.74	1.82	4.11	2.73	5.78	3.84
14.0	0.600	0.399	1.10	0.730	1.74	1.16	2.64	1.76	3.96	2.63	5.57	3.70
14.5	0.579	0.385	1.06	0.705	1.68	1.12	2.55	1.70	3.82	2.54	5.37	3.57
15.0	0.559	0.372	1.02	0.681	1.63	1.08	2.46	1.64	3.69	2.46	5.19	3.45

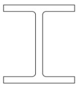
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
162	108	218	145	279	186	347	231	425	283	507	337
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
155	103	209	139	268	178	333	222	407	271	485	323
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
42.9	28.6	57.8	38.5	74.4	49.6	92.8	61.9	113	75.2	135	89.7
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
1.23	0.819	1.94	1.29	2.87	1.91	4.07	2.71	5.52	3.67	7.32	4.87

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.539	2.90	0.637	3.14	0.744	3.29	0.847	3.48	0.945	3.8	1.05	3.99
Area, × 10^2 mm^2											
7.64		10.32		13.21		16.43		20.09		23.95	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
80.14	171.0	317.8	27.67	317.8	27.67	541.2	44.92	869.3	68.31	1317	100.9
r_y, × 10 mm											
1.05		1.24		1.45		1.65		1.84		2.05	
r_x/r_y											
3.09		3.28		3.38		3.48		3.58		3.62	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

IPE Shapes

F_y = 235 MPa

IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330		Shape	IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
602	401	706	470	827	550	972	647	1140	757	1320	881	**0.00**	46.7	31.0	60.4	40.2	77.5	51.6	102	68.1	133	88.4	170	113
545	363	651	433	772	514	920	612	1090	724	1270	847	**1.00**	46.7	31.0	60.4	40.2	77.5	51.6	102	68.1	133	88.4	170	113
482	321	588	391	709	471	859	572	1030	685	1210	806	**1.50**	44.7	29.7	58.8	39.1	76.6	50.9	102	68.1	133	88.4	170	113
405	269	510	340	628	418	781	520	953	634	1130	752	**2.00**	41.9	27.8	55.4	36.8	72.5	48.3	97.8	65.0	129	86.1	167	111
324	215	425	283	538	358	691	460	862	574	1030	688	**2.50**	39.0	26.0	51.9	34.6	68.5	45.6	92.7	61.6	123	81.9	160	106
246	164	340	226	445	296	594	395	763	508	928	617	**3.00**	36.2	24.1	48.5	32.3	64.4	42.9	87.5	58.2	117	77.7	152	101
182	121	261	174	356	237	498	331	661	440	816	543	**3.50**	33.4	22.2	45.1	30.0	60.4	40.2	82.4	54.8	111	73.5	145	96.2
139	92.6	200	133	276	183	405	270	559	372	703	468	**4.00**	30.5	20.3	41.6	27.7	56.3	37.5	77.3	51.4	104	69.3	137	91.1
110	73.2	158	105	218	145	322	215	463	308	595	396	**4.50**	27.3	18.2	38.2	25.4	52.3	34.8	72.2	48.0	97.9	65.2	129	86.0
89.1	59.3	128	85.1	176	117	261	174	376	250	492	327	**5.00**	24.2	16.1	33.9	22.6	48.3	32.1	67.1	44.6	91.6	61.0	122	81.0
73.6	49.0	106	70.3	146	97.0	216	144	311	207	406	270	**5.50**	21.6	14.4	30.3	20.1	43.1	28.6	61.2	40.7	85.4	56.8	114	75.9
61.8	41.1	88.8	59.1	123	81.5	181	121	261	174	341	227	**6.00**	19.6	13.1	27.4	18.2	38.8	25.8	54.9	36.5	77.5	51.6	106	70.8
52.7	35.1	75.7	50.4	104	69.5	155	103	223	148	291	194	**6.50**	18.0	11.9	25.0	16.6	35.4	23.5	49.8	33.1	69.9	46.5	96.2	64.0
45.4	30.2	65.3	43.4	90.0	59.9	133	88.7	192	128	251	167	**7.00**	16.6	11.0	23.0	15.3	32.5	21.6	45.5	30.3	63.7	42.4	87.4	58.2
39.6	26.3	56.8	37.8	78.4	52.2	116	77.2	167	111	219	145	**7.50**	15.4	10.2	21.3	14.2	30.1	20.0	42.0	27.9	58.5	38.9	80.2	53.3
34.8	23.1	50.0	33.2	68.9	45.8	102	67.9	147	97.8	192	128	**8.00**	14.3	9.54	19.8	13.2	28.0	18.6	38.9	25.9	54.1	36.0	74.0	49.3
30.8	20.5	44.3	29.4	61.0	40.6	90.4	60.1	130	86.6	170	113	**8.50**	13.4	8.94	18.6	12.4	26.2	17.4	36.3	24.2	50.3	33.5	68.8	45.8
27.5	18.3	39.5	26.3	54.4	36.2	80.6	53.6	116	77.3	152	101	**9.00**	12.6	8.42	17.5	11.6	24.6	16.4	34.1	22.7	47.0	31.3	64.3	42.8
24.7	16.4	35.4	23.6	48.9	32.5	72.3	48.1	104	69.4	136	90.6	**9.50**	11.9	7.95	16.5	11.0	23.2	15.5	32.1	21.3	44.2	29.4	60.3	40.1
22.3	14.8	32.0	21.3	44.1	29.3	65.3	43.4	94.1	62.6	123	81.8	**10.0**	11.3	7.53	15.6	10.4	22.0	14.6	30.3	20.2	41.7	27.7	56.8	37.8
20.2	13.4	29.0	19.3	40.0	26.6	59.2	39.4	85.3	56.8	112	74.2	**10.5**	10.8	7.16	14.8	9.86	20.9	13.9	28.7	19.1	39.4	26.2	53.7	35.7
18.4	12.2	26.4	17.6	36.4	24.3	54.0	35.9	77.8	51.7	102	67.6	**11.0**	10.3	6.82	14.1	9.39	19.9	13.2	27.3	18.2	37.4	24.9	51.0	33.9
16.8	11.2	24.2	16.1	33.3	22.2	49.4	32.8	71.1	47.3	93.0	61.8	**11.5**	9.79	6.51	13.5	8.96	19.0	12.6	26.0	17.3	35.6	23.7	48.5	32.2
15.5	10.3	22.2	14.8	30.6	20.4	45.3	30.2	65.3	43.5	85.4	56.8	**12.0**	9.37	6.23	12.9	8.57	18.1	12.1	24.8	16.5	34.0	22.6	46.2	30.8
14.2	9.48	20.5	13.6	28.2	18.8	41.8	27.8	60.2	40.1	78.7	52.3	**12.5**	8.98	5.98	12.3	8.21	17.4	11.6	23.8	15.8	32.5	21.6	44.2	29.4
13.2	8.77	18.9	12.6	26.1	17.4	38.6	25.7	55.7	37.0	72.7	48.4	**13.0**	8.63	5.74	11.9	7.89	16.7	11.1	22.8	15.2	31.1	20.7	42.3	28.1
12.2	8.13	17.5	11.7	24.2	16.1	35.8	23.8	51.6	34.3	67.5	44.9	**13.5**	8.30	5.52	11.4	7.58	16.0	10.7	21.9	14.6	29.9	19.9	40.6	27.0
11.4	7.56	16.3	10.9	22.5	15.0	33.3	22.2	48.0	31.9	62.7	41.7	**14.0**	8.00	5.32	11.0	7.30	15.4	10.3	21.1	14.0	28.7	19.1	39.0	26.0
10.6	7.05	15.2	10.1	21.0	14.0	31.1	20.7	44.7	29.8	58.5	38.9	**14.5**	7.71	5.13	10.6	7.05	14.9	9.90	20.3	13.5	27.7	18.4	37.6	25.0
9.90	6.58	14.2	9.46	19.6	13.0	29.0	19.3	41.8	27.8	54.6	36.4	**15.0**	7.45	4.96	10.2	6.80	14.4	9.56	19.6	13.0	26.7	17.8	36.2	24.1

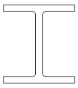
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
602	401	706	470	827	550	972	647	1140	757	1320	881
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
577	384	676	450	792	528	930	620	1090	726	1270	845
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
158	105	183	122	210	140	251	168	300	200	349	233
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
9.44	6.28	12.3	8.18	15.6	10.4	20.5	13.6	26.5	17.6	32.5	21.6

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.15	4.32	1.27	4.63	1.38	5.03	1.55	5.35	1.72	5.73	1.82	6.06
Area, × 10^2 mm^2											
28.48		33.37		39.12		45.95		53.81		62.61	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1943	142.4	2772	204.9	3892	283.6	5790	419.9	8356	603.8	11770	788.1
r_y, × 10 mm											
2.24		2.48		2.69		3.02		3.35		3.55	
r_x/r_y											
3.69		3.67		3.71		3.72		3.72		3.86	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPE Shapes

F_y = 235 MPa

Shape	IPE 360		IPE 400		IPE 450		IPE 500		IPE 550		IPE 600	
Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
	Available Compressive Strength, kN											
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	1540	1020	1790	1190	2090	1390	2440	1630	2840	1890	3300	2200
1.00	1490	989	1730	1150	2030	1350	2380	1580	2770	1840	3220	2150
1.50	1420	947	1660	1110	1960	1300	2300	1530	2690	1790	3130	2080
2.00	1340	891	1570	1050	1860	1240	2190	1460	2570	1710	3010	2000
2.50	1240	824	1460	973	1740	1160	2070	1370	2430	1620	2860	1900
3.00	1130	749	1340	892	1600	1070	1920	1280	2270	1510	2680	1790
3.50	1010	669	1210	804	1460	971	1760	1170	2090	1390	2490	1660
4.00	883	588	1070	713	1310	869	1590	1060	1900	1260	2290	1520
4.50	762	507	936	622	1150	767	1420	944	1710	1140	2070	1380
5.00	646	430	804	535	1000	668	1250	831	1520	1010	1860	1240
5.50	538	358	679	452	860	572	1090	722	1330	883	1650	1100
6.00	452	301	570	379	726	483	929	618	1150	764	1440	961
6.50	385	256	486	323	619	412	791	526	981	653	1250	831
7.00	332	221	419	279	533	355	682	454	846	563	1080	717
7.50	289	193	365	243	465	309	594	395	737	490	938	624
8.00	254	169	321	213	408	272	522	348	648	431	825	549
8.50	225	150	284	189	362	241	463	308	574	382	731	486
9.00	201	134	253	169	323	215	413	275	512	341	652	434
9.50	180	120	227	151	290	193	370	246	459	306	585	389
10.0	163	108	205	137	261	174	334	222	415	276	528	351
10.5	148	98.2	186	124	237	158	303	202	376	250	479	319
11.0	135	89.5	170	113	216	144	276	184	343	228	436	290
11.5	123	81.9	155	103	198	131	253	168	314	209	399	266
12.0	113	75.2	143	94.9	181	121	232	154	288	192	367	244
12.5	104	69.3	131	87.4	167	111	214	142	265	177	338	225
13.0	96.3	64.1	121	80.8	155	103	198	132	245	163	312	208
13.5	89.3	59.4	113	75.0	143	95.4	183	122	228	151	290	193
14.0	83.0	55.3	105	69.7	133	88.7	171	113	212	141	269	179
14.5	77.4	51.5	97.7	65.0	124	82.7	159	106	197	131	251	167
15.0	72.3	48.1	91.3	60.7	116	77.3	149	98.8	184	123	235	156

Shape	IPE 360		IPE 400		IPE 450		IPE 500		IPE 550		IPE 600	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	Available Flexural Strength, kN·m											
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	216	143	276	184	360	240	464	309	589	392	743	494
1.00	216	143	276	184	360	240	464	309	589	392	743	494
1.50	216	143	276	184	360	240	464	309	589	392	743	494
2.00	215	143	276	184	360	240	464	309	589	392	743	494
2.50	205	137	266	177	349	232	453	302	580	386	737	490
3.00	196	131	254	169	334	222	435	289	557	371	710	472
3.50	187	124	243	162	319	212	417	277	535	356	682	454
4.00	178	118	231	154	305	203	398	265	512	341	655	436
4.50	169	112	220	146	290	193	380	253	489	326	627	417
5.00	159	106	209	139	275	183	361	240	467	311	600	399
5.50	150	100	197	131	261	173	343	228	444	296	573	381
6.00	141	93.9	186	124	246	164	325	216	422	281	545	363
6.50	131	87.1	175	116	231	154	306	204	399	266	518	345
7.00	119	79.0	159	106	214	142	288	191	376	250	491	326
7.50	109	72.2	146	96.9	194	129	262	174	350	233	463	308
8.00	100	66.6	134	89.1	178	119	240	160	320	213	427	284
8.50	92.8	61.8	124	82.5	165	110	221	147	294	196	392	261
9.00	86.6	57.6	116	76.9	153	102	205	136	272	181	363	241
9.50	81.1	54.0	108	72.0	143	95.1	191	127	254	169	338	225
10.0	76.3	50.8	102	67.6	134	89.3	179	119	237	158	315	210
10.5	72.1	48.0	95.9	63.8	126	84.1	168	112	223	148	296	197
11.0	68.3	45.5	90.8	60.4	119	79.5	159	106	211	140	279	186
11.5	64.9	43.2	86.2	57.4	113	75.4	150	100	199	133	264	176
12.0	61.9	41.2	82.1	54.6	108	71.7	143	95.1	189	126	250	166
12.5	59.1	39.3	78.4	52.1	103	68.3	136	90.6	180	120	238	158
13.0	56.5	37.6	75.0	49.9	98.2	65.3	130	86.5	172	114	227	151
13.5	54.2	36.1	71.9	47.8	94.0	62.5	124	82.8	164	109	217	144
14.0	52.1	34.7	69.0	45.9	90.2	60.0	119	79.3	157	105	208	138
14.5	50.1	33.4	66.4	44.2	86.7	57.7	115	76.2	151	101	199	133
15.0	48.3	32.1	63.9	42.5	83.4	55.5	110	73.3	145	96.7	192	127

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1540	1020	1790	1190	2090	1390	2440	1630	2840	1890	3300	2200

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1470	982	1710	1140	2000	1330	2340	1560	2720	1810	3160	2110

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
406	271	485	323	596	398	719	479	861	574	1020	677

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
40.4	26.9	48.4	32.2	58.5	38.9	71.0	47.3	84.7	56.4	103	68.3

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.95	6.40	2.03	6.65	2.12	6.84	2.21	7.06	2.28	7.33	2.39	7.66

Area, × 10^2 mm^2

72.73	84.46	98.82	115.5	134.4	156.0

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
16270	1043	23130	1318	33740	1676	48200	2142	67120	2668	92080	3387

r_y, × 10 mm

3.79	3.95	4.12	4.31	4.45	4.66

r_x/r_y

3.94	4.19	4.49	4.74	5.02	5.21

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPE Shapes

F_y = 275 MPa

IPE 80		IPE 100		IPE 120		IPE 140		IPE 160		IPE 180		Shape	IPE 80		IPE 100		IPE 120		IPE 140		IPE 160		IPE 180	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
189	126	255	170	327	218	407	271	497	331	593	394	**0.00**	5.75	3.82	9.75	6.49	15.0	10.0	21.9	14.5	30.7	20.4	41.2	27.4
111	74.1	175	116	248	165	328	218	419	278	516	343	**1.00**	5.18	3.44	9.01	6.00	14.2	9.44	21.1	14.0	30.0	20.0	41.0	27.3
58.3	38.8	105	70.0	175	117	251	167	337	225	434	289	**1.50**	4.61	3.07	8.12	5.40	12.8	8.54	19.2	12.8	27.6	18.4	37.9	25.2
32.8	21.8	61.8	41.1	108	72.0	173	115	250	166	340	226	**2.00**	4.04	2.69	7.22	4.80	11.5	7.65	17.3	11.5	25.1	16.7	34.8	23.1
21.0	14.0	39.6	26.3	69.2	46.1	112	74.2	170	113	249	166	**2.50**	3.47	2.31	6.32	4.20	10.1	6.75	15.4	10.3	22.7	15.1	31.6	21.0
14.6	9.70	27.5	18.3	48.1	32.0	77.4	51.5	118	78.3	174	116	**3.00**	2.86	1.91	5.32	3.54	8.69	5.78	13.6	9.02	20.2	13.5	28.5	19.0
10.7	7.13	20.2	13.4	35.3	23.5	56.9	37.9	86.5	57.6	128	85.2	**3.50**	2.44	1.62	4.51	3.00	7.32	4.87	11.4	7.57	17.4	11.6	25.4	16.9
8.20	5.46	15.5	10.3	27.0	18.0	43.6	29.0	66.2	44.1	98.0	65.2	**4.00**	2.13	1.41	3.92	2.61	6.33	4.21	9.78	6.51	14.9	9.93	21.6	14.3
6.48	4.31	12.2	8.12	21.4	14.2	34.4	22.9	52.3	34.8	77.4	51.5	**4.50**	1.88	1.25	3.47	2.31	5.58	3.71	8.59	5.71	13.1	8.68	18.8	12.5
5.25	3.49	9.89	6.58	17.3	11.5	27.9	18.5	42.4	28.2	62.7	41.7	**5.00**	1.69	1.13	3.11	2.07	5.00	3.32	7.66	5.10	11.6	7.72	16.6	11.1
4.34	2.89	8.17	5.44	14.3	9.52	23.0	15.3	35.0	23.3	51.8	34.5	**5.50**	1.54	1.02	2.82	1.88	4.52	3.01	6.92	4.60	10.5	6.96	14.9	9.93
3.65	2.43	6.87	4.57	12.0	8.00	19.4	12.9	29.4	19.6	43.6	29.0	**6.00**	1.41	0.936	2.58	1.72	4.13	2.75	6.31	4.20	9.52	6.34	13.5	9.01
3.11	2.07	5.85	3.89	10.2	6.81	16.5	11.0	25.1	16.7	37.1	24.7	**6.50**	1.30	0.863	2.38	1.58	3.80	2.53	5.80	3.86	8.74	5.82	12.4	8.26
2.68	1.78	5.05	3.36	8.83	5.88	14.2	9.46	21.6	14.4	32.0	21.3	**7.00**	1.20	0.801	2.21	1.47	3.52	2.34	5.37	3.57	8.08	5.38	11.5	7.62
2.33	1.55	4.40	2.92	7.69	5.12	12.4	8.24	18.8	12.5	27.9	18.5	**7.50**	1.12	0.747	2.06	1.37	3.28	2.18	5.00	3.32	7.52	5.00	10.6	7.08
2.05	1.36	3.86	2.57	6.76	4.50	10.9	7.24	16.6	11.0	24.5	16.3	**8.00**	1.05	0.700	1.93	1.28	3.07	2.05	4.67	3.11	7.03	4.68	9.94	6.61
1.82	1.21	3.42	2.28	5.99	3.98	9.65	6.42	14.7	9.76	21.7	14.4	**8.50**	0.989	0.658	1.81	1.21	2.89	1.92	4.39	2.92	6.60	4.39	9.32	6.20
1.62	1.08	3.05	2.03	5.34	3.55	8.60	5.72	13.1	8.70	19.4	12.9	**9.00**	0.934	0.622	1.71	1.14	2.73	1.81	4.14	2.76	6.22	4.14	8.78	5.84
1.45	0.967	2.74	1.82	4.79	3.19	7.72	5.14	11.7	7.81	17.4	11.6	**9.50**	0.885	0.589	1.62	1.08	2.58	1.72	3.92	2.61	5.88	3.91	8.30	5.52
1.31	0.873	2.47	1.64	4.33	2.88	6.97	4.64	10.6	7.05	15.7	10.4	**10.0**	0.840	0.559	1.54	1.02	2.45	1.63	3.72	2.47	5.58	3.71	7.87	5.23
1.19	0.792	2.24	1.49	3.92	2.61	6.32	4.21	9.61	6.40	14.2	9.46	**10.5**	0.800	0.532	1.47	0.975	2.33	1.55	3.54	2.35	5.31	3.53	7.48	4.98
1.08	0.722	2.04	1.36	3.58	2.38	5.76	3.83	8.76	5.83	13.0	8.62	**11.0**	0.764	0.508	1.40	0.930	2.23	1.48	3.37	2.25	5.06	3.37	7.13	4.74
0.992	0.660	1.87	1.24	3.27	2.18	5.27	3.51	8.01	5.33	11.9	7.89	**11.5**	0.730	0.486	1.34	0.890	2.13	1.42	3.23	2.15	4.84	3.22	6.81	4.53
0.911	0.606	1.72	1.14	3.01	2.00	4.84	3.22	7.36	4.90	10.9	7.25	**12.0**	0.700	0.466	1.28	0.852	2.04	1.36	3.09	2.06	4.63	3.08	6.52	4.34
0.840	0.559	1.58	1.05	2.77	1.84	4.46	2.97	6.78	4.51	10.0	6.68	**12.5**	0.672	0.447	1.23	0.818	1.96	1.30	2.96	1.97	4.44	2.95	6.25	4.16
0.777	0.517	1.46	0.973	2.56	1.70	4.12	2.74	6.27	4.17	9.28	6.17	**13.0**	0.646	0.430	1.18	0.787	1.88	1.25	2.85	1.90	4.27	2.84	6.00	3.99
0.720	0.479	1.36	0.903	2.37	1.58	3.82	2.54	5.81	3.87	8.60	5.72	**13.5**	0.622	0.414	1.14	0.757	1.81	1.20	2.74	1.82	4.11	2.73	5.78	3.84
0.670	0.445	1.26	0.839	2.21	1.47	3.56	2.37	5.41	3.60	8.00	5.32	**14.0**	0.600	0.399	1.10	0.730	1.74	1.16	2.64	1.76	3.96	2.63	5.57	3.70
0.624	0.415	1.18	0.782	2.06	1.37	3.31	2.21	5.04	3.35	7.46	4.96	**14.5**	0.579	0.385	1.06	0.705	1.68	1.12	2.55	1.70	3.82	2.54	5.37	3.57
0.583	0.388	1.10	0.731	1.92	1.28	3.10	2.06	4.71	3.13	6.97	4.64	**15.0**	0.559	0.372	1.02	0.681	1.63	1.08	2.46	1.64	3.69	2.46	5.19	3.45

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
189	126	255	170	327	218	407	271	497	331	593	394
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
185	123	250	166	320	213	397	265	486	324	579	386
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
50.2	33.4	67.7	45.1	87.1	58.1	109	72.4	132	88.0	157	105
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
1.44	0.958	2.26	1.51	3.36	2.24	4.76	3.17	6.46	4.30	8.56	5.70

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.489	2.50	0.589	2.72	0.688	2.86	0.783	3.04	0.873	3.28	0.973	3.61
Area, × 10^2 mm^2											
7.64		10.32		13.21		16.43		20.09		23.95	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
80.14	171.0	317.8	27.67	317.8	27.67	541.2	44.92	869.3	68.31	1317	100.9
r_y, × 10 mm											
1.05		1.24		1.45		1.65		1.84		2.05	
r_x/r_y											
3.09		3.28		3.38		3.48		3.58		3.62	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPE Shapes

F_y = 275 MPa

IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330		Shape		IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
705	469	826	550	968	644	1140	757	1330	886	1550	1030	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	54.6	36.3	70.6	47.0	90.7	60.4	120	79.7	156	103	199	132
628	418	751	500	893	594	1070	710	1260	841	1480	984		1.00	54.6	36.3	70.6	47.0	90.7	60.4	120	79.7	156	103	199	132
543	361	667	444	808	537	985	655	1180	788	1400	929		1.50	51.3	34.1	67.6	45.0	88.3	58.7	119	79.1	156	103	199	132
443	295	565	376	701	467	881	586	1080	720	1290	857		2.00	47.4	31.6	63.0	41.9	82.8	55.1	112	74.5	149	98.9	193	128
341	227	457	304	585	389	763	507	963	640	1160	772		2.50	43.6	29.0	58.4	38.8	77.4	51.5	105	70.0	140	93.3	182	121
247	165	352	234	469	312	640	426	834	555	1020	680		3.00	39.8	26.5	53.7	35.7	71.9	47.8	98.3	65.4	132	87.7	172	115
182	121	261	174	360	240	520	346	705	469	879	585		3.50	35.9	23.9	49.1	32.6	66.4	44.2	91.4	60.8	123	82.1	162	108
139	92.6	200	133	276	183	408	272	580	386	739	492		4.00	31.5	21.0	44.4	29.6	61.0	40.6	84.5	56.2	115	76.5	152	101
110	73.2	158	105	218	145	322	215	465	309	607	404		4.50	27.3	18.2	38.6	25.7	55.1	36.7	77.7	51.7	107	70.9	142	94.3
89.1	59.3	128	85.1	176	117	261	174	376	250	492	327		5.00	24.2	16.1	33.9	22.6	48.3	32.2	69.3	46.1	98.2	65.4	132	87.6
73.6	49.0	106	70.3	146	97.0	216	144	311	207	406	270		5.50	21.6	14.4	30.3	20.1	43.1	28.6	61.2	40.7	87.0	57.9	120	80.0
61.8	41.1	88.8	59.1	123	81.5	181	121	261	174	341	227		6.00	19.6	13.1	27.4	18.2	38.8	25.8	54.9	36.5	77.5	51.6	107	71.1
52.7	35.1	75.7	50.4	104	69.5	155	103	223	148	291	194		6.50	18.0	11.9	25.0	16.6	35.4	23.5	49.8	33.1	69.9	46.5	96.2	64.0
45.4	30.2	65.3	43.4	90.0	59.9	133	88.7	192	128	251	167		7.00	16.6	11.0	23.0	15.3	32.5	21.6	45.5	30.3	63.7	42.4	87.4	58.2
39.6	26.3	56.8	37.8	78.4	52.2	116	77.2	167	111	219	145		7.50	15.4	10.2	21.3	14.2	30.1	20.0	42.0	27.9	58.5	38.9	80.2	53.3
34.8	23.1	50.0	33.2	68.9	45.8	102	67.9	147	97.8	192	128		8.00	14.3	9.54	19.8	13.2	28.0	18.6	38.9	25.9	54.1	36.0	74.0	49.3
30.8	20.5	44.3	29.4	61.0	40.6	90.4	60.1	130	86.6	170	113		8.50	13.4	8.94	18.6	12.4	26.2	17.4	36.3	24.2	50.3	33.5	68.8	45.8
27.5	18.3	39.5	26.3	54.4	36.2	80.6	53.6	116	77.3	152	101		9.00	12.6	8.42	17.5	11.6	24.6	16.4	34.1	22.7	47.0	31.3	64.3	42.8
24.7	16.4	35.4	23.6	48.9	32.5	72.3	48.1	104	69.4	136	90.6		9.50	11.9	7.95	16.5	11.0	23.2	15.5	32.1	21.3	44.2	29.4	60.3	40.1
22.3	14.8	32.0	21.3	44.1	29.3	65.3	43.4	94.1	62.6	123	81.8		10.0	11.3	7.53	15.6	10.4	22.0	14.6	30.3	20.2	41.7	27.7	56.8	37.8
20.2	13.4	29.0	19.3	40.0	26.6	59.2	39.4	85.3	56.8	112	74.2		10.5	10.8	7.16	14.8	9.86	20.9	13.9	28.7	19.1	39.4	26.2	53.7	35.7
18.4	12.2	26.4	17.6	36.4	24.3	54.0	35.9	77.8	51.7	102	67.6		11.0	10.3	6.82	14.1	9.39	19.9	13.2	27.3	18.2	37.4	24.9	51.0	33.9
16.8	11.2	24.2	16.1	33.3	22.2	49.4	32.8	71.1	47.3	93.0	61.8		11.5	9.79	6.51	13.5	8.96	19.0	12.6	26.0	17.3	35.6	23.7	48.5	32.2
15.5	10.3	22.2	14.8	30.6	20.4	45.3	30.2	65.3	43.5	85.4	56.8		12.0	9.37	6.23	12.9	8.57	18.1	12.1	24.8	16.5	34.0	22.6	46.2	30.8
14.2	9.48	20.5	13.6	28.2	18.8	41.8	27.8	60.2	40.1	78.7	52.3		12.5	8.98	5.98	12.3	8.21	17.4	11.6	23.8	15.8	32.5	21.6	44.2	29.4
13.2	8.77	18.9	12.6	26.1	17.4	38.6	25.7	55.7	37.0	72.7	48.4		13.0	8.63	5.74	11.9	7.89	16.7	11.1	22.8	15.2	31.1	20.7	42.3	28.1
12.2	8.13	17.5	11.7	24.2	16.1	35.8	23.8	51.6	34.3	67.5	44.9		13.5	8.30	5.52	11.4	7.58	16.0	10.7	21.9	14.6	29.9	19.9	40.6	27.0
11.4	7.56	16.3	10.9	22.5	15.0	33.3	22.2	48.0	31.9	62.7	41.7		14.0	8.00	5.32	11.0	7.30	15.4	10.3	21.1	14.0	28.7	19.1	39.0	26.0
10.6	7.05	15.2	10.1	21.0	14.0	31.1	20.7	44.7	29.8	58.5	38.9		14.5	7.71	5.13	10.6	7.05	14.9	9.90	20.3	13.5	27.7	18.4	37.6	25.0
9.90	6.58	14.2	9.46	19.6	13.0	29.0	19.3	41.8	27.8	54.6	36.4		15.0	7.45	4.96	10.2	6.80	14.4	9.56	19.6	13.0	26.7	17.8	36.2	24.1

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
602	401	706	470	827	550	972	647	1140	757	1320	881
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
384	577	450	676	528	792	620	930	726	1090	845	1270
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
185	123	214	143	246	164	294	196	351	234	408	272
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
11.0	7.35	14.4	9.57	18.3	12.2	24.0	16.0	####	20.6	38.0	25.3

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.06	3.80	1.18	4.08	1.28	4.44	1.43	4.74	1.59	5.10	1.68	5.40
Area, × 10^2 mm^2											
28.48		33.37		39.12		45.95		53.81		62.61	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1943	142.4	2772	204.9	3892	283.6	5790	419.9	8356	603.8	11770	788.1
r_y, × 10 mm											
2.24		2.48		2.69		3.02		3.35		3.55	
r_x/r_y											
3.69		3.67		3.71		3.72		3.72		3.86	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces IPE Shapes

F_y = 275 MPa

IPE 360		IPE 400		IPE 450^c		IPE 500^c		IPE 550^c		IPE 600^c		Shape	IPE 360		IPE 400		IPE 450		IPE 500		IPE 550		IPE 600	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1800	1200	2090	1390	2450	1630	2860	1900	3330	2210	3860	2570	**0.00**	252	168	323	215	421	280	543	361	690	459	869	578
1730	1150	2010	1340	2360	1570	2750	1830	3200	2130	3710	2470	**1.00**	252	168	323	215	421	280	543	361	690	459	869	578
1640	1090	1920	1280	2260	1510	2660	1770	3100	2060	3600	2400	**1.50**	252	168	323	215	421	280	543	361	690	459	869	578
1530	1020	1800	1200	2130	1420	2520	1680	2960	1970	3460	2300	**2.00**	247	165	320	213	420	279	543	361	690	459	869	578
1400	929	1650	1100	1970	1310	2350	1560	2770	1840	3260	2170	**2.50**	235	156	305	203	400	266	521	347	667	444	848	564
1250	831	1490	994	1800	1190	2160	1430	2550	1700	3030	2020	**3.00**	223	148	289	193	381	253	497	330	637	424	812	540
1090	728	1320	880	1610	1070	1950	1290	2320	1540	2780	1850	**3.50**	211	140	274	182	361	240	472	314	607	404	776	516
940	626	1150	765	1410	939	1730	1150	2080	1380	2510	1670	**4.00**	198	132	259	172	342	227	448	298	577	384	740	492
791	526	981	653	1220	812	1510	1010	1830	1220	2240	1490	**4.50**	186	124	244	162	322	214	423	282	547	364	704	468
651	433	821	546	1040	689	1300	868	1590	1060	1970	1310	**5.00**	174	116	229	152	303	201	399	266	517	344	668	444
538	358	679	452	864	575	1110	735	1360	908	1710	1140	**5.50**	162	108	213	142	283	188	375	249	487	324	631	420
452	301	570	379	726	483	929	618	1150	766	1470	975	**6.00**	146	97.1	197	131	264	176	350	233	458	304	595	396
385	256	486	323	619	412	791	526	981	653	1250	831	**6.50**	131	87.1	176	117	237	158	321	214	428	285	559	372
332	221	419	279	533	355	682	454	846	563	1080	717	**7.00**	119	79.0	159	106	214	142	289	192	386	257	518	344
289	193	365	243	465	309	594	395	737	490	938	624	**7.50**	109	72.2	146	96.9	194	129	262	174	350	233	468	311
254	169	321	213	408	272	522	348	648	431	825	549	**8.00**	100	66.6	134	89.1	178	119	240	160	320	213	427	284
225	150	284	189	362	241	463	308	574	382	731	486	**8.50**	92.8	61.8	124	82.5	165	110	221	147	294	196	392	261
201	134	253	169	323	215	413	275	512	341	652	434	**9.00**	86.6	57.6	116	76.9	153	102	205	136	272	181	363	241
180	120	227	151	290	193	370	246	459	306	585	389	**9.50**	81.1	54.0	108	72.0	143	95.1	191	127	254	169	338	225
163	108	205	137	261	174	334	222	415	276	528	351	**10.0**	76.3	50.8	102	67.6	134	89.3	179	119	237	158	315	210
148	98.2	186	124	237	158	303	202	376	250	479	319	**10.5**	72.1	48.0	95.9	63.8	126	84.1	168	112	223	148	296	197
135	89.5	170	113	216	144	276	184	343	228	436	290	**11.0**	68.3	45.5	90.8	60.4	119	79.5	159	106	211	140	279	186
123	81.9	155	103	198	131	253	168	314	209	399	266	**11.5**	64.9	43.2	86.2	57.4	113	75.4	150	100	199	133	264	176
113	75.2	143	94.9	181	121	232	154	288	192	367	244	**12.0**	61.9	41.2	82.1	54.6	108	71.7	143	95.1	189	126	250	166
104	69.3	131	87.4	167	111	214	142	265	177	338	225	**12.5**	59.1	39.3	78.4	52.1	103	68.3	136	90.6	180	120	238	158
96.3	64.1	121	80.8	155	103	198	132	245	163	312	208	**13.0**	56.5	37.6	75.0	49.9	98.2	65.3	130	86.5	172	114	227	151
89.3	59.4	113	75.0	143	95.4	183	122	228	151	290	193	**13.5**	54.2	36.1	71.9	47.8	94.0	62.5	124	82.8	164	109	217	144
83.0	55.3	105	69.7	133	88.7	171	113	212	141	269	179	**14.0**	52.1	34.7	69.0	45.9	90.2	60.0	119	79.3	157	105	208	138
77.4	51.5	97.7	65.0	124	82.7	159	106	197	131	251	167	**14.5**	50.1	33.4	66.4	44.2	86.7	57.7	115	76.2	151	101	199	133
72.3	48.1	91.3	60.7	116	77.3	149	98.8	184	123	235	156	**15.0**	48.3	32.1	63.9	42.5	83.4	55.5	110	73.3	145	96.7	192	127

Properties

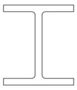
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1540	1020	1790	1190	2090	1390	2440	1630	2840	1890	3300	2200
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
982	1470	1140	1710	1330	2000	1560	2340	1810	2720	2110	3160
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
475	317	568	378	698	465	842	561	1010	672	1190	792
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
47.3	31.5	56.7	37.7	68.4	45.5	83.1	55.3	99.1	66.0	120	80.0

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.80	5.71	1.87	5.93	1.96	6.10	2.05	6.33	2.11	6.58	2.21	6.88
Area, × 10^2 mm^2											
72.73		84.46		98.82		115.5		134.4		156.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
16270	1043	23130	1318	33740	1676	48200	2142	67120	2668	92080	3387
r_y, × 10 mm											
3.79		3.95		4.12		4.31		4.45		4.66	
r_x/r_y											
3.94		4.19		4.49		4.74		5.02		5.21	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPE Shapes

F_y = 355 MPa

Available Compressive Strength, kN

Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending

Shape	IPE 80		IPE 100		IPE 120		IPE 140		IPE 160		IPE 180	
Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	244	162	330	219	422	281	525	349	642	427	765	509
1.00	123	82.1	202	134	295	196	398	265	514	342	640	426
1.50	58.3	38.8	105	70.0	189	125	282	187	389	259	511	340
2.00	32.8	21.8	61.8	41.1	108	72.0	174	116	264	175	374	249
2.50	21.0	14.0	39.6	26.3	69.2	46.1	112	74.2	170	113	251	167
3.00	14.6	9.70	27.5	18.3	48.1	32.0	77.4	51.5	118	78.3	174	116
3.50	10.7	7.13	20.2	13.4	35.3	23.5	56.9	37.9	86.5	57.6	128	85.2
4.00	8.20	5.46	15.5	10.3	27.0	18.0	43.6	29.0	66.2	44.1	98.0	65.2
4.50	6.48	4.31	12.2	8.12	21.4	14.2	34.4	22.9	52.3	34.8	77.4	51.5
5.00	5.25	3.49	9.89	6.58	17.3	11.5	27.9	18.5	42.4	28.2	62.7	41.7
5.50	4.34	2.89	8.17	5.44	14.3	9.52	23.0	15.3	35.0	23.3	51.8	34.5
6.00	3.65	2.43	6.87	4.57	12.0	8.00	19.4	12.9	29.4	19.6	43.6	29.0
6.50	3.11	2.07	5.85	3.89	10.2	6.81	16.5	11.0	25.1	16.7	37.1	24.7
7.00	2.68	1.78	5.05	3.36	8.83	5.88	14.2	9.46	21.6	14.4	32.0	21.3
7.50	2.33	1.55	4.40	2.92	7.69	5.12	12.4	8.24	18.8	12.5	27.9	18.5
8.00	2.05	1.36	3.86	2.57	6.76	4.50	10.9	7.24	16.6	11.0	24.5	16.3
8.50	1.82	1.21	3.42	2.28	5.99	3.98	9.65	6.42	14.7	9.76	21.7	14.4
9.00	1.62	1.08	3.05	2.03	5.34	3.55	8.60	5.72	13.1	8.70	19.4	12.9
9.50	1.45	0.967	2.74	1.82	4.79	3.19	7.72	5.14	11.7	7.81	17.4	11.6
10.0	1.31	0.873	2.47	1.64	4.33	2.88	6.97	4.64	10.6	7.05	15.7	10.4
10.5	1.19	0.792	2.24	1.49	3.92	2.61	6.32	4.21	9.61	6.40	14.2	9.46
11.0	1.08	0.722	2.04	1.36	3.58	2.38	5.76	3.83	8.76	5.83	13.0	8.62
11.5	0.992	0.660	1.87	1.24	3.27	2.18	5.27	3.51	8.01	5.33	11.9	7.89
12.0	0.911	0.606	1.72	1.14	3.01	2.00	4.84	3.22	7.36	4.90	10.9	7.25
12.5	0.840	0.559	1.58	1.05	2.77	1.84	4.46	2.97	6.78	4.51	10.0	6.68
13.0	0.777	0.517	1.46	0.973	2.56	1.70	4.12	2.74	6.27	4.17	9.28	6.17
13.5	0.720	0.479	1.36	0.903	2.37	1.58	3.82	2.54	5.81	3.87	8.60	5.72
14.0	0.670	0.445	1.26	0.839	2.21	1.47	3.56	2.37	5.41	3.60	8.00	5.32
14.5	0.624	0.415	1.18	0.782	2.06	1.37	3.31	2.21	5.04	3.35	7.46	4.96
15.0	0.583	0.388	1.10	0.731	1.92	1.28	3.10	2.06	4.71	3.13	6.97	4.64

Available Flexural Strength, kN·m

Shape	IPE 80		IPE 100		IPE 120		IPE 140		IPE 160		IPE 180	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	7.42	4.94	12.6	8.38	19.4	12.9	28.2	18.8	39.6	26.3	53.2	35.4
1.00	6.35	4.22	11.1	7.41	17.6	11.7	26.3	17.5	37.7	25.1	51.7	34.4
1.50	5.39	3.59	9.64	6.41	15.4	10.3	23.2	15.5	33.7	22.4	46.6	31.0
2.00	4.42	2.94	8.14	5.41	13.2	8.77	20.2	13.4	29.7	19.8	41.6	27.7
2.50	3.47	2.31	6.49	4.32	10.7	7.13	17.0	11.3	25.7	17.1	36.5	24.3
3.00	2.86	1.91	5.32	3.54	8.69	5.78	13.6	9.06	21.0	14.0	30.9	20.6
3.50	2.44	1.62	4.51	3.00	7.32	4.87	11.4	7.57	17.4	11.6	25.4	16.9
4.00	2.13	1.41	3.92	2.61	6.33	4.21	9.78	6.51	14.9	9.93	21.6	14.3
4.50	1.88	1.25	3.47	2.31	5.58	3.71	8.59	5.71	13.1	8.68	18.8	12.5
5.00	1.69	1.13	3.11	2.07	5.00	3.32	7.66	5.10	11.6	7.72	16.6	11.1
5.50	1.54	1.02	2.82	1.88	4.52	3.01	6.92	4.60	10.5	6.96	14.9	9.93
6.00	1.41	0.936	2.58	1.72	4.13	2.75	6.31	4.20	9.52	6.34	13.5	9.01
6.50	1.30	0.863	2.38	1.58	3.80	2.53	5.80	3.86	8.74	5.82	12.4	8.26
7.00	1.20	0.801	2.21	1.47	3.52	2.34	5.37	3.57	8.08	5.38	11.5	7.62
7.50	1.12	0.747	2.06	1.37	3.28	2.18	5.00	3.32	7.52	5.00	10.6	7.08
8.00	1.05	0.700	1.93	1.28	3.07	2.05	4.67	3.11	7.03	4.68	9.94	6.61
8.50	0.989	0.658	1.81	1.21	2.89	1.92	4.39	2.92	6.60	4.39	9.32	6.20
9.00	0.934	0.622	1.71	1.14	2.73	1.81	4.14	2.76	6.22	4.14	8.78	5.84
9.50	0.885	0.589	1.62	1.08	2.58	1.72	3.92	2.61	5.88	3.91	8.30	5.52
10.0	0.840	0.559	1.54	1.02	2.45	1.63	3.72	2.47	5.58	3.71	7.87	5.23
10.5	0.800	0.532	1.47	0.975	2.33	1.55	3.54	2.35	5.31	3.53	7.48	4.98
11.0	0.764	0.508	1.40	0.930	2.23	1.48	3.37	2.25	5.06	3.37	7.13	4.74
11.5	0.730	0.486	1.34	0.890	2.13	1.42	3.23	2.15	4.84	3.22	6.81	4.53
12.0	0.700	0.466	1.28	0.852	2.04	1.36	3.09	2.06	4.63	3.08	6.52	4.34
12.5	0.672	0.447	1.23	0.818	1.96	1.30	2.96	1.97	4.44	2.95	6.25	4.16
13.0	0.646	0.430	1.18	0.787	1.88	1.25	2.85	1.90	4.27	2.84	6.00	3.99
13.5	0.622	0.414	1.14	0.757	1.81	1.20	2.74	1.82	4.11	2.73	5.78	3.84
14.0	0.600	0.399	1.10	0.730	1.74	1.16	2.64	1.76	3.96	2.63	5.57	3.70
14.5	0.579	0.385	1.06	0.705	1.68	1.12	2.55	1.70	3.82	2.54	5.37	3.57
15.0	0.559	0.372	1.02	0.681	1.63	1.08	2.46	1.64	3.69	2.46	5.19	3.45

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
244	162	330	219	422	281	525	349	642	427	765	509

Available Strength in Tensile Rupture (A_e = 0.75A_g), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
219	146	296	197	379	253	471	314	576	384	687	458

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
64.8	43.2	87.3	58.2	112	75.0	140	93.4	170	114	203	135

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
1.86	1.24	2.92	1.95	4.34	2.89	6.15	4.09	8.34	5.55	11.1	7.36

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.439	1.98	0.518	2.16	0.606	2.30	0.689	2.47	0.769	2.68	0.856	2.87

Area, × 10^2 mm^2

7.64	10.32	13.21	16.43	20.09	23.95

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
80.14	171.0	317.8	27.67	317.8	27.67	541.2	44.92	869.3	68.31	1317	100.9

r_y, × 10 mm

1.05	1.24	1.45	1.65	1.84	2.05

r_x/r_y

3.09	3.28	3.38	3.48	3.58	3.62

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPE Shapes

F_y = 355 MPa

IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330^c		Shape	IPE 200		IPE 220		IPE 240		IPE 270		IPE 300		IPE 330	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
910	605	1070	709	1250	832	1470	977	1720	1140	2000	1330	**0.00**	70.5	46.9	91.2	60.7	117	77.9	155	103	201	134	257	171
783	521	943	628	1130	749	1350	899	1610	1070	1880	1250	**1.00**	69.7	46.4	91.2	60.7	117	77.9	155	103	201	134	257	171
649	432	810	539	989	658	1220	811	1480	984	1750	1160	**1.50**	63.5	42.2	84.2	56.1	110	73.5	149	99.4	198	132	256	171
499	332	653	435	824	549	1060	702	1310	875	1580	1050	**2.00**	57.3	38.1	76.8	51.1	102	67.7	138	92.1	185	123	240	160
356	237	496	330	652	434	876	583	1130	752	1380	916	**2.50**	51.1	34.0	69.3	46.1	92.9	61.8	128	84.8	172	114	224	149
247	165	355	236	490	326	698	465	940	625	1170	777	**3.00**	44.9	29.9	61.8	41.1	84.1	55.9	117	77.6	158	105	208	139
182	121	261	174	360	240	533	355	756	503	962	640	**3.50**	37.3	24.8	53.4	35.5	75.3	50.1	106	70.3	145	96.4	192	128
139	92.6	200	133	276	183	408	272	588	391	768	511	**4.00**	31.5	21.0	44.8	29.8	64.2	42.7	93.9	62.5	132	87.6	176	117
110	73.2	158	105	218	145	322	215	465	309	607	404	**4.50**	27.3	18.2	38.6	25.7	55.1	36.7	79.7	53.1	115	76.6	160	106
89.1	59.3	128	85.1	176	117	261	174	376	250	492	327	**5.00**	24.2	16.1	33.9	22.6	48.3	32.2	69.3	46.1	99.2	66.0	137	91.4
73.6	49.0	106	70.3	146	97.0	216	144	311	207	406	270	**5.50**	21.6	14.4	30.3	20.1	43.1	28.6	61.2	40.7	87.0	57.9	120	80.0
61.8	41.1	88.8	59.1	123	81.5	181	121	261	174	341	227	**6.00**	19.6	13.1	27.4	18.2	38.8	25.8	54.9	36.5	77.5	51.6	107	71.1
52.7	35.1	75.7	50.4	104	69.5	155	103	223	148	291	194	**6.50**	18.0	11.9	25.0	16.6	35.4	23.5	49.8	33.1	69.9	46.5	96.2	64.0
45.4	30.2	65.3	43.4	90.0	59.9	133	88.7	192	128	251	167	**7.00**	16.6	11.0	23.0	15.3	32.5	21.6	45.5	30.3	63.7	42.4	87.4	58.2
39.6	26.3	56.8	37.8	78.4	52.2	116	77.2	167	111	219	145	**7.50**	15.4	10.2	21.3	14.2	30.1	20.0	42.0	27.9	58.5	38.9	80.2	53.3
34.8	23.1	50.0	33.2	68.9	45.8	102	67.9	147	97.8	192	128	**8.00**	14.3	9.54	19.8	13.2	28.0	18.6	38.9	25.9	54.1	36.0	74.0	49.3
30.8	20.5	44.3	29.4	61.0	40.6	90.4	60.1	130	86.6	170	113	**8.50**	13.4	8.94	18.6	12.4	26.2	17.4	36.3	24.2	50.3	33.5	68.8	45.8
27.5	18.3	39.5	26.3	54.4	36.2	80.6	53.6	116	77.3	152	101	**9.00**	12.6	8.42	17.5	11.6	24.6	16.4	34.1	22.7	47.0	31.3	64.3	42.8
24.7	16.4	35.4	23.6	48.9	32.5	72.3	48.1	104	69.4	136	90.6	**9.50**	11.9	7.95	16.5	11.0	23.2	15.5	32.1	21.3	44.2	29.4	60.3	40.1
22.3	14.8	32.0	21.3	44.1	29.3	65.3	43.4	94.1	62.6	123	81.8	**10.0**	11.3	7.53	15.6	10.4	22.0	14.6	30.3	20.2	41.7	27.7	56.8	37.8
20.2	13.4	29.0	19.3	40.0	26.6	59.2	39.4	85.3	56.8	112	74.2	**10.5**	10.8	7.16	14.8	9.86	20.9	13.9	28.7	19.1	39.4	26.2	53.7	35.7
18.4	12.2	26.4	17.6	36.4	24.3	54.0	35.9	77.8	51.7	102	67.6	**11.0**	10.3	6.82	14.1	9.39	19.9	13.2	27.3	18.2	37.4	24.9	51.0	33.9
16.8	11.2	24.2	16.1	33.3	22.2	49.4	32.8	71.1	47.3	93.0	61.8	**11.5**	9.79	6.51	13.5	8.96	19.0	12.6	26.0	17.3	35.6	23.7	48.5	32.2
15.5	10.3	22.2	14.8	30.6	20.4	45.3	30.2	65.3	43.5	85.4	56.8	**12.0**	9.37	6.23	12.9	8.57	18.1	12.1	24.8	16.5	34.0	22.6	46.2	30.8
14.2	9.48	20.5	13.6	28.2	18.8	41.8	27.8	60.2	40.1	78.7	52.3	**12.5**	8.98	5.98	12.3	8.21	17.4	11.6	23.8	15.8	32.5	21.6	44.2	29.4
13.2	8.77	18.9	12.6	26.1	17.4	38.6	25.7	55.7	37.0	72.7	48.4	**13.0**	8.63	5.74	11.9	7.89	16.7	11.1	22.8	15.2	31.1	20.7	42.3	28.1
12.2	8.13	17.5	11.7	24.2	16.1	35.8	23.8	51.6	34.3	67.5	44.9	**13.5**	8.30	5.52	11.4	7.58	16.0	10.7	21.9	14.6	29.9	19.9	40.6	27.0
11.4	7.56	16.3	10.9	22.5	15.0	33.3	22.2	48.0	31.9	62.7	41.7	**14.0**	8.00	5.32	11.0	7.30	15.4	10.3	21.1	14.0	28.7	19.1	39.0	26.0
10.6	7.05	15.2	10.1	21.0	14.0	31.1	20.7	44.7	29.8	58.5	38.9	**14.5**	7.71	5.13	10.6	7.05	14.9	9.90	20.3	13.5	27.7	18.4	37.6	25.0
9.90	6.58	14.2	9.46	19.6	13.0	29.0	19.3	41.8	27.8	54.6	36.4	**15.0**	7.45	4.96	10.2	6.80	14.4	9.56	19.6	13.0	26.7	17.8	36.2	24.1

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
910	605	1070	709	1250	832	1470	977	1720	1140	2000	1330
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
817	545	957	638	1120	748	1320	879	1540	1030	1800	1200
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
239	159	276	184	317	211	380	253	454	302	527	351
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
14.3	9.48	18.6	12.4	23.6	15.7	31	20.6	40	26.6	49.1	32.7

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.936	3.11	1.04	3.36	1.12	3.65	1.26	3.94	1.40	4.27	1.48	4.51
Area, × 10^2 mm^2											
28.48		33.37		39.12		45.95		53.81		62.61	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1943	142.4	2772	204.9	3892	283.6	5790	419.9	8356	603.8	11770	788.1
r_y, × 10 mm											
2.24		2.48		2.69		3.02		3.35		3.55	
r_x/r_y											
3.69		3.67		3.71		3.72		3.72		3.86	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPE Shapes

F_y = 355 MPa

IPE 360^c		IPE 400^c		IPE 450^c		IPE 500^c		IPE 550^c		IPE 600^c		Shape	IPE 360		IPE 400		IPE 450		IPE 500		IPE 550		IPE 600	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
2320	1550	2700	1800	3160	2100	3690	2460	4290	2860	4980	3320	0.00	326	217	418	278	544	362	701	466	890	592	1120	747
2190	1460	2540	1690	2940	1960	3410	2270	3970	2640	4590	3050	1.00	326	217	418	278	544	362	701	466	890	592	1120	747
2070	1370	2400	1600	2800	1860	3270	2170	3810	2530	4420	2940	1.50	326	217	418	278	544	362	701	466	890	592	1120	747
1880	1250	2220	1480	2620	1740	3070	2040	3590	2390	4200	2790	2.00	309	206	401	267	527	351	686	456	877	584	1120	743
1670	1110	2000	1330	2390	1590	2840	1890	3340	2220	3920	2610	2.50	290	193	377	251	496	330	648	431	831	553	1060	705
1450	965	1750	1160	2120	1410	2560	1700	3050	2030	3610	2400	3.00	271	180	353	235	466	310	610	406	784	522	1000	668
1220	814	1490	994	1830	1220	2250	1490	2700	1790	3260	2170	3.50	252	167	329	219	435	290	572	381	738	491	947	630
1000	668	1250	830	1550	1030	1930	1280	2340	1560	2860	1900	4.00	232	155	305	203	405	269	534	355	691	460	891	593
804	535	1010	675	1290	856	1620	1080	1990	1320	2470	1640	4.50	213	142	281	187	375	249	496	330	645	429	835	555
651	433	821	546	1050	696	1340	890	1660	1100	2100	1390	5.00	189	126	257	171	344	229	458	305	598	398	779	518
538	358	679	452	864	575	1110	735	1370	912	1740	1160	5.50	165	110	223	148	303	201	413	275	552	367	722	481
452	301	570	379	726	483	929	618	1150	766	1470	975	6.00	146	97.1	197	131	266	177	362	241	485	323	654	435
385	256	486	323	619	412	791	526	981	653	1250	831	6.50	131	87.1	176	117	237	158	321	214	430	286	578	385
332	221	419	279	533	355	682	454	846	563	1080	717	7.00	119	79.0	159	106	214	142	289	192	386	257	518	344
289	193	365	243	465	309	594	395	737	490	938	624	7.50	109	72.2	146	96.9	194	129	262	174	350	233	468	311
254	169	321	213	408	272	522	348	648	431	825	549	8.00	100	66.6	134	89.1	178	119	240	160	320	213	427	284
225	150	284	189	362	241	463	308	574	382	731	486	8.50	92.8	61.8	124	82.5	165	110	221	147	294	196	392	261
201	134	253	169	323	215	413	275	512	341	652	434	9.00	86.6	57.6	116	76.9	153	102	205	136	272	181	363	241
180	120	227	151	290	193	370	246	459	306	585	389	9.50	81.1	54.0	108	72.0	143	95.1	191	127	254	169	338	225
163	108	205	137	261	174	334	222	415	276	528	351	10.0	76.3	50.8	102	67.6	134	89.3	179	119	237	158	315	210
148	98.2	186	124	237	158	303	202	376	250	479	319	10.5	72.1	48.0	95.9	63.8	126	84.1	168	112	223	148	296	197
135	89.5	170	113	216	144	276	184	343	228	436	290	11.0	68.3	45.5	90.8	60.4	119	79.5	159	106	211	140	279	186
123	81.9	155	103	198	131	253	168	314	209	399	266	11.5	64.9	43.2	86.2	57.4	113	75.4	150	100	199	133	264	176
113	75.2	143	94.9	181	121	232	154	288	192	367	244	12.0	61.9	41.2	82.1	54.6	108	71.7	143	95.1	189	126	250	166
104	69.3	131	87.4	167	111	214	142	265	177	338	225	12.5	59.1	39.3	78.4	52.1	103	68.3	136	90.6	180	120	238	158
96.3	64.1	121	80.8	155	103	198	132	245	163	312	208	13.0	56.5	37.6	75.0	49.9	98.2	65.3	130	86.5	172	114	227	151
89.3	59.4	113	75.0	143	95.4	183	122	228	151	290	193	13.5	54.2	36.1	71.9	47.8	94.0	62.5	124	82.8	164	109	217	144
83.0	55.3	105	69.7	133	88.7	171	113	212	141	269	179	14.0	52.1	34.7	69.0	45.9	90.2	60.0	119	79.3	157	105	208	138
77.4	51.5	97.7	65.0	124	82.7	159	106	197	131	251	167	14.5	50.1	33.4	66.4	44.2	86.7	57.7	115	76.2	151	101	199	133
72.3	48.1	91.3	60.7	116	77.3	149	98.8	184	123	235	156	15.0	48.3	32.1	63.9	42.5	83.4	55.5	110	73.3	145	96.7	192	127

Properties

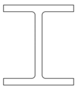
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2320	1550	2700	1800	3160	2100	3690	2460	4290	2860	4980	3320
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2090	1390	2420	1620	2830	1890	3310	2210	3860	2570	4480	2980
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
613	409	733	488	901	601	1090	724	1300	867	1530	1020
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
61.1	40.6	73.2	48.7	88.3	58.8	107	71.4	128	85.1	155	103

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.58	4.78	1.65	4.98	1.72	5.14	1.80	5.35	1.86	5.56	1.95	5.82
Area, × 10^2 mm^2											
72.73		84.46		98.82		115.5		134.4		156.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
16270	1043	23130	1318	33740	1676	48200	2142	67120	2668	92080	3387
r_y, × 10 mm											
3.79		3.95		4.12		4.31		4.45		4.66	
r_x/r_y											
3.94		4.19		4.49		4.74		5.02		5.21	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

IPEA Shapes

F_y = 235 MPa

IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180		Shape	IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	Design	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
135	89.8	186	124	233	155	283	188	342	228	414	276	**0.00**	4.01	2.67	6.98	4.64	10.5	7.02	15.1	10.1	21.0	13.9	28.6	19.0
85.1	56.6	133	88.4	182	121	236	157	295	196	368	245	**1.00**	3.65	2.43	6.50	4.33	10.0	6.68	14.7	9.81	20.8	13.8	28.6	19.0
47.8	31.8	87.4	58.2	134	89.0	188	125	245	163	317	211	**1.50**	3.26	2.17	5.87	3.91	9.09	6.05	13.4	8.93	19.0	12.7	26.7	17.7
26.9	17.9	50.9	33.9	86.6	57.6	136	90.6	189	126	258	171	**2.00**	2.87	1.91	5.24	3.49	8.14	5.42	12.1	8.05	17.3	11.5	24.5	16.3
17.2	11.4	32.6	21.7	55.4	36.9	90.9	60.5	135	89.8	197	131	**2.50**	2.48	1.65	4.61	3.07	7.19	4.79	10.8	7.17	15.6	10.4	22.3	14.8
11.9	7.95	22.6	15.1	38.5	25.6	63.1	42.0	93.8	62.4	142	94.8	**3.00**	2.05	1.36	3.91	2.60	6.17	4.10	9.46	6.29	13.9	9.27	20.1	13.4
8.78	5.84	16.6	11.1	28.3	18.8	46.4	30.8	68.9	45.9	105	69.6	**3.50**	1.74	1.16	3.31	2.20	5.17	3.44	7.87	5.23	11.9	7.95	17.9	11.9
6.72	4.47	12.7	8.47	21.7	14.4	35.5	23.6	52.8	35.1	80.1	53.3	**4.00**	1.51	1.01	2.87	1.91	4.46	2.97	6.72	4.47	10.1	6.75	15.2	10.1
5.31	3.53	10.1	6.69	17.1	11.4	28.0	18.7	41.7	27.7	63.3	42.1	**4.50**	1.34	0.892	2.54	1.69	3.92	2.61	5.88	3.91	8.82	5.87	13.1	8.72
4.30	2.86	8.14	5.42	13.9	9.22	22.7	15.1	33.8	22.5	51.3	34.1	**5.00**	1.20	0.801	2.27	1.51	3.50	2.33	5.22	3.48	7.81	5.20	11.6	7.69
3.55	2.36	6.73	4.48	11.5	7.62	18.8	12.5	27.9	18.6	42.4	28.2	**5.50**	1.09	0.727	2.06	1.37	3.17	2.11	4.71	3.13	7.02	4.67	10.3	6.88
2.99	1.99	5.66	3.76	9.63	6.40	15.8	10.5	23.5	15.6	35.6	23.7	**6.00**	1.00	0.665	1.88	1.25	2.89	1.92	4.28	2.85	6.37	4.24	9.35	6.22
2.54	1.69	4.82	3.21	8.20	5.46	13.4	8.94	20.0	13.3	30.3	20.2	**6.50**	0.922	0.613	1.73	1.15	2.66	1.77	3.93	2.62	5.84	3.88	8.55	5.69
2.19	1.46	4.16	2.76	7.07	4.71	11.6	7.71	17.2	11.5	26.2	17.4	**7.00**	0.855	0.569	1.61	1.07	2.46	1.64	3.63	2.42	5.39	3.58	7.87	5.24
1.91	1.27	3.62	2.41	6.16	4.10	10.1	6.72	15.0	9.99	22.8	15.2	**7.50**	0.797	0.531	1.50	0.998	2.29	1.52	3.38	2.25	5.00	3.33	7.30	4.85
1.68	1.12	3.18	2.12	5.41	3.60	8.87	5.90	13.2	8.78	20.0	13.3	**8.00**	0.747	0.497	1.40	0.934	2.14	1.43	3.16	2.10	4.67	3.11	6.80	4.53
1.49	0.990	2.82	1.87	4.80	3.19	7.86	5.23	11.7	7.77	17.7	11.8	**8.50**	0.703	0.468	1.32	0.879	2.02	1.34	2.96	1.97	4.38	2.92	6.37	4.24
1.33	0.883	2.51	1.67	4.28	2.85	7.01	4.67	10.4	6.93	15.8	10.5	**9.00**	0.664	0.441	1.25	0.829	1.90	1.26	2.79	1.86	4.13	2.75	6.00	3.99
1.19	0.793	2.26	1.50	3.84	2.55	6.29	4.19	9.35	6.22	14.2	9.45	**9.50**	0.628	0.418	1.18	0.785	1.80	1.20	2.64	1.76	3.90	2.59	5.66	3.77
1.08	0.715	2.04	1.35	3.47	2.31	5.68	3.78	8.44	5.62	12.8	8.53	**10.0**	0.597	0.397	1.12	0.745	1.71	1.14	2.51	1.67	3.70	2.46	5.36	3.57
0.975	0.649	1.85	1.23	3.14	2.09	5.15	3.43	7.66	5.09	11.6	7.74	**10.5**	0.568	0.378	1.07	0.710	1.63	1.08	2.38	1.59	3.51	2.34	5.09	3.39
0.889	0.591	1.68	1.12	2.86	1.91	4.69	3.12	6.98	4.64	10.6	7.05	**11.0**	0.542	0.361	1.02	0.677	1.55	1.03	2.27	1.51	3.35	2.23	4.85	3.23
0.813	0.541	1.54	1.02	2.62	1.74	4.29	2.86	6.38	4.25	9.69	6.45	**11.5**	0.519	0.345	0.973	0.647	1.48	0.986	2.17	1.44	3.20	2.13	4.63	3.08
0.747	0.497	1.41	0.941	2.41	1.60	3.94	2.62	5.86	3.90	8.90	5.92	**12.0**	0.497	0.331	0.932	0.620	1.42	0.944	2.08	1.38	3.06	2.04	4.43	2.95
0.688	0.458	1.30	0.867	2.22	1.48	3.63	2.42	5.40	3.59	8.20	5.46	**12.5**	0.477	0.317	0.895	0.595	1.36	0.906	1.99	1.33	2.94	1.95	4.25	2.83
0.636	0.423	1.20	0.802	2.05	1.36	3.36	2.24	5.00	3.32	7.59	5.05	**13.0**	0.459	0.305	0.860	0.572	1.31	0.871	1.92	1.27	2.82	1.88	4.08	2.71
0.590	0.392	1.12	0.743	1.90	1.27	3.12	2.07	4.63	3.08	7.03	4.68	**13.5**	0.441	0.294	0.828	0.551	1.26	0.838	1.84	1.23	2.71	1.81	3.92	2.61
0.549	0.365	1.04	0.691	1.77	1.18	2.90	1.93	4.31	2.87	6.54	4.35	**14.0**	0.426	0.283	0.798	0.531	1.21	0.808	1.78	1.18	2.62	1.74	3.78	2.51
0.511	0.340	0.968	0.644	1.65	1.10	2.70	1.80	4.02	2.67	6.10	4.06	**14.5**	0.411	0.273	0.771	0.513	1.17	0.780	1.71	1.14	2.52	1.68	3.65	2.43
0.478	0.318	0.905	0.602	1.54	1.02	2.52	1.68	3.75	2.50	5.70	3.79	**15.0**	0.397	0.264	0.745	0.496	1.13	0.754	1.66	1.10	2.44	1.62	3.52	2.34

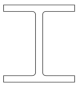
Properties

Available Strength in Tensile Yielding, kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
135	89.8	186	124	233	155	283	188	342	228	414	276
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
129	86.1	178	178	149	223	181	271	218	328	264	396
Available Strength in Shear, kN											
ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v
36.3	24.2	49.7	33.2	63.0	42.0	73.6	49.1	88.5	59.0	107	71.5
Available Strength in Flexure about Y-Y axis, kN·m											
ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b
0.992	0.660	1.59	1.06	2.32	1.55	3.28	2.18	4.38	2.91	5.91	3.93

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.534	2.54	0.626	0.729	2.88	0.847	3.03	0.94	3.28	3.75	1.05	3.54
Area, × 10^2 mm^2											
6.38		8.78		11.03		13.39		16.18		19.58	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
64.38	6.85	141.2	13.12	257.4	22.39	434.9	36.42	689.3	54.43	106.3	81.89
r_y, × 10 mm											
1.04		1.22		1.42		1.65		1.83		2.05	
r_x/r_y											
3.06		3.29		3.40		3.45		3.57		3.60	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPEA Shapes

F_y = 235 MPa

Shape	IPEA 200		IPEA 220		IPEA 240		IPEA 270		IPEA 300		IPEA 330	
Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
	Available Compressive Strength, kN											
Effective length, L_c, m, with respect to the least radius of gyration, r_y	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	496	330	598	398	705	469	828	551	984	655	1160	770
1.00	449	299	550	366	657	437	784	522	941	626	1110	740
1.50	396	264	497	330	603	401	732	487	890	592	1060	704
2.00	332	221	430	286	534	355	665	443	823	548	988	657
2.50	265	177	357	238	457	304	588	392	744	495	903	601
3.00	201	134	285	190	377	251	506	337	658	438	809	539
3.50	148	98.8	218	145	301	200	424	282	569	379	711	473
4.00	114	75.6	167	111	233	155	345	230	482	320	613	408
4.50	89.8	59.7	132	87.5	184	122	275	183	398	265	518	344
5.00	72.7	48.4	107	70.9	149	99.2	223	148	323	215	428	284
5.50	60.1	40.0	88.1	58.6	123	82.0	184	122	267	178	353	235
6.00	50.5	33.6	74.0	49.2	104	68.9	155	103	225	149	297	198
6.50	43.0	28.6	63.1	42.0	88.2	58.7	132	87.6	191	127	253	168
7.00	37.1	24.7	54.4	36.2	76.1	50.6	114	75.5	165	110	218	145
7.50	32.3	21.5	47.4	31.5	66.3	44.1	98.9	65.8	144	95.7	190	126
8.00	28.4	18.9	41.6	27.7	58.2	38.8	86.9	57.8	126	84.1	167	111
8.50	25.2	16.7	36.9	24.5	51.6	34.3	77.0	51.2	112	74.5	148	98.4
9.00	22.4	14.9	32.9	21.9	46.0	30.6	68.7	45.7	99.8	66.4	132	87.8
9.50	20.1	13.4	29.5	19.6	41.3	27.5	61.6	41.0	89.6	59.6	118	78.8
10.0	18.2	12.1	26.6	17.7	37.3	24.8	55.6	37.0	80.9	53.8	107	71.1
10.5	16.5	11.0	24.2	16.1	33.8	22.5	50.5	33.6	73.4	48.8	96.9	64.5
11.0	15.0	10.0	22.0	14.7	30.8	20.5	46.0	30.6	66.8	44.5	88.3	58.8
11.5	13.7	9.15	20.1	13.4	28.2	18.8	42.1	28.0	61.2	40.7	80.8	53.8
12.0	12.6	8.40	18.5	12.3	25.9	17.2	38.6	25.7	56.2	37.4	74.2	49.4
12.5	11.6	7.74	17.1	11.3	23.9	15.9	35.6	23.7	51.8	34.4	68.4	45.5
13.0	10.8	7.16	15.8	10.5	22.1	14.7	32.9	21.9	47.9	31.8	63.2	42.1
13.5	9.98	6.64	14.6	9.73	20.5	13.6	30.5	20.3	44.4	29.5	58.6	39.0
14.0	9.28	6.17	13.6	9.04	19.0	12.7	28.4	18.9	41.3	27.5	54.5	36.3
14.5	8.65	5.75	12.7	8.43	17.7	11.8	26.5	17.6	38.5	25.6	50.8	33.8
15.0	8.08	5.38	11.8	7.88	16.6	11.0	24.7	16.5	35.9	23.9	47.5	31.6

Shape	IPEA 200		IPEA 220		IPEA 240		IPEA 270		IPEA 300		IPEA 330	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	Available Flexural Strength, kN·m											
or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	38.4	25.6	50.8	33.8	65.9	43.8	87.2	58.0	115	76.2	148	98.8
1.00	38.4	25.6	50.8	33.8	65.9	43.8	87.2	58.0	115	76.2	148	98.8
1.50	36.5	24.3	49.3	32.8	65.0	43.2	87.2	58.0	115	76.2	148	98.8
2.00	33.9	22.5	46.0	30.6	61.1	40.7	82.9	55.2	111	74.0	146	97.0
2.50	31.2	20.8	42.8	28.4	57.3	38.1	78.1	52.0	105	70.1	139	92.3
3.00	28.5	19.0	39.5	26.3	53.5	35.6	73.3	48.8	99.4	66.2	131	87.5
3.50	25.9	17.2	36.3	24.1	49.6	33.0	68.5	45.6	93.5	62.2	124	82.7
4.00	22.9	15.2	33.0	22.0	45.8	30.5	63.7	42.4	87.6	58.3	117	77.9
4.50	19.7	13.1	29.0	19.3	42.0	27.9	58.9	39.2	81.7	54.4	110	73.2
5.00	17.3	11.5	25.4	16.9	37.0	24.6	53.8	35.8	75.8	50.5	103	68.4
5.50	15.5	10.3	22.5	15.0	32.8	21.8	47.3	31.5	69.0	45.9	95.6	63.6
6.00	14.0	9.29	20.3	13.5	29.5	19.6	42.2	28.1	61.2	40.7	86.4	57.5
6.50	12.7	8.47	18.5	12.3	26.8	17.8	38.1	25.4	54.9	36.5	77.4	51.5
7.00	11.7	7.80	16.9	11.3	24.5	16.3	34.7	23.1	49.8	33.2	70.1	46.7
7.50	10.9	7.22	15.7	10.4	22.7	15.1	31.9	21.3	45.6	30.4	64.1	42.7
8.00	10.1	6.73	14.6	9.70	21.1	14.0	29.6	19.7	42.1	28.0	59.1	39.3
8.50	9.46	6.30	13.6	9.06	19.7	13.1	27.5	18.3	39.0	26.0	54.7	36.4
9.00	8.90	5.92	12.8	8.51	18.5	12.3	25.8	17.1	36.4	24.2	51.0	34.0
9.50	8.40	5.59	12.1	8.02	17.4	11.6	24.2	16.1	34.2	22.7	47.8	31.8
10.0	7.95	5.29	11.4	7.59	16.4	10.9	22.8	15.2	32.2	21.4	45.0	29.9
10.5	7.55	5.02	10.8	7.20	15.6	10.4	21.6	14.4	30.4	20.2	42.5	28.3
11.0	7.19	4.78	10.3	6.85	14.8	9.87	20.5	13.7	28.8	19.2	40.2	26.8
11.5	6.86	4.56	9.83	6.54	14.1	9.41	19.5	13.0	27.4	18.2	38.2	25.4
12.0	6.56	4.37	9.39	6.25	13.5	9.00	18.6	12.4	26.1	17.4	36.4	24.2
12.5	6.29	4.18	9.00	5.99	12.9	8.62	17.8	11.9	24.9	16.6	34.8	23.1
13.0	6.04	4.02	8.64	5.75	12.4	8.27	17.1	11.4	23.9	15.9	33.3	22.1
13.5	5.81	3.86	8.30	5.52	11.9	7.94	16.4	10.9	22.9	15.2	31.9	21.2
14.0	5.59	3.72	7.99	5.32	11.5	7.65	15.8	10.5	22.0	14.6	30.6	20.4
14.5	5.39	3.59	7.71	5.13	11.1	7.37	15.2	10.1	21.2	14.1	29.5	19.6
15.0	5.21	3.47	7.44	4.95	10.7	7.12	14.7	9.76	20.4	13.6	28.4	18.9

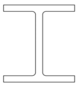
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
496	330	598	398	705	469	828	551	984	655	1160	770
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
475	317	572	382	675	450	793	529	942	628	1110	739
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
125	83.3	153	102	174	116	207	138	255	170	300	200
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
7.73	5.14	10.3	6.82	13.2	8.78	17.4	11.6	22.7	15.1	28.2	18.8

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.14	3.87	1.26	4.22	1.38	4.61	1.55	4.96	1.71	5.37	1.82	5.71
Area, × 10^2 mm^2											
23.5		28.3		33.31		39.15		46.53		54.74	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1591	117.2	2317	171.4	3290	240.1	4917	358.0	7173	519.0	10230	685.2
r_y, × 10 mm											
2.23		2.46		2.68		3.02		3.34		3.54	
r_x/r_y											
3.69		3.68		3.71		3.71		3.72		3.86	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces IPEA Shapes

F_y = 235 MPa

IPEA 360[c]		IPEA 400[c]		IPEA 450[c]		IPEA 500[c]		IPEA 550[c]		IPEA 600[c]		Shape	IPEA 360		IPEA 400		IPEA 450		IPEA 500		IPEA 550		IPEA 600	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1350	900	1550	1030	1810	1200	2140	1420	2480	1650	2900	1930	0.00	192	128	242	161	316	210	412	274	523	348	664	442
1300	866	1480	983	1710	1140	2010	1340	2320	1550	2710	1800	1.00	192	128	242	161	316	210	412	274	523	348	664	442
1250	834	1430	949	1660	1100	1960	1300	2260	1510	2650	1760	1.50	192	128	242	161	316	210	412	274	523	348	664	442
1180	786	1360	904	1590	1060	1880	1250	2180	1450	2560	1700	2.00	191	127	242	161	316	210	412	274	523	348	664	442
1100	729	1270	847	1500	997	1790	1190	2080	1380	2450	1630	2.50	183	121	232	155	306	204	403	268	517	344	662	440
998	664	1170	777	1400	931	1680	1120	1960	1310	2330	1550	3.00	174	116	222	148	293	195	386	257	496	330	636	423
894	595	1060	702	1280	850	1560	1030	1830	1220	2190	1450	3.50	165	110	211	140	279	186	369	245	474	316	611	406
788	524	939	625	1150	764	1410	939	1690	1120	2040	1350	4.00	157	104	200	133	265	177	351	234	453	302	585	389
682	454	823	547	1020	678	1260	841	1520	1010	1860	1240	4.50	148	98.4	190	126	252	168	334	222	432	288	560	372
581	387	710	472	890	592	1120	743	1360	904	1680	1120	5.00	139	92.6	179	119	238	158	317	211	411	274	534	355
486	323	602	401	767	510	975	648	1200	797	1490	994	5.50	130	86.8	168	112	224	149	300	199	390	260	508	338
408	272	506	337	650	432	839	558	1040	694	1320	876	6.00	122	81.0	158	105	211	140	283	188	369	246	483	321
348	231	431	287	554	368	715	476	896	596	1150	764	6.50	110	72.9	144	96.1	197	131	265	177	348	232	457	304
300	200	372	247	478	318	617	410	772	514	991	659	7.00	99.0	65.9	130	86.5	177	118	244	162	327	218	432	287
261	174	324	216	416	277	537	357	673	448	863	574	7.50	90.2	60.0	118	78.7	160	106	220	146	296	197	403	268
230	153	285	189	366	243	472	314	591	393	759	505	8.00	82.9	55.2	108	72.1	146	97.3	201	134	270	179	366	244
203	135	252	168	324	215	418	278	524	348	672	447	8.50	76.7	51.0	100	66.6	135	89.5	184	123	247	164	335	223
181	121	225	150	289	192	373	248	467	311	600	399	9.00	71.3	47.5	92.9	61.8	125	82.9	170	113	228	152	309	206
163	108	202	134	259	173	335	223	419	279	538	358	9.50	66.7	44.4	86.7	57.7	116	77.2	158	105	212	141	286	191
147	97.8	182	121	234	156	302	201	378	252	486	323	10.0	62.6	41.7	81.4	54.1	109	72.3	148	98.4	198	132	267	178
133	88.7	165	110	212	141	274	182	343	228	441	293	10.5	59.1	39.3	76.6	51.0	102	67.9	139	92.4	185	123	250	166
121	80.8	151	100	193	129	250	166	313	208	401	267	11.0	55.9	37.2	72.4	48.2	96.3	64.0	131	87.0	174	116	235	156
111	73.9	138	91.7	177	118	228	152	286	190	367	244	11.5	53.0	35.3	68.6	45.7	91.1	60.6	124	82.2	165	110	222	148
102	67.9	127	84.2	163	108	210	140	263	175	337	224	12.0	50.5	33.6	65.2	43.4	86.5	57.5	117	78.0	156	104	210	140
94.0	62.6	117	77.6	150	99.6	193	129	242	161	311	207	12.5	48.1	32.0	62.2	41.4	82.3	54.8	111	74.1	148	98.6	199	133
86.9	57.8	108	71.7	138	92.1	179	119	224	149	287	191	13.0	46.0	30.6	59.4	39.5	78.5	52.3	106	70.7	141	93.9	190	126
80.6	53.6	100	66.5	128	85.4	166	110	208	138	266	177	13.5	44.1	29.3	56.9	37.8	75.1	50.0	101	67.5	135	89.7	181	120
75.0	49.9	93.0	61.9	119	79.4	154	103	193	128	248	165	14.0	42.3	28.2	54.6	36.3	72.0	47.9	97.2	64.7	129	85.8	173	115
69.9	46.5	86.7	57.7	111	74.0	144	95.6	180	120	231	154	14.5	40.7	27.1	52.4	34.9	69.1	46.0	93.2	62.0	124	82.3	166	110
65.3	43.5	81.0	53.9	104	69.2	134	89.4	168	112	216	144	15.0	39.2	26.1	50.5	33.6	66.4	44.2	89.6	59.6	119	79.0	159	106

Properties

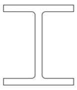
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1350	900	1550	1030	1810	1200	2140	1420	2480	1650	2900	1930
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1300	863	1480	987	1730	1150	2050	1360	2380	1580	2770	1850
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
333	222	392	261	479	319	589	392	694	463	825	550
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
36.4	24.2	42.7	28.4	52.0	34.6	63.8	42.4	76.5	50.9	93.5	62.2

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.97	6.09	2.05	6.30	2.15	6.50	2.25	6.78	2.34	7.06	2.45	7.40
Area, × 10^2 mm^2											
63.96		73.10		85.55		101.1		117.3		137.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
14520	944.3	20290	1171	29760	1502	42930	1939	59980	2432	82920	3116
r_y, × 10 mm											
3.84		4.00		4.19		4.38		4.55		4.77	
r_x/r_y											
3.92		4.17		4.45		4.71		4.97		5.16	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPEA Shapes

F_y = 275 MPa

Available Compressive Strength, kN

IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180		Shape
ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	Design
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending
158	105	217	145	273	182	331	220	400	266	485	322	0.00
92.1	61.3	147	97.7	204	136	268	178	336	224	422	281	1.00
47.8	31.8	90.0	59.9	142	94.8	205	136	271	180	355	236	1.50
26.9	17.9	50.9	33.9	86.6	57.6	141	93.6	200	133	278	185	2.00
17.2	11.4	32.6	21.7	55.4	36.9	90.9	60.5	135	89.9	204	135	2.50
11.9	7.95	22.6	15.1	38.5	25.6	63.1	42.0	93.8	62.4	142	94.8	3.00
8.78	5.84	16.6	11.1	28.3	18.8	46.4	30.8	68.9	45.9	105	69.6	3.50
6.72	4.47	12.7	8.47	21.7	14.4	35.5	23.6	52.8	35.1	80.1	53.3	4.00
5.31	3.53	10.1	6.69	17.1	11.4	28.0	18.7	41.7	27.7	63.3	42.1	4.50
4.30	2.86	8.14	5.42	13.9	9.22	22.7	15.1	33.8	22.5	51.3	34.1	5.00
3.55	2.36	6.73	4.48	11.5	7.62	18.8	12.5	27.9	18.6	42.4	28.2	5.50
2.99	1.99	5.66	3.76	9.63	6.40	15.8	10.5	23.5	15.6	35.6	23.7	6.00
2.54	1.69	4.82	3.21	8.20	5.46	13.4	8.94	20.0	13.3	30.3	20.2	6.50
2.19	1.46	4.16	2.76	7.07	4.71	11.6	7.71	17.2	11.5	26.2	17.4	7.00
1.91	1.27	3.62	2.41	6.16	4.10	10.1	6.72	15.0	9.99	22.8	15.2	7.50
1.68	1.12	3.18	2.12	5.41	3.60	8.87	5.90	13.2	8.78	20.0	13.3	8.00
1.49	0.990	2.82	1.87	4.80	3.19	7.86	5.23	11.7	7.77	17.7	11.8	8.50
1.33	0.883	2.51	1.67	4.28	2.85	7.01	4.67	10.4	6.93	15.8	10.5	9.00
1.19	0.793	2.26	1.50	3.84	2.55	6.29	4.19	9.35	6.22	14.2	9.45	9.50
1.08	0.715	2.04	1.35	3.47	2.31	5.68	3.78	8.44	5.62	12.8	8.53	10.0
0.975	0.649	1.85	1.23	3.14	2.09	5.15	3.43	7.66	5.09	11.6	7.74	10.5
0.889	0.591	1.68	1.12	2.86	1.91	4.69	3.12	6.98	4.64	10.6	7.05	11.0
0.813	0.541	1.54	1.02	2.62	1.74	4.29	2.86	6.38	4.25	9.69	6.45	11.5
0.747	0.497	1.41	0.941	2.41	1.60	3.94	2.62	5.86	3.90	8.90	5.92	12.0
0.688	0.458	1.30	0.867	2.22	1.48	3.63	2.42	5.40	3.59	8.20	5.46	12.5
0.636	0.423	1.20	0.802	2.05	1.36	3.36	2.24	5.00	3.32	7.59	5.05	13.0
0.590	0.392	1.12	0.743	1.90	1.27	3.12	2.07	4.63	3.08	7.03	4.68	13.5
0.549	0.365	1.04	0.691	1.77	1.18	2.90	1.93	4.31	2.87	6.54	4.35	14.0
0.511	0.340	0.968	0.644	1.65	1.10	2.70	1.80	4.02	2.67	6.10	4.06	14.5
0.478	0.318	0.905	0.602	1.54	1.02	2.52	1.68	3.75	2.50	5.70	3.79	15.0

Available Flexural Strength, kN·m

Shape	IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
Design	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	4.70	3.13	8.16	5.43	12.3	8.21	17.7	11.8	24.5	16.3	33.5	22.3
1.00	4.15	2.76	7.43	4.95	11.5	7.65	16.9	11.3	23.9	15.9	33.3	22.2
1.50	3.61	2.40	6.57	4.37	10.2	6.80	15.2	10.1	21.6	14.4	30.4	20.2
2.00	3.08	2.05	5.70	3.79	8.93	5.94	13.4	8.91	19.3	12.9	27.5	18.3
2.50	2.49	1.65	4.79	3.19	7.64	5.08	11.6	7.72	17.1	11.3	24.6	16.4
3.00	2.05	1.36	3.91	2.60	6.17	4.10	9.50	6.32	14.6	9.68	21.7	14.4
3.50	1.74	1.16	3.31	2.20	5.17	3.44	7.87	5.23	11.9	7.95	18.0	12.0
4.00	1.51	1.01	2.87	1.91	4.46	2.97	6.72	4.47	10.1	6.75	15.2	10.1
4.50	1.34	0.892	2.54	1.69	3.92	2.61	5.88	3.91	8.82	5.87	13.1	8.72
5.00	1.20	0.801	2.27	1.51	3.50	2.33	5.22	3.48	7.81	5.20	11.6	7.69
5.50	1.09	0.727	2.06	1.37	3.17	2.11	4.71	3.13	7.02	4.67	10.3	6.88
6.00	1.00	0.665	1.88	1.25	2.89	1.92	4.28	2.85	6.37	4.24	9.35	6.22
6.50	0.922	0.613	1.73	1.15	2.66	1.77	3.93	2.62	5.84	3.88	8.55	5.69
7.00	0.855	0.569	1.61	1.07	2.46	1.64	3.63	2.42	5.39	3.58	7.87	5.24
7.50	0.797	0.531	1.50	0.998	2.29	1.52	3.38	2.25	5.00	3.33	7.30	4.85
8.00	0.747	0.497	1.40	0.934	2.14	1.43	3.16	2.10	4.67	3.11	6.80	4.53
8.50	0.703	0.468	1.32	0.879	2.02	1.34	2.96	1.97	4.38	2.92	6.37	4.24
9.00	0.664	0.441	1.25	0.829	1.90	1.26	2.79	1.86	4.13	2.75	6.00	3.99
9.50	0.628	0.418	1.18	0.785	1.80	1.20	2.64	1.76	3.90	2.59	5.66	3.77
10.0	0.597	0.397	1.12	0.745	1.71	1.14	2.51	1.67	3.70	2.46	5.36	3.57
10.5	0.568	0.378	1.07	0.710	1.63	1.08	2.38	1.59	3.51	2.34	5.09	3.39
11.0	0.542	0.361	1.02	0.677	1.55	1.03	2.27	1.51	3.35	2.23	4.85	3.23
11.5	0.519	0.345	0.973	0.647	1.48	0.986	2.17	1.44	3.20	2.13	4.63	3.08
12.0	0.497	0.331	0.932	0.620	1.42	0.944	2.08	1.38	3.06	2.04	4.43	2.95
12.5	0.477	0.317	0.895	0.595	1.36	0.906	1.99	1.33	2.94	1.95	4.25	2.83
13.0	0.459	0.305	0.860	0.572	1.31	0.871	1.92	1.27	2.82	1.88	4.08	2.71
13.5	0.441	0.294	0.828	0.551	1.26	0.838	1.84	1.23	2.71	1.81	3.92	2.61
14.0	0.426	0.283	0.798	0.531	1.21	0.808	1.78	1.18	2.62	1.74	3.78	2.51
14.5	0.411	0.273	0.771	0.513	1.17	0.780	1.71	1.14	2.52	1.68	3.65	2.43
15.0	0.397	0.264	0.745	0.496	1.13	0.754	1.66	1.10	2.44	1.62	3.52	2.34

Properties

Available Strength in Tensile Yielding, kN

ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
158	105	217	145	273	182	331	220	400	266	485	322

Available Strength in Tensile Rupture (A_e = 0.75A_g), kN

ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
154	103	212	142	267	178	324	216	391	261	474	316

Available Strength in Shear, kN

ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v
42.5	28.3	58.2	38.8	73.7	49.2	86.1	57.4	104	69.1	126	83.7

Available Strength in Flexure about Y-Y axis, kN·m

ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b
1.16	0.772	1.87	1.24	2.72	1.81	3.84	2.56	5.12	3.41	6.92	4.60

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.494	2.20	0.579	2.41	0.674	2.52	0.783	2.68	0.869	2.90	0.973	3.15

Area, × 10^2 mm^2

6.38	8.78	11.0	13.4	16.2	19.6

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
64.38	6.85	141.2	13.12	257.4	22.39	434.9	36.42	689.3	54.43	106.3	81.89

r_y, × 10 mm

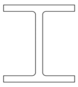
1.04	1.22	1.42	1.65	1.83	2.05

r_x/r_y

3.06	3.29	3.40	3.45	3.57	3.60

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces IPEA Shapes

F_y = 275 MPa

IPEA 200		IPEA 220		IPEA 240		IPEA 270		IPEA 300[c]		IPEA 330[c]		Shape		IPEA 200		IPEA 220		IPEA 240		IPEA 270		IPEA 300		IPEA 330	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
581	386	699	465	824	549	969	645	1150	766	1350	901	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	45.0	29.9	59.4	39.6	77.1	51.3	102	67.9	134	89.2	174	116
517	344	635	423	760	506	909	605	1090	727	1290	858		1.00	45.0	29.9	59.4	39.6	77.1	51.3	102	67.9	134	89.2	174	116
446	297	563	375	687	457	839	558	1020	681	1220	812		1.50	41.8	27.8	56.6	37.6	74.8	49.8	101	67.4	134	89.2	174	116
363	242	476	317	596	396	750	499	934	622	1120	748		2.00	38.3	25.4	52.2	34.7	69.7	46.3	94.9	63.1	128	84.9	168	112
279	186	383	255	496	330	650	432	831	553	1010	674		2.50	34.7	23.1	47.9	31.8	64.5	42.9	88.5	58.9	120	79.7	158	105
202	134	294	196	397	264	545	363	719	479	891	593		3.00	31.1	20.7	43.5	29.0	59.4	39.5	82.1	54.6	112	74.5	149	98.9
148	98.8	218	145	304	202	443	295	607	404	766	510		3.50	27.3	18.2	39.2	26.1	54.3	36.1	75.7	50.4	104	69.3	139	92.6
114	75.6	167	111	233	155	348	231	499	332	643	428		4.00	22.9	15.2	33.9	22.5	49.1	32.7	69.3	46.1	96.4	64.1	130	86.3
89.8	59.7	132	87.5	184	122	275	183	399	266	528	351		4.50	19.7	13.1	29.0	19.3	42.4	28.2	62.3	41.5	88.6	58.9	120	79.9
72.7	48.4	107	70.9	149	99.2	223	148	323	215	428	284		5.00	17.3	11.5	25.4	16.9	37.0	24.6	53.8	35.8	79.0	52.6	111	73.6
60.1	40.0	88.1	58.6	123	82.0	184	122	267	178	353	235		5.50	15.5	10.3	22.5	15.0	32.8	21.8	47.3	31.5	69.0	45.9	97.6	64.9
50.5	33.6	74.0	49.2	104	68.9	155	103	225	149	297	198		6.00	14.0	9.29	20.3	13.5	29.5	19.6	42.2	28.1	61.2	40.7	86.4	57.5
43.0	28.6	63.1	42.0	88.2	58.7	132	87.6	191	127	253	168		6.50	12.7	8.47	18.5	12.3	26.8	17.8	38.1	25.4	54.9	36.5	77.4	51.5
37.1	24.7	54.4	36.2	76.1	50.6	114	75.5	165	110	218	145		7.00	11.7	7.80	16.9	11.3	24.5	16.3	34.7	23.1	49.8	33.2	70.1	46.7
32.3	21.5	47.4	31.5	66.3	44.1	98.9	65.8	144	95.7	190	126		7.50	10.9	7.22	15.7	10.4	22.7	15.1	31.9	21.3	45.6	30.4	64.1	42.7
28.4	18.9	41.6	27.7	58.2	38.8	86.9	57.8	126	84.1	167	111		8.00	10.1	6.73	14.6	9.70	21.1	14.0	29.6	19.7	42.1	28.0	59.1	39.3
25.2	16.7	36.9	24.5	51.6	34.3	77.0	51.2	112	74.5	148	98.4		8.50	9.46	6.30	13.6	9.06	19.7	13.1	27.5	18.3	39.0	26.0	54.7	36.4
22.4	14.9	32.9	21.9	46.0	30.6	68.7	45.7	99.8	66.4	132	87.8		9.00	8.90	5.92	12.8	8.51	18.5	12.3	25.8	17.1	36.4	24.2	51.0	34.0
20.1	13.4	29.5	19.6	41.3	27.5	61.6	41.0	89.6	59.6	118	78.8		9.50	8.40	5.59	12.1	8.02	17.4	11.6	24.2	16.1	34.2	22.7	47.8	31.8
18.2	12.1	26.6	17.7	37.3	24.8	55.6	37.0	80.9	53.8	107	71.1		10.0	7.95	5.29	11.4	7.59	16.4	10.9	22.8	15.2	32.2	21.4	45.0	29.9
16.5	11.0	24.2	16.1	33.8	22.5	50.5	33.6	73.4	48.8	96.9	64.5		10.5	7.55	5.02	10.8	7.20	15.6	10.4	21.6	14.4	30.4	20.2	42.5	28.3
15.0	10.0	22.0	14.7	30.8	20.5	46.0	30.6	66.8	44.5	88.3	58.8		11.0	7.19	4.78	10.3	6.85	14.8	9.87	20.5	13.7	28.8	19.2	40.2	26.8
13.7	9.15	20.1	13.4	28.2	18.8	42.1	28.0	61.2	40.7	80.8	53.8		11.5	6.86	4.56	9.83	6.54	14.1	9.41	19.5	13.0	27.4	18.2	38.2	25.4
12.6	8.40	18.5	12.3	25.9	17.2	38.6	25.7	56.2	37.4	74.2	49.4		12.0	6.56	4.37	9.39	6.25	13.5	9.00	18.6	12.4	26.1	17.4	36.4	24.2
11.6	7.74	17.1	11.3	23.9	15.9	35.6	23.7	51.8	34.4	68.4	45.5		12.5	6.29	4.18	9.00	5.99	12.9	8.62	17.8	11.9	24.9	16.6	34.8	23.1
10.8	7.16	15.8	10.5	22.1	14.7	32.9	21.9	47.9	31.8	63.2	42.1		13.0	6.04	4.02	8.64	5.75	12.4	8.27	17.1	11.4	23.9	15.9	33.3	22.1
9.98	6.64	14.6	9.73	20.5	13.6	30.5	20.3	44.4	29.5	58.6	39.0		13.5	5.81	3.86	8.30	5.52	11.9	7.94	16.4	10.9	22.9	15.2	31.9	21.2
9.28	6.17	13.6	9.04	19.0	12.7	28.4	18.9	41.3	27.5	54.5	36.3		14.0	5.59	3.72	7.99	5.32	11.5	7.65	15.8	10.5	22.0	14.6	30.6	20.4
8.65	5.75	12.7	8.43	17.7	11.8	26.5	17.6	38.5	25.6	50.8	33.8		14.5	5.39	3.59	7.71	5.13	11.1	7.37	15.2	10.1	21.2	14.1	29.5	19.6
8.08	5.38	11.8	7.88	16.6	11.0	24.7	16.5	35.9	23.9	47.5	31.6		15.0	5.21	3.47	7.44	4.95	10.7	7.12	14.7	9.76	20.4	13.6	28.4	18.9

Properties

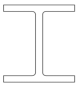
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
581	386	699	465	824	549	969	645	1150	766	1350	901
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
568	378	684	456	806	537	947	631	1130	750	1320	883
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
146	97.5	179	119	203	136	242	162	299	199	351	234
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
9.04	6.02	12.0	7.98	15.4	10.3	20.4	13.6	26.6	17.7	33.0	22.0

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.06	3.44	1.17	3.75	1.27	4.10	1.43	4.43	1.59	4.81	1.68	5.12
Area, × 10^2 mm^2											
23.5		28.3		33.31		39.15		46.53		54.74	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1591	117.2	2317	171.4	3290	240.1	4917	358.0	7173	519.0	10230	685.2
r_y, × 10 mm											
2.23		2.46		2.68		3.02		3.34		3.54	
r_x/r_y											
3.69		3.68		3.71		3.71		3.72		3.86	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPEA Shapes

F_y = 275 MPa

IPEA 360^c		IPEA 400^c		IPEA 450^c		IPEA 500^c		IPEA 550^c		IPEA 600^c		Shape		IPEA 360		IPEA 400		IPEA 450		IPEA 500		IPEA 550		IPEA 600	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1580	1050	1810	1200	2120	1410	2500	1660	2900	1930	3390	2260	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	224	149	283	188	370	246	482	320	613	408	777	517
1490	992	1690	1120	1960	1300	2300	1530	2660	1770	3100	2060		1.00	224	149	283	188	370	246	482	320	613	408	777	517
1430	949	1620	1080	1890	1250	2230	1480	2580	1710	3010	2010		1.50	224	149	283	188	370	246	482	320	613	408	777	517
1340	892	1530	1020	1790	1190	2120	1410	2470	1640	2900	1930		2.00	220	147	280	186	369	246	482	320	613	408	777	517
1240	823	1430	949	1680	1120	2000	1330	2340	1550	2760	1830		2.50	209	139	266	177	351	234	463	308	594	395	762	507
1110	738	1300	867	1550	1030	1860	1240	2180	1450	2590	1720		3.00	197	131	252	168	333	222	440	293	566	377	728	484
975	649	1160	770	1410	936	1710	1130	2010	1340	2410	1600		3.50	186	124	238	158	315	210	417	278	538	358	695	462
841	559	1010	672	1240	828	1540	1020	1840	1220	2220	1470		4.00	174	116	224	149	297	198	395	263	511	340	661	440
711	473	865	575	1080	719	1350	900	1640	1090	2020	1340		4.50	163	108	210	140	279	186	372	248	483	321	628	418
588	391	727	484	923	614	1170	779	1440	955	1790	1190		5.00	151	101	196	130	261	174	350	233	456	303	594	395
486	323	602	401	774	515	998	664	1240	824	1560	1040		5.50	139	92.7	182	121	243	162	327	218	428	285	561	373
408	272	506	337	650	432	839	558	1050	699	1350	897		6.00	123	81.7	162	108	222	148	305	203	400	266	527	351
348	231	431	287	554	368	715	476	896	596	1150	765		6.50	110	72.9	144	96.1	197	131	272	181	368	245	493	328
300	200	372	247	478	318	617	410	772	514	991	659		7.00	99.0	65.9	130	86.5	177	118	244	162	328	218	447	298
261	174	324	216	416	277	537	357	673	448	863	574		7.50	90.2	60.0	118	78.7	160	106	220	146	296	197	403	268
230	153	285	189	366	243	472	314	591	393	759	505		8.00	82.9	55.2	108	72.1	146	97.3	201	134	270	179	366	244
203	135	252	168	324	215	418	278	524	348	672	447		8.50	76.7	51.0	100	66.6	135	89.5	184	123	247	164	335	223
181	121	225	150	289	192	373	248	467	311	600	399		9.00	71.3	47.5	92.9	61.8	125	82.9	170	113	228	152	309	206
163	108	202	134	259	173	335	223	419	279	538	358		9.50	66.7	44.4	86.7	57.7	116	77.2	158	105	212	141	286	191
147	97.8	182	121	234	156	302	201	378	252	486	323		10.0	62.6	41.7	81.4	54.1	109	72.3	148	98.4	198	132	267	178
133	88.7	165	110	212	141	274	182	343	228	441	293		10.5	59.1	39.3	76.6	51.0	102	67.9	139	92.4	185	123	250	166
121	80.8	151	100	193	129	250	166	313	208	401	267		11.0	55.9	37.2	72.4	48.2	96.3	64.0	131	87.0	174	116	235	156
111	73.9	138	91.7	177	118	228	152	286	190	367	244		11.5	53.0	35.3	68.6	45.7	91.1	60.6	124	82.2	165	110	222	148
102	67.9	127	84.2	163	108	210	140	263	175	337	224		12.0	50.5	33.6	65.2	43.4	86.5	57.5	117	78.0	156	104	210	140
94.0	62.6	117	77.6	150	99.6	193	129	242	161	311	207		12.5	48.1	32.0	62.2	41.4	82.3	54.8	111	74.1	148	98.6	199	133
86.9	57.8	108	71.7	138	92.1	179	119	224	149	287	191		13.0	46.0	30.6	59.4	39.5	78.5	52.3	106	70.7	141	93.9	190	126
80.6	53.6	100	66.5	128	85.4	166	110	208	138	266	177		13.5	44.1	29.3	56.9	37.8	75.1	50.0	101	67.5	135	89.7	181	120
75.0	49.9	93.0	61.9	119	79.4	154	103	193	128	248	165		14.0	42.3	28.2	54.6	36.3	72.0	47.9	97.2	64.7	129	85.8	173	115
69.9	46.5	86.7	57.7	111	74.0	144	95.6	180	120	231	154		14.5	40.7	27.1	52.4	34.9	69.1	46.0	93.2	62.0	124	82.3	166	110
65.3	43.5	81.0	53.9	104	69.2	134	89.4	168	112	216	144		15.0	39.2	26.1	50.5	33.6	66.4	44.2	89.6	59.6	119	79.0	159	106

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1580	1050	1810	1200	2120	1410	2500	1660	2900	1930	3390	2260
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1550	1030	1770	1180	2070	1380	2450	1630	2840	1890	3310	2210
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
389	260	459	306	561	374	689	459	812	542	965	644
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
42.5	28.3	50.0	33.3	60.8	40.5	74.6	49.7	89.5	59.5	109	72.8

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.82	5.47	1.9	5.66	1.99	5.86	2.08	6.12	2.16	6.4	2.26	6.68
Area, × 10^2 mm^2											
63.96		73.10		85.55		101.1		117.3		137.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
14520	944.3	20290	1171	29760	1502	42930	1939	59980	2432	82920	3116
r_y, × 10 mm											
3.84		4.00		4.19		4.38		4.55		4.77	
r_x/r_y											
3.92		4.17		4.45		4.71		4.97		5.16	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPEA Shapes

F_y = 355 MPa

Shape	IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
	Available Compressive Strength, kN											
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	204	136	281	187	352	234	428	285	517	344	626	416
1.00	102	67.6	169	113	243	161	324	216	413	275	523	348
1.50	47.8	31.8	90.5	60.2	152	101	230	153	312	207	418	278
2.00	26.9	17.9	50.9	33.9	86.6	57.6	142	94.5	210	140	306	203
2.50	17.2	11.4	32.6	21.7	55.4	36.9	90.9	60.5	135	89.9	205	136
3.00	11.9	7.95	22.6	15.1	38.5	25.6	63.1	42.0	93.8	62.4	142	94.8
3.50	8.78	5.84	16.6	11.1	28.3	18.8	46.4	30.8	68.9	45.9	105	69.6
4.00	6.72	4.47	12.7	8.47	21.7	14.4	35.5	23.6	52.8	35.1	80.1	53.3
4.50	5.31	3.53	10.1	6.69	17.1	11.4	28.0	18.7	41.7	27.7	63.3	42.1
5.00	4.30	2.86	8.14	5.42	13.9	9.22	22.7	15.1	33.8	22.5	51.3	34.1
5.50	3.55	2.36	6.73	4.48	11.5	7.62	18.8	12.5	27.9	18.6	42.4	28.2
6.00	2.99	1.99	5.66	3.76	9.63	6.40	15.8	10.5	23.5	15.6	35.6	23.7
6.50	2.54	1.69	4.82	3.21	8.20	5.46	13.4	8.94	20.0	13.3	30.3	20.2
7.00	2.19	1.46	4.16	2.76	7.07	4.71	11.6	7.71	17.2	11.5	26.2	17.4
7.50	1.91	1.27	3.62	2.41	6.16	4.10	10.1	6.72	15.0	9.99	22.8	15.2
8.00	1.68	1.12	3.18	2.12	5.41	3.60	8.87	5.90	13.2	8.78	20.0	13.3
8.50	1.49	0.990	2.82	1.87	4.80	3.19	7.86	5.23	11.7	7.77	17.7	11.8
9.00	1.33	0.883	2.51	1.67	4.28	2.85	7.01	4.67	10.4	6.93	15.8	10.5
9.50	1.19	0.793	2.26	1.50	3.84	2.55	6.29	4.19	9.35	6.22	14.2	9.45
10.0	1.08	0.715	2.04	1.35	3.47	2.31	5.68	3.78	8.44	5.62	12.8	8.53
10.5	0.975	0.649	1.85	1.23	3.14	2.09	5.15	3.43	7.66	5.09	11.6	7.74
11.0	0.889	0.591	1.68	1.12	2.86	1.91	4.69	3.12	6.98	4.64	10.6	7.05
11.5	0.813	0.541	1.54	1.02	2.62	1.74	4.29	2.86	6.38	4.25	9.69	6.45
12.0	0.747	0.497	1.41	0.941	2.41	1.60	3.94	2.62	5.86	3.90	8.90	5.92
12.5	0.688	0.458	1.30	0.867	2.22	1.48	3.63	2.42	5.40	3.59	8.20	5.46
13.0	0.636	0.423	1.20	0.802	2.05	1.36	3.36	2.24	5.00	3.32	7.59	5.05
13.5	0.590	0.392	1.12	0.743	1.90	1.27	3.12	2.07	4.63	3.08	7.03	4.68
14.0	0.549	0.365	1.04	0.691	1.77	1.18	2.90	1.93	4.31	2.87	6.54	4.35
14.5	0.511	0.340	0.968	0.644	1.65	1.10	2.70	1.80	4.02	2.67	6.10	4.06
15.0	0.478	0.318	0.905	0.602	1.54	1.02	2.52	1.68	3.75	2.50	5.70	3.79

Shape	IPEA 80		IPEA 100		IPEA 120		IPEA 140		IPEA 160		IPEA 180	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	Available Flexural Strength, kN·m											
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	6.06	4.03	10.5	7.01	15.9	10.6	22.9	15.2	31.7	21.1	43.2	28.8
1.00	5.05	3.36	9.13	6.08	14.2	9.47	21.1	14.0	29.9	19.9	41.9	27.9
1.50	4.15	2.76	7.70	5.12	12.1	8.07	18.2	12.1	26.3	17.5	37.3	24.8
2.00	3.18	2.12	6.20	4.13	10.0	6.67	15.4	10.2	22.6	15.1	32.6	21.7
2.50	2.49	1.65	4.79	3.19	7.66	5.10	12.0	7.99	18.6	12.4	28.0	18.6
3.00	2.05	1.36	3.91	2.60	6.17	4.10	9.50	6.32	14.6	9.68	22.2	14.8
3.50	1.74	1.16	3.31	2.20	5.17	3.44	7.87	5.23	11.9	7.95	18.0	12.0
4.00	1.51	1.01	2.87	1.91	4.46	2.97	6.72	4.47	10.1	6.75	15.2	10.1
4.50	1.34	0.892	2.54	1.69	3.92	2.61	5.88	3.91	8.82	5.87	13.1	8.72
5.00	1.20	0.801	2.27	1.51	3.50	2.33	5.22	3.48	7.81	5.20	11.6	7.69
5.50	1.09	0.727	2.06	1.37	3.17	2.11	4.71	3.13	7.02	4.67	10.3	6.88
6.00	1.00	0.665	1.88	1.25	2.89	1.92	4.28	2.85	6.37	4.24	9.35	6.22
6.50	0.922	0.613	1.73	1.15	2.66	1.77	3.93	2.62	5.84	3.88	8.55	5.69
7.00	0.855	0.569	1.61	1.07	2.46	1.64	3.63	2.42	5.39	3.58	7.87	5.24
7.50	0.797	0.531	1.50	0.998	2.29	1.52	3.38	2.25	5.00	3.33	7.30	4.85
8.00	0.747	0.497	1.40	0.934	2.14	1.43	3.16	2.10	4.67	3.11	6.80	4.53
8.50	0.703	0.468	1.32	0.879	2.02	1.34	2.96	1.97	4.38	2.92	6.37	4.24
9.00	0.664	0.441	1.25	0.829	1.90	1.26	2.79	1.86	4.13	2.75	6.00	3.99
9.50	0.628	0.418	1.18	0.785	1.80	1.20	2.64	1.76	3.90	2.59	5.66	3.77
10.0	0.597	0.397	1.12	0.745	1.71	1.14	2.51	1.67	3.70	2.46	5.36	3.57
10.5	0.568	0.378	1.07	0.710	1.63	1.08	2.38	1.59	3.51	2.34	5.09	3.39
11.0	0.542	0.361	1.02	0.677	1.55	1.03	2.27	1.51	3.35	2.23	4.85	3.23
11.5	0.519	0.345	0.973	0.647	1.48	0.986	2.17	1.44	3.20	2.13	4.63	3.08
12.0	0.497	0.331	0.932	0.620	1.42	0.944	2.08	1.38	3.06	2.04	4.43	2.95
12.5	0.477	0.317	0.895	0.595	1.36	0.906	1.99	1.33	2.94	1.95	4.25	2.83
13.0	0.459	0.305	0.860	0.572	1.31	0.871	1.92	1.27	2.82	1.88	4.08	2.71
13.5	0.441	0.294	0.828	0.551	1.26	0.838	1.84	1.23	2.71	1.81	3.92	2.61
14.0	0.426	0.283	0.798	0.531	1.21	0.808	1.78	1.18	2.62	1.74	3.78	2.51
14.5	0.411	0.273	0.771	0.513	1.17	0.780	1.71	1.14	2.52	1.68	3.65	2.43
15.0	0.397	0.264	0.745	0.496	1.13	0.754	1.66	1.10	2.44	1.62	3.52	2.34

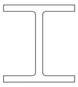
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
204	136	281	187	352	234	428	285	517	344	626	416
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
183	122	252	168	316	211	384	256	464	309	562	374
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
54.8	36.6	75.1	50.1	95.2	63.5	111	74.1	134	89.2	162	108
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
1.50	0.997	2.41	1.60	3.51	2.33	4.96	3.30	6.61	4.40	8.93	5.94

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.434	1.76	0.510	1.94	0.593	2.06	0.689	2.21	0.764	2.41	0.856	2.52
Area, × 10^2 mm^2											
6.38		8.78		11.0		13.4		16.2		19.6	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
64.38	6.85	141.2	13.12	257.4	22.39	434.9	36.42	689.3	54.43	106.3	81.89
r_y, × 10 mm											
1.04		1.22		1.42		1.65		1.83		2.05	
r_x/r_y											
3.06		3.29		3.40		3.45		3.57		3.60	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPEA Shapes

F_y = 355 MPa

IPEA 200		IPEA 220^c		IPEA 240^c		IPEA 270^c		IPEA 300^c		IPEA 330^c		Shape		IPEA 200		IPEA 220		IPEA 240		IPEA 270		IPEA 300		IPEA 330	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
750	499	903	601	1060	708	1250	832	1490	989	1750	1160	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	58.1	38.6	76.7	51.1	99.6	66.2	132	87.7	173	115	224	149
645	429	797	530	958	638	1130	754	1360	903	1600	1060		1.00	57.3	38.1	76.7	51.1	99.6	66.2	132	87.7	173	115	224	149
533	355	682	454	841	559	1030	687	1260	838	1500	995		1.50	51.6	34.3	70.2	46.7	93.4	62.1	127	84.5	171	113	224	149
409	272	549	365	700	466	899	598	1130	754	1360	906		2.00	45.9	30.6	63.4	42.2	85.2	56.7	117	77.8	158	105	209	139
291	194	415	276	553	368	747	497	975	649	1200	799		2.50	40.3	26.8	56.5	37.6	77.1	51.3	107	71.2	146	97.3	194	129
202	134	296	197	414	276	595	396	810	539	1020	678		3.00	33.8	22.5	49.6	33.0	68.9	45.9	96.9	64.5	134	89.1	179	119
148	98.8	218	145	304	202	454	302	650	433	838	558		3.50	27.3	18.2	40.7	27.1	60.0	39.9	86.9	57.8	122	81.0	164	109
114	75.6	167	111	233	155	348	231	505	336	668	444		4.00	22.9	15.2	33.9	22.5	49.7	33.1	74.0	49.2	110	72.9	149	99.4
89.8	59.7	132	87.5	184	122	275	183	399	266	528	351		4.50	19.7	13.1	29.0	19.3	42.4	28.2	62.3	41.5	92.4	61.4	131	87.3
72.7	48.4	107	70.9	149	99.2	223	148	323	215	428	284		5.00	17.3	11.5	25.4	16.9	37.0	24.6	53.8	35.8	79.0	52.6	112	74.6
60.1	40.0	88.1	58.6	123	82.0	184	122	267	178	353	235		5.50	15.5	10.3	22.5	15.0	32.8	21.8	47.3	31.5	69.0	45.9	97.6	64.9
50.5	33.6	74.0	49.2	104	68.9	155	103	225	149	297	198		6.00	14.0	9.29	20.3	13.5	29.5	19.6	42.2	28.1	61.2	40.7	86.4	57.5
43.0	28.6	63.1	42.0	88.2	58.7	132	87.6	191	127	253	168		6.50	12.7	8.47	18.5	12.3	26.8	17.8	38.1	25.4	54.9	36.5	77.4	51.5
37.1	24.7	54.4	36.2	76.1	50.6	114	75.5	165	110	218	145		7.00	11.7	7.80	16.9	11.3	24.5	16.3	34.7	23.1	49.8	33.2	70.1	46.7
32.3	21.5	47.4	31.5	66.3	44.1	98.9	65.8	144	95.7	190	126		7.50	10.9	7.22	15.7	10.4	22.7	15.1	31.9	21.3	45.6	30.4	64.1	42.7
28.4	18.9	41.6	27.7	58.2	38.8	86.9	57.8	126	84.1	167	111		8.00	10.1	6.73	14.6	9.70	21.1	14.0	29.6	19.7	42.1	28.0	59.1	39.3
25.2	16.7	36.9	24.5	51.6	34.3	77.0	51.2	112	74.5	148	98.4		8.50	9.46	6.30	13.6	9.06	19.7	13.1	27.5	18.3	39.0	26.0	54.7	36.4
22.4	14.9	32.9	21.9	46.0	30.6	68.7	45.7	99.8	66.4	132	87.8		9.00	8.90	5.92	12.8	8.51	18.5	12.3	25.8	17.1	36.4	24.2	51.0	34.0
20.1	13.4	29.5	19.6	41.3	27.5	61.6	41.0	89.6	59.6	118	78.8		9.50	8.40	5.59	12.1	8.02	17.4	11.6	24.2	16.1	34.2	22.7	47.8	31.8
18.2	12.1	26.6	17.7	37.3	24.8	55.6	37.0	80.9	53.8	107	71.1		10.0	7.95	5.29	11.4	7.59	16.4	10.9	22.8	15.2	32.2	21.4	45.0	29.9
16.5	11.0	24.2	16.1	33.8	22.5	50.5	33.6	73.4	48.8	96.9	64.5		10.5	7.55	5.02	10.8	7.20	15.6	10.4	21.6	14.4	30.4	20.2	42.5	28.3
15.0	10.0	22.0	14.7	30.8	20.5	46.0	30.6	66.8	44.5	88.3	58.8		11.0	7.19	4.78	10.3	6.85	14.8	9.87	20.5	13.7	28.8	19.2	40.2	26.8
13.7	9.15	20.1	13.4	28.2	18.8	42.1	28.0	61.2	40.7	80.8	53.8		11.5	6.86	4.56	9.83	6.54	14.1	9.41	19.5	13.0	27.4	18.2	38.2	25.4
12.6	8.40	18.5	12.3	25.9	17.2	38.6	25.7	56.2	37.4	74.2	49.4		12.0	6.56	4.37	9.39	6.25	13.5	9.00	18.6	12.4	26.1	17.4	36.4	24.2
11.6	7.74	17.1	11.3	23.9	15.9	35.6	23.7	51.8	34.4	68.4	45.5		12.5	6.29	4.18	9.00	5.99	12.9	8.62	17.8	11.9	24.9	16.6	34.8	23.1
10.8	7.16	15.8	10.5	22.1	14.7	32.9	21.9	47.9	31.8	63.2	42.1		13.0	6.04	4.02	8.64	5.75	12.4	8.27	17.1	11.4	23.9	15.9	33.3	22.1
9.98	6.64	14.6	9.73	20.5	13.6	30.5	20.3	44.4	29.5	58.6	39.0		13.5	5.81	3.86	8.30	5.52	11.9	7.94	16.4	10.9	22.9	15.2	31.9	21.2
9.28	6.17	13.6	9.04	19.0	12.7	28.4	18.9	41.3	27.5	54.5	36.3		14.0	5.59	3.72	7.99	5.32	11.5	7.65	15.8	10.5	22.0	14.6	30.6	20.4
8.65	5.75	12.7	8.43	17.7	11.8	26.5	17.6	38.5	25.6	50.8	33.8		14.5	5.39	3.59	7.71	5.13	11.1	7.37	15.2	10.1	21.2	14.1	29.5	19.6
8.08	5.38	11.8	7.88	16.6	11.0	24.7	16.5	35.9	23.9	47.5	31.6		15.0	5.21	3.47	7.44	4.95	10.7	7.12	14.7	9.76	20.4	13.6	28.4	18.9

Properties

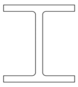
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
750	499	903	601	1060	708	1250	832	1490	989	1750	1160
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
673	449	811	540	956	637	1120	749	1330	890	1570	1050
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
189	126	231	154	263	175	313	209	386	257	453	302
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
11.7	7.77	15.5	10.3	19.9	13.3	26.3	17.5	34.3	22.8	42.6	28.3

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.932	2.86	1.03	3.13	1.12	3.42	1.26	3.73	1.40	4.06	1.48	4.32
Area, × 10^2 mm^2											
23.5		28.3		33.31		39.15		46.53		54.74	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1591	117.2	2317	171.4	3290	240.1	4917	358.0	7173	519.0	10230	685.2
r_y, × 10 mm											
2.23		2.46		2.68		3.02		3.34		3.54	
r_x/r_y											
3.69		3.68		3.71		3.71		3.72		3.86	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPEA Shapes

F_y = 355 MPa

IPEA 360^c		IPEA 400^c		IPEA 450^c		IPEA 500^c		IPEA 550^c		IPEA 600^c		Shape	IPEA 360		IPEA 400		IPEA 450		IPEA 500		IPEA 550		IPEA 600	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
2040	1360	2340	1550	2730	1820	3230	2150	3750	2490	4380	2910	0.00	290	193	366	243	477	318	622	414	791	526	1000	668
1850	1230	2100	1400	2430	1620	2860	1900	3300	2200	3850	2560	1.00	290	193	366	243	477	318	622	414	791	526	1000	668
1750	1160	2000	1330	2320	1540	2740	1820	3170	2110	3710	2470	1.50	290	193	366	243	477	318	622	414	791	526	1000	668
1620	1080	1850	1230	2170	1440	2580	1710	3000	2000	3530	2350	2.00	276	183	351	234	463	308	610	406	782	520	1000	667
1460	970	1690	1120	1990	1330	2390	1590	2790	1860	3310	2200	2.50	258	171	329	219	436	290	575	383	740	492	951	633
1290	856	1500	1000	1790	1190	2170	1440	2560	1700	3050	2030	3.00	240	159	307	204	408	271	540	359	697	464	900	599
1090	728	1310	873	1590	1060	1940	1290	2310	1530	2780	1850	3.50	222	148	285	190	380	253	505	336	655	435	848	564
903	601	1100	732	1380	916	1710	1130	2050	1360	2500	1660	4.00	204	136	263	175	352	234	471	313	612	407	796	530
726	483	900	599	1150	763	1460	971	1790	1190	2210	1470	4.50	186	124	242	161	324	216	436	290	569	379	745	495
588	391	729	485	936	623	1210	804	1510	1000	1910	1270	5.00	161	107	214	142	296	197	401	267	527	350	693	461
486	323	602	401	774	515	999	665	1250	832	1610	1070	5.50	139	92.7	185	123	254	169	354	235	479	319	641	427
408	272	506	337	650	432	839	558	1050	699	1350	898	6.00	123	81.7	162	108	222	148	308	205	417	277	570	379
348	231	431	287	554	368	715	476	896	596	1150	765	6.50	110	72.9	144	96.1	197	131	272	181	368	245	502	334
300	200	372	247	478	318	617	410	772	514	991	659	7.00	99.0	65.9	130	86.5	177	118	244	162	328	218	447	298
261	174	324	216	416	277	537	357	673	448	863	574	7.50	90.2	60.0	118	78.7	160	106	220	146	296	197	403	268
230	153	285	189	366	243	472	314	591	393	759	505	8.00	82.9	55.2	108	72.1	146	97.3	201	134	270	179	366	244
203	135	252	168	324	215	418	278	524	348	672	447	8.50	76.7	51.0	100	66.6	135	89.5	184	123	247	164	335	223
181	121	225	150	289	192	373	248	467	311	600	399	9.00	71.3	47.5	92.9	61.8	125	82.9	170	113	228	152	309	206
163	108	202	134	259	173	335	223	419	279	538	358	9.50	66.7	44.4	86.7	57.7	116	77.2	158	105	212	141	286	191
147	97.8	182	121	234	156	302	201	378	252	486	323	10.0	62.6	41.7	81.4	54.1	109	72.3	148	98.4	198	132	267	178
133	88.7	165	110	212	141	274	182	343	228	441	293	10.5	59.1	39.3	76.6	51.0	102	67.9	139	92.4	185	123	250	166
121	80.8	151	100	193	129	250	166	313	208	401	267	11.0	55.9	37.2	72.4	48.2	96.3	64.0	131	87.0	174	116	235	156
111	73.9	138	91.7	177	118	228	152	286	190	367	244	11.5	53.0	35.3	68.6	45.7	91.1	60.6	124	82.2	165	110	222	148
102	67.9	127	84.2	163	108	210	140	263	175	337	224	12.0	50.5	33.6	65.2	43.4	86.5	57.5	117	78.0	156	104	210	140
94.0	62.6	117	77.6	150	99.6	193	129	242	161	311	207	12.5	48.1	32.0	62.2	41.4	82.3	54.8	111	74.1	148	98.6	199	133
86.9	57.8	108	71.7	138	92.1	179	119	224	149	287	191	13.0	46.0	30.6	59.4	39.5	78.5	52.3	106	70.7	141	93.9	190	126
80.6	53.6	100	66.5	128	85.4	166	110	208	138	266	177	13.5	44.1	29.3	56.9	37.8	75.1	50.0	101	67.5	135	89.7	181	120
75.0	49.9	93.0	61.9	119	79.4	154	103	193	128	248	165	14.0	42.3	28.2	54.6	36.3	72.0	47.9	97.2	64.7	129	85.8	173	115
69.9	46.5	86.7	57.7	111	74.0	144	95.6	180	120	231	154	14.5	40.7	27.1	52.4	34.9	69.1	46.0	93.2	62.0	124	82.3	166	110
65.3	43.5	81.0	53.9	104	69.2	134	89.4	168	112	216	144	15.0	39.2	26.1	50.5	33.6	66.4	44.2	89.6	59.6	119	79.0	159	106

Properties

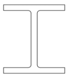
Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2040	1360	2340	1550	2730	1820	3230	2150	3750	2490	4380	2910
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1830	1220	2100	1400	2450	1640	2900	1930	3370	2240	3930	2620
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
503	335	592	395	724	482	889	593	1050	699	1250	831
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
54.9	36.5	64.6	43.0	78.5	52.2	96.4	64.1	115	76.8	141	94.0

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.60	4.62	1.67	4.80	1.75	4.98	1.83	5.21	1.90	5.43	1.99	5.70
Area, × 10^2 mm^2											
63.96		73.10		85.55		101.1		117.3		137.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
14520	944.3	20290	1171	29760	1502	42930	1939	59980	2432	82920	3116
r_y, × 10 mm											
3.84		4.00		4.19		4.38		4.55		4.77	
r_x/r_y											
3.92		4.17		4.45		4.71		4.97		5.16	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

[c] Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

IPEO Shapes

F_y = 235 MPa

IPEO 180		IPEO 200		IPEO 220		IPEO 240		IPEO 270		IPEO 300		Shape		IPEO 180		IPEO 200		IPEO 220		IPEO 240		IPEO 270		IPEO 300	
ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	Design		ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
573	381	676	450	791	526	924	615	1140	758	1330	884	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	40.0	26.6	52.7	35.1	67.9	45.2	86.8	57.7	122	80.9	157	105
511	340	615	409	732	487	865	576	1080	719	1270	848		1.00	40.0	26.6	52.7	35.1	67.9	45.2	86.8	57.7	122	80.9	157	105
442	294	547	364	664	442	796	530	1010	674	1210	805		1.50	38.0	25.3	50.9	33.9	66.5	44.3	86.0	57.2	122	80.9	157	105
362	241	464	309	579	385	709	472	924	615	1120	748		2.00	35.6	23.7	48.0	32.0	63.0	41.9	81.9	54.5	117	77.9	154	103
279	186	375	250	486	323	611	406	822	547	1020	681		2.50	33.3	22.1	45.2	30.1	59.5	39.6	77.8	51.7	112	74.4	148	98.3
203	135	290	193	392	261	509	338	712	474	912	607		3.00	30.9	20.6	42.3	28.1	56.0	37.3	73.7	49.0	106	70.8	141	93.9
149	99.2	215	143	304	203	410	273	601	400	796	529		3.50	28.6	19.0	39.4	26.2	52.5	35.0	69.5	46.3	101	67.2	135	89.5
114	76.0	165	110	233	155	320	213	494	329	680	452		4.00	26.2	17.5	36.6	24.3	49.0	32.6	65.4	43.5	95.7	63.7	128	85.1
90.2	60.0	130	86.5	184	123	252	168	396	263	569	379		4.50	23.7	15.8	33.7	22.4	45.5	30.3	61.3	40.8	90.4	60.1	121	80.7
73.1	48.6	105	70.1	149	99.2	205	136	320	213	466	310		5.00	21.0	14.0	30.3	20.2	42.0	28.0	57.2	38.0	85.0	56.6	115	76.4
60.4	40.2	87.1	57.9	123	82.0	169	112	265	176	385	256		5.50	18.9	12.6	27.2	18.1	37.7	25.1	52.9	35.2	79.7	53.0	108	72.0
50.7	33.8	73.2	48.7	104	68.9	142	94.5	222	148	324	215		6.00	17.2	11.5	24.7	16.4	34.1	22.7	47.8	31.8	74.0	49.2	102	67.6
43.2	28.8	62.3	41.5	88.3	58.7	121	80.5	190	126	276	183		6.50	15.8	10.5	22.6	15.1	31.2	20.7	43.6	29.0	67.3	44.7	94.0	62.5
37.3	24.8	53.8	35.8	76.1	50.6	104	69.4	163	109	238	158		7.00	14.6	9.70	20.9	13.9	28.7	19.1	40.1	26.7	61.7	41.0	85.8	57.1
32.5	21.6	46.8	31.2	66.3	44.1	90.9	60.5	142	94.7	207	138		7.50	13.6	9.02	19.4	12.9	26.6	17.7	37.1	24.7	57.0	37.9	79.0	52.6
28.5	19.0	41.2	27.4	58.3	38.8	79.9	53.2	125	83.3	182	121		8.00	12.7	8.43	18.1	12.0	24.8	16.5	34.6	23.0	53.0	35.3	73.2	48.7
25.3	16.8	36.5	24.3	51.6	34.3	70.8	47.1	111	73.8	161	107		8.50	11.9	7.91	17.0	11.3	23.2	15.5	32.4	21.5	49.5	32.9	68.3	45.4
22.6	15.0	32.5	21.6	46.0	30.6	63.1	42.0	98.9	65.8	144	95.7		9.00	11.2	7.45	16.0	10.6	21.9	14.5	30.4	20.3	46.5	30.9	63.9	42.5
20.2	13.5	29.2	19.4	41.3	27.5	56.7	37.7	88.7	59.0	129	85.9		9.50	10.6	7.05	15.1	10.0	20.6	13.7	28.7	19.1	43.8	29.1	60.1	40.0
18.3	12.2	26.3	17.5	37.3	24.8	51.1	34.0	80.1	53.3	117	77.5		10.0	10.0	6.68	14.3	9.52	19.6	13.0	27.2	18.1	41.4	27.6	56.8	37.8
16.6	11.0	23.9	15.9	33.8	22.5	46.4	30.9	72.6	48.3	106	70.3		10.5	9.55	6.35	13.6	9.05	18.6	12.4	25.8	17.2	39.3	26.2	53.8	35.8
15.1	10.0	21.8	14.5	30.8	20.5	42.3	28.1	66.2	44.0	96.3	64.1		11.0	9.10	6.06	13.0	8.63	17.7	11.8	24.6	16.4	37.4	24.9	51.1	34.0
13.8	9.19	19.9	13.3	28.2	18.8	38.7	25.7	60.6	40.3	88.1	58.6		11.5	8.70	5.79	12.4	8.24	16.9	11.2	23.5	15.6	35.7	23.7	48.7	32.4
12.7	8.44	18.3	12.2	25.9	17.2	35.5	23.6	55.6	37.0	80.9	53.8		12.0	8.33	5.54	11.9	7.89	16.2	10.8	22.5	14.9	34.1	22.7	46.5	30.9
11.7	7.78	16.9	11.2	23.9	15.9	32.7	21.8	51.3	34.1	74.6	49.6		12.5	7.99	5.31	11.4	7.56	15.5	10.3	21.5	14.3	32.6	21.7	44.5	29.6
10.8	7.19	15.6	10.4	22.1	14.7	30.3	20.1	47.4	31.5	68.9	45.9		13.0	7.67	5.11	10.9	7.26	14.9	9.90	20.7	13.7	31.3	20.8	42.6	28.4
10.0	6.67	14.5	9.62	20.5	13.6	28.1	18.7	43.9	29.2	63.9	42.5		13.5	7.38	4.91	10.5	6.99	14.3	9.52	19.9	13.2	30.1	20.0	40.9	27.2
9.32	6.20	13.4	8.94	19.0	12.7	26.1	17.4	40.9	29.2	59.4	39.6		14.0	7.12	4.73	10.1	6.73	13.8	9.17	19.1	12.7	29.0	19.3	39.4	26.2
8.69	5.78	12.5	8.34	17.7	11.8	24.3	16.2	38.1	29.2	55.4	36.9		14.5	6.87	4.57	9.76	6.50	13.3	8.85	18.5	12.3	27.9	18.6	37.9	25.2
8.12	5.40	11.7	7.79	16.6	11.0	22.7	15.1	35.6	29.2	51.8	34.5		15.0	6.63	4.41	9.43	6.28	12.8	8.55	17.8	11.9	27.0	17.9	36.6	24.4

Properties

Available Strength in Tensile Yielding, kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
573	381	676	450	791	526	924	615	1140	758	1330	884
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
549	366	647	431	757	505	885	590	1090	727	1270	848
Available Strength in Shear, kN											
ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v
154	103	177	118	207	138	239	159	290	193	343	229
Available Strength in Flexure about Y-Y axis, kN·m											
ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b
8.44	5.62	11.0	7.30	14.2	9.42	17.9	11.9	24.9	16.6	32.3	21.5

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.07	4.37	1.18	4.72	1.30	5.04	1.41	5.45	1.59	5.93	1.77	6.32
Area, × 10^2 mm^2											
27.10		31.96		37.39		43.71		53.84		62.83	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1505	117.3	2211	168.9	3134	239.4	4369	328.5	6947	513.5	9994	745.7
r_y, × 10 mm											
2.08		2.30		2.53		2.74		3.09		3.45	
r_x/r_y											
3.58		3.62		3.62		3.65		3.68		3.66	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPEO Shapes

F_y = 235 MPa

Shape	IPEO 330		IPEO 360		IPEO 400		IPEO 450		IPEO 500		IPEO 550		IPEO 600	
Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
	Available Compressive Strength, kN													
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	1540	1020	1780	1180	2040	1360	2490	1660	2890	1920	3300	2200	4160	2770
1.00	1480	984	1720	1140	1980	1320	2420	1610	2820	1870	3220	2140	4070	2710
1.50	1410	939	1650	1100	1900	1270	2340	1550	2730	1810	3130	2080	3960	2640
2.00	1320	879	1560	1040	1800	1200	2220	1480	2610	1730	3000	1990	3820	2540
2.50	1210	808	1440	961	1680	1120	2090	1390	2460	1640	2840	1890	3630	2420
3.00	1090	728	1320	876	1550	1030	1930	1290	2290	1520	2660	1770	3420	2280
3.50	969	645	1180	786	1400	931	1760	1170	2100	1400	2460	1640	3190	2120
4.00	841	560	1040	693	1250	830	1590	1060	1910	1270	2250	1490	2940	1960
4.50	717	477	904	601	1100	729	1410	937	1710	1140	2030	1350	2680	1780
5.00	600	399	771	513	947	630	1230	820	1510	1000	1810	1200	2420	1610
5.50	496	330	646	430	806	536	1060	708	1320	877	1590	1060	2160	1440
6.00	416	277	542	361	678	451	903	601	1130	755	1390	924	1900	1270
6.50	355	236	462	308	577	384	769	512	967	643	1190	793	1660	1110
7.00	306	204	399	265	498	331	663	441	834	555	1030	684	1440	955
7.50	267	177	347	231	434	288	578	384	726	483	895	596	1250	832
8.00	234	156	305	203	381	254	508	338	638	425	787	523	1100	731
8.50	207	138	270	180	338	225	450	299	566	376	697	464	974	648
9.00	185	123	241	160	301	200	401	267	504	336	622	414	869	578
9.50	166	111	216	144	270	180	360	240	453	301	558	371	780	519
10.0	150	99.7	195	130	244	162	325	216	409	272	503	335	704	468
10.5	136	90.5	177	118	221	147	295	196	371	247	457	304	638	425
11.0	124	82.4	161	107	202	134	269	179	338	225	416	277	581	387
11.5	113	75.4	148	98.3	184	123	246	164	309	206	381	253	532	354
12.0	104	69.3	136	90.2	169	113	226	150	284	189	350	233	489	325
12.5	95.9	63.8	125	83.2	156	104	208	138	261	174	322	214	450	300
13.0	88.7	59.0	116	76.9	144	96.0	192	128	242	161	298	198	416	277
13.5	82.3	54.7	107	71.3	134	89.0	178	119	224	149	276	184	386	257
14.0	76.5	50.9	99.6	66.3	124	82.8	166	110	208	139	257	171	359	239
14.5	71.3	47.4	92.9	61.8	116	77.2	155	103	194	129	239	159	335	223
15.0	66.6	44.3	86.8	57.8	108	72.1	144	96.1	182	121	224	149	313	208

Shape	IPEO 330		IPEO 360		IPEO 400		IPEO 450		IPEO 500		IPEO 550		IPEO 600	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	Available Flexural Strength, kN·m													
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	199	133	251	167	318	211	433	288	553	368	690	459	685	456
1.00	199	133	251	167	318	211	433	288	553	368	690	459	685	456
1.50	199	133	251	167	318	211	433	288	553	368	690	459	685	456
2.00	197	131	250	167	318	211	433	288	553	368	690	459	682	454
2.50	189	126	241	160	307	205	422	281	543	361	682	454	662	441
3.00	181	121	231	154	295	197	407	270	523	348	658	438	643	428
3.50	173	115	222	148	284	189	391	260	504	335	634	422	623	415
4.00	165	110	212	141	272	181	375	250	484	322	610	406	604	402
4.50	157	105	203	135	260	173	360	239	464	309	586	390	585	389
5.00	149	99.4	193	128	248	165	344	229	445	296	562	374	565	376
5.50	141	94.1	183	122	236	157	328	218	425	283	538	358	546	363
6.00	133	88.8	174	116	224	149	313	208	405	270	514	342	526	350
6.50	125	83.5	164	109	212	141	297	198	386	257	490	326	507	337
7.00	115	76.7	154	103	200	133	281	187	366	244	466	310	487	324
7.50	106	70.5	142	94.2	185	123	266	177	347	231	443	294	468	311
8.00	98.0	65.2	131	87.0	171	113	245	163	322	214	417	277	448	298
8.50	91.3	60.7	122	80.9	158	105	227	151	298	198	385	256	429	285
9.00	85.4	56.8	114	75.6	148	98.3	211	140	277	184	357	238	410	272
9.50	80.2	53.4	107	70.9	138	92.1	198	132	259	172	334	222	386	257
10.0	75.7	50.4	100	66.8	130	86.7	186	124	243	162	313	208	365	243
10.5	71.7	47.7	95.0	63.2	123	81.9	175	117	229	153	295	196	347	231
11.0	68.0	45.3	90.1	60.0	117	77.6	166	111	217	144	279	185	330	219
11.5	64.8	43.1	85.8	57.1	111	73.8	158	105	206	137	264	176	315	209
12.0	61.8	41.1	81.8	54.4	106	70.3	150	100	196	130	251	167	301	200
12.5	59.1	39.3	78.2	52.0	101	67.2	144	95.5	187	124	239	159	288	192
13.0	56.7	37.7	74.9	49.8	96.7	64.3	137	91.4	179	119	229	152	276	184
13.5	54.4	36.2	71.9	47.8	92.7	61.7	132	87.6	171	114	219	146	266	177
14.0	52.3	34.8	69.1	46.0	89.1	59.3	126	84.1	164	109	210	140	256	170
14.5	50.4	33.5	66.5	44.3	85.7	57.0	122	80.9	158	105	202	134	247	164
15.0	48.6	32.3	64.1	42.7	82.6	55.0	117	78.0	152	101	194	129	238	158

Properties

Available Strength in Tensile Yielding, kN													
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t
1540	1020	1780	1180	2040	1360	2490	1660	2890	1920	3300	2200	4160	2770
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN													
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t
1470	980	1700	1140	1950	1300	2380	1590	2770	1850	3160	2110	3990	2660
Available Strength in Shear, kN													
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
400	267	472	315	553	368	707	472	856	571	996	664	1290	860
Available Strength in Flexure about Y-Y axis, kN·m													
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
39.1	26.0	48.0	31.9	56.9	37.9	72.1	48.0	86.4	57.5	102	67.6	135	90.1

Limiting Unbraced Lengths, m													
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.87	6.63	1.98	6.98	2.07	7.17	2.16	7.50	2.25	7.71	2.34	7.94	2.46	8.71
Area, × 10^2 mm^2													
72.62		84.13		96.39		117.7		136.7		156.1		196.8	
Moment of Inertia, × 10^4 mm^4													
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
13910	960.4	19050	1251	26750	1564	40920	2085	57780	2622	79160	3224	118300	4521
r_y, × 10 mm													
3.64		3.86		4.03		4.21		4.38		4.55		4.79	
r_x/r_y													
3.80		3.90		4.13		4.43		4.69		4.95		5.12	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPEO Shapes

F_y = 275 MPa

IPEO 180		IPEO 200		IPEO 220		IPEO 240		IPEO 270		IPEO 300		Shape	IPEO 180		IPEO 200		IPEO 220		IPEO 240		IPEO 270		IPEO 300	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
671	446	791	526	925	616	1080	720	1330	887	1560	1030	0.00	46.8	31.1	61.7	41.1	79.5	52.9	102	67.6	142	94.6	184	122
586	390	708	471	845	562	1000	666	1250	834	1480	985	1.00	46.7	31.1	61.7	41.1	79.5	52.9	102	67.6	142	94.6	184	122
495	330	617	411	754	502	908	604	1160	773	1390	927	1.50	43.5	29.0	58.5	38.9	76.6	51.0	99.3	66.1	142	94.3	184	122
391	260	509	339	643	428	793	528	1040	694	1280	851	2.00	40.3	26.8	54.6	36.3	71.9	47.8	93.7	62.4	134	89.5	178	118
289	192	397	264	524	348	666	443	910	605	1140	762	2.50	37.1	24.7	50.7	33.7	67.1	44.7	88.1	58.6	127	84.7	169	112
203	135	293	195	408	271	538	358	769	512	1000	666	3.00	33.9	22.6	46.8	31.1	62.4	41.5	82.5	54.9	120	79.8	160	106
149	99.2	215	143	304	203	417	278	631	420	853	568	3.50	30.7	20.4	42.9	28.5	57.6	38.3	76.9	51.2	113	75.0	151	100
114	76.0	165	110	233	155	320	213	501	333	710	472	4.00	27.1	18.1	39.0	25.9	52.9	35.2	71.3	47.5	105	70.2	142	94.6
90.2	60.0	130	86.5	184	123	252	168	396	263	575	383	4.50	23.7	15.8	34.3	22.8	47.8	31.8	65.7	43.7	98.2	65.4	133	88.6
73.1	48.6	105	70.1	149	99.2	205	136	320	213	466	310	5.00	21.0	14.0	30.3	20.2	42.1	28.0	59.2	39.4	91.0	60.5	124	82.7
60.4	40.2	87.1	57.9	123	82.0	169	112	265	176	385	256	5.50	18.9	12.6	27.2	18.1	37.7	25.1	52.9	35.2	82.2	54.7	115	76.8
50.7	33.8	73.2	48.7	104	68.9	142	94.5	222	148	324	215	6.00	17.2	11.5	24.7	16.4	34.1	22.7	47.8	31.8	74.0	49.2	104	69.1
43.2	28.8	62.3	41.5	88.3	58.7	121	80.5	190	126	276	183	6.50	15.8	10.5	22.6	15.1	31.2	20.7	43.6	29.0	67.3	44.7	94.0	62.5
37.3	24.8	53.8	35.8	76.1	50.6	104	69.4	163	109	238	158	7.00	14.6	9.70	20.9	13.9	28.7	19.1	40.1	26.7	61.7	41.0	85.8	57.1
32.5	21.6	46.8	31.2	66.3	44.1	90.9	60.5	142	94.7	207	138	7.50	13.6	9.02	19.4	12.9	26.6	17.7	37.1	24.7	57.0	37.9	79.0	52.6
28.5	19.0	41.2	27.4	58.3	38.8	79.9	53.2	125	83.3	182	121	8.00	12.7	8.43	18.1	12.0	24.8	16.5	34.6	23.0	53.0	35.3	73.2	48.7
25.3	16.8	36.5	24.3	51.6	34.3	70.8	47.1	111	73.8	161	107	8.50	11.9	7.91	17.0	11.3	23.2	15.5	32.4	21.5	49.5	32.9	68.3	45.4
22.6	15.0	32.5	21.6	46.0	30.6	63.1	42.0	98.9	65.8	144	95.7	9.00	11.2	7.45	16.0	10.6	21.9	14.5	30.4	20.3	46.5	30.9	63.9	42.5
20.2	13.5	29.2	19.4	41.3	27.5	56.7	37.7	88.7	59.0	129	85.9	9.50	10.6	7.05	15.1	10.0	20.6	13.7	28.7	19.1	43.8	29.1	60.1	40.0
18.3	12.2	26.3	17.5	37.3	24.8	51.1	34.0	80.1	53.3	117	77.5	10.0	10.0	6.68	14.3	9.52	19.6	13.0	27.2	18.1	41.4	27.6	56.8	37.8
16.6	11.0	23.9	15.9	33.8	22.5	46.4	30.9	72.6	48.3	106	70.3	10.5	9.55	6.35	13.6	9.05	18.6	12.4	25.8	17.2	39.3	26.2	53.8	35.8
15.1	10.0	21.8	14.5	30.8	20.5	42.3	28.1	66.2	44.0	96.3	64.1	11.0	9.10	6.06	13.0	8.63	17.7	11.8	24.6	16.4	37.4	24.9	51.1	34.0
13.8	9.19	19.9	13.3	28.2	18.8	38.7	25.7	60.6	40.3	88.1	58.6	11.5	8.70	5.79	12.4	8.24	16.9	11.2	23.5	15.6	35.7	23.7	48.7	32.4
12.7	8.44	18.3	12.2	25.9	17.2	35.5	23.6	55.6	37.0	80.9	53.8	12.0	8.33	5.54	11.9	7.89	16.2	10.8	22.5	14.9	34.1	22.7	46.5	30.9
11.7	7.78	16.9	11.2	23.9	15.9	32.7	21.8	51.3	34.1	74.6	49.6	12.5	7.99	5.31	11.4	7.56	15.5	10.3	21.5	14.3	32.6	21.7	44.5	29.6
10.8	7.19	15.6	10.4	22.1	14.7	30.3	20.1	47.4	31.5	68.9	45.9	13.0	7.67	5.11	10.9	7.26	14.9	9.90	20.7	13.7	31.3	20.8	42.6	28.4
10.0	6.67	14.5	9.62	20.5	13.6	28.1	18.7	43.9	29.2	63.9	42.5	13.5	7.38	4.91	10.5	6.99	14.3	9.52	19.9	13.2	30.1	20.0	40.9	27.2
9.32	6.20	13.4	8.94	19.0	12.7	26.1	17.4	40.9	27.2	59.4	39.6	14.0	7.12	4.73	10.1	6.73	13.8	9.17	19.1	12.7	29.0	19.3	39.4	26.2
8.69	5.78	12.5	8.34	17.7	11.8	24.3	16.2	38.1	25.3	55.4	36.9	14.5	6.87	4.57	9.76	6.50	13.3	8.85	18.5	12.3	27.9	18.6	37.9	25.2
8.12	5.40	11.7	7.79	16.6	11.0	22.7	15.1	35.6	23.7	51.8	34.5	15.0	6.63	4.41	9.43	6.28	12.8	8.55	17.8	11.9	27.0	17.9	36.6	24.4

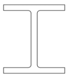
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
671	446	791	526	925	616	1080	720	1330	887	1560	1030
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
655	437	773	515	904	603	1060	705	1300	868	1520	1010
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
180	120	207	138	242	161	280	186	339	226	401	268
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
9.88	6.57	12.8	8.54	16.6	11.0	20.9	13.9	29.1	19.4	37.8	25.1

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.987	3.82	1.09	4.13	1.20	4.42	1.30	4.78	1.47	5.2	1.64	5.59
Area, × 10^2 mm^2											
27.10		31.96		37.39		43.71		53.84		62.83	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1505	117.3	2211	168.9	3134	239.4	4369	328.5	6947	513.5	9994	745.7
r_y, × 10 mm											
2.08		2.30		2.53		2.74		3.09		3.45	
r_x/r_y											
3.58		3.62		3.62		3.65		3.68		3.66	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPEO Shapes

F_y = 275 MPa

Available Compressive Strength, kN

Shape	IPEO 330		IPEO 360		IPEO 400		IPEO 450		IPEO 500		IPEO 550		IPEO 600	
Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	1800	1200	2080	1390	2390	1590	2910	1940	3380	2250	3860	2570	4870	3240
1.00	1720	1140	2000	1330	2300	1530	2820	1880	3280	2180	3760	2500	4750	3160
1.50	1630	1080	1910	1270	2200	1460	2710	1800	3160	2100	3630	2410	4600	3060
2.00	1510	1000	1780	1180	2070	1370	2550	1700	3000	1990	3450	2300	4400	2930
2.50	1370	908	1630	1080	1910	1270	2370	1580	2800	1860	3240	2160	4160	2760
3.00	1210	805	1460	974	1730	1150	2170	1440	2570	1710	3000	1990	3870	2580
3.50	1050	697	1290	858	1540	1020	1950	1300	2330	1550	2740	1820	3570	2370
4.00	889	591	1110	741	1340	894	1720	1140	2080	1380	2460	1640	3240	2160
4.50	737	490	943	627	1150	767	1500	996	1830	1220	2180	1450	2910	1940
5.00	600	399	781	520	972	647	1280	852	1580	1050	1910	1270	2580	1720
5.50	496	330	646	430	806	536	1070	715	1350	898	1650	1100	2260	1500
6.00	416	277	542	361	678	451	903	601	1130	755	1400	931	1950	1300
6.50	355	236	462	308	577	384	769	512	967	643	1190	793	1670	1110
7.00	306	204	399	265	498	331	663	441	834	555	1030	684	1440	955
7.50	267	177	347	231	434	288	578	384	726	483	895	596	1250	832
8.00	234	156	305	203	381	254	508	338	638	425	787	523	1100	731
8.50	207	138	270	180	338	225	450	299	566	376	697	464	974	648
9.00	185	123	241	160	301	200	401	267	504	336	622	414	869	578
9.50	166	111	216	144	270	180	360	240	453	301	558	371	780	519
10.0	150	99.7	195	130	244	162	325	216	409	272	503	335	704	468
10.5	136	90.5	177	118	221	147	295	196	371	247	457	304	638	425
11.0	124	82.4	161	107	202	134	269	179	338	225	416	277	581	387
11.5	113	75.4	148	98.3	184	123	246	164	309	206	381	253	532	354
12.0	104	69.3	136	90.2	169	113	226	150	284	189	350	233	489	325
12.5	95.9	63.8	125	83.2	156	104	208	138	261	174	322	214	450	300
13.0	88.7	59.0	116	76.9	144	96.0	192	128	242	161	298	198	416	277
13.5	82.3	54.7	107	71.3	134	89.0	178	119	224	149	276	184	386	257
14.0	76.5	50.9	99.6	66.3	124	82.8	166	110	208	139	257	171	359	239
14.5	71.3	47.4	92.9	61.8	116	77.2	155	103	194	129	239	159	335	223
15.0	66.6	44.3	86.8	57.8	108	72.1	144	96.1	182	121	224	149	313	208

Available Flexural Strength, kN·m

Shape	IPEO 330		IPEO 360		IPEO 400		IPEO 450		IPEO 500		IPEO 550		IPEO 600	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	233	155	294	195	372	247	506	337	647	430	808	537	1110	736
1.00	233	155	294	195	372	247	506	337	647	430	808	537	1110	736
1.50	233	155	294	195	372	247	506	337	647	430	808	537	1110	736
2.00	227	151	289	192	369	245	506	337	647	430	808	537	1110	736
2.50	217	144	276	184	353	235	485	323	625	416	786	523	1090	724
3.00	206	137	263	175	337	224	464	309	598	398	754	502	1050	698
3.50	195	130	250	167	321	214	443	295	572	381	722	480	1010	671
4.00	184	123	238	158	305	203	422	281	546	363	690	459	969	645
4.50	174	116	225	149	289	192	402	267	520	346	658	438	929	618
5.00	163	108	212	141	273	182	381	253	493	328	626	416	890	592
5.50	152	101	199	132	257	171	360	239	467	311	594	395	850	565
6.00	140	93.2	186	124	241	160	339	225	441	293	562	374	810	539
6.50	126	84.1	170	113	223	148	318	211	415	276	530	353	770	512
7.00	115	76.7	154	103	202	134	291	193	385	256	498	331	730	486
7.50	106	70.5	142	94.2	185	123	266	177	351	233	455	302	691	459
8.00	98.0	65.2	131	87.0	171	113	245	163	322	214	417	277	642	427
8.50	91.3	60.7	122	80.9	158	105	227	151	298	198	385	256	593	394
9.00	85.4	56.8	114	75.6	148	98.3	211	140	277	184	357	238	550	366
9.50	80.2	53.4	107	70.9	138	92.1	198	132	259	172	334	222	514	342
10.0	75.7	50.4	100	66.8	130	86.7	186	124	243	162	313	208	482	321
10.5	71.7	47.7	95.0	63.2	123	81.9	175	117	229	153	295	196	454	302
11.0	68.0	45.3	90.1	60.0	117	77.6	166	111	217	144	279	185	429	285
11.5	64.8	43.1	85.8	57.1	111	73.8	158	105	206	137	264	176	407	271
12.0	61.8	41.1	81.8	54.4	106	70.3	150	100	196	130	251	167	387	257
12.5	59.1	39.3	78.2	52.0	101	67.2	144	95.5	187	124	239	159	369	245
13.0	56.7	37.7	74.9	49.8	96.7	64.3	137	91.4	179	119	229	152	352	234
13.5	54.4	36.2	71.9	47.8	92.7	61.7	132	87.6	171	114	219	146	337	224
14.0	52.3	34.8	69.1	46.0	89.1	59.3	126	84.1	164	109	210	140	324	215
14.5	50.4	33.5	66.5	44.3	85.7	57.0	122	80.9	158	105	202	134	311	207
15.0	48.6	32.3	64.1	42.7	82.6	55.0	117	78.0	152	101	194	129	299	199

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1800	1200	2080	1390	2390	1590	2910	1940	3380	2250	3860	2570	4870	3240

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1760	1170	2030	1360	2330	1550	2850	1900	3310	2200	3780	2520	4760	3170

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
468	312	553	368	647	431	828	552	1000	668	1170	777	1510	1010

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
45.8	30.5	56.2	37.4	66.6	44.3	84.4	56.2	101	67.3	119	79.1	158	105

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.73	5.87	1.83	6.18	1.91	6.36	2.00	6.66	2.08	6.86	2.16	7.07	2.27	7.73

Area, × 10^2 mm^2

72.62	84.13	96.39	117.7	136.7	156.1	196.8

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
13910	960.4	19050	1251	26750	1564	40920	2085	57780	2622	79160	3224	118300	4521

r_y, × 10 mm

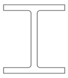
3.64	3.86	4.03	4.21	4.38	4.55	4.79

r_x / r_y

3.80	3.90	4.13	4.43	4.69	4.95	5.12

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces IPEO Shapes

F_y = 355 MPa

IPEO 180		IPEO 200		IPEO 220		IPEO 240		IPEO 270		IPEO 300		Shape	IPEO 180		IPEO 200		IPEO 220		IPEO 240		IPEO 270		IPEO 300	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
866	576	1020	679	1190	795	1400	929	1720	1140	2010	1340	0.00	60.4	40.2	79.7	53.0	103	68.3	131	87.2	184	122	238	158
728	484	886	589	1060	707	1260	841	1590	1060	1880	1250	1.00	59.0	39.3	79.2	52.7	103	68.3	131	87.2	184	122	238	158
585	389	741	493	917	610	1110	742	1440	958	1740	1160	1.50	53.8	35.8	72.8	48.4	95.7	63.7	125	82.9	179	119	236	157
432	287	578	385	746	497	935	622	1250	835	1560	1040	2.00	48.5	32.3	66.4	44.2	88.0	58.6	115	76.8	167	111	222	148
292	194	420	279	573	381	746	497	1050	699	1350	900	2.50	43.3	28.8	60.0	39.9	80.3	53.4	106	70.8	155	103	207	138
203	135	293	195	414	276	566	377	846	563	1140	756	3.00	38.1	25.3	53.6	35.6	72.6	48.3	97.3	64.7	143	95.5	193	129
149	99.2	215	143	304	203	417	278	654	435	925	615	3.50	31.8	21.2	46.5	30.9	64.8	43.1	88.1	58.6	132	87.6	179	119
114	76.0	165	110	233	155	320	213	501	333	728	485	4.00	27.1	18.1	39.4	26.2	55.3	36.8	78.2	52.0	120	79.8	165	110
90.2	60.0	130	86.5	184	123	252	168	396	263	575	383	4.50	23.7	15.8	34.3	22.8	47.8	31.8	67.4	44.8	106	70.6	150	100
73.1	48.6	105	70.1	149	99.2	205	136	320	213	466	310	5.00	21.0	14.0	30.3	20.2	42.1	28.0	59.2	39.4	92.6	61.6	132	87.7
60.4	40.2	87.1	57.9	123	82.0	169	112	265	176	385	256	5.50	18.9	12.6	27.2	18.1	37.7	25.1	52.9	35.2	82.2	54.7	116	77.3
50.7	33.8	73.2	48.7	104	68.9	142	94.5	222	148	324	215	6.00	17.2	11.5	24.7	16.4	34.1	22.7	47.8	31.8	74.0	49.2	104	69.1
43.2	28.8	62.3	41.5	88.3	58.7	121	80.5	190	126	276	183	6.50	15.8	10.5	22.6	15.1	31.2	20.7	43.6	29.0	67.3	44.7	94.0	62.5
37.3	24.8	53.8	35.8	76.1	50.6	104	69.4	163	109	238	158	7.00	14.6	9.70	20.9	13.9	28.7	19.1	40.1	26.7	61.7	41.0	85.8	57.1
32.5	21.6	46.8	31.2	66.3	44.1	90.9	60.5	142	94.7	207	138	7.50	13.6	9.02	19.4	12.9	26.6	17.7	37.1	24.7	57.0	37.9	79.0	52.6
28.5	19.0	41.2	27.4	58.3	38.8	79.9	53.2	125	83.3	182	121	8.00	12.7	8.43	18.1	12.0	24.8	16.5	34.6	23.0	53.0	35.3	73.2	48.7
25.3	16.8	36.5	24.3	51.6	34.3	70.8	47.1	111	73.8	161	107	8.50	11.9	7.91	17.0	11.3	23.2	15.5	32.4	21.5	49.5	32.9	68.3	45.4
22.6	15.0	32.5	21.6	46.0	30.6	63.1	42.0	98.9	65.8	144	95.7	9.00	11.2	7.45	16.0	10.6	21.9	14.5	30.4	20.3	46.5	30.9	63.9	42.5
20.2	13.5	29.2	19.4	41.3	27.5	56.7	37.7	88.7	59.0	129	85.9	9.50	10.6	7.05	15.1	10.0	20.6	13.7	28.7	19.1	43.8	29.1	60.1	40.0
18.3	12.2	26.3	17.5	37.3	24.8	51.1	34.0	80.1	53.3	117	77.5	10.0	10.0	6.68	14.3	9.52	19.6	13.0	27.2	18.1	41.4	27.6	56.8	37.8
16.6	11.0	23.9	15.9	33.8	22.5	46.4	30.9	72.6	48.3	106	70.3	10.5	9.55	6.35	13.6	9.05	18.6	12.4	25.8	17.2	39.3	26.2	53.8	35.8
15.1	10.0	21.8	14.5	30.8	20.5	42.3	28.1	66.2	44.0	96.3	64.1	11.0	9.10	6.06	13.0	8.63	17.7	11.8	24.6	16.4	37.4	24.9	51.1	34.0
13.8	9.19	19.9	13.3	28.2	18.8	38.7	25.7	60.6	40.3	88.1	58.6	11.5	8.70	5.79	12.4	8.24	16.9	11.2	23.5	15.6	35.7	23.7	48.7	32.4
12.7	8.44	18.3	12.2	25.9	17.2	35.5	23.6	55.6	37.0	80.9	53.8	12.0	8.33	5.54	11.9	7.89	16.2	10.8	22.5	14.9	34.1	22.7	46.5	30.9
11.7	7.78	16.9	11.2	23.9	15.9	32.7	21.8	51.3	34.1	74.6	49.6	12.5	7.99	5.31	11.4	7.56	15.5	10.3	21.5	14.3	32.6	21.7	44.5	29.6
10.8	7.19	15.6	10.4	22.1	14.7	30.3	20.1	47.4	31.5	68.9	45.9	13.0	7.67	5.11	10.9	7.26	14.9	9.90	20.7	13.7	31.3	20.8	42.6	28.4
10.0	6.67	14.5	9.62	20.5	13.6	28.1	18.7	43.9	29.2	63.9	42.5	13.5	7.38	4.91	10.5	6.99	14.3	9.52	19.9	13.2	30.1	20.0	40.9	27.2
9.32	6.20	13.4	8.94	19.0	12.7	26.1	17.4	40.9	27.2	59.4	39.6	14.0	7.12	4.73	10.1	6.73	13.8	9.17	19.1	12.7	29.0	19.3	39.4	26.2
8.69	5.78	12.5	8.34	17.7	11.8	24.3	16.2	38.1	25.3	55.4	36.9	14.5	6.87	4.57	9.76	6.50	13.3	8.85	18.5	12.3	27.9	18.6	37.9	25.2
8.12	5.40	11.7	7.79	16.6	11.0	22.7	15.1	35.6	23.7	51.8	34.5	15.0	6.63	4.41	9.43	6.28	12.8	8.55	17.8	11.9	27.0	17.9	36.6	24.4

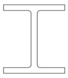
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
866	576	1020	679	1190	795	1400	929	1720	1140	2010	1340
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
747	498	881	587	1030	687	1200	803	1480	989	1730	1150
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
233	155	267	178	312	208	361	241	438	292	518	345
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
12.8	8.48	16.6	11.0	21.4	14.2	27.0	17.9	37.6	25.0	48.8	32.4

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.869	3.10	0.961	3.36	1.06	3.61	1.14	3.91	1.29	4.28	1.44	4.62
Area, × 10^2 mm^2											
27.10		31.96		37.39		43.71		53.84		62.83	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
1505	117.3	2211	168.9	3134	239.4	4369	328.5	6947	513.5	9994	745.7
r_y, × 10 mm											
2.08		2.30		2.53		2.74		3.09		3.45	
r_x / r_y											
3.58		3.62		3.62		3.65		3.68		3.66	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPEO Shapes

F_y = 355 MPa

Available Compressive Strength, kN

Shape	IPEO 330		IPEO 360		IPEO 400		IPEO 450		IPEO 500^c		IPEO 550^c		IPEO 600	
Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	2320	1540	2690	1790	3080	2050	3760	2500	4370	2910	4990	3320	6290	4180
1.00	2190	1460	2560	1700	2940	1960	3600	2400	4200	2790	4780	3180	6080	4050
1.50	2040	1360	2400	1600	2770	1850	3420	2270	4000	2660	4600	3060	5840	3890
2.00	1850	1230	2200	1460	2560	1700	3170	2110	3730	2480	4310	2870	5510	3670
2.50	1630	1080	1960	1300	2310	1530	2880	1920	3420	2270	3970	2640	5120	3410
3.00	1390	926	1710	1130	2030	1350	2570	1710	3070	2040	3600	2390	4680	3110
3.50	1160	770	1450	963	1750	1160	2240	1490	2700	1800	3190	2130	4210	2800
4.00	935	622	1200	797	1470	976	1910	1270	2330	1550	2790	1850	3720	2470
4.50	740	493	964	642	1200	802	1590	1060	1970	1310	2390	1590	3240	2150
5.00	600	399	781	520	976	649	1300	865	1630	1090	2010	1340	2770	1840
5.50	496	330	646	430	806	536	1070	715	1350	899	1660	1110	2330	1550
6.00	416	277	542	361	678	451	903	601	1130	755	1400	931	1950	1300
6.50	355	236	462	308	577	384	769	512	967	643	1190	793	1670	1110
7.00	306	204	399	265	498	331	663	441	834	555	1030	684	1440	955
7.50	267	177	347	231	434	288	578	384	726	483	895	596	1250	832
8.00	234	156	305	203	381	254	508	338	638	425	787	523	1100	731
8.50	207	138	270	180	338	225	450	299	566	376	697	464	974	648
9.00	185	123	241	160	301	200	401	267	504	336	622	414	869	578
9.50	166	111	216	144	270	180	360	240	453	301	558	371	780	519
10.0	150	99.7	195	130	244	162	325	216	409	272	503	335	704	468
10.5	136	90.5	177	118	221	147	295	196	371	247	457	304	638	425
11.0	124	82.4	161	107	202	134	269	179	338	225	416	277	581	387
11.5	113	75.4	148	98.3	184	123	246	164	309	206	381	253	532	354
12.0	104	69.3	136	90.2	169	113	226	150	284	189	350	233	489	325
12.5	95.9	63.8	125	83.2	156	104	208	138	261	174	322	214	450	300
13.0	88.7	59.0	116	76.9	144	96.0	192	128	242	161	298	198	416	277
13.5	82.3	54.7	107	71.3	134	89.0	178	119	224	149	276	184	386	257
14.0	76.5	50.9	99.6	66.3	124	82.8	166	110	208	139	257	171	359	239
14.5	71.3	47.4	92.9	61.8	116	77.2	155	103	194	129	239	159	335	223
15.0	66.6	44.3	86.8	57.8	108	72.1	144	96.1	182	121	224	149	313	208

Available Flexural Strength, kN·m

Shape	IPEO 330		IPEO 360		IPEO 400		IPEO 450		IPEO 500		IPEO 550		IPEO 600	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	301	200	379	252	480	319	654	435	835	555	1040	694	1430	950
1.00	301	200	379	252	480	319	654	435	835	555	1040	694	1430	950
1.50	301	200	379	252	480	319	654	435	835	555	1040	694	1430	950
2.00	285	189	363	241	464	309	638	424	821	546	1030	687	1430	950
2.50	267	178	342	228	438	292	604	402	779	518	982	653	1370	908
3.00	250	166	322	214	413	275	571	380	738	491	931	620	1300	866
3.50	233	155	301	200	387	258	538	358	696	463	881	586	1240	824
4.00	216	144	280	187	362	241	504	336	655	435	830	553	1180	782
4.50	198	132	260	173	336	224	471	313	613	408	780	519	1110	740
5.00	179	119	239	159	311	207	438	291	571	380	729	485	1050	698
5.50	157	104	212	141	280	186	404	269	530	353	679	452	986	656
6.00	140	93.2	188	125	248	165	359	239	477	318	623	415	922	614
6.50	126	84.1	170	113	223	148	321	214	426	284	555	369	854	568
7.00	115	76.7	154	103	202	134	291	193	385	256	500	333	769	512
7.50	106	70.5	142	94.2	185	123	266	177	351	233	455	302	700	466
8.00	98.0	65.2	131	87.0	171	113	245	163	322	214	417	277	642	427
8.50	91.3	60.7	122	80.9	158	105	227	151	298	198	385	256	593	394
9.00	85.4	56.8	114	75.6	148	98.3	211	140	277	184	357	238	550	366
9.50	80.2	53.4	107	70.9	138	92.1	198	132	259	172	334	222	514	342
10.0	75.7	50.4	100	66.8	130	86.7	186	124	243	162	313	208	482	321
10.5	71.7	47.7	95.0	63.2	123	81.9	175	117	229	153	295	196	454	302
11.0	68.0	45.3	90.1	60.0	117	77.6	166	111	217	144	279	185	429	285
11.5	64.8	43.1	85.8	57.1	111	73.8	158	105	206	137	264	176	407	271
12.0	61.8	41.1	81.8	54.4	106	70.3	150	100	196	130	251	167	387	257
12.5	59.1	39.3	78.2	52.0	101	67.2	144	95.5	187	124	239	159	369	245
13.0	56.7	37.7	74.9	49.8	96.7	64.3	137	91.4	179	119	229	152	352	234
13.5	54.4	36.2	71.9	47.8	92.7	61.7	132	87.6	171	114	219	146	337	224
14.0	52.3	34.8	69.1	46.0	89.1	59.3	126	84.1	164	109	210	140	324	215
14.5	50.4	33.5	66.5	44.3	85.7	57.0	122	80.9	158	105	202	134	311	207
15.0	48.6	32.3	64.1	42.7	82.6	55.0	117	78.0	152	101	194	129	299	199

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2320	1540	2690	1790	3080	2050	3760	2500	4370	2910	4990	3320	6290	4180

Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2000	1330	2320	1550	2660	1770	3240	2160	3770	2510	4300	2870	5420	3620

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
605	403	713	476	835	556	1070	712	1290	862	1500	1000	1950	1300

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
59.1	39.3	72.5	48.2	86	57.2	109	72.5	131	86.8	154	102	205	136

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.52	4.85	1.61	5.12	1.68	5.29	1.76	5.54	1.83	5.73	1.90	5.92	2.00	6.43

Area, × 10^2 mm^2

72.62	84.13	96.39	117.7	136.7	156.1	196.8

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
13910	960.4	19050	1251	26750	1564	40920	2085	57780	2622	79160	3224	118300	4521

r_y × 10, mm

3.64	3.86	4.03	4.21	4.38	4.55	4.79

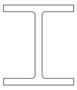
r_x / r_y

3.80	3.90	4.13	4.43	4.69	4.95	5.12

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

^{c} Shape is slender for compression; tabulated values have been adjusted accordingly.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces IPN Shapes

F_y = 235 MPa

IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180		Shape		IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
160	107	224	149	300	200	387	258	482	321	590	393	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	4.82	3.21	8.42	5.60	13.5	8.95	20.2	13.4	28.8	19.1	39.6	26.3
87.8	58.4	145	96.5	216	144	300	200	392	261	498	331		1.00	4.40	2.92	7.83	5.21	12.7	8.48	19.4	12.9	28.0	18.7	39.0	25.9
43.5	28.9	84.0	55.9	143	95.2	218	145	302	201	402	268		1.50	4.00	2.66	7.18	4.78	11.8	7.83	18.1	12.0	26.2	17.5	36.7	24.4
24.4	16.3	47.3	31.5	83.7	55.7	140	93.0	210	140	298	199		2.00	3.60	2.39	6.53	4.35	10.8	7.19	16.7	11.1	24.4	16.3	34.4	22.9
15.6	10.4	30.3	20.1	53.6	35.6	89.4	59.5	137	90.9	203	135		2.50	3.20	2.13	5.88	3.91	9.84	6.55	15.3	10.2	22.7	15.1	32.1	21.3
10.9	7.23	21.0	14.0	37.2	24.7	62.1	41.3	94.8	63.1	141	94.0		3.00	2.77	1.85	5.23	3.48	8.87	5.90	14.0	9.31	20.9	13.9	29.8	19.8
7.98	5.31	15.4	10.3	27.3	18.2	45.6	30.4	69.7	46.4	104	69.0		3.50	2.37	1.58	4.50	3.00	7.85	5.22	12.6	8.40	19.1	12.7	27.4	18.3
6.11	4.07	11.8	7.86	20.9	13.9	34.9	23.2	53.3	35.5	79.4	52.9		4.00	2.07	1.38	3.93	2.61	6.83	4.54	11.1	7.40	17.2	11.5	25.1	16.7
4.83	3.21	9.34	6.21	16.5	11.0	27.6	18.4	42.1	28.0	62.8	41.8		4.50	1.84	1.22	3.48	2.32	6.04	4.02	9.83	6.54	15.2	10.1	22.6	15.0
3.91	2.60	7.56	5.03	13.4	8.91	22.4	14.9	34.1	22.7	50.8	33.8		5.00	1.65	1.10	3.13	2.08	5.42	3.61	8.81	5.86	13.6	9.06	20.2	13.4
3.23	2.15	6.25	4.16	11.1	7.36	18.5	12.3	28.2	18.8	42.0	28.0		5.50	1.50	0.997	2.84	1.89	4.92	3.27	7.98	5.31	12.3	8.20	18.3	12.1
2.72	1.81	5.25	3.49	9.30	6.19	15.5	10.3	23.7	15.8	35.3	23.5		6.00	1.37	0.913	2.60	1.73	4.50	3.00	7.30	4.86	11.3	7.50	16.7	11.1
2.31	1.54	4.48	2.98	7.92	5.27	13.2	8.80	20.2	13.4	30.1	20.0		6.50	1.27	0.843	2.40	1.59	4.15	2.76	6.73	4.48	10.4	6.90	15.3	10.2
2.00	1.33	3.86	2.57	6.83	4.54	11.4	7.59	17.4	11.6	25.9	17.3		7.00	1.18	0.782	2.22	1.48	3.85	2.56	6.24	4.15	9.62	6.40	14.2	9.45
1.74	1.16	3.36	2.24	5.95	3.96	9.93	6.61	15.2	10.1	22.6	15.0		7.50	1.10	0.730	2.07	1.38	3.59	2.39	5.81	3.87	8.96	5.96	13.2	8.81
1.53	1.02	2.95	1.97	5.23	3.48	8.73	5.81	13.3	8.87	19.9	13.2		8.00	1.03	0.684	1.94	1.29	3.36	2.24	5.45	3.62	8.39	5.58	12.4	8.24
1.35	0.901	2.62	1.74	4.63	3.08	7.73	5.15	11.8	7.86	17.6	11.7		8.50	0.967	0.644	1.83	1.22	3.16	2.11	5.12	3.41	7.89	5.25	11.6	7.75
1.21	0.803	2.33	1.55	4.13	2.75	6.90	4.59	10.5	7.01	15.7	10.4		9.00	0.913	0.608	1.73	1.15	2.99	1.99	4.83	3.22	7.44	4.95	11.0	7.31
1.08	0.721	2.10	1.39	3.71	2.47	6.19	4.12	9.46	6.29	14.1	9.37		9.50	0.865	0.576	1.64	1.09	2.83	1.88	4.58	3.05	7.05	4.69	10.4	6.92
0.978	0.651	1.89	1.26	3.35	2.23	5.59	3.72	8.53	5.68	12.7	8.46		10.0	0.822	0.547	1.55	1.03	2.69	1.79	4.35	2.89	6.69	4.45	9.87	6.57
0.887	0.590	1.72	1.14	3.04	2.02	5.07	3.37	7.74	5.15	11.5	7.67		10.5	0.783	0.521	1.48	0.984	2.56	1.70	4.14	2.75	6.37	4.24	9.39	6.25
0.808	0.538	1.56	1.04	2.77	1.84	4.62	3.07	7.05	4.69	10.5	6.99		11.0	0.747	0.497	1.41	0.939	2.44	1.62	3.95	2.63	6.08	4.04	8.96	5.96
0.739	0.492	1.43	0.951	2.53	1.68	4.23	2.81	6.45	4.29	9.61	6.39		11.5	0.714	0.475	1.35	0.898	2.33	1.55	3.77	2.51	5.81	3.87	8.56	5.70
0.679	0.452	1.31	0.874	2.32	1.55	3.88	2.58	5.93	3.94	8.83	5.87		12.0	0.685	0.455	1.29	0.861	2.24	1.49	3.62	2.41	5.57	3.70	8.20	5.46
0.626	0.416	1.21	0.805	2.14	1.43	3.58	2.38	5.46	3.63	8.13	5.41		12.5	0.657	0.437	1.24	0.826	2.15	1.43	3.47	2.31	5.34	3.55	7.87	5.24
0.579	0.385	1.12	0.744	1.98	1.32	3.31	2.20	5.05	3.36	7.52	5.00		13.0	0.632	0.420	1.19	0.794	2.06	1.37	3.34	2.22	5.13	3.42	7.57	5.03
0.537	0.357	1.04	0.690	1.84	1.22	3.07	2.04	4.68	3.12	6.97	4.64		13.5	0.608	0.405	1.15	0.765	1.99	1.32	3.21	2.14	4.94	3.29	7.28	4.85
0.499	0.332	0.965	0.642	1.71	1.14	2.85	1.90	4.35	2.90	6.49	4.31		14.0	0.587	0.390	1.11	0.737	1.92	1.27	3.10	2.06	4.77	3.17	7.02	4.67
0.465	0.309	0.899	0.598	1.59	1.06	2.66	1.77	4.06	2.70	6.05	4.02		14.5	0.566	0.377	1.07	0.712	1.85	1.23	2.99	1.99	4.60	3.06	6.78	4.51
0.435	0.289	0.840	0.559	1.49	0.990	2.48	1.65	3.79	2.52	5.65	3.76		15.0	0.547	0.364	1.03	0.688	1.79	1.19	2.89	1.92	4.45	2.96	6.55	4.36

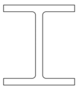
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
160	107	224	149	300	200	387	258	482	321	590	393
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
153	102	215	143	288	192	371	247	462	308	565	377
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
44.0	29.3	63.5	42.3	86.3	57.5	113	75.0	142	94.8	175	117
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
1.02	0.675	1.65	1.10	2.51	1.67	3.62	2.41	5.01	3.33	6.70	4.46

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.467	2.89	0.549	3.13	0.632	3.40	0.719	3.69	0.796	3.99	0.878	4.28
Area, × 10^2 mm^2											
7.58		10.60		14.20		18.30		22.80		27.90	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
77.80	6.29	171.0	12.20	328.0	21.50	573.0	35.20	935.0	54.70	1450	81.30
r_y, × 10 mm											
0.910		1.07		1.23		1.40		1.55		1.71	
r_x/r_y											
3.52		3.75		3.91		4.01		4.13		4.21	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPN Shapes

F_y = 235 MPa

IPN 200		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300		Shape	IPN 200		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
706	470	835	556	975	649	1130	750	1290	858	1460	971	**0.00**	52.9	35.2	68.5	45.6	87.1	58.0	109	72.3	134	88.9	161	107
613	408	739	492	880	585	1030	684	1190	790	1350	900	**1.00**	52.6	35.0	68.5	45.6	87.1	58.0	109	72.3	134	88.9	161	107
513	341	635	422	773	515	915	609	1070	712	1230	818	**1.50**	49.7	33.1	65.3	43.4	84.0	55.9	106	70.3	131	87.1	159	106
399	266	513	341	646	430	778	518	926	616	1080	716	**2.00**	46.8	31.2	61.7	41.1	79.8	53.1	101	67.0	125	83.2	152	101
290	193	389	259	512	341	632	421	768	511	907	604	**2.50**	43.9	29.2	58.2	38.7	75.6	50.3	95.7	63.7	119	79.3	145	96.6
202	135	279	186	386	257	490	326	611	407	736	490	**3.00**	41.0	27.3	54.7	36.4	71.3	47.5	90.7	60.4	113	75.4	139	92.2
149	98.8	205	136	284	189	365	243	466	310	575	383	**3.50**	38.1	25.4	51.1	34.0	67.1	44.6	85.8	57.1	108	71.5	132	87.7
114	75.7	157	104	217	145	279	186	357	237	440	293	**4.00**	35.2	23.4	47.6	31.7	62.9	41.8	80.8	53.8	102	67.7	125	83.3
89.9	59.8	124	82.5	172	114	221	147	282	187	348	231	**4.50**	32.3	21.5	44.1	29.3	58.6	39.0	75.8	50.5	95.9	63.8	118	78.8
72.8	48.4	100	66.8	139	92.5	179	119	228	152	282	188	**5.00**	29.0	19.3	40.3	26.8	54.4	36.2	70.9	47.2	90.1	59.9	112	74.3
60.2	40.0	83.0	55.2	115	76.5	148	98.3	189	125	233	155	**5.50**	26.2	17.4	36.4	24.2	49.6	33.0	65.9	43.9	84.2	56.0	105	69.9
50.5	33.6	69.8	46.4	96.6	64.2	124	82.6	158	105	196	130	**6.00**	23.9	15.9	33.2	22.1	45.2	30.1	60.0	39.9	77.9	51.8	98.3	65.4
43.1	28.7	59.4	39.5	82.3	54.7	106	70.4	135	89.8	167	111	**6.50**	21.9	14.6	30.5	20.3	41.5	27.6	55.1	36.6	71.4	47.5	90.5	60.2
37.1	24.7	51.2	34.1	70.9	47.2	91.2	60.7	116	77.5	144	95.7	**7.00**	20.3	13.5	28.2	18.7	38.3	25.5	50.9	33.8	65.9	43.9	83.5	55.6
32.4	21.5	44.6	29.7	61.8	41.1	79.5	52.9	101	67.5	125	83.3	**7.50**	18.9	12.6	26.2	17.4	35.7	23.7	47.3	31.5	61.3	40.8	77.5	51.6
28.4	18.9	39.2	26.1	54.3	36.1	69.8	46.5	89.1	59.3	110	73.2	**8.00**	17.7	11.8	24.5	16.3	33.3	22.2	44.2	29.4	57.2	38.1	72.4	48.2
25.2	16.8	34.8	23.1	48.1	32.0	61.9	41.2	79.0	52.5	97.5	64.9	**8.50**	16.6	11.1	23.0	15.3	31.3	20.8	41.5	27.6	53.7	35.7	67.9	45.2
22.5	14.9	31.0	20.6	42.9	28.6	55.2	36.7	70.4	46.9	87.0	57.9	**9.00**	15.7	10.4	21.7	14.4	29.5	19.6	39.1	26.0	50.6	33.6	64.0	42.5
20.2	13.4	27.8	18.5	38.5	25.6	49.5	33.0	63.2	42.1	78.1	51.9	**9.50**	14.8	9.87	20.5	13.7	27.9	18.6	36.9	24.6	47.8	31.8	60.4	40.2
18.2	12.1	25.1	16.7	34.8	23.1	44.7	29.7	57.0	38.0	70.5	46.9	**10.0**	14.1	9.37	19.5	13.0	26.5	17.6	35.0	23.3	45.3	30.2	57.3	38.1
16.5	11.0	22.8	15.2	31.5	21.0	40.5	27.0	51.7	34.4	63.9	42.5	**10.5**	13.4	8.91	18.5	12.3	25.2	16.7	33.3	22.2	43.1	28.7	54.5	36.2
15.0	10.0	20.8	13.8	28.7	19.1	36.9	24.6	47.1	31.4	58.2	38.7	**11.0**	12.8	8.50	17.7	11.8	24.0	16.0	31.8	21.1	41.1	27.3	51.9	34.5
13.8	9.15	19.0	12.6	26.3	17.5	33.8	22.5	43.1	28.7	53.3	35.4	**11.5**	12.2	8.13	16.9	11.2	22.9	15.3	30.3	20.2	39.2	26.1	49.6	33.0
12.6	8.41	17.4	11.6	24.1	16.1	31.0	20.7	39.6	26.4	48.9	32.6	**12.0**	11.7	7.78	16.2	10.8	22.0	14.6	29.0	19.3	37.6	25.0	47.5	31.6
11.6	7.75	16.1	10.7	22.2	14.8	28.6	19.0	36.5	24.3	45.1	30.0	**12.5**	11.2	7.47	15.5	10.3	21.1	14.0	27.9	18.5	36.0	24.0	45.5	30.3
10.8	7.16	14.9	9.89	20.6	13.7	26.4	17.6	33.8	22.5	41.7	27.7	**13.0**	10.8	7.18	14.9	9.93	20.2	13.5	26.8	17.8	34.6	23.0	43.7	29.1
9.98	6.64	13.8	9.17	19.1	12.7	24.5	16.3	31.3	20.8	38.7	25.7	**13.5**	10.4	6.91	14.4	9.55	19.5	13.0	25.8	17.1	33.3	22.2	42.1	28.0
9.28	6.18	12.8	8.52	17.7	11.8	22.8	15.2	29.1	19.4	35.9	23.9	**14.0**	10.0	6.66	13.8	9.21	18.8	12.5	24.8	16.5	32.1	21.3	40.5	27.0
8.65	5.76	11.9	7.95	16.5	11.0	21.3	14.1	27.1	18.1	33.5	22.3	**14.5**	9.66	6.43	13.4	8.89	18.1	12.0	24.0	15.9	31.0	20.6	39.1	26.0
8.09	5.38	11.2	7.43	15.5	10.3	19.9	13.2	25.4	16.9	31.3	20.8	**15.0**	9.34	6.21	12.9	8.59	17.5	11.6	23.1	15.4	29.9	19.9	37.8	25.1

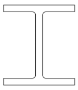
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
706	470	835	556	975	649	1130	750	1290	858	1460	971
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
676	451	800	533	934	622	1080	720	1240	824	1400	932
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
212	141	251	168	294	196	345	230	399	266	457	305
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
8.80	5.85	11.2	7.45	14.1	9.39	17.3	11.5	20.7	13.8	24.4	16.3

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.96	4.60	1.04	4.91	1.13	5.24	1.19	5.55	1.26	5.84	1.31	6.12
Area, × 10^2 mm^2											
33.40		39.50		46.10		53.30		61.00		69.00	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
2140	117.0	3060	162.0	4250	221.0	5740	288.0	7590	364.0	9800	451.0
r_y, × 10 mm											
1.87		2.02		2.20		2.32		2.45		2.56	
r_x/r_y											
4.28		4.36		4.36		4.48		4.53		4.65	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPN Shapes

F_y = 235 MPa

IPN 320		IPN 340		IPN 360		IPN 380		IPN 400		IPN 450		Shape		IPN 320		IPN 340		IPN 360		IPN 380		IPN 400		IPN 450	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design		$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1640	1090	1830	1220	2050	1360	2260	1510	2500	1660	3110	2070	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	193	129	228	152	270	180	313	209	363	241	508	338
1530	1020	1720	1140	1930	1290	2140	1430	2370	1580	2980	1980		1.00	193	129	228	152	270	180	313	209	363	241	508	338
1400	934	1590	1060	1800	1190	2000	1330	2230	1480	2830	1880		1.50	191	127	227	151	270	179	313	209	363	241	508	338
1240	827	1420	946	1620	1080	1820	1210	2040	1350	2620	1750		2.00	184	122	219	145	260	173	304	202	353	235	500	333
1060	706	1230	820	1420	943	1610	1070	1820	1210	2390	1590		2.50	176	117	210	140	250	166	293	195	341	227	484	322
876	583	1030	689	1200	801	1380	921	1580	1050	2120	1410		3.00	168	112	201	134	240	160	282	187	328	219	469	312
698	464	842	560	993	661	1160	771	1340	891	1850	1230		3.50	161	107	192	128	230	153	271	180	316	210	453	301
539	359	662	440	794	529	944	628	1110	736	1580	1050		4.00	153	102	184	122	221	147	260	173	304	202	437	291
426	284	523	348	628	418	751	500	889	592	1320	877		4.50	145	96.6	175	116	211	140	249	166	292	194	422	281
345	230	424	282	508	338	608	405	720	479	1080	717		5.00	137	91.4	166	111	201	134	238	158	280	186	406	270
285	190	350	233	420	280	503	334	595	396	891	593		5.50	130	86.3	157	105	191	127	227	151	267	178	390	260
240	159	294	196	353	235	422	281	500	333	748	498		6.00	122	81.2	149	98.9	181	121	216	144	255	170	375	249
204	136	251	167	301	200	360	239	426	284	638	424		6.50	114	75.8	140	93.0	172	114	205	136	243	162	359	239
176	117	216	144	259	173	310	206	368	245	550	366		7.00	105	69.9	130	86.4	162	108	194	129	231	153	343	228
153	102	188	125	226	150	270	180	320	213	479	319		7.50	97.5	64.9	120	80.1	150	99.8	182	121	218	145	328	218
135	89.7	165	110	199	132	238	158	281	187	421	280		8.00	91.0	60.6	112	74.8	140	93.1	170	113	204	136	312	208
119	79.5	147	97.5	176	117	210	140	249	166	373	248		8.50	85.3	56.8	105	70.1	131	87.3	159	106	191	127	295	196
107	70.9	131	87.0	157	104	188	125	222	148	333	221		9.00	80.3	53.5	99.1	65.9	123	82.1	150	99.5	180	120	277	184
95.6	63.6	117	78.1	141	93.7	168	112	200	133	299	199		9.50	75.9	50.5	93.6	62.3	117	77.5	141	94.0	170	113	261	174
86.3	57.4	106	70.5	127	84.6	152	101	180	120	269	179		10.0	71.9	47.9	88.7	59.0	110	73.5	134	89.0	161	107	247	165
78.3	52.1	96.1	63.9	115	76.7	138	91.8	163	109	244	163		10.5	68.4	45.5	84.3	56.1	105	69.8	127	84.5	153	101	235	156
71.3	47.5	87.5	58.2	105	69.9	126	83.6	149	99.0	223	148		11.0	65.2	43.4	80.3	53.4	99.9	66.5	121	80.5	145	96.6	223	149
65.3	43.4	80.1	53.3	96.1	63.9	115	76.5	136	90.6	204	136		11.5	62.2	41.4	76.7	51.0	95.4	63.5	116	76.9	139	92.2	213	142
59.9	39.9	73.5	48.9	88.3	58.7	106	70.3	125	83.2	187	124		12.0	59.6	39.6	73.4	48.8	91.3	60.7	111	73.5	133	88.2	204	136
55.2	36.7	67.8	45.1	81.3	54.1	97.3	64.7	115	76.7	172	115		12.5	57.1	38.0	70.4	46.8	87.5	58.2	106	70.5	127	84.6	195	130
51.1	34.0	62.7	41.7	75.2	50.0	90.0	59.9	107	70.9	159	106		13.0	54.9	36.5	67.6	45.0	84.1	55.9	102	67.7	122	81.2	187	125
47.4	31.5	58.1	38.7	69.7	46.4	83.4	55.5	98.8	65.8	148	98.4		13.5	52.8	35.1	65.0	43.3	80.9	53.8	97.9	65.1	117	78.1	180	120
44.0	29.3	54.0	35.9	64.8	43.1	77.6	51.6	91.9	61.1	137	91.5		14.0	50.8	33.8	62.6	41.7	77.9	51.8	94.3	62.7	113	75.2	174	115
41.0	27.3	50.4	33.5	60.5	40.2	72.3	48.1	85.7	57.0	128	85.3		14.5	49.1	32.6	60.4	40.2	75.1	50.0	90.9	60.5	109	72.5	167	111
38.4	25.5	47.1	31.3	56.5	37.6	67.6	45.0	80.0	53.3	120	79.7		15.0	47.4	31.5	58.4	38.8	72.6	48.3	87.8	58.4	105	70.1	162	108

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1640	1090	1830	1220	2050	1360	2260	1510	2500	1660	3110	2070
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1570	1050	1760	1170	1960	1310	2170	1440	2390	1590	2980	1980
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
519	346	585	390	660	440	734	489	812	541	1030	685
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
28.7	19.1	33.3	22.2	38.6	25.7	44.3	29.5	50.4	33.5	68.7	45.7

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.37	6.41	1.44	6.68	1.49	7.02	1.55	7.34	1.61	7.6	1.76	8.32
Area, × 10^2 mm^2											
77.70		86.70		97.00		107.0		118.0		147.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
12510	555.0	15700	674.0	19610	818.0	24010	975.0	29210	1160	45850	1730
r_y, × 10 mm											
2.67		2.80		2.90		3.02		3.13		3.43	
r_x/r_y											
4.7600		4.8200		4.9000		4.9700		5.0200		5.1600	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPN Shapes

F_y = 235 MPa

IPN 500		IPN 550		IPN 600		Shape	IPN 500		IPN 550		IPN 600	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN							Available Flexural Strength, kN·m					
LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD
3790	2520	4480	2980	5370	3570	0.00	685	456	897	597	1150	767
3650	2430	4350	2890	5230	3480	1.00	685	456	897	597	1150	767
3490	2320	4180	2780	5050	3360	1.50	685	456	897	597	1150	767
3280	2180	3960	2640	4820	3210	2.00	682	454	897	597	1150	767
3020	2010	3700	2460	4540	3020	2.50	662	441	876	583	1140	756
2740	1820	3400	2260	4210	2800	3.00	643	428	852	567	1110	737
2440	1620	3070	2040	3860	2570	3.50	623	415	828	551	1080	718
2130	1420	2740	1820	3480	2320	4.00	604	402	803	535	1050	699
1830	1210	2400	1600	3100	2070	4.50	585	389	779	519	1020	680
1540	1020	2070	1380	2730	1820	5.00	565	376	755	503	993	661
1280	849	1760	1170	2370	1580	5.50	546	363	731	486	964	642
1070	713	1480	987	2020	1350	6.00	526	350	707	470	936	622
913	608	1260	841	1720	1150	6.50	507	337	683	454	907	603
788	524	1090	725	1490	989	7.00	487	324	659	438	878	584
686	456	949	631	1290	861	7.50	468	311	635	422	850	565
603	401	834	555	1140	757	8.00	448	298	611	406	821	546
534	355	739	492	1010	671	8.50	429	285	587	390	792	527
476	317	659	438	899	598	9.00	410	272	563	374	764	508
428	285	591	394	807	537	9.50	386	257	538	358	735	489
386	257	534	355	728	485	10.0	365	243	510	339	706	470
350	233	484	322	661	440	10.5	347	231	483	321	676	449
319	212	441	294	602	400	11.0	330	219	459	306	642	427
292	194	404	269	551	366	11.5	315	209	438	291	612	407
268	178	371	247	506	337	12.0	301	200	418	278	584	389
247	164	342	227	466	310	12.5	288	192	400	266	559	372
228	152	316	210	431	287	13.0	276	184	384	255	536	357
212	141	293	195	400	266	13.5	266	177	369	245	515	343
197	131	272	181	372	247	14.0	256	170	355	236	495	330
184	122	254	169	346	230	14.5	247	164	342	228	477	318
172	114	237	158	324	215	15.0	238	158	330	220	461	306

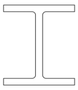
Properties

Available Strength in Tensile Yielding, kN					
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
3790	2520	4480	2980	5370	3570
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN					
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
3620	2420	4290	2860	5140	3430
Available Strength in Shear, kN					
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1270	846	1470	982	1830	1220
Available Strength in Flexure about Y-Y axis, kN·m					
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
90.7	60.3	118	78.6	147	97.9

Limiting Unbraced Lengths, m					
L_p	L_r	L_p	L_r	L_p	L_r
1.91	9.06	2.06	9.58	2.20	10.4
Area, × 10^2 mm^2					
179.0		212.0		254.0	
Moment of Inertia, × 10^4 mm^4					
I_x	I_y	I_x	I_y	I_x	I_y
68740	2480	99180	3490	138800	4674
r_y, × 10 mm					
3.72		4.02		4.29	
r_x/r_y					
5.27		5.37		5.45	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPN Shapes

F_y = 275 MPa

IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180		Shape	IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
188	125	262	175	351	234	453	301	564	375	691	459	**0.00**	5.64	3.75	9.85	6.55	15.7	10.5	23.6	15.7	33.7	22.4	46.3	30.8
92.8	61.7	158	105	239	159	336	224	443	295	566	376	**1.00**	5.01	3.34	8.97	5.97	14.6	9.73	22.4	14.9	32.4	21.5	45.1	30.0
43.5	28.9	84.0	55.9	148	98.2	232	154	327	217	441	293	**1.50**	4.46	2.97	8.07	5.37	13.3	8.85	20.5	13.6	29.9	19.9	41.9	27.9
24.4	16.3	47.3	31.5	83.7	55.7	140	93.0	213	142	311	207	**2.00**	3.91	2.60	7.17	4.77	12.0	7.96	18.6	12.4	27.4	18.2	38.7	25.8
15.6	10.4	30.3	20.1	53.6	35.6	89.4	59.5	137	90.9	203	135	**2.50**	3.35	2.23	6.27	4.17	10.6	7.07	16.7	11.1	24.9	16.6	35.6	23.7
10.9	7.23	21.0	14.0	37.2	24.7	62.1	41.3	94.8	63.1	141	94.0	**3.00**	2.77	1.85	5.29	3.52	9.24	6.15	14.9	9.90	22.5	15.0	32.4	21.5
7.98	5.31	15.4	10.3	27.3	18.2	45.6	30.4	69.7	46.4	104	69.0	**3.50**	2.37	1.58	4.50	3.00	7.85	5.22	12.8	8.52	19.9	13.3	29.2	19.4
6.11	4.07	11.8	7.86	20.9	13.9	34.9	23.2	53.3	35.5	79.4	52.9	**4.00**	2.07	1.38	3.93	2.61	6.83	4.54	11.1	7.40	17.2	11.5	25.6	17.1
4.83	3.21	9.34	6.21	16.5	11.0	27.6	18.4	42.1	28.0	62.8	41.8	**4.50**	1.84	1.22	3.48	2.32	6.04	4.02	9.83	6.54	15.2	10.1	22.6	15.0
3.91	2.60	7.56	5.03	13.4	8.91	22.4	14.9	34.1	22.7	50.8	33.8	**5.00**	1.65	1.10	3.13	2.08	5.42	3.61	8.81	5.86	13.6	9.06	20.2	13.4
3.23	2.15	6.25	4.16	11.1	7.36	18.5	12.3	28.2	18.8	42.0	28.0	**5.50**	1.50	0.997	2.84	1.89	4.92	3.27	7.98	5.31	12.3	8.20	18.3	12.1
2.72	1.81	5.25	3.49	9.30	6.19	15.5	10.3	23.7	15.8	35.3	23.5	**6.00**	1.37	0.913	2.60	1.73	4.50	3.00	7.30	4.86	11.3	7.50	16.7	11.1
2.31	1.54	4.48	2.98	7.92	5.27	13.2	8.80	20.2	13.4	30.1	20.0	**6.50**	1.27	0.843	2.40	1.59	4.15	2.76	6.73	4.48	10.4	6.90	15.3	10.2
2.00	1.33	3.86	2.57	6.83	4.54	11.4	7.59	17.4	11.6	25.9	17.3	**7.00**	1.18	0.782	2.22	1.48	3.85	2.56	6.24	4.15	9.62	6.40	14.2	9.45
1.74	1.16	3.36	2.24	5.95	3.96	9.93	6.61	15.2	10.1	22.6	15.0	**7.50**	1.10	0.730	2.07	1.38	3.59	2.39	5.81	3.87	8.96	5.96	13.2	8.81
1.53	1.02	2.95	1.97	5.23	3.48	8.73	5.81	13.3	8.87	19.9	13.2	**8.00**	1.03	0.684	1.94	1.29	3.36	2.24	5.45	3.62	8.39	5.58	12.4	8.24
1.35	0.901	2.62	1.74	4.63	3.08	7.73	5.15	11.8	7.86	17.6	11.7	**8.50**	0.967	0.644	1.83	1.22	3.16	2.11	5.12	3.41	7.89	5.25	11.6	7.75
1.21	0.803	2.33	1.55	4.13	2.75	6.90	4.59	10.5	7.01	15.7	10.4	**9.00**	0.913	0.608	1.73	1.15	2.99	1.99	4.83	3.22	7.44	4.95	11.0	7.31
1.08	0.721	2.10	1.39	3.71	2.47	6.19	4.12	9.46	6.29	14.1	9.37	**9.50**	0.865	0.576	1.64	1.09	2.83	1.88	4.58	3.05	7.05	4.69	10.4	6.92
0.978	0.651	1.89	1.26	3.35	2.23	5.59	3.72	8.53	5.68	12.7	8.46	**10.0**	0.822	0.547	1.55	1.03	2.69	1.79	4.35	2.89	6.69	4.45	9.87	6.57
0.887	0.590	1.72	1.14	3.04	2.02	5.07	3.37	7.74	5.15	11.5	7.67	**10.5**	0.783	0.521	1.48	0.984	2.56	1.70	4.14	2.75	6.37	4.24	9.39	6.25
0.808	0.538	1.56	1.04	2.77	1.84	4.62	3.07	7.05	4.69	10.5	6.99	**11.0**	0.747	0.497	1.41	0.939	2.44	1.62	3.95	2.63	6.08	4.04	8.96	5.96
0.739	0.492	1.43	0.951	2.53	1.68	4.23	2.81	6.45	4.29	9.61	6.39	**11.5**	0.714	0.475	1.35	0.898	2.33	1.55	3.77	2.51	5.81	3.87	8.56	5.70
0.679	0.452	1.31	0.874	2.32	1.55	3.88	2.58	5.93	3.94	8.83	5.87	**12.0**	0.685	0.455	1.29	0.861	2.24	1.49	3.62	2.41	5.57	3.70	8.20	5.46
0.626	0.416	1.21	0.805	2.14	1.43	3.58	2.38	5.46	3.63	8.13	5.41	**12.5**	0.657	0.437	1.24	0.826	2.15	1.43	3.47	2.31	5.34	3.55	7.87	5.24
0.579	0.385	1.12	0.744	1.98	1.32	3.31	2.20	5.05	3.36	7.52	5.00	**13.0**	0.632	0.420	1.19	0.794	2.06	1.37	3.34	2.22	5.13	3.42	7.57	5.03
0.537	0.357	1.04	0.690	1.84	1.22	3.07	2.04	4.68	3.12	6.97	4.64	**13.5**	0.608	0.405	1.15	0.765	1.99	1.32	3.21	2.14	4.94	3.29	7.28	4.85
0.499	0.332	0.965	0.642	1.71	1.14	2.85	1.90	4.35	2.90	6.49	4.31	**14.0**	0.587	0.390	1.11	0.737	1.92	1.27	3.10	2.06	4.77	3.17	7.02	4.67
0.465	0.309	0.899	0.598	1.59	1.06	2.66	1.77	4.06	2.70	6.05	4.02	**14.5**	0.566	0.377	1.07	0.712	1.85	1.23	2.99	1.99	4.60	3.06	6.78	4.51
0.435	0.289	0.840	0.559	1.49	0.990	2.48	1.65	3.79	2.52	5.65	3.76	**15.0**	0.547	0.364	1.03	0.688	1.79	1.19	2.89	1.92	4.45	2.96	6.55	4.36

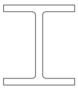
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
188	125	262	175	351	234	453	301	564	375	691	459
Available Strength in Tensile Rupture (A_e = 0.75A_g), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
183	122	256	171	343	229	443	295	551	368	675	450
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
51.5	34.3	74.3	49.5	101	67.3	132	87.8	166	111	205	137
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
1.19	0.79	1.93	1.29	2.93	1.95	4.24	2.82	5.86	3.90	7.84	5.22

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.432	2.48	0.508	2.69	5.84	2.93	0.664	3.18	0.736	3.45	0.812	3.71
Area, × 10^2 mm^2											
7.58		10.60		14.20		18.30		22.80		27.90	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
77.80	6.29	171.0	12.20	328.0	21.50	573.0	35.20	935.0	54.70	1450	81.30
r_y, × 10 mm											
0.910		1.07		1.23		1.40		1.55		1.71	
r_x/r_y											
3.52		3.75		3.91		4.01		4.13		4.21	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

IPN Shapes

F_y = 275 MPa

Shape	IPN 200		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300		IPN 200		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300	
Design	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	Available Compressive Strength, kN												Available Flexural Strength, kN·m											
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	827	550	978	650	1140	759	1320	878	1510	1000	1710	1140	61.9	41.2	80.2	53.4	102	67.8	127	84.6	156	104	189	125
1.00	700	466	847	564	1010	673	1180	788	1370	912	1560	1040	61.0	40.6	79.8	53.1	102	67.8	127	84.6	156	104	189	125
1.50	568	378	709	472	870	579	1030	688	1210	807	1400	930	57.0	37.9	74.9	49.9	96.7	64.3	122	81.0	151	100	183	122
2.00	424	282	552	367	705	469	855	569	1020	681	1200	796	53.0	35.3	70.1	46.6	90.9	60.5	115	76.5	143	95.2	174	116
2.50	291	194	400	266	537	358	670	446	823	547	979	652	49.0	32.6	65.2	43.4	85.1	56.6	108	72.0	135	89.8	165	110
3.00	202	135	279	186	386	257	497	330	630	419	767	510	45.0	29.9	60.4	40.2	79.3	52.7	101	67.4	127	84.5	156	104
3.50	149	98.8	205	136	284	189	365	243	466	310	575	383	41.0	27.3	55.5	36.9	73.5	48.9	94.5	62.9	119	79.2	147	97.5
4.00	114	75.7	157	104	217	145	279	186	357	237	440	293	37.0	24.6	50.7	33.7	67.7	45.0	87.7	58.3	111	73.9	137	91.4
4.50	89.9	59.8	124	82.5	172	114	221	147	282	187	348	231	32.5	21.6	45.3	30.1	61.9	41.2	80.9	53.8	103	68.6	128	85.2
5.00	72.8	48.4	100	66.8	139	92.5	179	119	228	152	282	188	29.0	19.3	40.3	26.8	55.1	36.7	73.4	48.8	95.0	63.2	119	79.1
5.50	60.2	40.0	83.0	55.2	115	76.5	148	98.3	189	125	233	155	26.2	17.4	36.4	24.2	49.6	33.0	66.0	43.9	85.7	57.0	109	72.4
6.00	50.5	33.6	69.8	46.4	96.6	64.2	124	82.6	158	105	196	130	23.9	15.9	33.2	22.1	45.2	30.1	60.0	39.9	77.9	51.8	98.8	65.7
6.50	43.1	28.7	59.4	39.5	82.3	54.7	106	70.4	135	89.8	167	111	21.9	14.6	30.5	20.3	41.5	27.6	55.1	36.6	71.4	47.5	90.5	60.2
7.00	37.1	24.7	51.2	34.1	70.9	47.2	91.2	60.7	116	77.5	144	95.7	20.3	13.5	28.2	18.7	38.3	25.5	50.9	33.8	65.9	43.9	83.5	55.6
7.50	32.4	21.5	44.6	29.7	61.8	41.1	79.5	52.9	101	67.5	125	83.3	18.9	12.6	26.2	17.4	35.7	23.7	47.3	31.5	61.3	40.8	77.5	51.6
8.00	28.4	18.9	39.2	26.1	54.3	36.1	69.8	46.5	89.1	59.3	110	73.2	17.7	11.8	24.5	16.3	33.3	22.2	44.2	29.4	57.2	38.1	72.4	48.2
8.50	25.2	16.8	34.8	23.1	48.1	32.0	61.9	41.2	79.0	52.5	97.5	64.9	16.6	11.1	23.0	15.3	31.3	20.8	41.5	27.6	53.7	35.7	67.9	45.2
9.00	22.5	14.9	31.0	20.6	42.9	28.6	55.2	36.7	70.4	46.9	87.0	57.9	15.7	10.4	21.7	14.4	29.5	19.6	39.1	26.0	50.6	33.6	64.0	42.5
9.50	20.2	13.4	27.8	18.5	38.5	25.6	49.5	33.0	63.2	42.1	78.1	51.9	14.8	9.87	20.5	13.7	27.9	18.6	36.9	24.6	47.8	31.8	60.4	40.2
10.0	18.2	12.1	25.1	16.7	34.8	23.1	44.7	29.7	57.0	38.0	70.5	46.9	14.1	9.37	19.5	13.0	26.5	17.6	35.0	23.3	45.3	30.2	57.3	38.1
10.5	16.5	11.0	22.8	15.2	31.5	21.0	40.5	27.0	51.7	34.4	63.9	42.5	13.4	8.91	18.5	12.3	25.2	16.7	33.3	22.2	43.1	28.7	54.5	36.2
11.0	15.0	10.0	20.8	13.8	28.7	19.1	36.9	24.6	47.1	31.4	58.2	38.7	12.8	8.50	17.7	11.8	24.0	16.0	31.8	21.1	41.1	27.3	51.9	34.5
11.5	13.8	9.15	19.0	12.6	26.3	17.5	33.8	22.5	43.1	28.7	53.3	35.4	12.2	8.13	16.9	11.2	22.9	15.3	30.3	20.2	39.2	26.1	49.6	33.0
12.0	12.6	8.41	17.4	11.6	24.1	16.1	31.0	20.7	39.6	26.4	48.9	32.6	11.7	7.78	16.2	10.8	22.0	14.6	29.0	19.3	37.6	25.0	47.5	31.6
12.5	11.6	7.75	16.1	10.7	22.2	14.8	28.6	19.0	36.5	24.3	45.1	30.0	11.2	7.47	15.5	10.3	21.1	14.0	27.9	18.5	36.0	24.0	45.5	30.3
13.0	10.8	7.16	14.9	9.89	20.6	13.7	26.4	17.6	33.8	22.5	41.7	27.7	10.8	7.18	14.9	9.93	20.2	13.5	26.8	17.8	34.6	23.0	43.7	29.1
13.5	9.98	6.64	13.8	9.17	19.1	12.7	24.5	16.3	31.3	20.8	38.7	25.7	10.4	6.91	14.4	9.55	19.5	13.0	25.8	17.1	33.3	22.2	42.1	28.0
14.0	9.28	6.18	12.8	8.52	17.7	11.8	22.8	15.2	29.1	19.4	35.9	23.9	10.0	6.66	13.8	9.21	18.8	12.5	24.8	16.5	32.1	21.3	40.5	27.0
14.5	8.65	5.76	11.9	7.95	16.5	11.0	21.3	14.1	27.1	18.1	33.5	22.3	9.66	6.43	13.4	8.89	18.1	12.0	24.0	15.9	31.0	20.6	39.1	26.0
15.0	8.09	5.38	11.2	7.43	15.5	10.3	19.9	13.2	25.4	16.9	31.3	20.8	9.34	6.21	12.9	8.59	17.5	11.6	23.1	15.4	29.9	19.9	37.8	25.1

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
827	550	978	650	1140	759	1320	878	1510	1000	1710	1140
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
808	539	955	637	1120	743	1290	859	1480	984	1670	1110
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
248	165	294	196	345	230	403	269	467	311	535	356
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
10.3	6.85	13.1	8.72	16.5	11.0	20.2	13.4	24.2	16.1	28.6	19.0

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.888	3.99	0.959	4.26	1.04	4.55	1.10	4.82	1.16	5.07	1.22	5.31
Area, × 10^2 mm^2											
33.40		39.50		46.10		53.30		61.00		69.00	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
2140	117.0	3060	162.0	4250	221.0	5740	288.0	7590	364.0	9800	451.0
r_y, × 10 mm											
1.87		2.02		2.20		2.32		2.45		2.56	
r_x/r_y											
4.28		4.36		4.36		4.48		4.53		4.65	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPN Shapes

F_y = 275 MPa

IPN 320		IPN 340		IPN 360		IPN 380		IPN 400		IPN 450		Shape		IPN 320		IPN 340		IPN 360		IPN 380		IPN 400		IPN 450	
ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	ϕ_cP_n	P_n/Ω_c	Design		ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b	ϕ_bM_n	M_n/Ω_b
Available Compressive Strength, kN														Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1920	1280	2150	1430	2400	1600	2650	1760	2920	1940	3640	2420	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	0.00	226	151	267	178	316	210	367	244	424	282	594	395
1770	1180	1990	1330	2240	1490	2480	1650	2750	1830	3460	2300		1.00	226	151	267	178	316	210	367	244	424	282	594	395
1600	1060	1820	1210	2050	1370	2290	1530	2550	1700	3250	2170		1.50	221	147	263	175	312	208	365	243	424	282	594	395
1390	922	1590	1060	1820	1210	2050	1360	2300	1530	2980	1990		2.00	211	140	251	167	299	199	350	233	407	271	578	385
1150	767	1350	897	1560	1040	1780	1180	2010	1340	2670	1780		2.50	200	133	239	159	286	190	335	223	390	260	556	370
921	613	1100	731	1290	856	1490	991	1710	1140	2330	1550		3.00	190	126	227	151	272	181	320	213	373	248	535	356
704	469	863	574	1030	683	1210	805	1410	937	1980	1320		3.50	179	119	215	143	259	172	305	203	357	237	513	342
539	359	662	440	794	529	950	632	1130	749	1650	1100		4.00	168	112	203	135	245	163	290	193	340	226	492	327
426	284	523	348	628	418	751	500	889	592	1330	885		4.50	158	105	191	127	232	154	275	183	323	215	470	313
345	230	424	282	508	338	608	405	720	479	1080	717		5.00	147	98.0	179	119	218	145	260	173	306	204	449	299
285	190	350	233	420	280	503	334	595	396	891	593		5.50	137	91.0	167	111	205	136	244	163	290	193	427	284
240	159	294	196	353	235	422	281	500	333	748	498		6.00	124	82.8	154	102	191	127	229	153	273	182	406	270
204	136	251	167	301	200	360	239	426	284	638	424		6.50	114	75.8	141	93.7	176	117	213	142	256	170	384	256
176	117	216	144	259	173	310	206	368	245	550	366		7.00	105	69.9	130	86.4	162	108	196	131	236	157	363	241
153	102	188	125	226	150	270	180	320	213	479	319		7.50	97.5	64.9	120	80.1	150	99.8	182	121	219	146	339	225
135	89.7	165	110	199	132	238	158	281	187	421	280		8.00	91.0	60.6	112	74.8	140	93.1	170	113	204	136	315	210
119	79.5	147	97.5	176	117	210	140	249	166	373	248		8.50	85.3	56.8	105	70.1	131	87.3	159	106	191	127	295	196
107	70.9	131	87.0	157	104	188	125	222	148	333	221		9.00	80.3	53.5	99.1	65.9	123	82.1	150	99.5	180	120	277	184
95.6	63.6	117	78.1	141	93.7	168	112	200	133	299	199		9.50	75.9	50.5	93.6	62.3	117	77.5	141	94.0	170	113	261	174
86.3	57.4	106	70.5	127	84.6	152	101	180	120	269	179		10.0	71.9	47.9	88.7	59.0	110	73.5	134	89.0	161	107	247	165
78.3	52.1	96.1	63.9	115	76.7	138	91.8	163	109	244	163		10.5	68.4	45.5	84.3	56.1	105	69.8	127	84.5	153	101	235	156
71.3	47.5	87.5	58.2	105	69.9	126	83.6	149	99.0	223	148		11.0	65.2	43.4	80.3	53.4	99.9	66.5	121	80.5	145	96.6	223	149
65.3	43.4	80.1	53.3	96.1	63.9	115	76.5	136	90.6	204	136		11.5	62.2	41.4	76.7	51.0	95.4	63.5	116	76.9	139	92.2	213	142
59.9	39.9	73.5	48.9	88.3	58.7	106	70.3	125	83.2	187	124		12.0	59.6	39.6	73.4	48.8	91.3	60.7	111	73.5	133	88.2	204	136
55.2	36.7	67.8	45.1	81.3	54.1	97.3	64.7	115	76.7	172	115		12.5	57.1	38.0	70.4	46.8	87.5	58.2	106	70.5	127	84.6	195	130
51.1	34.0	62.7	41.7	75.2	50.0	90.0	59.9	107	70.9	159	106		13.0	54.9	36.5	67.6	45.0	84.1	55.9	102	67.7	122	81.2	187	125
47.4	31.5	58.1	38.7	69.7	46.4	83.4	55.5	98.8	65.8	148	98.4		13.5	52.8	35.1	65.0	43.3	80.9	53.8	97.9	65.1	117	78.1	180	120
44.0	29.3	54.0	35.9	64.8	43.1	77.6	51.6	91.9	61.1	137	91.5		14.0	50.8	33.8	62.6	41.7	77.9	51.8	94.3	62.7	113	75.2	174	115
41.0	27.3	50.4	33.5	60.5	40.2	72.3	48.1	85.7	57.0	128	85.3		14.5	49.1	32.6	60.4	40.2	75.1	50.0	90.9	60.5	109	72.5	167	111
38.4	25.5	47.1	31.3	56.5	37.6	67.6	45.0	80.0	53.3	120	79.7		15.0	47.4	31.5	58.4	38.8	72.6	48.3	87.8	58.4	105	70.1	162	108

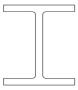
Properties

Available Strength in Tensile Yielding, kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
1920	1280	2150	1430	2400	1600	2650	1760	2920	1940	3640	2420
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c	ϕ_tP_n	P_n/Ω_t	ϕ_tP_n	P_n/Ω_c
1880	1250	2100	1400	2350	1560	2590	1730	2850	1900	3560	2370
Available Strength in Shear, kN											
ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v	ϕ_vV_n	V_n/Ω_v
607	405	684	456	772	515	859	573	950	634	1200	802
Available Strength in Flexure about Y-Y axis, kN·m											
ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b	ϕ_bM_{ny}	M_{ny}/Ω_b
33.5	22.3	39.0	25.9	45.1	30.0	51.9	34.5	59.0	39.3	80.4	53.5

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.27	5.56	1.33	5.80	1.38	6.09	1.43	6.37	1.49	6.59	1.63	7.22
Area, × 10^2 mm^2											
77.70		86.70		97.00		107.0		118.0		147.0	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
12510	555.0	15700	674.0	19610	818.0	24010	975.0	29210	1160	45850	1730
r_y, × 10 mm											
2.67		2.80		2.90		3.02		3.13		3.43	
r_x/r_y											
4.76		4.82		4.90		4.97		5.02		5.16	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPN Shapes

F_y = 275 MPa

IPN 500		IPN 550		IPN 600		Shape	IPN 500		IPN 550		IPN 600	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN							Available Flexural Strength, kN·m					
LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD
4430	2950	5250	3490	6290	4180	**0.00**	802	534	1050	698	1350	898
4250	2830	5060	3370	6090	4050	**1.00**	802	534	1050	698	1350	898
4030	2680	4840	3220	5850	3890	**1.50**	802	534	1050	698	1350	898
3740	2490	4540	3020	5540	3680	**2.00**	789	525	1040	694	1350	898
3400	2270	4190	2790	5160	3430	**2.50**	763	507	1010	672	1310	874
3030	2020	3790	2520	4730	3140	**3.00**	736	490	977	650	1270	847
2640	1760	3370	2240	4260	2840	**3.50**	709	472	944	628	1230	821
2260	1500	2950	1960	3790	2520	**4.00**	683	454	911	606	1200	795
1890	1260	2530	1680	3310	2200	**4.50**	656	436	878	584	1160	769
1540	1030	2130	1420	2850	1890	**5.00**	629	419	845	562	1120	743
1280	849	1760	1170	2410	1600	**5.50**	603	401	812	540	1080	717
1070	713	1480	987	2020	1350	**6.00**	576	383	779	518	1040	691
913	608	1260	841	1720	1150	**6.50**	549	365	746	497	999	665
788	524	1090	725	1490	989	**7.00**	523	348	713	475	960	638
686	456	949	631	1290	861	**7.50**	496	330	680	453	920	612
603	401	834	555	1140	757	**8.00**	467	311	647	431	881	586
534	355	739	492	1010	671	**8.50**	437	291	611	406	842	560
476	317	659	438	899	598	**9.00**	410	273	573	381	803	534
428	285	591	394	807	537	**9.50**	386	257	539	359	755	502
386	257	534	355	728	485	**10.0**	365	243	510	339	713	474
350	233	484	322	661	440	**10.5**	347	231	483	321	676	449
319	212	441	294	602	400	**11.0**	330	219	459	306	642	427
292	194	404	269	551	366	**11.5**	315	209	438	291	612	407
268	178	371	247	506	337	**12.0**	301	200	418	278	584	389
247	164	342	227	466	310	**12.5**	288	192	400	266	559	372
228	152	316	210	431	287	**13.0**	276	184	384	255	536	357
212	141	293	195	400	266	**13.5**	266	177	369	245	515	343
197	131	272	181	372	247	**14.0**	256	170	355	236	495	330
184	122	254	169	346	230	**14.5**	247	164	342	228	477	318
172	114	237	158	324	215	**15.0**	238	158	330	220	461	306

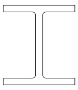
Properties

Available Strength in Tensile Yielding, kN					
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
4430	2950	5250	3490	6290	4180
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN					
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
4330	2890	5130	3420	6140	4100
Available Strength in Shear, kN					
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1490	990	1720	1150	2140	1430
Available Strength in Flexure about Y-Y axis, kN·m					
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
106	70.6	138	92.0	172	115

Limiting Unbraced Lengths, m					
L_p	L_r	L_p	L_r	L_p	L_r
1.77	7.87	1.91	8.33	2.04	9.01
Area, × 10^2 mm^2					
179.0		212.0		254.0	
Moment of Inertia, × 10^4 mm^4					
I_x	I_y	I_x	I_y	I_x	I_y
68740	2480	99180	3490	138800	4674
r_y, × 10 mm					
3.72		4.02		4.29	
r_x/r_y					
5.27		5.37		5.45	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPN Shapes

F_y = 355 MPa

IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180		Shape
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design
Available Compressive Strength, kN												
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending
242	161	339	225	454	302	585	389	728	485	891	593	**0.00**
97.6	64.9	175	117	276	184	398	265	533	354	689	458	**1.00**
43.5	28.9	84.0	55.9	149	99.0	246	164	360	239	499	332	**1.50**
24.4	16.3	47.3	31.5	83.7	55.7	140	93.0	213	142	318	211	**2.00**
15.6	10.4	30.3	20.1	53.6	35.6	89.4	59.5	137	90.9	203	135	**2.50**
10.9	7.23	21.0	14.0	37.2	24.7	62.1	41.3	94.8	63.1	141	94.0	**3.00**
7.98	5.31	15.4	10.3	27.3	18.2	45.6	30.4	69.7	46.4	104	69.0	**3.50**
6.11	4.07	11.8	7.86	20.9	13.9	34.9	23.2	53.3	35.5	79.4	52.9	**4.00**
4.83	3.21	9.34	6.21	16.5	11.0	27.6	18.4	42.1	28.0	62.8	41.8	**4.50**
3.91	2.60	7.56	5.03	13.4	8.91	22.4	14.9	34.1	22.7	50.8	33.8	**5.00**
3.23	2.15	6.25	4.16	11.1	7.36	18.5	12.3	28.2	18.8	42.0	28.0	**5.50**
2.72	1.81	5.25	3.49	9.30	6.19	15.5	10.3	23.7	15.8	35.3	23.5	**6.00**
2.31	1.54	4.48	2.98	7.92	5.27	13.2	8.80	20.2	13.4	30.1	20.0	**6.50**
2.00	1.33	3.86	2.57	6.83	4.54	11.4	7.59	17.4	11.6	25.9	17.3	**7.00**
1.74	1.16	3.36	2.24	5.95	3.96	9.93	6.61	15.2	10.1	22.6	15.0	**7.50**
1.53	1.02	2.95	1.97	5.23	3.48	8.73	5.81	13.3	8.87	19.9	13.2	**8.00**
1.35	0.901	2.62	1.74	4.63	3.08	7.73	5.15	11.8	7.86	17.6	11.7	**8.50**
1.21	0.803	2.33	1.55	4.13	2.75	6.90	4.59	10.5	7.01	15.7	10.4	**9.00**
1.08	0.721	2.10	1.39	3.71	2.47	6.19	4.12	9.46	6.29	14.1	9.37	**9.50**
0.978	0.651	1.89	1.26	3.35	2.23	5.59	3.72	8.53	5.68	12.7	8.46	**10.0**
0.887	0.590	1.72	1.14	3.04	2.02	5.07	3.37	7.74	5.15	11.5	7.67	**10.5**
0.808	0.538	1.56	1.04	2.77	1.84	4.62	3.07	7.05	4.69	10.5	6.99	**11.0**
0.739	0.492	1.43	0.951	2.53	1.68	4.23	2.81	6.45	4.29	9.61	6.39	**11.5**
0.679	0.452	1.31	0.874	2.32	1.55	3.88	2.58	5.93	3.94	8.83	5.87	**12.0**
0.626	0.416	1.21	0.805	2.14	1.43	3.58	2.38	5.46	3.63	8.13	5.41	**12.5**
0.579	0.385	1.12	0.744	1.98	1.32	3.31	2.20	5.05	3.36	7.52	5.00	**13.0**
0.537	0.357	1.04	0.690	1.84	1.22	3.07	2.04	4.68	3.12	6.97	4.64	**13.5**
0.499	0.332	0.965	0.642	1.71	1.14	2.85	1.90	4.35	2.90	6.49	4.31	**14.0**
0.465	0.309	0.899	0.598	1.59	1.06	2.66	1.77	4.06	2.70	6.05	4.02	**14.5**
0.435	0.289	0.840	0.559	1.49	0.990	2.48	1.65	3.79	2.52	5.65	3.76	**15.0**

Shape	IPN 80		IPN 100		IPN 120		IPN 140		IPN 160		IPN 180	
Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
	Available Flexural Strength, kN·m											
Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
0.00	7.28	4.85	12.7	8.46	20.3	13.5	30.5	20.3	43.5	28.9	59.7	39.8
1.00	6.13	4.08	11.0	7.35	18.1	12.1	27.9	18.5	40.5	27.0	56.7	37.7
1.50	5.19	3.45	9.53	6.34	15.9	10.6	24.7	16.5	36.4	24.2	51.4	34.2
2.00	4.23	2.82	8.02	5.33	13.7	9.09	21.6	14.4	32.3	21.5	46.1	30.7
2.50	3.35	2.23	6.41	4.26	11.2	7.48	18.5	12.3	28.2	18.7	40.8	27.2
3.00	2.77	1.85	5.29	3.52	9.24	6.15	15.1	10.1	23.6	15.7	35.4	23.5
3.50	2.37	1.58	4.50	3.00	7.85	5.22	12.8	8.52	19.9	13.3	29.7	19.8
4.00	2.07	1.38	3.93	2.61	6.83	4.54	11.1	7.40	17.2	11.5	25.6	17.1
4.50	1.84	1.22	3.48	2.32	6.04	4.02	9.83	6.54	15.2	10.1	22.6	15.0
5.00	1.65	1.10	3.13	2.08	5.42	3.61	8.81	5.86	13.6	9.06	20.2	13.4
5.50	1.50	0.997	2.84	1.89	4.92	3.27	7.98	5.31	12.3	8.20	18.3	12.1
6.00	1.37	0.913	2.60	1.73	4.50	3.00	7.30	4.86	11.3	7.50	16.7	11.1
6.50	1.27	0.843	2.40	1.59	4.15	2.76	6.73	4.48	10.4	6.90	15.3	10.2
7.00	1.18	0.782	2.22	1.48	3.85	2.56	6.24	4.15	9.62	6.40	14.2	9.45
7.50	1.10	0.730	2.07	1.38	3.59	2.39	5.81	3.87	8.96	5.96	13.2	8.81
8.00	1.03	0.684	1.94	1.29	3.36	2.24	5.45	3.62	8.39	5.58	12.4	8.24
8.50	0.967	0.644	1.83	1.22	3.16	2.11	5.12	3.41	7.89	5.25	11.6	7.75
9.00	0.913	0.608	1.73	1.15	2.99	1.99	4.83	3.22	7.44	4.95	11.0	7.31
9.50	0.865	0.576	1.64	1.09	2.83	1.88	4.58	3.05	7.05	4.69	10.4	6.92
10.0	0.822	0.547	1.55	1.03	2.69	1.79	4.35	2.89	6.69	4.45	9.87	6.57
10.5	0.783	0.521	1.48	0.984	2.56	1.70	4.14	2.75	6.37	4.24	9.39	6.25
11.0	0.747	0.497	1.41	0.939	2.44	1.62	3.95	2.63	6.08	4.04	8.96	5.96
11.5	0.714	0.475	1.35	0.898	2.33	1.55	3.77	2.51	5.81	3.87	8.56	5.70
12.0	0.685	0.455	1.29	0.861	2.24	1.49	3.62	2.41	5.57	3.70	8.20	5.46
12.5	0.657	0.437	1.24	0.826	2.15	1.43	3.47	2.31	5.34	3.55	7.87	5.24
13.0	0.632	0.420	1.19	0.794	2.06	1.37	3.34	2.22	5.13	3.42	7.57	5.03
13.5	0.608	0.405	1.15	0.765	1.99	1.32	3.21	2.14	4.94	3.29	7.28	4.85
14.0	0.587	0.390	1.11	0.737	1.92	1.27	3.10	2.06	4.77	3.17	7.02	4.67
14.5	0.566	0.377	1.07	0.712	1.85	1.23	2.99	1.99	4.60	3.06	6.78	4.51
15.0	0.547	0.364	1.03	0.688	1.79	1.19	2.89	1.92	4.45	2.96	6.55	4.36

Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
242	161	339	225	454	302	585	389	728	485	891	593
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
217	145	304	203	407	272	525	350	654	436	800	534
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
130	86.9	130	86.9	130	86.9	170	113	215	143	265	176
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
1.53	1.02	2.49	1.66	3.79	2.52	5.47	3.64	7.57	5.03	10.1	6.73

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.380	1.95	0.447	2.12	0.514	2.32	0.585	2.53	0.648	2.74	0.714	2.95
Area, × 10^2 mm^2											
7.58		10.60		14.20		18.30		22.80		27.90	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
77.80	6.29	171.0	12.20	328.0	21.50	573.0	35.20	935.0	54.70	1450	81.30
r_y, × 10 mm											
0.910		1.07		1.23		1.40		1.55		1.71	
r_x/r_y											
3.52		3.75		3.91		4.01		4.13		4.21	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.

Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPN Shapes

F_y = 355 MPa

IPN 200		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300		Shape	IPN 200		IPN 220		IPN 240		IPN 260		IPN 280		IPN 300	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
1070	710	1260	840	1470	980	1700	1130	1950	1300	2200	1470	**0.00**	79.9	53.1	104	68.9	132	87.6	164	109	202	134	243	162
860	572	1050	698	1260	839	1480	985	1720	1140	1970	1310	**1.00**	77.0	51.2	101	67.2	130	86.5	164	109	202	134	243	162
657	437	833	554	1040	691	1240	827	1470	978	1700	1130	**1.50**	70.3	46.8	92.9	61.8	120	80.1	152	101	189	126	230	153
451	300	603	401	791	526	973	648	1180	785	1390	926	**2.00**	63.7	42.4	84.9	56.5	111	73.7	141	93.7	176	117	215	143
291	194	402	267	556	370	711	473	890	592	1080	715	**2.50**	57.0	37.9	76.8	51.1	101	67.3	130	86.2	163	108	200	133
202	135	279	186	386	257	497	330	634	422	783	521	**3.00**	50.3	33.5	68.7	45.7	91.5	60.9	118	78.7	149	99.4	185	123
149	98.8	205	136	284	189	365	243	466	310	575	383	**3.50**	42.9	28.6	60.2	40.1	81.9	54.5	107	71.2	136	90.6	169	113
114	75.7	157	104	217	145	279	186	357	237	440	293	**4.00**	37.0	24.6	51.6	34.4	70.9	47.2	94.7	63.0	123	81.8	154	102
89.9	59.8	124	82.5	172	114	221	147	282	187	348	231	**4.50**	32.5	21.6	45.3	30.1	62.0	41.2	82.6	55.0	108	71.6	137	91.0
72.8	48.4	100	66.8	139	92.5	179	119	228	152	282	188	**5.00**	29.0	19.3	40.3	26.8	55.1	36.7	73.4	48.8	95.4	63.4	121	80.6
60.2	40.0	83.0	55.2	115	76.5	148	98.3	189	125	233	155	**5.50**	26.2	17.4	36.4	24.2	49.6	33.0	66.0	43.9	85.7	57.0	109	72.4
50.5	33.6	69.8	46.4	96.6	64.2	124	82.6	158	105	196	130	**6.00**	23.9	15.9	33.2	22.1	45.2	30.1	60.0	39.9	77.9	51.8	98.8	65.7
43.1	28.7	59.4	39.5	82.3	54.7	106	70.4	135	89.8	167	111	**6.50**	21.9	14.6	30.5	20.3	41.5	27.6	55.1	36.6	71.4	47.5	90.5	60.2
37.1	24.7	51.2	34.1	70.9	47.2	91.2	60.7	116	77.5	144	95.7	**7.00**	20.3	13.5	28.2	18.7	38.3	25.5	50.9	33.8	65.9	43.9	83.5	55.6
32.4	21.5	44.6	29.7	61.8	41.1	79.5	52.9	101	67.5	125	83.3	**7.50**	18.9	12.6	26.2	17.4	35.7	23.7	47.3	31.5	61.3	40.8	77.5	51.6
28.4	18.9	39.2	26.1	54.3	36.1	69.8	46.5	89.1	59.3	110	73.2	**8.00**	17.7	11.8	24.5	16.3	33.3	22.2	44.2	29.4	57.2	38.1	72.4	48.2
25.2	16.8	34.8	23.1	48.1	32.0	61.9	41.2	79.0	52.5	97.5	64.9	**8.50**	16.6	11.1	23.0	15.3	31.3	20.8	41.5	27.6	53.7	35.7	67.9	45.2
22.5	14.9	31.0	20.6	42.9	28.6	55.2	36.7	70.4	46.9	87.0	57.9	**9.00**	15.7	10.4	21.7	14.4	29.5	19.6	39.1	26.0	50.6	33.6	64.0	42.5
20.2	13.4	27.8	18.5	38.5	25.6	49.5	33.0	63.2	42.1	78.1	51.9	**9.50**	14.8	9.87	20.5	13.7	27.9	18.6	36.9	24.6	47.8	31.8	60.4	40.2
18.2	12.1	25.1	16.7	34.8	23.1	44.7	29.7	57.0	38.0	70.5	46.9	**10.0**	14.1	9.37	19.5	13.0	26.5	17.6	35.0	23.3	45.3	30.2	57.3	38.1
16.5	11.0	22.8	15.2	31.5	21.0	40.5	27.0	51.7	34.4	63.9	42.5	**10.5**	13.4	8.91	18.5	12.3	25.2	16.7	33.3	22.2	43.1	28.7	54.5	36.2
15.0	10.0	20.8	13.8	28.7	19.1	36.9	24.6	47.1	31.4	58.2	38.7	**11.0**	12.8	8.50	17.7	11.8	24.0	16.0	31.8	21.1	41.1	27.3	51.9	34.5
13.8	9.15	19.0	12.6	26.3	17.5	33.8	22.5	43.1	28.7	53.3	35.4	**11.5**	12.2	8.13	16.9	11.2	22.9	15.3	30.3	20.2	39.2	26.1	49.6	33.0
12.6	8.41	17.4	11.6	24.1	16.1	31.0	20.7	39.6	26.4	48.9	32.6	**12.0**	11.7	7.78	16.2	10.8	22.0	14.6	29.0	19.3	37.6	25.0	47.5	31.6
11.6	7.75	16.1	10.7	22.2	14.8	28.6	19.0	36.5	24.3	45.1	30.0	**12.5**	11.2	7.47	15.5	10.3	21.1	14.0	27.9	18.5	36.0	24.0	45.5	30.3
10.8	7.16	14.9	9.89	20.6	13.7	26.4	17.6	33.8	22.5	41.7	27.7	**13.0**	10.8	7.18	14.9	9.93	20.2	13.5	26.8	17.8	34.6	23.0	43.7	29.1
9.98	6.64	13.8	9.17	19.1	12.7	24.5	16.3	31.3	20.8	38.7	25.7	**13.5**	10.4	6.91	14.4	9.55	19.5	13.0	25.8	17.1	33.3	22.2	42.1	28.0
9.28	6.18	12.8	8.52	17.7	11.8	22.8	15.2	29.1	19.4	35.9	23.9	**14.0**	10.0	6.66	13.8	9.21	18.8	12.5	24.8	16.5	32.1	21.3	40.5	27.0
8.65	5.76	11.9	7.95	16.5	11.0	21.3	14.1	27.1	18.1	33.5	22.3	**14.5**	9.66	6.43	13.4	8.89	18.1	12.0	24.0	15.9	31.0	20.6	39.1	26.0
8.09	5.38	11.2	7.43	15.5	10.3	19.9	13.2	25.4	16.9	31.3	20.8	**15.0**	9.34	6.21	12.9	8.59	17.5	11.6	23.1	15.4	29.9	19.9	37.8	25.1

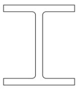
Properties

Available Strength in Tensile Yielding, kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
1070	710	1260	840	1470	980	1700	1130	1950	1300	2200	1470
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN											
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
958	639	1130	755	1320	882	1530	1020	1750	1170	1980	1320
Available Strength in Shear, kN											
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
320	213	380	253	445	296	521	347	602	402	690	460
Available Strength in Flexure about Y-Y axis, kN·m											
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
13.3	8.84	16.9	11.3	21.3	14.2	26.1	17.3	31.3	20.8	36.9	24.6

Limiting Unbraced Lengths, m											
L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
0.781	3.19	0.844	3.41	0.919	3.64	0.969	3.86	1.02	4.06	1.07	4.26
Area, × 10^2 mm^2											
33.40		39.50		46.10		53.30		61.00		69.00	
Moment of Inertia, × 10^4 mm^4											
I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
2140	117.0	3060	162.0	4250	221.0	5740	288.0	7590	364.0	9800	451.0
r_y, × 10 mm											
1.87		2.02		2.20		2.32		2.45		2.56	
r_x/r_y											
4.28		4.36		4.36		4.48		4.53		4.65	

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces

IPN Shapes

F_y = 355 MPa

IPN 320		IPN 340		IPN 360		IPN 380		IPN 400		IPN 450		Shape	IPN 320		IPN 340		IPN 360		IPN 380		IPN 400		IPN 450	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN													Available Flexural Strength, kN·m											
LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
2480	1650	2770	1840	3100	2060	3420	2270	3770	2510	4700	3120	**0.00**	292	194	345	230	408	271	473	315	548	364	767	510
2230	1490	2520	1670	2830	1890	3150	2090	3490	2320	4410	2930	**1.00**	292	194	345	230	408	271	473	315	548	364	767	510
1960	1300	2230	1480	2530	1690	2840	1890	3170	2110	4070	2710	**1.50**	279	185	332	221	395	263	462	307	537	357	762	507
1630	1080	1890	1260	2170	1440	2460	1640	2770	1840	3640	2420	**2.00**	261	174	312	208	372	248	437	291	509	339	726	483
1280	854	1520	1010	1770	1180	2040	1360	2330	1550	3150	2090	**2.50**	244	162	292	194	350	233	412	274	481	320	691	460
959	638	1170	777	1380	921	1630	1080	1890	1260	2640	1760	**3.00**	226	150	272	181	328	218	387	257	454	302	655	436
704	469	865	575	1040	690	1240	826	1470	979	2140	1430	**3.50**	208	139	252	168	306	203	362	241	426	283	619	412
539	359	662	440	794	529	950	632	1130	749	1680	1120	**4.00**	191	127	232	155	283	188	337	224	398	265	584	388
426	284	523	348	628	418	751	500	889	592	1330	885	**4.50**	173	115	213	141	261	174	312	207	370	246	548	365
345	230	424	282	508	338	608	405	720	479	1080	717	**5.00**	153	102	190	126	237	158	287	191	342	228	512	341
285	190	350	233	420	280	503	334	595	396	891	593	**5.50**	137	91.2	170	113	212	141	258	172	311	207	477	317
240	159	294	196	353	235	422	281	500	333	748	498	**6.00**	124	82.8	154	102	192	128	233	155	281	187	437	291
204	136	251	167	301	200	360	239	426	284	638	424	**6.50**	114	75.8	141	93.7	176	117	213	142	257	171	398	265
176	117	216	144	259	173	310	206	368	245	550	366	**7.00**	105	69.9	130	86.4	162	108	196	131	236	157	366	243
153	102	188	125	226	150	270	180	320	213	479	319	**7.50**	97.5	64.9	120	80.1	150	99.8	182	121	219	146	339	225
135	89.7	165	110	199	132	238	158	281	187	421	280	**8.00**	91.0	60.6	112	74.8	140	93.1	170	113	204	136	315	210
119	79.5	147	97.5	176	117	210	140	249	166	373	248	**8.50**	85.3	56.8	105	70.1	131	87.3	159	106	191	127	295	196
107	70.9	131	87.0	157	104	188	125	222	148	333	221	**9.00**	80.3	53.5	99.1	65.9	123	82.1	150	99.5	180	120	277	184
95.6	63.6	117	78.1	141	93.7	168	112	200	133	299	199	**9.50**	75.9	50.5	93.6	62.3	117	77.5	141	94.0	170	113	261	174
86.3	57.4	106	70.5	127	84.6	152	101	180	120	269	179	**10.0**	71.9	47.9	88.7	59.0	110	73.5	134	89.0	161	107	247	165
78.3	52.1	96.1	63.9	115	76.7	138	91.8	163	109	244	163	**10.5**	68.4	45.5	84.3	56.1	105	69.8	127	84.5	153	101	235	156
71.3	47.5	87.5	58.2	105	69.9	126	83.6	149	99.0	223	148	**11.0**	65.2	43.4	80.3	53.4	99.9	66.5	121	80.5	145	96.6	223	149
65.3	43.4	80.1	53.3	96.1	63.9	115	76.5	136	90.6	204	136	**11.5**	62.2	41.4	76.7	51.0	95.4	63.5	116	76.9	139	92.2	213	142
59.9	39.9	73.5	48.9	88.3	58.7	106	70.3	125	83.2	187	124	**12.0**	59.6	39.6	73.4	48.8	91.3	60.7	111	73.5	133	88.2	204	136
55.2	36.7	67.8	45.1	81.3	54.1	97.3	64.7	115	76.7	172	115	**12.5**	57.1	38.0	70.4	46.8	87.5	58.2	106	70.5	127	84.6	195	130
51.1	34.0	62.7	41.7	75.2	50.0	90.0	59.9	107	70.9	159	106	**13.0**	54.9	36.5	67.6	45.0	84.1	55.9	102	67.7	122	81.2	187	125
47.4	31.5	58.1	38.7	69.7	46.4	83.4	55.5	98.8	65.8	148	98.4	**13.5**	52.8	35.1	65.0	43.3	80.9	53.8	97.9	65.1	117	78.1	180	120
44.0	29.3	54.0	35.9	64.8	43.1	77.6	51.6	91.9	61.1	137	91.5	**14.0**	50.8	33.8	62.6	41.7	77.9	51.8	94.3	62.7	113	75.2	174	115
41.0	27.3	50.4	33.5	60.5	40.2	72.3	48.1	85.7	57.0	128	85.3	**14.5**	49.1	32.6	60.4	40.2	75.1	50.0	90.9	60.5	109	72.5	167	111
38.4	25.5	47.1	31.3	56.5	37.6	67.6	45.0	80.0	53.3	120	79.7	**15.0**	47.4	31.5	58.4	38.8	72.6	48.3	87.8	58.4	105	70.1	162	108

Properties

Available Strength in Tensile Yielding, kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2480	1650	2770	1840	3100	2060	3420	2270	3770	2510	4700	3120

Available Strength in Tensile Rupture (A_e = 0.75A_g), kN

$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_c
2230	1490	2490	1660	2780	1860	3070	2050	3390	2260	4220	2810

Available Strength in Shear, kN

$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
784	523	884	589	997	665	1110	739	1230	818	1550	1040

Available Strength in Flexure about Y-Y axis, kN·m

$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
43.3	28.8	50.3	33.5	58.3	38.8	67.0	44.6	76.2	50.7	104	69.0

Limiting Unbraced Lengths, m

L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r	L_p	L_r
1.12	4.46	1.17	4.65	1.21	4.88	1.26	5.10	1.31	5.28	1.43	5.79

Area, × 10^2 mm^2

77.70	86.70	97.00	107.0	118.0	147.0

Moment of Inertia, × 10^4 mm^4

I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y	I_x	I_y
12510	555.0	15700	674.0	19610	818.0	24010	975.0	29210	1160	45850	1730

r_y, × 10 mm

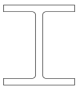
2.67	2.80	2.90	3.02	3.13	3.43

r_x/r_y

4.76	4.82	4.90	4.97	5.02	5.16

Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

Table E.1 Continued.



Available Strength for Members Subject to Axial, Shear, Flexural and Combined Forces
IPN Shapes

F_y = 355 MPa

IPN 500		IPN 550		IPN 600		Shape	IPN 500		IPN 550		IPN 600	
$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	Design	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b	$\phi_b M_n$	M_n/Ω_b
Available Compressive Strength, kN							Available Flexural Strength, kN·m					
LRFD	ASD	LRFD	ASD	LRFD	ASD	Effective length, L_c, m, with respect to the least radius of gyration, r_y or unbraced length, L_b, m, for X-X axis bending	LRFD	ASD	LRFD	ASD	LRFD	ASD
5720	3810	6770	4510	8120	5400	0.00	1040	689	1350	901	1740	1160
5420	3600	6470	4300	7790	5180	1.00	1040	689	1350	901	1740	1160
5060	3370	6100	4060	7400	4920	1.50	1040	689	1350	901	1740	1160
4600	3060	5620	3740	6890	4580	2.00	996	662	1320	878	1710	1140
4070	2710	5060	3370	6280	4180	2.50	951	633	1270	842	1650	1100
3510	2330	4450	2960	5620	3740	3.00	907	604	1210	805	1580	1050
2940	1950	3830	2550	4920	3270	3.50	863	574	1160	769	1520	1010
2400	1590	3210	2140	4220	2810	4.00	819	545	1100	733	1450	968
1910	1270	2640	1750	3540	2360	4.50	775	515	1050	696	1390	925
1540	1030	2140	1420	2910	1940	5.00	730	486	992	660	1320	881
1280	849	1760	1170	2410	1600	5.50	686	456	938	624	1260	838
1070	713	1480	987	2020	1350	6.00	642	427	883	588	1190	795
913	608	1260	841	1720	1150	6.50	593	394	829	551	1130	752
788	524	1090	725	1490	989	7.00	544	362	765	509	1060	708
686	456	949	631	1290	861	7.50	502	334	705	469	990	659
603	401	834	555	1140	757	8.00	467	311	655	436	918	611
534	355	739	492	1010	671	8.50	437	291	611	406	856	570
476	317	659	438	899	598	9.00	410	273	573	381	802	534
428	285	591	394	807	537	9.50	386	257	539	359	755	502
386	257	534	355	728	485	10.0	365	243	510	339	713	474
350	233	484	322	661	440	10.5	347	231	483	321	676	449
319	212	441	294	602	400	11.0	330	219	459	306	642	427
292	194	404	269	551	366	11.5	315	209	438	291	612	407
268	178	371	247	506	337	12.0	301	200	418	278	584	389
247	164	342	227	466	310	12.5	288	192	400	266	559	372
228	152	316	210	431	287	13.0	276	184	384	255	536	357
212	141	293	195	400	266	13.5	266	177	369	245	515	343
197	131	272	181	372	247	14.0	256	170	355	236	495	330
184	122	254	169	346	230	14.5	247	164	342	228	477	318
172	114	237	158	324	215	15.0	238	158	330	220	461	306

Properties

Available Strength in Tensile Yielding, kN					
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
5720	3810	6770	4510	8120	5400
Available Strength in Tensile Rupture ($A_e = 0.75A_g$), kN					
$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t
5140	3420	6080	4050	7290	4860
Available Strength in Shear, kN					
$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v	$\phi_v V_n$	V_n/Ω_v
1920	1280	2230	1480	2760	1840
Available Strength in Flexure about Y-Y axis, kN·m					
$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b
137	91.2	178	119	222	148

Limiting Unbraced Lengths, m					
L_p	L_r	L_p	L_r	L_p	L_r
1.55	6.30	1.68	6.69	1.79	7.23
Area, × 10^2 mm^2					
179.0		212.0		254.0	
Moment of Inertia, × 10^4 mm^4					
I_x	I_y	I_x	I_y	I_x	I_y
68740	2480	99180	3490	138800	4674
r_y, × 10 mm					
3.72		4.02		4.29	
r_x/r_y					
5.27		5.37		5.45	

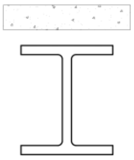
Note: Tabulated values in gray indicate L_c/r_y equal to or greater than 200; C_b = 1.00.

APPENDIX F

DESIGN TABLES FOR COMPOSITE MEMBERS

Tables start on the next page.

Table F.1 Available strength in flexure for composite memebrs.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×1086	5750	3830	TFL	0.00	32600	9810	6520	10100	6720	10400	6910	10700	7110	11000	7300	11300	7500	11600	7690
			2	31.3	25900	9410	6260	9640	6420	9880	6570	10100	6730	10300	6880	10600	7040	10800	7190
			3	62.5	19200	8830	5880	9000	5990	9180	6110	9350	6220	9520	6340	9700	6450	9870	6570
			4	93.8	12600	8060	5360	8170	5440	8290	5510	8400	5590	8510	5660	8630	5740	8740	5820
			BFL	125	5900	7100	4730	7160	4760	7210	4800	7260	4830	7320	4870	7370	4900	7420	4940
HD 400×990	5140	3420	TFL	0.00	29700	8670	5770	8940	5950	9210	6130	9480	6300	9740	6480	10000	6660	10300	6840
			2	28.8	23600	8320	5540	8540	5680	8750	5820	8960	5960	9170	6100	9390	6240	9600	6390
			3	57.5	17500	7820	5200	7970	5310	8130	5410	8290	5520	8450	5620	8610	5730	8760	5830
			4	86.3	11500	7150	4760	7260	4830	7360	4900	7460	4970	7570	5030	7670	5100	7770	5170
			BFL	115	5440	6330	4210	6380	4250	6430	4280	6480	4310	6530	4340	6580	4380	6630	4410
HD 400×900	4570	3040	TFL	0.00	27000	7670	5100	7910	5260	8150	5420	8400	5590	8640	5750	8880	5910	9130	6070
			2	26.5	21500	7350	4890	7550	5020	7740	5150	7930	5280	8130	5410	8320	5540	8510	5670
			3	53.0	16000	6910	4600	7050	4690	7200	4790	7340	4880	7480	4980	7630	5080	7770	5170
			4	79.5	10500	6330	4210	6430	4280	6520	4340	6620	4400	6710	4460	6800	4530	6900	4590
			BFL	106	4980	5630	3740	5670	3770	5720	3800	5760	3830	5810	3860	5850	3890	5890	3920
HD 400×818	4070	2710	TFL	0.00	24500	6770	4510	6990	4650	7210	4800	7430	4950	7650	5090	7880	5240	8100	5390
			2	24.3	19500	6490	4320	6670	4440	6850	4550	7020	4670	7200	4790	7370	4910	7550	5020
			3	48.5	14500	6110	4060	6240	4150	6370	4240	6500	4320	6630	4410	6760	4500	6890	4590
			4	72.8	9570	5610	3730	5700	3790	5780	3850	5870	3900	5960	3960	6040	4020	6130	4080
			BFL	97.0	4590	5010	3330	5050	3360	5090	3390	5130	3410	5170	3440	5210	3470	5250	3500
HD 400×744	3630	2420	TFL	0.00	22300	6000	3990	6200	4120	6400	4260	6600	4390	6800	4520	7000	4660	7200	4790
			2	22.2	17800	5750	3820	5910	3930	6070	4040	6230	4140	6390	4250	6550	4360	6710	4460
			3	44.5	13300	5410	3600	5530	3680	5650	3760	5770	3840	5890	3920	6010	4000	6120	4080
			4	66.7	8740	4980	3310	5060	3370	5140	3420	5220	3470	5300	3520	5370	3580	5450	3630
			BFL	88.9	4230	4460	2970	4500	2990	4540	3020	4580	3040	4610	3070	4650	3090	4690	3120
HD 400×677	3250	2160	TFL	0.00	20300	5320	3540	5510	3660	5690	3780	5870	3910	6050	4030	6240	4150	6420	4270
			2	20.4	16200	5100	3390	5250	3490	5390	3590	5540	3680	5680	3780	5830	3880	5980	3980
			3	40.8	12100	4800	3200	4910	3270	5020	3340	5130	3410	5240	3490	5350	3560	5460	3630
			4	61.1	7990	4430	2950	4500	3000	4580	3040	4650	3090	4720	3140	4790	3190	4860	3240
			BFL	81.5	3900	3980	2650	4020	2670	4050	2700	4090	2720	4120	2740	4160	2770	4190	2790
HD 400×634	3010	2000	TFL	0.00	19000	4900	3260	5080	3380	5250	3490	5420	3600	5590	3720	5760	3830	5930	3950
			2	19.3	15100	4700	3130	4830	3220	4970	3310	5110	3400	5240	3490	5380	3580	5520	3670
			3	38.6	11300	4430	2940	4530	3010	4630	3080	4730	3150	4830	3220	4930	3280	5040	3350
			4	57.8	7460	4090	2720	4150	2760	4220	2810	4290	2850	4350	2900	4420	2940	4490	2990
			BFL	77.1	3620	3680	2450	3710	2470	3750	2490	3780	2510	3810	2540	3840	2560	3880	2580
HD 400×592	2780	1850	TFL	0.00	17700	4510	3000	4670	3110	4830	3210	4990	3320	5150	3430	5310	3530	5470	3640
			2	18.1	14200	4320	2870	4450	2960	4580	3040	4700	3130	4830	3210	4960	3300	5090	3380
			3	36.2	10600	4070	2710	4170	2770	4260	2840	4360	2900	4450	2960	4550	3030	4640	3090
			4	54.2	7010	3770	2510	3830	2550	3890	2590	3960	2630	4020	2670	4080	2720	4140	2760
			BFL	72.3	3430	3400	2260	3430	2280	3460	2300	3490	2320	3520	2350	3560	2370	3590	2390
HD 400×551	2550	1700	TFL	0.00	16500	4120	2740	4260	2840	4410	2940	4560	3040	4710	3130	4860	3230	5010	3330
			2	16.9	13200	3940	2620	4060	2700	4180	2780	4300	2860	4420	2940	4530	3020	4650	3100
			3	33.8	9840	3720	2470	3810	2530	3890	2590	3980	2650	4070	2710	4160	2770	4250	2830
			4	50.7	6520	3440	2290	3500	2330	3560	2370	3620	2410	3680	2450	3730	2480	3790	2520
			BFL	67.6	3200	3110	2070	3140	2090	3170	2110	3200	2130	3230	2150	3260	2170	3290	2190
HD 400×509	2330	1550	TFL	0.00	15300	3750	2490	3880	2580	4020	2680	4160	2770	4300	2860	4430	2950	4570	3040
			2	15.7	12200	3590	2390	3700	2460	3810	2530	3920	2610	4030	2680	4140	2750	4250	2820
			3	31.4	9120	3380	2250	3470	2310	3550	2360	3630	2420	3710	2470	3800	2530	3880	2580
			4	47.0	6060	3140	2090	3190	2120	3250	2160	3300	2200	3360	2230	3410	2270	3470	2310
			BFL	62.7	2990	2850	1900	2880	1910	2900	1930	2930	1950	2960	1970	2980	1990	3010	2000

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

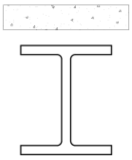
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×1086	5750	3830	TFL	0.00	32600	11900	7890	12200	8080	12400	8280	12700	8470	13000	8670	13300	8860	13600	9060
			2	31.3	25900	11000	7350	11300	7500	11500	7660	11700	7810	12000	7970	12200	8120	12400	8280
			3	62.5	19200	10000	6680	10200	6800	10400	6910	10600	7030	10700	7140	10900	7260	11100	7370
			4	93.8	12600	8850	5890	8970	5970	9080	6040	9190	6120	9310	6190	9420	6270	9530	6340
			BFL	125	5900	7480	4970	7530	5010	7580	5050	7640	5080	7690	5120	7740	5150	7800	5190
HD 400×990	5140	3420	TFL	0.00	29700	10500	7010	10800	7190	11100	7370	11300	7550	11600	7730	11900	7900	12100	8080
			2	28.8	23600	9810	6530	10000	6670	10200	6810	10400	6950	10700	7090	10900	7230	11100	7380
			3	57.5	17500	8920	5940	9080	6040	9240	6150	9400	6250	9550	6360	9710	6460	9870	6570
			4	86.3	11500	7880	5240	7980	5310	8080	5380	8190	5450	8290	5520	8390	5580	8500	5650
			BFL	115	5440	6670	4440	6720	4470	6770	4510	6820	4540	6870	4570	6920	4600	6970	4640
HD 400×900	4570	3040	TFL	0.00	27000	9370	6230	9610	6390	9850	6560	10100	6720	10300	6880	10600	7040	10800	7200
			2	26.5	21500	8710	5790	8900	5920	9090	6050	9290	6180	9480	6310	9680	6440	9870	6570
			3	53.0	16000	7920	5270	8060	5360	8200	5460	8350	5550	8490	5650	8640	5750	8780	5840
			4	79.5	10500	6990	4650	7090	4720	7180	4780	7280	4840	7370	4900	7470	4970	7560	5030
			BFL	106	4980	5940	3950	5980	3980	6030	4010	6070	4040	6120	4070	6160	4100	6210	4130
HD 400×818	4070	2710	TFL	0.00	24500	8320	5530	8540	5680	8760	5830	8980	5970	9200	6120	9420	6270	9640	6410
			2	24.3	19500	7720	5140	7900	5260	8080	5370	8250	5490	8430	5610	8600	5720	8780	5840
			3	48.5	14500	7020	4670	7150	4760	7290	4850	7420	4930	7550	5020	7680	5110	7810	5200
			4	72.8	9570	6210	4130	6300	4190	6390	4250	6470	4310	6560	4360	6640	4420	6730	4480
			BFL	97.0	4590	5300	3520	5340	3550	5380	3580	5420	3610	5460	3630	5500	3660	5540	3690
HD 400×744	3630	2420	TFL	0.00	22300	7400	4920	7600	5060	7800	5190	8000	5320	8200	5460	8400	5590	8600	5720
			2	22.2	17800	6870	4570	7030	4680	7190	4780	7350	4890	7510	4990	7670	5100	7830	5210
			3	44.5	13300	6240	4150	6360	4230	6480	4310	6600	4390	6720	4470	6840	4550	6960	4630
			4	66.7	8740	5530	3680	5610	3730	5690	3780	5770	3840	5850	3890	5920	3940	6000	3990
			BFL	88.9	4230	4730	3150	4770	3170	4800	3200	4840	3220	4880	3250	4920	3270	4960	3300
HD 400×677	3250	2160	TFL	0.00	20300	6600	4390	6780	4510	6970	4640	7150	4760	7330	4880	7510	5000	7700	5120
			2	20.4	16200	6120	4070	6270	4170	6410	4270	6560	4360	6700	4460	6850	4560	7000	4650
			3	40.8	12100	5570	3700	5670	3780	5780	3850	5890	3920	6000	3990	6110	4070	6220	4140
			4	61.1	7990	4940	3280	5010	3330	5080	3380	5150	3430	5220	3480	5290	3520	5370	3570
			BFL	81.5	3900	4230	2810	4260	2840	4300	2860	4330	2880	4370	2910	4400	2930	4440	2950
HD 400×634	3010	2000	TFL	0.00	19000	6100	4060	6270	4170	6440	4290	6610	4400	6780	4510	6960	4630	7130	4740
			2	19.3	15100	5650	3760	5790	3850	5930	3940	6060	4030	6200	4120	6330	4210	6470	4310
			3	38.6	11300	5140	3420	5240	3490	5340	3550	5440	3620	5540	3690	5650	3760	5750	3820
			4	57.8	7460	4560	3030	4620	3080	4690	3120	4760	3170	4830	3210	4890	3260	4960	3300
			BFL	77.1	3620	3910	2600	3940	2620	3970	2640	4010	2670	4040	2690	4070	2710	4100	2730
HD 400×592	2780	1850	TFL	0.00	17700	5630	3740	5790	3850	5950	3960	6110	4060	6270	4170	6430	4280	6590	4380
			2	18.1	14200	5210	3470	5340	3550	5470	3640	5600	3720	5720	3810	5850	3890	5980	3980
			3	36.2	10600	4740	3150	4830	3220	4930	3280	5030	3340	5120	3410	5220	3470	5310	3530
			4	54.2	7010	4210	2800	4270	2840	4330	2880	4400	2930	4460	2970	4520	3010	4590	3050
			BFL	72.3	3430	3620	2410	3650	2430	3680	2450	3710	2470	3740	2490	3770	2510	3800	2530
HD 400×551	2550	1700	TFL	0.00	16500	5160	3430	5300	3530	5450	3630	5600	3730	5750	3820	5900	3920	6050	4020
			2	16.9	13200	4770	3170	4890	3250	5010	3330	5130	3410	5250	3490	5360	3570	5480	3650
			3	33.8	9840	4340	2890	4430	2940	4510	3000	4600	3060	4690	3120	4780	3180	4870	3240
			4	50.7	6520	3850	2560	3910	2600	3970	2640	4030	2680	4090	2720	4150	2760	4200	2800
			BFL	67.6	3200	3320	2210	3350	2230	3370	2250	3400	2260	3430	2280	3460	2300	3490	2320
HD 400×509	2330	1550	TFL	0.00	15300	4710	3130	4850	3220	4980	3320	5120	3410	5260	3500	5390	3590	5530	3680
			2	15.7	12200	4360	2900	4470	2970	4570	3040	4680	3120	4790	3190	4900	3260	5010	3340
			3	31.4	9120	3960	2630	4040	2690	4120	2740	4210	2800	4290	2850	4370	2910	4450	2960
			4	47.0	6060	3520	2340	3580	2380	3630	2410	3680	2450	3740	2490	3790	2520	3850	2560
			BFL	62.7	2990	3040	2020	3070	2040	3090	2060	3120	2080	3150	2090	3170	2110	3200	2130

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

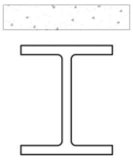
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×463	2090	1390	TFL	0.00	13900	3340	2220	3460	2300	3580	2380	3710	2470	3830	2550	3960	2630	4080	2720
			2	14.4	11100	3190	2120	3290	2190	3390	2260	3490	2320	3590	2390	3690	2460	3790	2520
			3	28.7	8300	3010	2000	3090	2050	3160	2100	3240	2150	3310	2200	3390	2250	3460	2300
			4	43.1	5520	2800	1860	2850	1900	2900	1930	2950	1960	3000	1990	3050	2030	3100	2060
			BFL	57.4	2740	2550	1700	2570	1710	2600	1730	2620	1740	2650	1760	2670	1780	2700	1790
HD 400×421	1880	1250	TFL	0.00	12600	2980	1980	3100	2060	3210	2140	3320	2210	3440	2290	3550	2360	3660	2440
			2	13.2	10100	2850	1900	2940	1960	3030	2020	3130	2080	3220	2140	3310	2200	3400	2260
			3	26.3	7570	2690	1790	2760	1840	2830	1880	2900	1930	2970	1970	3040	2020	3100	2060
			4	39.5	5040	2510	1670	2550	1700	2600	1730	2640	1760	2690	1790	2730	1820	2780	1850
			BFL	52.6	2510	2290	1520	2310	1540	2330	1550	2360	1570	2380	1580	2400	1600	2420	1610
HD 400×382	1680	1120	TFL	0.00	11400	2660	1770	2760	1840	2860	1910	2970	1970	3070	2040	3170	2110	3280	2180
			2	12.0	9160	2540	1690	2620	1750	2710	1800	2790	1860	2870	1910	2950	1970	3040	2020
			3	24.0	6870	2400	1600	2460	1640	2530	1680	2590	1720	2650	1760	2710	1800	2770	1850
			4	36.0	4580	2240	1490	2280	1520	2320	1540	2360	1570	2400	1600	2440	1630	2480	1650
			BFL	48.0	2290	2050	1360	2070	1380	2090	1390	2110	1400	2130	1420	2150	1430	2170	1440
HD 400×347	1510	1000	TFL	0.00	10400	2370	1580	2460	1640	2560	1700	2650	1760	2740	1830	2840	1890	2930	1950
			2	10.9	8310	2270	1510	2340	1560	2420	1610	2490	1660	2570	1710	2640	1760	2720	1810
			3	21.9	6240	2140	1430	2200	1460	2250	1500	2310	1540	2370	1570	2420	1610	2480	1650
			4	32.8	4160	2000	1330	2040	1350	2070	1380	2110	1400	2150	1430	2190	1450	2220	1480
			BFL	43.7	2090	1830	1220	1850	1230	1870	1240	1890	1260	1910	1270	1930	1280	1950	1290
HD 400×314	1350	897	TFL	0.00	9380	2110	1400	2190	1460	2280	1510	2360	1570	2440	1630	2530	1680	2610	1740
			2	9.90	7520	2010	1340	2080	1390	2150	1430	2220	1480	2280	1520	2350	1570	2420	1610
			3	19.8	5650	1910	1270	1960	1300	2010	1340	2060	1370	2110	1400	2160	1440	2210	1470
			4	29.7	3780	1780	1180	1810	1210	1850	1230	1880	1250	1920	1270	1950	1300	1980	1320
			BFL	39.6	1920	1640	1090	1650	1100	1670	1110	1690	1120	1710	1140	1720	1150	1740	1160
HD 400×287	1230	818	TFL	0.00	8610	1910	1270	1990	1320	2060	1370	2140	1430	2220	1480	2300	1530	2370	1580
			2	9.15	6890	1830	1210	1890	1260	1950	1300	2010	1340	2070	1380	2140	1420	2200	1460
			3	18.3	5180	1730	1150	1770	1180	1820	1210	1870	1240	1910	1270	1960	1300	2010	1340
			4	27.5	3460	1610	1070	1650	1090	1680	1120	1710	1140	1740	1160	1770	1180	1800	1200
			BFL	36.6	1740	1490	990	1500	1000	1520	1010	1530	1020	1550	1030	1570	1040	1580	1050
HD 400×262	1110	740	TFL	0.00	7860	1720	1150	1790	1190	1860	1240	1940	1290	2010	1330	2080	1380	2150	1430
			2	8.33	6310	1650	1100	1700	1130	1760	1170	1820	1210	1870	1250	1930	1280	1990	1320
			3	16.7	4750	1560	1040	1600	1070	1650	1090	1690	1120	1730	1150	1770	1180	1820	1210
			4	25.0	3190	1460	972	1490	991	1520	1010	1550	1030	1580	1050	1600	1070	1630	1090
			BFL	33.3	1630	1350	898	1360	908	1380	917	1390	927	1410	937	1420	947	1440	957
HD 400×237	991	659	TFL	0.00	7070	1530	1020	1590	1060	1650	1100	1720	1140	1780	1190	1850	1230	1910	1270
			2	7.55	5670	1460	971	1510	1010	1560	1040	1610	1070	1660	1110	1710	1140	1770	1170
			3	15.1	4270	1380	920	1420	945	1460	971	1500	996	1540	1020	1570	1050	1610	1070
			4	22.7	2870	1300	862	1320	879	1350	896	1370	913	1400	930	1420	948	1450	965
			BFL	30.2	1460	1200	798	1210	806	1230	815	1240	824	1250	833	1260	842	1280	850
HD 400×216	901	600	TFL	0.00	6470	1380	921	1440	960	1500	998	1560	1040	1620	1080	1680	1110	1730	1150
			2	6.93	5190	1320	880	1370	911	1420	942	1460	973	1510	1000	1560	1040	1600	1070
			3	13.9	3910	1250	833	1290	857	1320	880	1360	904	1390	927	1430	950	1460	974
			4	20.8	2630	1170	782	1200	797	1220	813	1250	829	1270	845	1290	860	1320	876
			BFL	27.7	1340	1090	725	1100	733	1110	741	1130	749	1140	757	1150	765	1160	773
HD 400×187	770	512	TFL	0.00	5580	1180	782	1230	816	1280	849	1330	883	1380	916	1430	950	1480	983
			2	6.00	4480	1120	747	1160	774	1200	801	1240	828	1280	855	1320	882	1370	908
			3	12.0	3380	1060	708	1100	729	1130	749	1160	769	1190	789	1220	810	1250	830
			4	18.0	2280	1000	666	1020	679	1040	693	1060	706	1080	720	1100	734	1120	747
			BFL	24.0	1170	930	619	940	626	951	633	961	640	972	647	983	654	993	661

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

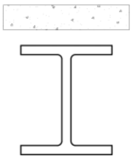
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×463	2090	1390	TFL	0.00	13900	4210	2800	4330	2880	4460	2970	4580	3050	4710	3130	4830	3210	4960	3300
			2	14.4	11100	3890	2590	3990	2650	4090	2720	4190	2790	4290	2850	4390	2920	4490	2990
			3	28.7	8300	3540	2350	3610	2400	3690	2450	3760	2500	3830	2550	3910	2600	3980	2650
			4	43.1	5520	3150	2090	3200	2130	3250	2160	3300	2190	3340	2230	3390	2260	3440	2290
			BFL	57.4	2740	2720	1810	2750	1830	2770	1840	2790	1860	2820	1880	2840	1890	2870	1910
HD 400×421	1880	1250	TFL	0.00	12600	3780	2510	3890	2590	4000	2660	4120	2740	4230	2820	4350	2890	4460	2970
			2	13.2	10100	3490	2320	3580	2380	3670	2440	3760	2500	3850	2560	3940	2620	4030	2680
			3	26.3	7570	3170	2110	3240	2160	3310	2200	3380	2250	3440	2290	3510	2340	3580	2380
			4	39.5	5040	2820	1880	2870	1910	2910	1940	2960	1970	3000	2000	3050	2030	3100	2060
			BFL	52.6	2510	2450	1630	2470	1640	2490	1660	2510	1670	2540	1690	2560	1700	2580	1720
HD 400×382	1680	1120	TFL	0.00	11400	3380	2250	3480	2320	3590	2390	3690	2450	3790	2520	3890	2590	4000	2660
			2	12.0	9160	3120	2080	3200	2130	3280	2190	3370	2240	3450	2290	3530	2350	3610	2400
			3	24.0	6870	2840	1890	2900	1930	2960	1970	3020	2010	3080	2050	3140	2090	3210	2130
			4	36.0	4580	2530	1680	2570	1710	2610	1740	2650	1760	2690	1790	2730	1820	2770	1850
			BFL	48.0	2290	2190	1460	2210	1470	2230	1490	2250	1500	2270	1510	2290	1530	2320	1540
HD 400×347	1510	1000	TFL	0.00	10400	3020	2010	3120	2070	3210	2140	3300	2200	3400	2260	3490	2320	3590	2390
			2	10.9	8310	2790	1860	2860	1910	2940	1960	3010	2010	3090	2060	3160	2110	3240	2150
			3	21.9	6240	2540	1690	2590	1720	2650	1760	2700	1800	2760	1840	2820	1870	2870	1910
			4	32.8	4160	2260	1500	2300	1530	2340	1550	2370	1580	2410	1600	2450	1630	2490	1650
			BFL	43.7	2090	1960	1310	1980	1320	2000	1330	2020	1340	2040	1360	2060	1370	2080	1380
HD 400×314	1350	897	TFL	0.00	9380	2700	1790	2780	1850	2870	1910	2950	1960	3040	2020	3120	2080	3200	2130
			2	9.90	7520	2490	1660	2560	1700	2620	1750	2690	1790	2760	1840	2830	1880	2890	1930
			3	19.8	5650	2260	1500	2310	1540	2360	1570	2410	1610	2460	1640	2520	1670	2570	1710
			4	29.7	3780	2020	1340	2050	1370	2090	1390	2120	1410	2150	1430	2190	1460	2220	1480
			BFL	39.6	1920	1760	1170	1780	1180	1790	1190	1810	1200	1830	1220	1840	1230	1860	1240
HD 400×287	1230	818	TFL	0.00	8610	2450	1630	2530	1680	2610	1730	2680	1790	2760	1840	2840	1890	2920	1940
			2	9.15	6890	2260	1500	2320	1540	2380	1590	2450	1630	2510	1670	2570	1710	2630	1750
			3	18.3	5180	2050	1370	2100	1400	2150	1430	2190	1460	2240	1490	2290	1520	2330	1550
			4	27.5	3460	1830	1220	1860	1240	1890	1260	1930	1280	1960	1300	1990	1320	2020	1340
			BFL	36.6	1740	1600	1060	1610	1070	1630	1080	1640	1090	1660	1100	1680	1120	1690	1130
HD 400×262	1110	740	TFL	0.00	7860	2220	1480	2290	1520	2360	1570	2430	1620	2500	1660	2570	1710	2640	1760
			2	8.33	6310	2040	1360	2100	1400	2160	1440	2210	1470	2270	1510	2330	1550	2390	1590
			3	16.7	4750	1860	1240	1900	1270	1940	1290	1990	1320	2030	1350	2070	1380	2120	1410
			4	25.0	3190	1660	1110	1690	1120	1720	1140	1750	1160	1780	1180	1810	1200	1830	1220
			BFL	33.3	1630	1450	966	1470	976	1480	986	1500	996	1510	1010	1530	1020	1540	1030
HD 400×237	991	659	TFL	0.00	7070	1970	1310	2040	1350	2100	1400	2160	1440	2230	1480	2290	1520	2350	1570
			2	7.55	5670	1820	1210	1870	1240	1920	1280	1970	1310	2020	1340	2070	1380	2120	1410
			3	15.1	4270	1650	1100	1690	1120	1730	1150	1770	1180	1800	1200	1840	1230	1880	1250
			4	22.7	2870	1480	982	1500	999	1530	1020	1550	1030	1580	1050	1600	1070	1630	1080
			BFL	30.2	1460	1290	859	1300	868	1320	877	1330	885	1340	894	1360	903	1370	912
HD 400×216	901	600	TFL	0.00	6470	1790	1190	1850	1230	1910	1270	1970	1310	2020	1350	2080	1390	2140	1420
			2	6.93	5190	1650	1100	1700	1130	1740	1160	1790	1190	1840	1220	1880	1250	1930	1280
			3	13.9	3910	1500	997	1530	1020	1570	1040	1600	1070	1640	1090	1670	1110	1710	1140
			4	20.8	2630	1340	892	1360	907	1390	923	1410	939	1430	955	1460	970	1480	986
			BFL	27.7	1340	1170	781	1190	789	1200	797	1210	805	1220	813	1230	821	1250	829
HD 400×187	770	512	TFL	0.00	5580	1530	1020	1580	1050	1630	1080	1680	1120	1730	1150	1780	1180	1830	1220
			2	6.00	4480	1410	935	1450	962	1490	989	1530	1020	1570	1040	1610	1070	1650	1100
			3	12.0	3380	1280	850	1310	870	1340	890	1370	911	1400	931	1430	951	1460	971
			4	18.0	2280	1140	761	1160	775	1180	788	1210	802	1230	815	1250	829	1270	843
			BFL	24.0	1170	1000	668	1010	675	1020	682	1040	689	1050	696	1060	703	1070	710

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

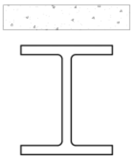
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 360×196	812	540	TFL	0.00	5880	1250	831	1300	866	1360	902	1410	937	1460	972	1510	1010	1570	1040
			2	6.55	4730	1190	795	1240	823	1280	851	1320	879	1360	908	1410	936	1450	964
			3	13.1	3580	1130	753	1160	775	1200	796	1230	818	1260	839	1290	860	1330	882
			4	19.7	2430	1060	707	1090	722	1110	737	1130	751	1150	766	1170	780	1190	795
			BFL	26.2	1280	988	657	999	665	1010	673	1020	680	1030	688	1050	695	1060	703
HD 360×179	736	490	TFL	0.00	5370	1130	752	1180	784	1230	816	1270	848	1320	880	1370	912	1420	945
			2	5.98	4320	1080	719	1120	744	1160	770	1200	796	1240	822	1270	848	1310	874
			3	12.0	3270	1020	682	1050	701	1080	721	1110	740	1140	760	1170	779	1200	799
			4	17.9	2220	963	641	983	654	1000	667	1020	681	1040	694	1060	707	1080	721
			BFL	23.9	1180	896	596	907	603	917	610	928	617	939	624	949	632	960	639
HD 360×162	664	442	TFL	0.00	4850	1010	674	1060	703	1100	732	1140	761	1190	790	1230	819	1270	848
			2	5.45	3900	967	643	1000	667	1040	690	1070	714	1110	737	1140	760	1180	784
			3	10.9	2950	917	610	944	628	970	646	997	663	1020	681	1050	699	1080	716
			4	16.4	2000	863	574	881	586	899	598	917	610	935	622	953	634	971	646
			BFL	21.8	1050	804	535	813	541	823	547	832	554	842	560	851	566	860	572
HD 360×147	600	399	TFL	0.00	4420	914	608	954	635	994	661	1030	687	1070	714	1110	740	1150	767
			2	4.95	3550	873	581	905	602	937	624	969	645	1000	666	1030	688	1070	709
			3	9.90	2690	829	551	853	568	877	584	902	600	926	616	950	632	974	648
			4	14.9	1830	781	519	797	530	814	541	830	552	847	563	863	574	880	585
			BFL	19.8	972	728	485	737	490	746	496	755	502	763	508	772	514	781	520
HD 360×134	542	361	TFL	0.00	4010	823	547	859	571	895	595	931	619	967	643	1000	667	1040	691
			2	4.50	3230	786	523	815	542	844	562	873	581	902	600	931	620	960	639
			3	9.00	2450	746	496	768	511	790	526	812	540	834	555	856	570	878	584
			4	13.5	1670	703	468	718	478	733	488	748	498	763	508	778	518	793	528
			BFL	18.0	887	657	437	665	442	673	448	681	453	689	458	697	464	705	469
HD 320×300	1170	777	TFL	0.00	8980	1920	1280	2000	1330	2080	1380	2160	1440	2240	1490	2320	1550	2400	1600
			2	12.0	7210	1830	1220	1900	1260	1960	1300	2030	1350	2090	1390	2150	1430	2220	1480
			3	24.0	5450	1720	1150	1770	1180	1820	1210	1870	1240	1920	1280	1970	1310	2020	1340
			4	36.0	3680	1600	1060	1630	1080	1660	1110	1690	1130	1730	1150	1760	1170	1790	1190
			BFL	48.0	1920	1450	964	1470	976	1480	987	1500	999	1520	1010	1540	1020	1550	1030
HD 320×245	938	624	TFL	0.00	7330	1510	1010	1580	1050	1650	1100	1710	1140	1780	1180	1840	1230	1910	1270
			2	10.0	5880	1440	960	1500	995	1550	1030	1600	1070	1650	1100	1710	1140	1760	1170
			3	20.0	4430	1360	903	1400	930	1440	956	1480	983	1520	1010	1560	1040	1600	1060
			4	30.0	2980	1260	838	1290	856	1310	874	1340	891	1370	909	1390	927	1420	945
			BFL	40.0	1520	1150	764	1160	773	1180	782	1190	791	1200	801	1220	810	1230	819
HD 320×198	736	490	TFL	0.00	5930	1180	786	1240	822	1290	857	1340	893	1400	928	1450	964	1500	999
			2	8.00	4780	1130	749	1170	778	1210	806	1260	835	1300	864	1340	892	1380	921
			3	16.0	3630	1060	706	1090	728	1130	750	1160	772	1190	793	1230	815	1260	837
			4	24.0	2480	989	658	1010	673	1030	688	1060	703	1080	718	1100	732	1120	747
			BFL	32.0	1330	909	605	921	612	932	620	944	628	956	636	968	644	980	652
HD 320×158	575	382	TFL	0.00	4730	915	609	957	637	1000	665	1040	694	1090	722	1130	750	1170	779
			2	6.38	3820	871	580	906	603	940	626	975	648	1010	671	1040	694	1080	717
			3	12.8	2910	823	547	849	565	875	582	901	600	928	617	954	635	980	652
			4	19.1	2000	769	512	787	524	805	536	823	548	841	560	859	572	877	584
			BFL	25.5	1100	710	472	720	479	730	485	739	492	749	499	759	505	769	512
HD 320×127	455	302	TFL	0.00	3790	716	477	751	499	785	522	819	545	853	567	887	590	921	613
			2	5.13	3070	682	454	710	472	737	491	765	509	793	527	820	546	848	564
			3	10.3	2350	645	429	666	443	687	457	708	471	729	485	750	499	771	513
			4	15.4	1620	604	402	618	411	633	421	648	431	662	441	677	450	691	460
			BFL	20.5	900	560	372	568	378	576	383	584	389	592	394	600	399	608	405

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

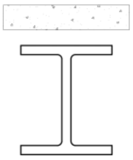
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 360×196	812	540	TFL	0.00	5880	1620	1080	1670	1110	1730	1150	1780	1180	1830	1220	1880	1250	1940	1290
			2	6.55	4730	1490	993	1530	1020	1580	1050	1620	1080	1660	1110	1710	1130	1750	1160
			3	13.1	3580	1360	903	1390	925	1420	946	1450	968	1490	989	1520	1010	1550	1030
			4	19.7	2430	1220	809	1240	824	1260	838	1280	853	1300	867	1330	882	1350	897
			BFL	26.2	1280	1070	711	1080	718	1090	726	1100	734	1110	741	1130	749	1140	757
HD 360×179	736	490	TFL	0.00	5370	1470	977	1520	1010	1560	1040	1610	1070	1660	1110	1710	1140	1760	1170
			2	5.98	4320	1350	899	1390	925	1430	951	1470	977	1510	1000	1550	1030	1590	1050
			3	12.0	3270	1230	819	1260	838	1290	858	1320	877	1350	897	1380	917	1410	936
			4	17.9	2220	1100	734	1120	747	1140	761	1160	774	1180	787	1200	801	1220	814
			BFL	23.9	1180	970	646	981	653	991	660	1000	667	1010	674	1020	681	1030	688
HD 360×162	664	442	TFL	0.00	4850	1320	877	1360	906	1400	935	1450	964	1490	993	1540	1020	1580	1050
			2	5.45	3900	1210	807	1250	830	1280	854	1320	877	1350	900	1390	924	1420	947
			3	10.9	2950	1100	734	1130	752	1160	769	1180	787	1210	805	1240	822	1260	840
			4	16.4	2000	989	658	1010	670	1020	682	1040	694	1060	706	1080	718	1100	730
			BFL	21.8	1050	870	579	879	585	889	591	898	598	908	604	917	610	926	616
HD 360×147	600	399	TFL	0.00	4420	1190	793	1230	820	1270	846	1310	873	1350	899	1390	925	1430	952
			2	4.95	3550	1100	730	1130	751	1160	773	1190	794	1230	815	1260	837	1290	858
			3	9.90	2690	999	664	1020	681	1050	697	1070	713	1100	729	1120	745	1140	761
			4	14.9	1830	896	596	913	607	929	618	946	629	962	640	979	651	995	662
			BFL	19.8	972	790	525	798	531	807	537	816	543	825	549	833	555	842	560
HD 360×134	542	361	TFL	0.00	4010	1080	715	1110	739	1150	763	1180	787	1220	811	1260	835	1290	859
			2	4.50	3230	989	658	1020	678	1050	697	1080	716	1110	736	1130	755	1160	774
			3	9.00	2450	900	599	922	614	944	628	966	643	988	658	1010	672	1030	687
			4	13.5	1670	808	538	823	548	838	558	853	568	868	578	883	588	898	598
			BFL	18.0	887	713	474	721	480	729	485	737	490	745	496	753	501	761	506
HD 320×300	1170	777	TFL	0.00	8980	2490	1650	2570	1710	2650	1760	2730	1810	2810	1870	2890	1920	2970	1980
			2	12.0	7210	2280	1520	2350	1560	2410	1610	2480	1650	2540	1690	2610	1740	2670	1780
			3	24.0	5450	2070	1370	2110	1410	2160	1440	2210	1470	2260	1500	2310	1540	2360	1570
			4	36.0	3680	1830	1220	1860	1240	1890	1260	1930	1280	1960	1300	1990	1330	2030	1350
			BFL	48.0	1920	1570	1040	1590	1060	1600	1070	1620	1080	1640	1090	1660	1100	1670	1110
HD 320×245	938	624	TFL	0.00	7330	1980	1310	2040	1360	2110	1400	2170	1450	2240	1490	2310	1530	2370	1580
			2	10.0	5880	1810	1210	1870	1240	1920	1280	1970	1310	2020	1350	2080	1380	2130	1420
			3	20.0	4430	1640	1090	1680	1120	1720	1140	1760	1170	1800	1190	1840	1220	1880	1250
			4	30.0	2980	1450	963	1470	981	1500	998	1530	1020	1550	1030	1580	1050	1610	1070
			BFL	40.0	1520	1240	828	1260	837	1270	846	1290	855	1300	864	1310	874	1330	883
HD 320×198	736	490	TFL	0.00	5930	1560	1030	1610	1070	1660	1110	1720	1140	1770	1180	1820	1210	1880	1250
			2	8.00	4780	1430	949	1470	978	1510	1010	1560	1040	1600	1060	1640	1090	1690	1120
			3	16.0	3630	1290	859	1320	880	1360	902	1390	924	1420	945	1450	967	1490	989
			4	24.0	2480	1150	762	1170	777	1190	792	1210	807	1230	821	1260	836	1280	851
			BFL	32.0	1330	992	660	1000	668	1020	676	1030	684	1040	692	1050	700	1060	708
HD 320×158	575	382	TFL	0.00	4730	1210	807	1260	835	1300	864	1340	892	1380	920	1430	948	1470	977
			2	6.38	3820	1110	740	1150	763	1180	786	1220	809	1250	831	1280	854	1320	877
			3	12.8	2910	1010	670	1030	687	1060	704	1080	722	1110	739	1140	757	1160	774
			4	19.1	2000	895	596	913	608	931	620	949	632	967	644	985	656	1000	668
			BFL	25.5	1100	779	518	789	525	799	531	809	538	818	545	828	551	838	558
HD 320×127	455	302	TFL	0.00	3790	955	636	989	658	1020	681	1060	704	1090	726	1130	749	1160	772
			2	5.13	3070	876	583	903	601	931	619	958	638	986	656	1010	674	1040	693
			3	10.3	2350	792	527	814	541	835	555	856	569	877	583	898	597	919	612
			4	15.4	1620	706	470	721	480	735	489	750	499	765	509	779	518	794	528
			BFL	20.5	900	616	410	624	415	633	421	641	426	649	432	657	437	665	442

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

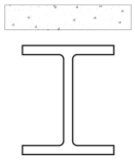
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 320×97.6	344	229	TFL	0.00	2920	539	359	566	376	592	394	618	411	645	429	671	446	697	464
			2	3.88	2380	514	342	535	356	557	370	578	385	599	399	621	413	642	427
			3	7.75	1830	486	324	503	335	519	346	536	356	552	367	569	378	585	389
			4	11.6	1280	457	304	469	312	480	319	492	327	503	335	515	343	526	350
			BFL	15.5	738	426	283	432	288	439	292	446	297	452	301	459	305	466	310
			6	15.9	734	426	283	432	288	439	292	445	296	452	301	459	305	465	310
			7	16.2	731	425	283	432	287	439	292	445	296	452	301	458	305	465	309
HD 320×74.2	253	168	TFL	0.00	2220	401	267	421	280	441	293	461	307	481	320	501	333	521	347
			2	2.75	1830	383	255	400	266	416	277	433	288	449	299	466	310	482	321
			3	5.50	1450	364	242	377	251	390	260	403	268	416	277	429	286	442	294
			4	8.25	1060	344	229	354	235	363	242	373	248	383	255	392	261	402	267
			BFL	11.0	672	324	215	330	219	336	223	342	227	348	231	354	235	360	239
			6	17.3	614	320	213	326	217	331	220	337	224	342	228	348	231	353	235
			7	23.6	556	317	211	322	214	327	217	332	221	337	224	342	227	347	231
HD 260×172	534	355	TFL	0.00	5160	906	603	952	633	999	664	1050	695	1090	726	1140	757	1180	788
			2	8.13	4140	856	569	893	594	930	619	968	644	1000	669	1040	693	1080	718
			3	16.3	3110	799	531	827	550	855	569	883	587	911	606	939	625	967	643
			4	24.4	2090	734	488	753	501	771	513	790	526	809	538	828	551	847	563
			BFL	32.5	1070	662	440	671	447	681	453	690	459	700	466	710	472	719	479
HD 260×142	426	284	TFL	0.00	4240	721	480	759	505	797	530	835	556	873	581	911	606	950	632
			2	6.63	3410	681	453	712	474	743	494	773	514	804	535	835	555	865	576
			3	13.3	2590	637	424	660	439	683	455	706	470	730	486	753	501	776	517
			4	19.9	1760	587	391	603	401	619	412	635	422	651	433	666	443	682	454
			BFL	26.5	936	533	355	541	360	550	366	558	371	567	377	575	383	583	388
HD 260×114	338	225	TFL	0.00	3420	567	377	598	398	629	418	659	439	690	459	721	480	752	500
			2	5.38	2760	536	356	560	373	585	389	610	406	635	423	660	439	685	456
			3	10.8	2100	501	333	520	346	539	359	558	371	577	384	596	396	614	409
			4	16.1	1440	463	308	476	317	489	325	502	334	515	343	528	351	541	360
			BFL	21.5	776	422	281	429	286	436	290	443	295	450	300	457	304	464	309
HD 260×93	271	181	TFL	0.00	2780	451	300	476	317	501	333	526	350	551	367	576	383	601	400
			2	4.38	2250	426	283	446	297	466	310	486	324	507	337	527	350	547	364
			3	8.75	1710	398	265	414	275	429	286	445	296	460	306	476	316	491	327
			4	13.1	1180	369	246	380	253	390	260	401	267	412	274	422	281	433	288
			BFL	17.5	644	338	225	343	229	349	232	355	236	361	240	367	244	372	248
HD260×68.2	195	129	TFL	0.00	2040	321	214	340	226	358	238	376	250	395	263	413	275	432	287
			2	3.13	1660	304	202	319	212	333	222	348	232	363	242	378	252	393	262
			3	6.25	1280	285	190	296	197	308	205	319	212	331	220	342	228	354	235
			4	9.38	895	265	176	273	182	281	187	289	192	297	198	305	203	313	208
			BFL	12.5	513	244	162	249	165	253	168	258	172	262	175	267	178	272	181
			6	12.7	511	244	162	249	165	253	168	258	171	262	175	267	178	272	181
			7	12.8	510	244	162	248	165	253	168	258	171	262	174	267	178	271	181
HD 260×54.1	151	101	TFL	0.00	1620	251	167	265	177	280	186	295	196	309	206	324	215	338	225
			2	2.38	1330	238	158	250	166	261	174	273	182	285	190	297	198	309	206
			3	4.75	1040	224	149	233	155	242	161	252	167	261	174	270	180	280	186
			4	7.13	750	209	139	216	143	222	148	229	152	236	157	243	161	249	166
			BFL	9.50	460	194	129	198	132	202	134	206	137	210	140	214	143	219	145
			6	13.0	433	192	128	196	130	200	133	204	136	208	138	212	141	216	143
			7	16.4	405	191	127	194	129	198	132	202	134	205	137	209	139	212	141

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

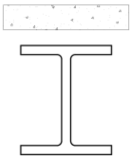
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 320×97.6	344	229	TFL	0.00	2920	724	481	750	499	776	516	802	534	829	551	855	569	881	586
			2	3.88	2380	664	442	685	456	706	470	728	484	749	498	771	513	792	527
			3	7.75	1830	602	400	618	411	635	422	651	433	668	444	684	455	701	466
			4	11.6	1280	538	358	549	366	561	373	573	381	584	389	596	396	607	404
			BFL	15.5	738	472	314	479	319	486	323	492	327	499	332	505	336	512	341
			6	15.9	734	472	314	478	318	485	323	492	327	498	332	505	336	511	340
			7	16.2	731	471	314	478	318	485	322	491	327	498	331	504	336	511	340
HD 320×74.2	253	168	TFL	0.00	2220	541	360	561	373	581	387	601	400	621	413	641	427	661	440
			2	2.75	1830	499	332	515	343	532	354	548	365	565	376	581	387	598	398
			3	5.50	1450	455	303	468	312	481	320	494	329	508	338	521	346	534	355
			4	8.25	1060	411	274	421	280	430	286	440	293	449	299	459	305	468	312
			BFL	11.0	672	366	243	372	247	378	251	384	256	390	260	396	264	402	268
			6	17.3	614	359	239	364	242	370	246	375	250	381	253	387	257	392	261
			7	23.6	556	352	234	357	237	362	241	367	244	372	247	377	251	382	254
HD 260×172	534	355	TFL	0.00	5160	1230	819	1280	850	1320	881	1370	912	1420	943	1460	973	1510	1000
			2	8.13	4140	1120	743	1150	768	1190	792	1230	817	1270	842	1300	867	1340	892
			3	16.3	3110	995	662	1020	681	1050	699	1080	718	1110	736	1130	755	1160	774
			4	24.4	2090	866	576	884	588	903	601	922	613	941	626	960	638	978	651
			BFL	32.5	1070	729	485	738	491	748	498	758	504	767	510	777	517	786	523
HD 260×142	426	284	TFL	0.00	4240	988	657	1030	682	1060	708	1100	733	1140	759	1180	784	1220	809
			2	6.63	3410	896	596	927	617	957	637	988	657	1020	678	1050	698	1080	719
			3	13.3	2590	800	532	823	547	846	563	869	578	893	594	916	609	939	625
			4	19.9	1760	698	465	714	475	730	486	746	496	762	507	777	517	793	528
			BFL	26.5	936	592	394	600	399	609	405	617	411	626	416	634	422	642	427
HD 260×114	338	225	TFL	0.00	3420	783	521	814	541	844	562	875	582	906	603	937	623	968	644
			2	5.38	2760	710	472	734	489	759	505	784	522	809	538	834	555	859	571
			3	10.8	2100	633	421	652	434	671	447	690	459	709	472	728	484	747	497
			4	16.1	1440	554	369	567	377	580	386	593	394	606	403	619	412	632	420
			BFL	21.5	776	471	313	478	318	485	323	492	327	499	332	506	337	513	341
HD 260×93	271	181	TFL	0.00	2780	626	417	651	433	676	450	701	467	726	483	751	500	776	516
			2	4.38	2250	567	377	587	391	608	404	628	418	648	431	668	445	689	458
			3	8.75	1710	506	337	522	347	537	357	553	368	568	378	583	388	599	398
			4	13.1	1180	443	295	454	302	465	309	475	316	486	323	496	330	507	337
			BFL	17.5	644	378	252	384	256	390	259	396	263	401	267	407	271	413	275
HD260×68.2	195	129	TFL	0.00	2040	450	299	468	312	487	324	505	336	523	348	542	360	560	373
			2	3.13	1660	408	272	423	281	438	291	453	301	468	311	483	321	498	331
			3	6.25	1280	365	243	377	251	388	258	400	266	411	274	423	281	434	289
			4	9.38	895	321	214	329	219	337	224	345	230	354	235	362	241	370	246
			BFL	12.5	513	276	184	281	187	286	190	290	193	295	196	299	199	304	202
			6	12.7	511	276	184	281	187	285	190	290	193	295	196	299	199	304	202
			7	12.8	510	276	184	281	187	285	190	290	193	294	196	299	199	304	202
HD 260×54.1	151	101	TFL	0.00	1620	353	235	368	245	382	254	397	264	411	274	426	283	441	293
			2	2.38	1330	321	214	333	222	345	230	357	238	369	246	381	254	393	262
			3	4.75	1040	289	192	298	199	308	205	317	211	327	217	336	223	345	230
			4	7.13	750	256	170	263	175	270	179	276	184	283	188	290	193	297	197
			BFL	9.50	460	223	148	227	151	231	154	235	156	239	159	243	162	248	165
			6	13.0	433	219	146	223	149	227	151	231	154	235	156	239	159	243	162
			7	16.4	405	216	144	220	146	223	149	227	151	231	154	234	156	238	158

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

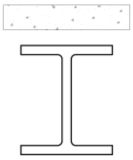
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×1086	6730	4480	TFL	0.00	38100	11500	7630	11800	7860	12200	8090	12500	8320	12800	8550	13200	8780	13500	9000
			2	31.3	30300	11000	7330	11300	7510	11600	7690	11800	7870	12100	8050	12400	8240	12700	8420
			3	62.5	22500	10300	6880	10500	7010	10700	7140	10900	7280	11100	7410	11300	7550	11500	7680
			4	93.8	14700	9430	6280	9570	6360	9700	6450	9830	6540	9960	6630	10100	6720	10200	6800
			BFL	125	6900	8310	5530	8380	5570	8440	5610	8500	5660	8560	5700	8620	5740	8690	5780
HD 400×990	6010	4000	TFL	0.00	34700	10200	6750	10500	6960	10800	7170	11100	7380	11400	7590	11700	7790	12000	8000
			2	28.8	27600	9740	6480	9990	6650	10200	6810	10500	6980	10700	7140	11000	7310	11200	7470
			3	57.5	20500	9150	6090	9330	6210	9520	6330	9700	6450	9890	6580	10100	6700	10300	6820
			4	86.3	13500	8370	5570	8490	5650	8610	5730	8730	5810	8850	5890	8980	5970	9100	6050
			BFL	115	6370	7410	4930	7470	4970	7520	5010	7580	5040	7640	5080	7700	5120	7750	5160
HD 400×900	5350	3560	TFL	0.00	31600	8970	5970	9260	6160	9540	6350	9830	6540	10100	6730	10400	6920	10700	7100
			2	26.5	25200	8610	5730	8830	5880	9060	6030	9280	6180	9510	6330	9740	6480	9960	6630
			3	53.0	18700	8090	5380	8250	5490	8420	5600	8590	5720	8760	5830	8930	5940	9100	6050
			4	79.5	12300	7410	4930	7520	5000	7630	5080	7740	5150	7850	5220	7960	5300	8070	5370
			BFL	106	5830	6580	4380	6640	4420	6690	4450	6740	4480	6790	4520	6850	4550	6900	4590
HD 400×818	4770	3170	TFL	0.00	28700	7920	5270	8180	5440	8440	5620	8700	5790	8960	5960	9220	6130	9470	6300
			2	24.3	22900	7600	5060	7800	5190	8010	5330	8220	5470	8420	5600	8630	5740	8830	5880
			3	48.5	17000	7150	4750	7300	4860	7450	4960	7610	5060	7760	5160	7910	5260	8070	5370
			4	72.8	11200	6570	4370	6670	4440	6770	4500	6870	4570	6970	4640	7070	4700	7170	4770
			BFL	97.0	5370	5860	3900	5910	3930	5950	3960	6000	3990	6050	4030	6100	4060	6150	4090
HD 400×744	4250	2830	TFL	0.00	26100	7020	4670	7250	4820	7490	4980	7720	5140	7950	5290	8190	5450	8420	5600
			2	22.2	20800	6730	4470	6910	4600	7100	4720	7290	4850	7470	4970	7660	5100	7850	5220
			3	44.5	15500	6330	4210	6470	4300	6610	4400	6750	4490	6890	4580	7030	4680	7170	4770
			4	66.7	10200	5830	3880	5920	3940	6010	4000	6100	4060	6200	4120	6290	4180	6380	4250
			BFL	88.9	4950	5220	3470	5270	3500	5310	3530	5350	3560	5400	3590	5440	3620	5490	3650
HD 400×677	3800	2530	TFL	0.00	23700	6230	4140	6440	4290	6660	4430	6870	4570	7080	4710	7300	4860	7510	5000
			2	20.4	18900	5970	3970	6140	4090	6310	4200	6480	4310	6650	4430	6820	4540	6990	4650
			3	40.8	14200	5620	3740	5750	3820	5880	3910	6000	3990	6130	4080	6260	4160	6390	4250
			4	61.1	9350	5190	3450	5270	3510	5350	3560	5440	3620	5520	3670	5610	3730	5690	3790
			BFL	81.5	4560	4660	3100	4700	3130	4740	3160	4790	3180	4830	3210	4870	3240	4910	3270
HD 400×634	3520	2340	TFL	0.00	22200	5740	3820	5940	3950	6140	4080	6340	4220	6540	4350	6740	4480	6940	4620
			2	19.3	17700	5500	3660	5660	3760	5820	3870	5980	3980	6140	4080	6300	4190	6460	4290
			3	38.6	13200	5180	3450	5300	3520	5420	3600	5540	3680	5660	3760	5770	3840	5890	3920
			4	57.8	8740	4780	3180	4860	3230	4940	3290	5020	3340	5100	3390	5170	3440	5250	3500
			BFL	77.1	4240	4310	2870	4340	2890	4380	2920	4420	2940	4460	2970	4500	2990	4540	3020
HD 400×592	3250	2160	TFL	0.00	20800	5280	3510	5470	3640	5650	3760	5840	3880	6030	4010	6210	4130	6400	4260
			2	18.1	16600	5060	3360	5200	3460	5350	3560	5500	3660	5650	3760	5800	3860	5950	3960
			3	36.2	12400	4770	3170	4880	3240	4990	3320	5100	3390	5210	3470	5320	3540	5430	3620
			4	54.2	8200	4410	2930	4480	2980	4550	3030	4630	3080	4700	3130	4780	3180	4850	3230
			BFL	72.3	4020	3980	2650	4020	2670	4050	2700	4090	2720	4120	2740	4160	2770	4200	2790
HD 400×551	2980	1980	TFL	0.00	19300	4820	3210	4990	3320	5160	3440	5340	3550	5510	3670	5690	3780	5860	3900
			2	16.9	15400	4610	3070	4750	3160	4890	3250	5030	3350	5170	3440	5310	3530	5440	3620
			3	33.8	11500	4350	2890	4450	2960	4560	3030	4660	3100	4760	3170	4870	3240	4970	3310
			4	50.7	7630	4030	2680	4100	2720	4160	2770	4230	2820	4300	2860	4370	2910	4440	2950
			BFL	67.6	3750	3650	2430	3680	2450	3710	2470	3750	2490	3780	2520	3810	2540	3850	2560
HD 400×509	2730	1820	TFL	0.00	17800	4390	2920	4550	3020	4710	3130	4870	3240	5030	3350	5190	3450	5350	3560
			2	15.7	14300	4200	2790	4330	2880	4460	2960	4580	3050	4710	3130	4840	3220	4970	3310
			3	31.4	10700	3960	2640	4060	2700	4150	2760	4250	2830	4350	2890	4440	2960	4540	3020
			4	47.0	7090	3670	2440	3740	2490	3800	2530	3860	2570	3930	2610	3990	2660	4060	2700
			BFL	62.7	3500	3330	2220	3370	2240	3400	2260	3430	2280	3460	2300	3490	2320	3520	2340

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

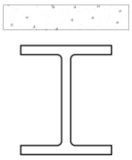
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×1086	6730	4480	TFL	0.00	38100	11500	7630	11800	7860	12200	8090	12500	8320	12800	8550	13200	8780	13500	9000
			2	31.3	30300	11000	7330	11300	7510	11600	7690	11800	7870	12100	8050	12400	8240	12700	8420
			3	62.5	22500	10300	6880	10500	7010	10700	7140	10900	7280	11100	7410	11300	7550	11500	7680
			4	93.8	14700	9430	6280	9570	6360	9700	6450	9830	6540	9960	6630	10100	6720	10200	6800
			BFL	125	6900	8310	5530	8380	5570	8440	5610	8500	5660	8560	5700	8620	5740	8690	5780
HD 400×990	6010	4000	TFL	0.00	34700	10200	6750	10500	6960	10800	7170	11100	7380	11400	7590	11700	7790	12000	8000
			2	28.8	27600	9740	6480	9990	6650	10200	6810	10500	6980	10700	7140	11000	7310	11200	7470
			3	57.5	20500	9150	6090	9330	6210	9520	6330	9700	6450	9890	6580	10100	6700	10300	6820
			4	86.3	13500	8370	5570	8490	5650	8610	5730	8730	5810	8850	5890	8980	5970	9100	6050
			BFL	115	6370	7410	4930	7470	4970	7520	5010	7580	5040	7640	5080	7700	5120	7750	5160
HD 400×900	5350	3560	TFL	0.00	31600	8970	5970	9260	6160	9540	6350	9830	6540	10100	6730	10400	6920	10700	7100
			2	26.5	25200	8610	5730	8830	5880	9060	6030	9280	6180	9510	6330	9740	6480	9960	6630
			3	53.0	18700	8090	5380	8250	5490	8420	5600	8590	5720	8760	5830	8930	5940	9100	6050
			4	79.5	12300	7410	4930	7520	5000	7630	5080	7740	5150	7850	5220	7960	5300	8070	5370
			BFL	106	5830	6580	4380	6640	4420	6690	4450	6740	4480	6790	4520	6850	4550	6900	4590
HD 400×818	4770	3170	TFL	0.00	28700	9730	6480	9990	6650	10200	6820	10500	6990	10800	7160	11000	7330	11300	7510
			2	24.3	22900	9040	6010	9240	6150	9450	6290	9660	6420	9860	6560	10100	6700	10300	6840
			3	48.5	17000	8220	5470	8370	5570	8530	5670	8680	5770	8830	5880	8980	5980	9140	6080
			4	72.8	11200	7270	4840	7370	4900	7470	4970	7570	5040	7670	5110	7770	5170	7880	5240
			BFL	97.0	5370	6200	4120	6240	4150	6290	4190	6340	4220	6390	4250	6440	4280	6490	4320
HD 400×744	4250	2830	TFL	0.00	26100	8660	5760	8890	5920	9130	6070	9360	6230	9600	6390	9830	6540	10100	6700
			2	22.2	20800	8040	5350	8220	5470	8410	5600	8600	5720	8780	5840	8970	5970	9160	6090
			3	44.5	15500	7310	4860	7450	4950	7590	5050	7730	5140	7870	5230	8000	5330	8140	5420
			4	66.7	10200	6470	4310	6560	4370	6660	4430	6750	4490	6840	4550	6930	4610	7020	4670
			BFL	88.9	4950	5530	3680	5580	3710	5620	3740	5670	3770	5710	3800	5760	3830	5800	3860
HD 400×677	3800	2530	TFL	0.00	23700	7720	5140	7940	5280	8150	5420	8370	5570	8580	5710	8790	5850	9010	5990
			2	20.4	18900	7160	4770	7330	4880	7500	4990	7670	5110	7850	5220	8020	5330	8190	5450
			3	40.8	14200	6510	4330	6640	4420	6770	4500	6900	4590	7020	4670	7150	4760	7280	4840
			4	61.1	9350	5780	3840	5860	3900	5940	3950	6030	4010	6110	4070	6200	4120	6280	4180
			BFL	81.5	4560	4950	3290	4990	3320	5030	3350	5070	3370	5110	3400	5150	3430	5200	3460
HD 400×634	3520	2340	TFL	0.00	22200	7140	4750	7340	4880	7540	5020	7740	5150	7940	5280	8140	5420	8340	5550
			2	19.3	17700	6610	4400	6770	4510	6930	4610	7090	4720	7250	4830	7410	4930	7570	5040
			3	38.6	13200	6010	4000	6130	4080	6250	4160	6370	4240	6490	4320	6610	4400	6730	4480
			4	57.8	8740	5330	3550	5410	3600	5490	3650	5570	3700	5650	3760	5730	3810	5800	3860
			BFL	77.1	4240	4570	3040	4610	3070	4650	3090	4690	3120	4730	3140	4760	3170	4800	3200
HD 400×592	3250	2160	TFL	0.00	20800	6590	4380	6770	4510	6960	4630	7150	4750	7330	4880	7520	5000	7710	5130
			2	18.1	16600	6100	4060	6250	4160	6400	4260	6550	4360	6700	4460	6850	4550	7000	4650
			3	36.2	12400	5550	3690	5660	3760	5770	3840	5880	3910	5990	3990	6100	4060	6210	4130
			4	54.2	8200	4920	3280	5000	3320	5070	3370	5150	3420	5220	3470	5290	3520	5370	3570
			BFL	72.3	4020	4230	2820	4270	2840	4310	2860	4340	2890	4380	2910	4410	2940	4450	2960
HD 400×551	2980	1980	TFL	0.00	19300	6030	4010	6210	4130	6380	4240	6550	4360	6730	4480	6900	4590	7070	4710
			2	16.9	15400	5580	3710	5720	3810	5860	3900	6000	3990	6140	4080	6280	4180	6420	4270
			3	33.8	11500	5080	3380	5180	3450	5280	3510	5390	3580	5490	3650	5590	3720	5700	3790
			4	50.7	7630	4510	3000	4580	3040	4650	3090	4710	3140	4780	3180	4850	3230	4920	3270
			BFL	67.6	3750	3880	2580	3910	2600	3950	2630	3980	2650	4020	2670	4050	2690	4080	2720
HD 400×509	2730	1820	TFL	0.00	17800	5510	3670	5670	3770	5830	3880	5990	3990	6150	4090	6310	4200	6470	4310
			2	15.7	14300	5100	3390	5230	3480	5350	3560	5480	3650	5610	3730	5740	3820	5870	3900
			3	31.4	10700	4630	3080	4730	3150	4830	3210	4920	3270	5020	3340	5110	3400	5210	3470
			4	47.0	7090	4120	2740	4180	2780	4250	2830	4310	2870	4380	2910	4440	2950	4500	3000
			BFL	62.7	3500	3560	2370	3590	2390	3620	2410	3650	2430	3680	2450	3710	2470	3740	2490

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

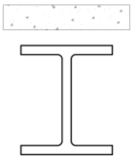
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×463	2440	1630	TFL	0.00	16200	3900	2600	4050	2690	4190	2790	4340	2890	4490	2990	4630	3080	4780	3180
			2	14.4	13000	3740	2490	3850	2560	3970	2640	4090	2720	4200	2800	4320	2870	4440	2950
			3	28.7	9710	3530	2350	3610	2400	3700	2460	3790	2520	3880	2580	3960	2640	4050	2690
			4	43.1	6460	3270	2180	3330	2220	3390	2260	3450	2290	3510	2330	3570	2370	3620	2410
			BFL	57.4	3200	2980	1980	3010	2000	3040	2020	3070	2040	3100	2060	3130	2080	3150	2100
HD 400×421	2200	1460	TFL	0.00	14800	3490	2320	3620	2410	3760	2500	3890	2590	4020	2680	4150	2760	4290	2850
			2	13.2	11800	3340	2220	3450	2290	3550	2360	3660	2430	3760	2500	3870	2580	3980	2650
			3	26.3	8850	3150	2100	3230	2150	3310	2200	3390	2260	3470	2310	3550	2360	3630	2420
			4	39.5	5900	2930	1950	2990	1990	3040	2020	3090	2060	3140	2090	3200	2130	3250	2160
			BFL	52.6	2940	2680	1780	2700	1800	2730	1820	2760	1830	2780	1850	2810	1870	2840	1890
HD 400×382	1970	1310	TFL	0.00	13400	3110	2070	3230	2150	3350	2230	3470	2310	3590	2390	3710	2470	3830	2550
			2	12.0	10700	2980	1980	3070	2040	3170	2110	3260	2170	3360	2240	3460	2300	3550	2360
			3	24.0	8040	2810	1870	2880	1920	2960	1970	3030	2010	3100	2060	3170	2110	3250	2160
			4	36.0	5360	2620	1740	2670	1770	2710	1810	2760	1840	2810	1870	2860	1900	2910	1930
			BFL	48.0	2680	2400	1590	2420	1610	2440	1630	2470	1640	2490	1660	2520	1670	2540	1690
HD 400×347	1770	1180	TFL	0.00	12200	2770	1850	2880	1920	2990	1990	3100	2060	3210	2140	3320	2210	3430	2280
			2	10.9	9730	2650	1760	2740	1820	2830	1880	2910	1940	3000	2000	3090	2060	3180	2110
			3	21.9	7300	2510	1670	2570	1710	2640	1760	2700	1800	2770	1840	2840	1890	2900	1930
			4	32.8	4870	2340	1560	2380	1580	2430	1610	2470	1640	2510	1670	2560	1700	2600	1730
			BFL	43.7	2440	2150	1430	2170	1440	2190	1460	2210	1470	2230	1490	2260	1500	2280	1520
HD 400×314	1580	1050	TFL	0.00	11000	2470	1640	2560	1710	2660	1770	2760	1840	2860	1900	2960	1970	3060	2030
			2	9.90	8790	2360	1570	2440	1620	2520	1670	2590	1730	2670	1780	2750	1830	2830	1880
			3	19.8	6610	2230	1480	2290	1520	2350	1560	2410	1600	2470	1640	2530	1680	2590	1720
			4	29.7	4430	2080	1390	2120	1410	2160	1440	2200	1470	2240	1490	2280	1520	2320	1540
			BFL	39.6	2240	1920	1280	1940	1290	1960	1300	1980	1320	2000	1330	2020	1340	2040	1360
HD 400×287	1440	957	TFL	0.00	10100	2230	1490	2330	1550	2420	1610	2510	1670	2600	1730	2690	1790	2780	1850
			2	9.15	8070	2140	1420	2210	1470	2280	1520	2350	1570	2430	1610	2500	1660	2570	1710
			3	18.3	6060	2020	1340	2080	1380	2130	1420	2180	1450	2240	1490	2290	1530	2350	1560
			4	27.5	4050	1890	1260	1930	1280	1960	1310	2000	1330	2040	1350	2070	1380	2110	1400
			BFL	36.6	2040	1740	1160	1760	1170	1780	1180	1800	1200	1810	1210	1830	1220	1850	1230
HD 400×262	1300	866	TFL	0.00	9200	2020	1340	2100	1400	2180	1450	2260	1510	2350	1560	2430	1620	2510	1670
			2	8.33	7380	1930	1280	1990	1330	2060	1370	2130	1420	2190	1460	2260	1500	2330	1550
			3	16.7	5560	1830	1210	1880	1250	1930	1280	1980	1310	2030	1350	2080	1380	2130	1410
			4	25.0	3730	1710	1140	1740	1160	1780	1180	1810	1200	1840	1230	1880	1250	1910	1270
			BFL	33.3	1910	1580	1050	1600	1060	1610	1070	1630	1090	1650	1100	1670	1110	1680	1120
HD 400×237	1160	772	TFL	0.00	8270	1790	1190	1860	1240	1940	1290	2010	1340	2090	1390	2160	1440	2230	1490
			2	7.55	6630	1710	1140	1770	1180	1830	1220	1890	1260	1950	1300	2010	1340	2070	1370
			3	15.1	4990	1620	1080	1660	1110	1710	1140	1750	1170	1800	1200	1840	1230	1890	1260
			4	22.7	3350	1520	1010	1550	1030	1580	1050	1610	1070	1640	1090	1670	1110	1700	1130
			BFL	30.2	1710	1400	933	1420	944	1430	954	1450	964	1460	974	1480	985	1500	995
HD 400×216	1050	702	TFL	0.00	7580	1620	1080	1690	1120	1760	1170	1820	1210	1890	1260	1960	1300	2030	1350
			2	6.93	6080	1550	1030	1600	1070	1660	1100	1710	1140	1770	1170	1820	1210	1880	1250
			3	13.9	4570	1470	975	1510	1000	1550	1030	1590	1060	1630	1080	1670	1110	1710	1140
			4	20.8	3070	1370	915	1400	933	1430	951	1460	970	1490	988	1510	1010	1540	1030
			BFL	27.7	1570	1270	848	1290	857	1300	867	1320	876	1330	886	1350	895	1360	904
HD 400×187	901	600	TFL	0.00	6530	1380	916	1430	955	1490	994	1550	1030	1610	1070	1670	1110	1730	1150
			2	6.00	5240	1310	875	1360	906	1410	937	1460	969	1500	1000	1550	1030	1600	1060
			3	12.0	3950	1250	829	1280	853	1320	876	1350	900	1390	924	1420	947	1460	971
			4	18.0	2660	1170	779	1190	795	1220	811	1240	827	1270	843	1290	859	1310	874
			BFL	24.0	1370	1090	724	1100	732	1110	740	1130	749	1140	757	1150	765	1160	773

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

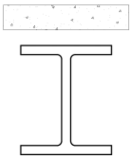
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×463	2440	1630	TFL	0.00	16200	4920	3280	5070	3370	5220	3470	5360	3570	5510	3660	5650	3760	5800	3860
			2	14.4	13000	4550	3030	4670	3110	4790	3180	4900	3260	5020	3340	5140	3420	5250	3490
			3	28.7	9710	4140	2750	4230	2810	4310	2870	4400	2930	4490	2990	4570	3040	4660	3100
			4	43.1	6460	3680	2450	3740	2490	3800	2530	3860	2570	3910	2600	3970	2640	4030	2680
			BFL	57.4	3200	3180	2120	3210	2140	3240	2160	3270	2180	3300	2190	3330	2210	3360	2230
HD 400×421	2200	1460	TFL	0.00	14800	4420	2940	4550	3030	4690	3120	4820	3210	4950	3290	5080	3380	5220	3470
			2	13.2	11800	4080	2720	4190	2790	4300	2860	4400	2930	4510	3000	4610	3070	4720	3140
			3	26.3	8850	3710	2470	3790	2520	3870	2580	3950	2630	4030	2680	4110	2730	4190	2790
			4	39.5	5900	3300	2200	3360	2230	3410	2270	3460	2300	3520	2340	3570	2370	3620	2410
			BFL	52.6	2940	2860	1900	2890	1920	2910	1940	2940	1960	2970	1970	2990	1990	3020	2010
HD 400×382	1970	1310	TFL	0.00	13400	3950	2630	4070	2710	4200	2790	4320	2870	4440	2950	4560	3030	4680	3110
			2	12.0	10700	3650	2430	3750	2490	3840	2560	3940	2620	4040	2690	4130	2750	4230	2810
			3	24.0	8040	3320	2210	3390	2260	3460	2300	3530	2350	3610	2400	3680	2450	3750	2500
			4	36.0	5360	2960	1970	3000	2000	3050	2030	3100	2060	3150	2090	3200	2130	3250	2160
			BFL	48.0	2680	2570	1710	2590	1720	2610	1740	2640	1750	2660	1770	2690	1790	2710	1800
HD 400×347	1770	1180	TFL	0.00	12200	3540	2350	3650	2430	3760	2500	3870	2570	3980	2650	4090	2720	4200	2790
			2	10.9	9730	3260	2170	3350	2230	3440	2290	3530	2350	3620	2410	3700	2460	3790	2520
			3	21.9	7300	2970	1970	3030	2020	3100	2060	3160	2110	3230	2150	3300	2190	3360	2240
			4	32.8	4870	2640	1760	2690	1790	2730	1820	2780	1850	2820	1880	2860	1910	2910	1930
			BFL	43.7	2440	2300	1530	2320	1540	2340	1560	2370	1570	2390	1590	2410	1600	2430	1620
HD 400×314	1580	1050	TFL	0.00	11000	3160	2100	3260	2170	3350	2230	3450	2300	3550	2360	3650	2430	3750	2490
			2	9.90	8790	2910	1940	2990	1990	3070	2040	3150	2090	3230	2150	3310	2200	3390	2250
			3	19.8	6610	2650	1760	2710	1800	2770	1840	2820	1880	2880	1920	2940	1960	3000	2000
			4	29.7	4430	2360	1570	2400	1600	2440	1620	2480	1650	2520	1680	2560	1700	2600	1730
			BFL	39.6	2240	2060	1370	2080	1380	2100	1400	2120	1410	2140	1420	2160	1440	2180	1450
HD 400×287	1440	957	TFL	0.00	10100	2870	1910	2960	1970	3050	2030	3140	2090	3230	2150	3320	2210	3410	2270
			2	9.15	8070	2640	1760	2720	1810	2790	1860	2860	1900	2930	1950	3010	2000	3080	2050
			3	18.3	6060	2400	1600	2460	1630	2510	1670	2570	1710	2620	1740	2680	1780	2730	1820
			4	27.5	4050	2140	1430	2180	1450	2220	1480	2250	1500	2290	1520	2330	1550	2360	1570
			BFL	36.6	2040	1870	1240	1890	1260	1910	1270	1920	1280	1940	1290	1960	1310	1980	1320
HD 400×262	1300	866	TFL	0.00	9200	2600	1730	2680	1780	2760	1840	2840	1890	2930	1950	3010	2000	3090	2060
			2	8.33	7380	2390	1590	2460	1640	2530	1680	2590	1720	2660	1770	2720	1810	2790	1860
			3	16.7	5560	2180	1450	2230	1480	2280	1510	2330	1550	2380	1580	2430	1610	2480	1650
			4	25.0	3730	1940	1290	1980	1320	2010	1340	2050	1360	2080	1380	2110	1410	2150	1430
			BFL	33.3	1910	1700	1130	1720	1140	1730	1150	1750	1170	1770	1180	1790	1190	1800	1200
HD 400×237	1160	772	TFL	0.00	8270	2310	1540	2380	1590	2460	1640	2530	1680	2610	1730	2680	1780	2760	1830
			2	7.55	6630	2130	1410	2190	1450	2250	1490	2310	1530	2360	1570	2420	1610	2480	1650
			3	15.1	4990	1930	1290	1980	1320	2020	1350	2070	1380	2110	1410	2160	1440	2200	1460
			4	22.7	3350	1730	1150	1760	1170	1790	1190	1820	1210	1850	1230	1880	1250	1910	1270
			BFL	30.2	1710	1510	1010	1530	1020	1540	1030	1560	1040	1570	1050	1590	1060	1600	1070
HD 400×216	1050	702	TFL	0.00	7580	2100	1400	2160	1440	2230	1490	2300	1530	2370	1580	2440	1620	2510	1670
			2	6.93	6080	1930	1280	1980	1320	2040	1360	2090	1390	2150	1430	2200	1470	2260	1500
			3	13.9	4570	1750	1170	1800	1190	1840	1220	1880	1250	1920	1280	1960	1300	2000	1330
			4	20.8	3070	1570	1040	1600	1060	1620	1080	1650	1100	1680	1120	1710	1140	1730	1150
			BFL	27.7	1570	1370	914	1390	923	1400	933	1420	942	1430	952	1440	961	1460	970
HD 400×187	901	600	TFL	0.00	6530	1790	1190	1850	1230	1910	1270	1960	1310	2020	1350	2080	1390	2140	1420
			2	6.00	5240	1640	1090	1690	1130	1740	1160	1790	1190	1830	1220	1880	1250	1930	1280
			3	12.0	3950	1500	995	1530	1020	1570	1040	1600	1070	1640	1090	1670	1110	1710	1140
			4	18.0	2660	1340	890	1360	906	1390	922	1410	938	1430	954	1460	970	1480	986
			BFL	24.0	1370	1170	781	1190	790	1200	798	1210	806	1220	814	1240	823	1250	831

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

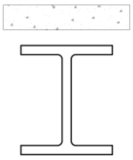
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 360×196	950	632	TFL	0.00	6880	1460	973	1520	1010	1590	1060	1650	1100	1710	1140	1770	1180	1830	1220
			2	6.55	5540	1400	930	1450	963	1500	996	1550	1030	1600	1060	1650	1100	1700	1130
			3	13.1	4190	1320	881	1360	907	1400	932	1440	957	1480	982	1510	1010	1550	1030
			4	19.7	2840	1240	828	1270	845	1300	862	1320	879	1350	896	1370	913	1400	930
			BFL	26.2	1490	1160	769	1170	778	1180	787	1200	796	1210	805	1220	814	1240	823
HD 360×179	862	573	TFL	0.00	6280	1320	880	1380	917	1440	955	1490	992	1550	1030	1600	1070	1660	1110
			2	5.98	5050	1260	841	1310	871	1350	901	1400	932	1450	962	1490	992	1540	1020
			3	12.0	3830	1200	798	1230	820	1270	843	1300	866	1340	889	1370	912	1410	935
			4	17.9	2600	1130	750	1150	765	1170	781	1200	797	1220	812	1240	828	1270	843
			BFL	23.9	1380	1050	698	1060	706	1070	714	1090	723	1100	731	1110	739	1120	747
HD 360×162	777	517	TFL	0.00	5670	1180	788	1240	822	1290	856	1340	890	1390	924	1440	958	1490	992
			2	5.45	4560	1130	753	1170	780	1210	808	1250	835	1300	862	1340	890	1380	917
			3	10.9	3450	1070	714	1100	735	1140	756	1170	776	1200	797	1230	818	1260	838
			4	16.4	2340	1010	672	1030	686	1050	700	1070	714	1090	728	1120	742	1140	756
			BFL	21.8	1220	941	626	952	633	963	641	974	648	985	655	996	663	1010	670
HD 360×147	702	467	TFL	0.00	5170	1070	712	1120	743	1160	774	1210	804	1260	835	1300	866	1350	897
			2	4.95	4160	1020	680	1060	705	1100	730	1130	755	1170	780	1210	805	1250	829
			3	9.90	3150	970	645	998	664	1030	683	1060	702	1080	721	1110	740	1140	759
			4	14.9	2150	913	608	933	621	952	633	971	646	991	659	1010	672	1030	685
			BFL	19.8	1140	852	567	863	574	873	581	883	588	893	594	904	601	914	608
HD 360×134	634	422	TFL	0.00	4690	963	641	1000	669	1050	697	1090	725	1130	753	1170	781	1220	809
			2	4.50	3780	920	612	954	635	988	657	1020	680	1060	702	1090	725	1120	748
			3	9.00	2860	873	581	899	598	925	615	950	632	976	650	1000	667	1030	684
			4	13.5	1950	823	547	840	559	858	571	875	582	893	594	911	606	928	618
			BFL	18.0	1040	769	511	778	518	787	524	797	530	806	536	815	543	825	549
HD 320×300	1370	909	TFL	0.00	10500	2250	1490	2340	1560	2440	1620	2530	1680	2620	1750	2720	1810	2810	1870
			2	12.0	8440	2140	1430	2220	1480	2290	1530	2370	1580	2450	1630	2520	1680	2600	1730
			3	24.0	6380	2020	1340	2070	1380	2130	1420	2190	1460	2250	1490	2300	1530	2360	1570
			4	36.0	4310	1870	1240	1910	1270	1940	1290	1980	1320	2020	1350	2060	1370	2100	1400
			BFL	48.0	2240	1700	1130	1720	1140	1740	1160	1760	1170	1780	1180	1800	1200	1820	1210
HD 320×245	1100	730	TFL	0.00	8580	1770	1180	1850	1230	1930	1280	2000	1330	2080	1380	2160	1440	2240	1490
			2	10.0	6880	1690	1120	1750	1160	1810	1210	1870	1250	1940	1290	2000	1330	2060	1370
			3	20.0	5180	1590	1060	1640	1090	1680	1120	1730	1150	1780	1180	1820	1210	1870	1240
			4	30.0	3480	1470	981	1510	1000	1540	1020	1570	1040	1600	1060	1630	1080	1660	1110
			BFL	40.0	1780	1340	894	1360	905	1380	916	1390	926	1410	937	1420	948	1440	958
HD 320×198	861	573	TFL	0.00	6940	1380	920	1450	962	1510	1000	1570	1040	1630	1090	1700	1130	1760	1170
			2	8.00	5590	1320	877	1370	910	1420	944	1470	977	1520	1010	1570	1040	1620	1080
			3	16.0	4250	1240	827	1280	852	1320	878	1360	903	1400	928	1430	954	1470	979
			4	24.0	2900	1160	770	1180	788	1210	805	1240	822	1260	840	1290	857	1310	874
			BFL	32.0	1550	1060	707	1080	717	1090	726	1110	735	1120	745	1130	754	1150	763
HD 320×158	673	448	TFL	0.00	5530	1070	712	1120	745	1170	779	1220	812	1270	845	1320	878	1370	911
			2	6.38	4470	1020	678	1060	705	1100	732	1140	759	1180	786	1220	812	1260	839
			3	12.8	3410	963	641	994	661	1020	681	1050	702	1090	722	1120	743	1150	763
			4	19.1	2350	900	599	921	613	942	627	963	641	984	655	1010	669	1030	683
			BFL	25.5	1280	831	553	842	560	854	568	865	576	877	583	888	591	900	599
HD 320×127	532	354	TFL	0.00	4440	838	558	878	584	918	611	958	637	998	664	1040	691	1080	717
			2	5.13	3590	798	531	831	553	863	574	895	596	928	617	960	639	992	660
			3	10.3	2740	754	502	779	518	804	535	829	551	853	568	878	584	903	601
			4	15.4	1900	707	470	724	482	741	493	758	504	775	516	792	527	809	538
			BFL	20.5	1050	655	436	664	442	674	448	683	455	693	461	702	467	712	474

LRFD	ASD
ϕ_b = 0.90	Ω_b = 1.67

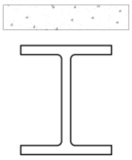
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 360×196	950	632	TFL	0.00	6880	1900	1260	1960	1300	2020	1340	2080	1380	2140	1430	2210	1470	2270	1510
			2	6.55	5540	1750	1160	1800	1190	1850	1230	1900	1260	1950	1290	2000	1330	2050	1360
			3	13.1	4190	1590	1060	1630	1080	1660	1110	1700	1130	1740	1160	1780	1180	1810	1210
			4	19.7	2840	1420	947	1450	964	1470	981	1500	998	1530	1020	1550	1030	1580	1050
			BFL	26.2	1490	1250	832	1260	841	1280	850	1290	859	1300	867	1320	876	1330	885
HD 360×179	862	573	TFL	0.00	6280	1720	1140	1770	1180	1830	1220	1890	1260	1940	1290	2000	1330	2060	1370
			2	5.98	5050	1580	1050	1630	1080	1670	1110	1720	1140	1760	1170	1810	1200	1850	1230
			3	12.0	3830	1440	958	1470	981	1510	1000	1540	1030	1580	1050	1610	1070	1650	1100
			4	17.9	2600	1290	859	1310	874	1340	890	1360	906	1380	921	1410	937	1430	952
			BFL	23.9	1380	1140	755	1150	764	1160	772	1170	780	1180	788	1200	797	1210	805
HD 360×162	777	517	TFL	0.00	5670	1540	1030	1590	1060	1640	1090	1700	1130	1750	1160	1800	1200	1850	1230
			2	5.45	4560	1420	944	1460	972	1500	999	1540	1030	1580	1050	1620	1080	1670	1110
			3	10.9	3450	1290	859	1320	880	1350	900	1380	921	1420	941	1450	962	1480	983
			4	16.4	2340	1160	770	1180	784	1200	798	1220	812	1240	826	1260	840	1280	854
			BFL	21.8	1220	1020	677	1030	685	1040	692	1050	699	1060	707	1070	714	1080	721
HD 360×147	702	467	TFL	0.00	5170	1400	928	1440	959	1490	990	1530	1020	1580	1050	1630	1080	1670	1110
			2	4.95	4160	1280	854	1320	879	1360	904	1400	929	1430	954	1470	979	1510	1000
			3	9.90	3150	1170	778	1200	796	1230	815	1250	834	1280	853	1310	872	1340	891
			4	14.9	2150	1050	698	1070	711	1090	723	1110	736	1130	749	1150	762	1160	775
			BFL	19.8	1140	924	615	934	622	945	628	955	635	965	642	975	649	986	656
HD 360×134	634	422	TFL	0.00	4690	1260	837	1300	865	1340	893	1380	921	1430	950	1470	978	1510	1010
			2	4.50	3780	1160	770	1190	793	1230	816	1260	838	1290	861	1330	883	1360	906
			3	9.00	2860	1050	701	1080	718	1110	735	1130	752	1160	770	1180	787	1210	804
			4	13.5	1950	946	629	963	641	981	653	998	664	1020	676	1030	688	1050	699
			BFL	18.0	1040	834	555	843	561	853	567	862	574	872	580	881	586	890	592
HD 320×300	1370	909	TFL	0.00	10500	2910	1930	3000	2000	3100	2060	3190	2120	3290	2190	3380	2250	3480	2310
			2	12.0	8440	2670	1780	2750	1830	2830	1880	2900	1930	2980	1980	3050	2030	3130	2080
			3	24.0	6380	2420	1610	2470	1650	2530	1680	2590	1720	2650	1760	2700	1800	2760	1840
			4	36.0	4310	2140	1420	2180	1450	2220	1470	2250	1500	2290	1530	2330	1550	2370	1580
			BFL	48.0	2240	1840	1220	1860	1240	1880	1250	1900	1260	1920	1280	1940	1290	1960	1300
HD 320×245	1100	730	TFL	0.00	8580	2310	1540	2390	1590	2470	1640	2540	1690	2620	1740	2700	1800	2780	1850
			2	10.0	6880	2120	1410	2180	1450	2250	1490	2310	1540	2370	1580	2430	1620	2490	1660
			3	20.0	5180	1920	1270	1960	1310	2010	1340	2050	1370	2100	1400	2150	1430	2190	1460
			4	30.0	3480	1690	1130	1720	1150	1760	1170	1790	1190	1820	1210	1850	1230	1880	1250
			BFL	40.0	1780	1460	969	1470	980	1490	990	1500	1000	1520	1010	1540	1020	1550	1030
HD 320×198	861	573	TFL	0.00	6940	1820	1210	1880	1250	1950	1290	2010	1340	2070	1380	2130	1420	2190	1460
			2	8.00	5590	1670	1110	1720	1140	1770	1180	1820	1210	1870	1250	1920	1280	1970	1310
			3	16.0	4250	1510	1000	1550	1030	1590	1060	1620	1080	1660	1110	1700	1130	1740	1160
			4	24.0	2900	1340	892	1370	909	1390	927	1420	944	1440	961	1470	979	1500	996
			BFL	32.0	1550	1160	772	1180	782	1190	791	1200	800	1220	810	1230	819	1240	828
HD 320×158	673	448	TFL	0.00	5530	1420	944	1470	977	1520	1010	1570	1040	1620	1080	1670	1110	1720	1140
			2	6.38	4470	1300	866	1340	893	1380	919	1420	946	1460	973	1500	1000	1540	1030
			3	12.8	3410	1180	783	1210	804	1240	824	1270	845	1300	865	1330	886	1360	906
			4	19.1	2350	1050	697	1070	711	1090	725	1110	739	1130	753	1150	767	1170	781
			BFL	25.5	1280	911	606	923	614	935	622	946	630	958	637	969	645	981	653
HD 320×127	532	354	TFL	0.00	4440	1120	744	1160	770	1200	797	1240	823	1280	850	1320	877	1360	903
			2	5.13	3590	1020	682	1060	703	1090	725	1120	746	1150	768	1190	789	1220	811
			3	10.3	2740	927	617	952	633	977	650	1000	666	1030	683	1050	699	1080	716
			4	15.4	1900	826	550	843	561	860	572	878	584	895	595	912	607	929	618
			BFL	20.5	1050	721	480	731	486	740	493	750	499	759	505	769	511	778	518

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

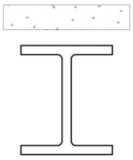
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 320×97.6	403	268	TFL	0.00	3420	631	420	662	440	693	461	724	481	754	502	785	522	816	543
			2	3.88	2780	601	400	626	417	651	433	676	450	701	467	726	483	751	500
			3	7.75	2140	569	379	588	392	608	404	627	417	646	430	666	443	685	456
			4	11.6	1500	535	356	548	365	562	374	575	383	589	392	602	401	616	410
			BFL	15.5	864	498	332	506	337	514	342	522	347	529	352	537	357	545	363
			6	15.9	859	498	331	506	336	513	342	521	347	529	352	537	357	544	362
			7	16.2	855	498	331	505	336	513	341	521	347	529	352	536	357	544	362
HD 320×74.2	296	197	TFL	0.00	2600	469	312	493	328	516	343	540	359	563	375	586	390	610	406
			2	2.75	2150	448	298	468	311	487	324	506	337	526	350	545	363	564	375
			3	5.50	1690	426	284	441	294	457	304	472	314	487	324	502	334	518	344
			4	8.25	1240	403	268	414	276	425	283	437	290	448	298	459	305	470	313
			BFL	11.0	786	379	252	386	257	393	261	400	266	407	271	414	275	421	280
			6	17.3	718	375	249	381	254	388	258	394	262	401	267	407	271	414	275
			7	23.6	650	370	246	376	250	382	254	388	258	394	262	400	266	406	270
HD 260×172	625	416	TFL	0.00	6040	1060	705	1110	741	1170	777	1220	814	1280	850	1330	886	1390	922
			2	8.13	4840	1000	666	1050	695	1090	724	1130	753	1180	782	1220	811	1260	840
			3	16.3	3640	935	622	967	644	1000	665	1030	687	1070	709	1100	731	1130	753
			4	24.4	2450	859	571	881	586	903	601	925	615	947	630	969	645	991	659
			BFL	32.5	1250	774	515	785	523	797	530	808	538	819	545	830	552	842	560
HD 260×142	499	332	TFL	0.00	4960	843	561	888	591	933	621	977	650	1020	680	1070	710	1110	739
			2	6.63	3990	797	530	833	554	869	578	905	602	941	626	977	650	1010	674
			3	13.3	3030	745	496	772	514	799	532	827	550	854	568	881	586	908	604
			4	19.9	2060	687	457	706	470	724	482	743	494	761	507	780	519	798	531
			BFL	26.5	1100	624	415	633	421	643	428	653	435	663	441	673	448	683	454
HD 260×114	396	263	TFL	0.00	4010	664	441	700	465	736	489	772	513	808	537	844	561	880	585
			2	5.38	3230	627	417	656	436	685	456	714	475	743	494	772	514	801	533
			3	10.8	2460	586	390	608	405	631	420	653	434	675	449	697	464	719	478
			4	16.1	1680	542	361	557	371	572	381	588	391	603	401	618	411	633	421
			BFL	21.5	909	494	329	502	334	510	340	519	345	527	351	535	356	543	361
HD 260×93	318	211	TFL	0.00	3260	527	351	557	370	586	390	615	409	645	429	674	448	703	468
			2	4.38	2630	498	331	522	347	545	363	569	379	593	394	616	410	640	426
			3	8.75	2000	466	310	484	322	502	334	520	346	538	358	556	370	574	382
			4	13.1	1380	432	287	444	296	457	304	469	312	482	320	494	329	506	337
			BFL	17.5	753	395	263	402	267	409	272	415	276	422	281	429	285	436	290
HD260×68.2	228	151	TFL	0.00	2390	376	250	398	264	419	279	441	293	462	307	483	322	505	336
			2	3.13	1940	355	236	373	248	390	260	408	271	425	283	443	294	460	306
			3	6.25	1490	333	222	347	231	360	240	374	249	387	258	401	266	414	275
			4	9.38	1050	310	206	319	213	329	219	338	225	348	231	357	238	367	244
			BFL	12.5	600	286	190	291	194	296	197	302	201	307	204	313	208	318	212
			6	12.7	598	285	190	291	194	296	197	302	201	307	204	312	208	318	211
			7	12.8	597	285	190	291	193	296	197	301	201	307	204	312	208	318	211
HD 260×54.1	177	118	TFL	0.00	1900	294	195	311	207	328	218	345	229	362	241	379	252	396	263
			2	2.38	1560	278	185	292	194	306	204	320	213	334	222	348	232	362	241
			3	4.75	1220	262	174	273	181	284	189	294	196	305	203	316	210	327	218
			4	7.13	878	244	163	252	168	260	173	268	178	276	184	284	189	292	194
			BFL	9.50	538	227	151	232	154	236	157	241	160	246	164	251	167	256	170
			6	13.0	506	225	150	229	153	234	156	239	159	243	162	248	165	252	168
			7	16.4	474	223	148	227	151	232	154	236	157	240	160	244	163	249	165

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

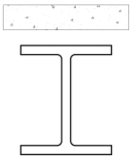
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 320×97.6	403	268	TFL	0.00	3420	847	563	877	584	908	604	939	625	970	645	1000	666	1030	686
			2	3.88	2780	777	517	802	533	827	550	852	567	877	583	902	600	927	617
			3	7.75	2140	704	468	723	481	743	494	762	507	781	520	801	533	820	545
			4	11.6	1500	630	419	643	428	657	437	670	446	684	455	697	464	711	473
			BFL	15.5	864	553	368	560	373	568	378	576	383	584	388	592	394	599	399
			6	15.9	859	552	367	560	373	568	378	575	383	583	388	591	393	599	398
			7	16.2	855	552	367	559	372	567	377	575	382	582	388	590	393	598	398
HD 320×74.2	296	197	TFL	0.00	2600	633	421	657	437	680	452	703	468	727	484	750	499	774	515
			2	2.75	2150	584	388	603	401	622	414	642	427	661	440	680	453	700	465
			3	5.50	1690	533	355	548	365	563	375	579	385	594	395	609	405	624	415
			4	8.25	1240	481	320	492	328	503	335	515	342	526	350	537	357	548	365
			BFL	11.0	786	428	285	435	290	442	294	449	299	456	304	464	308	471	313
			6	17.3	718	420	279	426	284	433	288	439	292	446	297	452	301	459	305
			7	23.6	650	411	274	417	278	423	282	429	285	435	289	441	293	447	297
HD 260×172	625	416	TFL	0.00	6040	1440	958	1490	994	1550	1030	1600	1070	1660	1100	1710	1140	1770	1180
			2	8.13	4840	1310	869	1350	898	1390	927	1440	956	1480	985	1520	1010	1570	1040
			3	16.3	3640	1160	775	1200	796	1230	818	1260	840	1300	862	1330	884	1360	905
			4	24.4	2450	1010	674	1030	689	1060	703	1080	718	1100	732	1120	747	1140	762
			BFL	32.5	1250	853	567	864	575	875	582	887	590	898	597	909	605	920	612
HD 260×142	499	332	TFL	0.00	4960	1160	769	1200	799	1250	828	1290	858	1330	888	1380	917	1420	947
			2	6.63	3990	1050	698	1080	722	1120	745	1160	769	1190	793	1230	817	1260	841
			3	13.3	3030	936	623	963	641	990	659	1020	677	1040	695	1070	713	1100	731
			4	19.9	2060	817	544	836	556	854	568	873	581	891	593	910	605	928	618
			BFL	26.5	1100	693	461	702	467	712	474	722	480	732	487	742	494	752	500
HD 260×114	396	263	TFL	0.00	4010	916	609	952	633	988	657	1020	681	1060	705	1100	729	1130	753
			2	5.38	3230	830	553	860	572	889	591	918	611	947	630	976	649	1000	669
			3	10.8	2460	741	493	763	508	785	523	808	537	830	552	852	567	874	581
			4	16.1	1680	648	431	663	441	678	451	694	461	709	472	724	482	739	492
			BFL	21.5	909	551	367	560	372	568	378	576	383	584	389	592	394	600	399
HD 260×93	318	211	TFL	0.00	3260	733	487	762	507	791	526	821	546	850	565	879	585	908	604
			2	4.38	2630	664	442	687	457	711	473	735	489	758	505	782	520	806	536
			3	8.75	2000	593	394	611	406	629	418	647	430	665	442	683	454	701	466
			4	13.1	1380	519	345	531	353	544	362	556	370	568	378	581	386	593	395
			BFL	17.5	753	443	294	449	299	456	304	463	308	470	313	477	317	483	322
HD260×68.2	228	151	TFL	0.00	2390	526	350	548	365	569	379	591	393	612	407	634	422	655	436
			2	3.13	1940	478	318	495	329	512	341	530	353	547	364	565	376	582	387
			3	6.25	1490	427	284	441	293	454	302	468	311	481	320	495	329	508	338
			4	9.38	1050	376	250	385	256	395	263	404	269	414	275	423	282	433	288
			BFL	12.5	600	323	215	329	219	334	222	340	226	345	230	350	233	356	237
			6	12.7	598	323	215	329	219	334	222	339	226	345	229	350	233	355	237
			7	12.8	597	323	215	328	218	334	222	339	226	344	229	350	233	355	236
HD 260×54.1	177	118	TFL	0.00	1900	413	275	430	286	447	298	464	309	481	320	498	332	516	343
			2	2.38	1560	376	250	390	260	404	269	418	278	432	287	446	297	460	306
			3	4.75	1220	338	225	349	232	360	240	371	247	382	254	393	262	404	269
			4	7.13	878	300	199	308	205	316	210	323	215	331	220	339	226	347	231
			BFL	9.50	538	261	173	265	177	270	180	275	183	280	186	285	189	290	193
			6	13.0	506	257	171	261	174	266	177	270	180	275	183	280	186	284	189
			7	16.4	474	253	168	257	171	261	174	266	177	270	180	274	182	279	185

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

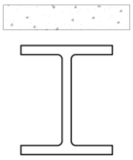
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×1086	8690	5780	TFL	0.00	49200	14800	9860	15300	10100	15700	10400	16100	10700	16600	11000	17000	11300	17500	11600
			2	31.3	39100	14200	9460	14600	9690	14900	9930	15300	10200	15600	10400	16000	10600	16300	10900
			3	62.5	29100	13300	8880	13600	9050	13900	9220	14100	9400	14400	9570	14600	9750	14900	9920
			4	93.8	19000	12200	8100	12300	8220	12500	8330	12700	8440	12900	8560	13000	8670	13200	8780
			BFL	125	8910	10700	7140	10800	7190	10900	7250	11000	7300	11100	7350	11100	7410	11200	7460
HD 400×990	7760	5160	TFL	0.00	44800	13100	8720	13500	8990	13900	9260	14300	9520	14700	9790	15100	10100	15500	10300
			2	28.8	35700	12600	8370	12900	8580	13200	8790	13500	9010	13900	9220	14200	9430	14500	9650
			3	57.5	26500	11800	7860	12000	8020	12300	8170	12500	8330	12800	8490	13000	8650	13200	8810
			4	86.3	17400	10800	7190	11000	7290	11100	7400	11300	7500	11400	7600	11600	7710	11700	7810
			BFL	115	8220	9570	6360	9640	6410	9710	6460	9790	6510	9860	6560	9940	6610	10000	6660
HD 400×900	6910	4600	TFL	0.00	40800	11600	7710	11900	7950	12300	8190	12700	8440	13100	8680	13400	8930	13800	9170
			2	26.5	32500	11100	7390	11400	7590	11700	7780	12000	7970	12300	8170	12600	8360	12900	8560
			3	53.0	24200	10400	6940	10700	7090	10900	7230	11100	7380	11300	7520	11500	7670	11700	7810
			4	79.5	15800	9570	6370	9710	6460	9850	6550	9990	6650	10100	6740	10300	6840	10400	6930
			BFL	106	7520	8500	5650	8570	5700	8630	5740	8700	5790	8770	5830	8840	5880	8900	5920
HD 400×818	6150	4090	TFL	0.00	37000	10200	6810	10600	7030	10900	7250	11200	7470	11600	7690	11900	7920	12200	8140
			2	24.3	29500	9810	6530	10100	6700	10300	6880	10600	7060	10900	7230	11100	7410	11400	7590
			3	48.5	22000	9220	6140	9420	6270	9620	6400	9820	6530	10000	6660	10200	6800	10400	6930
			4	72.8	14500	8480	5640	8610	5730	8740	5810	8870	5900	9000	5990	9130	6070	9260	6160
			BFL	97.0	6930	7560	5030	7620	5070	7690	5110	7750	5160	7810	5200	7870	5240	7940	5280
HD 400×744	5490	3650	TFL	0.00	33700	9060	6030	9360	6230	9660	6430	9970	6630	10300	6830	10600	7030	10900	7240
			2	22.2	26800	8680	5780	8920	5940	9170	6100	9410	6260	9650	6420	9890	6580	10100	6740
			3	44.5	20000	8170	5440	8350	5560	8530	5680	8710	5800	8890	5920	9070	6040	9250	6160
			4	66.7	13200	7520	5010	7640	5080	7760	5160	7880	5240	8000	5320	8120	5400	8240	5480
			BFL	88.9	6390	6740	4480	6800	4520	6850	4560	6910	4600	6970	4640	7030	4680	7080	4710
HD 400×677	4900	3260	TFL	0.00	30700	8040	5350	8320	5530	8590	5720	8870	5900	9140	6080	9420	6270	9700	6450
			2	20.4	24500	7710	5130	7930	5270	8150	5420	8370	5570	8590	5710	8810	5860	9030	6010
			3	40.8	18300	7260	4830	7420	4940	7590	5050	7750	5160	7910	5270	8080	5380	8240	5480
			4	61.1	12100	6690	4450	6800	4530	6910	4600	7020	4670	7130	4740	7240	4820	7350	4890
			BFL	81.5	5880	6020	4000	6070	4040	6120	4070	6180	4110	6230	4150	6280	4180	6340	4220
HD 400×634	4540	3020	TFL	0.00	28700	7410	4930	7670	5100	7930	5270	8180	5440	8440	5620	8700	5790	8960	5960
			2	19.3	22900	7100	4720	7300	4860	7510	5000	7720	5130	7920	5270	8130	5410	8330	5540
			3	38.6	17100	6690	4450	6840	4550	6990	4650	7150	4750	7300	4860	7450	4960	7610	5060
			4	57.8	11300	6170	4110	6270	4170	6380	4240	6480	4310	6580	4380	6680	4440	6780	4510
			BFL	77.1	5470	5560	3700	5610	3730	5660	3760	5710	3800	5760	3830	5810	3860	5850	3900
HD 400×592	4200	2790	TFL	0.00	26800	6810	4530	7050	4690	7300	4850	7540	5010	7780	5180	8020	5340	8260	5500
			2	18.1	21400	6530	4340	6720	4470	6910	4600	7100	4730	7300	4850	7490	4980	7680	5110
			3	36.2	16000	6150	4090	6300	4190	6440	4280	6580	4380	6730	4480	6870	4570	7020	4670
			4	54.2	10600	5690	3780	5780	3850	5880	3910	5970	3980	6070	4040	6170	4100	6260	4170
			BFL	72.3	5190	5140	3420	5180	3450	5230	3480	5280	3510	5320	3540	5370	3570	5420	3600
HD 400×551	3850	2560	TFL	0.00	24900	6220	4140	6440	4290	6670	4440	6890	4580	7120	4730	7340	4880	7560	5030
			2	16.9	19900	5950	3960	6130	4080	6310	4200	6490	4320	6670	4440	6850	4560	7030	4680
			3	33.8	14900	5610	3740	5750	3820	5880	3910	6020	4000	6150	4090	6280	4180	6420	4270
			4	50.7	9850	5200	3460	5290	3520	5380	3580	5460	3640	5550	3690	5640	3750	5730	3810
			BFL	67.6	4840	4710	3130	4750	3160	4790	3190	4840	3220	4880	3250	4920	3280	4970	3300
HD 400×509	3520	2340	TFL	0.00	23000	5660	3770	5870	3900	6080	4040	6280	4180	6490	4320	6700	4460	6900	4590
			2	15.7	18400	5420	3610	5590	3720	5750	3830	5920	3940	6080	4050	6250	4160	6410	4270
			3	31.4	13800	5110	3400	5240	3480	5360	3570	5490	3650	5610	3730	5730	3810	5860	3900
			4	47.0	9150	4740	3150	4820	3210	4910	3260	4990	3320	5070	3370	5150	3430	5240	3480
			BFL	62.7	4520	4300	2860	4350	2890	4390	2920	4430	2950	4470	2970	4510	3000	4550	3030

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

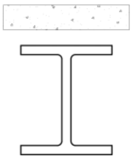
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×1086	8690	5780	TFL	0.00	49200	17900	11900	18400	12200	18800	12500	19200	12800	19700	13100	20100	13400	20600	13700
			2	31.3	39100	16700	11100	17000	11300	17400	11600	17700	11800	18100	12000	18400	12300	18800	12500
			3	62.5	29100	15200	10100	15400	10300	15700	10400	16000	10600	16200	10800	16500	11000	16700	11100
			4	93.8	19000	13400	8900	13500	9010	13700	9130	13900	9240	14100	9350	14200	9470	14400	9580
			BFL	125	8910	11300	7510	11400	7570	11500	7620	11500	7670	11600	7730	11700	7780	11800	7830
HD 400×990	7760	5160	TFL	0.00	44800	15900	10600	16300	10900	16700	11100	17100	11400	17500	11700	17900	11900	18300	12200
			2	28.8	35700	14800	9860	15100	10100	15500	10300	15800	10500	16100	10700	16400	10900	16700	11100
			3	57.5	26500	13500	8970	13700	9130	14000	9290	14200	9440	14400	9600	14700	9760	14900	9920
			4	86.3	17400	11900	7920	12100	8020	12200	8120	12400	8230	12500	8330	12700	8440	12800	8540
			BFL	115	8220	10100	6710	10200	6760	10200	6810	10300	6860	10400	6910	10500	6950	10500	7000
HD 400×900	6910	4600	TFL	0.00	40800	14200	9420	14500	9660	14900	9900	15300	10100	15600	10400	16000	10600	16400	10900
			2	26.5	32500	13200	8750	13400	8950	13700	9140	14000	9340	14300	9530	14600	9720	14900	9920
			3	53.0	24200	12000	7960	12200	8100	12400	8250	12600	8390	12800	8540	13000	8680	13300	8820
			4	79.5	15800	10600	7030	10700	7120	10900	7220	11000	7310	11100	7410	11300	7500	11400	7600
			BFL	106	7520	8970	5970	9040	6010	9110	6060	9180	6100	9240	6150	9310	6200	9380	6240
HD 400×818	6150	4090	TFL	0	37000	12600	8360	12900	8580	13200	8800	13600	9020	13900	9250	14200	9470	14600	9690
			2	24.3	29500	11700	7760	11900	7940	12200	8120	12500	8290	12700	8470	13000	8650	13300	8820
			3	48.5	22000	10600	7060	10800	7190	11000	7320	11200	7450	11400	7590	11600	7720	11800	7850
			4	72.8	14500	9390	6250	9520	6330	9650	6420	9780	6500	9910	6590	10000	6680	10200	6760
			BFL	97	6930	8000	5320	8060	5360	8120	5410	8190	5450	8250	5490	8310	5530	8370	5570
HD 400×744	5490	3650	TFL	0	33700	11200	7440	11500	7640	11800	7840	12100	8040	12400	8240	12700	8440	13000	8650
			2	22.2	26800	10400	6900	10600	7060	10900	7220	11100	7380	11300	7540	11600	7710	11800	7870
			3	44.5	20000	9430	6280	9610	6400	9790	6520	9970	6640	10200	6760	10300	6880	10500	7000
			4	66.7	13200	8360	5560	8470	5640	8590	5720	8710	5800	8830	5880	8950	5950	9070	6030
			BFL	88.9	6390	7140	4750	7200	4790	7260	4830	7310	4870	7370	4900	7430	4940	7490	4980
HD 400×677	4900	3260	TFL	0	30700	9970	6630	10200	6820	10500	7000	10800	7190	11100	7370	11400	7550	11600	7740
			2	20.4	24500	9250	6150	9470	6300	9690	6450	9910	6590	10100	6740	10300	6880	10600	7030
			3	40.8	18300	8410	5590	8570	5700	8740	5810	8900	5920	9070	6030	9230	6140	9390	6250
			4	61.1	12100	7460	4960	7560	5030	7670	5100	7780	5180	7890	5250	8000	5320	8110	5390
			BFL	81.5	5880	6390	4250	6440	4290	6500	4320	6550	4360	6600	4390	6650	4430	6710	4460
HD 400×634	4540	3020	TFL	0	28700	9220	6130	9470	6300	9730	6480	9990	6650	10200	6820	10500	6990	10800	7160
			2	19.3	22900	8540	5680	8750	5820	8950	5960	9160	6090	9360	6230	9570	6370	9770	6500
			3	38.6	17100	7760	5160	7920	5270	8070	5370	8220	5470	8380	5570	8530	5680	8680	5780
			4	57.8	11300	6880	4580	6980	4650	7090	4710	7190	4780	7290	4850	7390	4920	7490	4980
			BFL	77.1	5470	5900	3930	5950	3960	6000	3990	6050	4030	6100	4060	6150	4090	6200	4120
HD 400×592	4200	2790	TFL	0	26800	8500	5660	8740	5820	8980	5980	9230	6140	9470	6300	9710	6460	9950	6620
			2	18.1	21400	7870	5240	8070	5370	8260	5500	8450	5620	8640	5750	8840	5880	9030	6010
			3	36.2	16000	7160	4760	7300	4860	7450	4950	7590	5050	7730	5150	7880	5240	8020	5340
			4	54.2	10600	6360	4230	6450	4290	6550	4360	6640	4420	6740	4480	6830	4550	6930	4610
			BFL	72.3	5190	5460	3640	5510	3670	5560	3700	5600	3730	5650	3760	5700	3790	5740	3820
HD 400×551	3850	2560	TFL	0.00	24900	7790	5180	8010	5330	8240	5480	8460	5630	8680	5780	8910	5930	9130	6080
			2	16.9	19900	7210	4800	7390	4910	7570	5030	7740	5150	7920	5270	8100	5390	8280	5510
			3	33.8	14900	6550	4360	6690	4450	6820	4540	6950	4630	7090	4720	7220	4800	7350	4890
			4	50.7	9850	5820	3870	5910	3930	6000	3990	6090	4050	6170	4110	6260	4170	6350	4230
			BFL	67.6	4840	5010	3330	5050	3360	5100	3390	5140	3420	5180	3450	5230	3480	5270	3510
HD 400×509	3520	2340	TFL	0.00	23000	7110	4730	7320	4870	7530	5010	7730	5150	7940	5280	8150	5420	8360	5560
			2	15.7	18400	6580	4380	6750	4490	6910	4600	7080	4710	7240	4820	7410	4930	7570	5040
			3	31.4	13800	5980	3980	6110	4060	6230	4140	6350	4230	6480	4310	6600	4390	6730	4470
			4	47.0	9150	5320	3540	5400	3590	5480	3650	5570	3700	5650	3760	5730	3810	5810	3870
			BFL	62.7	4520	4590	3050	4630	3080	4670	3110	4710	3130	4750	3160	4790	3190	4830	3220

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

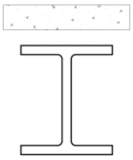
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×463	3160	2100	TFL	0.00	20900	5040	3350	5230	3480	5410	3600	5600	3730	5790	3850	5980	3980	6170	4100
			2	14.4	16700	4820	3210	4970	3310	5120	3410	5270	3510	5420	3610	5580	3710	5730	3810
			3	28.7	12500	4550	3030	4660	3100	4780	3180	4890	3250	5000	3330	5120	3400	5230	3480
			4	43.1	8330	4230	2810	4300	2860	4380	2910	4450	2960	4530	3010	4600	3060	4680	3110
			BFL	57.4	4140	3850	2560	3890	2590	3920	2610	3960	2640	4000	2660	4040	2680	4070	2710
HD 400×421	2840	1890	TFL	0.00	19100	4500	3000	4680	3110	4850	3230	5020	3340	5190	3450	5360	3570	5530	3680
			2	13.2	15200	4310	2870	4450	2960	4580	3050	4720	3140	4860	3230	5000	3320	5130	3420
			3	26.3	11400	4070	2710	4170	2780	4280	2850	4380	2910	4480	2980	4580	3050	4690	3120
			4	39.5	7610	3790	2520	3850	2560	3920	2610	3990	2660	4060	2700	4130	2750	4200	2790
			BFL	52.6	3790	3460	2300	3490	2320	3520	2340	3560	2370	3590	2390	3630	2410	3660	2440
HD 400×382	2540	1690	TFL	0.00	17300	4020	2670	4170	2780	4330	2880	4480	2980	4640	3090	4790	3190	4950	3290
			2	12.0	13800	3840	2560	3970	2640	4090	2720	4210	2800	4340	2890	4460	2970	4590	3050
			3	24.0	10400	3630	2410	3720	2480	3820	2540	3910	2600	4000	2660	4100	2730	4190	2790
			4	36.0	6910	3380	2250	3440	2290	3500	2330	3570	2370	3630	2410	3690	2460	3750	2500
			BFL	48.0	3460	3090	2060	3120	2080	3160	2100	3190	2120	3220	2140	3250	2160	3280	2180
HD 400×347	2280	1520	TFL	0.00	15700	3580	2380	3720	2480	3860	2570	4000	2660	4140	2760	4290	2850	4430	2950
			2	10.9	12600	3420	2280	3540	2350	3650	2430	3760	2500	3880	2580	3990	2650	4100	2730
			3	21.9	9420	3240	2150	3320	2210	3410	2270	3490	2320	3580	2380	3660	2440	3750	2490
			4	32.8	6290	3020	2010	3070	2050	3130	2080	3190	2120	3240	2160	3300	2200	3360	2230
			BFL	43.7	3160	2770	1840	2800	1860	2830	1880	2850	1900	2880	1920	2910	1940	2940	1960
HD 400×314	2040	1350	TFL	0.00	14200	3180	2120	3310	2200	3440	2290	3560	2370	3690	2460	3820	2540	3950	2630
			2	9.90	11400	3040	2020	3150	2090	3250	2160	3350	2230	3450	2300	3550	2360	3660	2430
			3	19.8	8530	2880	1920	2960	1970	3030	2020	3110	2070	3190	2120	3260	2170	3340	2220
			4	29.7	5720	2690	1790	2740	1820	2790	1860	2840	1890	2890	1930	2950	1960	3000	1990
			BFL	39.6	2900	2470	1650	2500	1660	2530	1680	2550	1700	2580	1720	2600	1730	2630	1750
HD 400×287	1860	1240	TFL	0.00	13000	2880	1920	3000	2000	3120	2080	3240	2150	3350	2230	3470	2310	3590	2390
			2	9.15	10400	2760	1830	2850	1900	2940	1960	3040	2020	3130	2080	3230	2150	3320	2210
			3	18.3	7820	2610	1740	2680	1780	2750	1830	2820	1880	2890	1920	2960	1970	3030	2020
			4	27.5	5230	2440	1620	2490	1650	2530	1690	2580	1720	2630	1750	2670	1780	2720	1810
			BFL	36.6	2640	2250	1500	2270	1510	2290	1530	2320	1540	2340	1560	2370	1570	2390	1590
HD 400x262	1680	1120	TFL	0.00	11900	2600	1730	2710	1800	2820	1870	2920	1950	3030	2020	3140	2090	3240	2160
			2	8.33	9530	2490	1660	2570	1710	2660	1770	2750	1830	2830	1880	2920	1940	3000	2000
			3	16.7	7170	2360	1570	2420	1610	2490	1650	2550	1700	2610	1740	2680	1780	2740	1830
			4	25.0	4820	2210	1470	2250	1500	2290	1530	2340	1550	2380	1580	2420	1610	2470	1640
			BFL	33.3	2470	2040	1360	2060	1370	2080	1390	2110	1400	2130	1420	2150	1430	2170	1450
HD 400×237	1500	996	TFL	0.00	10700	2310	1540	2400	1600	2500	1660	2600	1730	2690	1790	2790	1850	2880	1920
			2	7.55	8560	2200	1470	2280	1520	2360	1570	2440	1620	2510	1670	2590	1720	2670	1770
			3	15.1	6450	2090	1390	2150	1430	2200	1470	2260	1510	2320	1540	2380	1580	2440	1620
			4	22.7	4330	1960	1300	2000	1330	2030	1350	2070	1380	2110	1410	2150	1430	2190	1460
			BFL	30.2	2210	1810	1200	1830	1220	1850	1230	1870	1240	1890	1260	1910	1270	1930	1280
HD 400×216	1360	906	TFL	0.00	9780	2090	1390	2180	1450	2270	1510	2350	1570	2440	1630	2530	1680	2620	1740
			2	6.93	7840	2000	1330	2070	1380	2140	1420	2210	1470	2280	1520	2350	1560	2420	1610
			3	13.9	5910	1890	1260	1950	1290	2000	1330	2050	1360	2100	1400	2160	1440	2210	1470
			4	20.8	3970	1770	1180	1810	1200	1850	1230	1880	1250	1920	1280	1950	1300	1990	1320
			BFL	27.7	2030	1650	1090	1660	1110	1680	1120	1700	1130	1720	1140	1740	1160	1750	1170
HD 400×187	1160	774	TFL	0.00	8430	1780	1180	1850	1230	1930	1280	2000	1330	2080	1380	2160	1430	2230	1480
			2	6.00	6770	1700	1130	1760	1170	1820	1210	1880	1250	1940	1290	2000	1330	2060	1370
			3	12.0	5100	1610	1070	1650	1100	1700	1130	1750	1160	1790	1190	1840	1220	1880	1250
			4	18.0	3440	1510	1010	1540	1030	1570	1050	1600	1070	1630	1090	1670	1110	1700	1130
			BFL	24.0	1770	1400	935	1420	945	1440	956	1450	966	1470	977	1480	988	1500	998

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

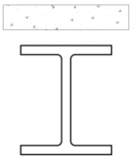
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400×463	3160	2100	TFL	0.00	20900	6360	4230	6540	4350	6730	4480	6920	4610	7110	4730	7300	4860	7490	4980
			2	14.4	16700	5880	3910	6030	4010	6180	4110	6330	4210	6480	4310	6630	4410	6780	4510
			3	28.7	12500	5340	3550	5450	3630	5570	3700	5680	3780	5790	3850	5910	3930	6020	4000
			4	43.1	8330	4750	3160	4830	3210	4900	3260	4980	3310	5050	3360	5130	3410	5200	3460
			BFL	57.4	4140	4110	2730	4150	2760	4180	2780	4220	2810	4260	2830	4300	2860	4330	2880
HD 400×421	2840	1890	TFL	0.00	19100	5710	3800	5880	3910	6050	4020	6220	4140	6390	4250	6560	4370	6740	4480
			2	13.2	15200	5270	3510	5410	3600	5550	3690	5680	3780	5820	3870	5960	3960	6090	4050
			3	26.3	11400	4790	3190	4890	3260	5000	3320	5100	3390	5200	3460	5300	3530	5410	3600
			4	39.5	7610	4270	2840	4330	2880	4400	2930	4470	2970	4540	3020	4610	3070	4680	3110
			BFL	52.6	3790	3690	2460	3730	2480	3760	2500	3800	2530	3830	2550	3870	2570	3900	2590
HD 400×382	2540	1690	TFL	0.00	17300	5100	3400	5260	3500	5420	3600	5570	3710	5730	3810	5880	3910	6040	4020
			2	12.0	13800	4710	3140	4840	3220	4960	3300	5090	3380	5210	3470	5330	3550	5460	3630
			3	24.0	10400	4280	2850	4380	2910	4470	2970	4560	3040	4660	3100	4750	3160	4840	3220
			4	36.0	6910	3820	2540	3880	2580	3940	2620	4000	2660	4060	2700	4130	2750	4190	2790
			BFL	48.0	3460	3310	2200	3340	2220	3370	2240	3400	2270	3440	2290	3470	2310	3500	2330
HD 400×347	2280	1520	TFL	0.00	15700	4570	3040	4710	3130	4850	3230	4990	3320	5130	3420	5270	3510	5420	3600
			2	10.9	12600	4210	2800	4330	2880	4440	2950	4550	3030	4670	3100	4780	3180	4890	3260
			3	21.9	9420	3830	2550	3910	2600	4000	2660	4080	2720	4170	2770	4250	2830	4340	2890
			4	32.8	6290	3410	2270	3470	2310	3530	2350	3580	2380	3640	2420	3700	2460	3750	2500
			BFL	43.7	3160	2970	1970	3000	1990	3020	2010	3050	2030	3080	2050	3110	2070	3140	2090
HD 400x314	2040	1350	TFL	0.00	14200	4080	2710	4200	2800	4330	2880	4460	2970	4590	3050	4710	3140	4840	3220
			2	9.90	11400	3760	2500	3860	2570	3960	2640	4060	2700	4170	2770	4270	2840	4370	2910
			3	19.8	8530	3420	2270	3490	2320	3570	2370	3650	2430	3720	2480	3800	2530	3880	2580
			4	29.7	5720	3050	2030	3100	2060	3150	2100	3200	2130	3250	2170	3310	2200	3360	2230
			BFL	39.6	2900	2660	1770	2680	1780	2710	1800	2730	1820	2760	1840	2790	1850	2810	1870
HD 400×287	1860	1240	TFL	0.00	13000	3700	2460	3820	2540	3940	2620	4060	2700	4170	2780	4290	2850	4410	2930
			2	9.15	10400	3410	2270	3510	2330	3600	2400	3690	2460	3790	2520	3880	2580	3980	2650
			3	18.3	7820	3100	2060	3170	2110	3240	2160	3310	2200	3380	2250	3450	2300	3520	2340
			4	27.5	5230	2770	1840	2820	1870	2860	1900	2910	1940	2960	1970	3000	2000	3050	2030
			BFL	36.6	2640	2410	1610	2440	1620	2460	1640	2480	1650	2510	1670	2530	1680	2560	1700
HD 400×262	1680	1120	TFL	0.00	11900	3350	2230	3460	2300	3570	2370	3670	2440	3780	2510	3890	2590	3990	2660
			2	8.33	9530	3090	2050	3170	2110	3260	2170	3350	2230	3430	2280	3520	2340	3600	2400
			3	16.7	7170	2810	1870	2870	1910	2940	1950	3000	2000	3070	2040	3130	2080	3200	2130
			4	25.0	4820	2510	1670	2550	1700	2600	1730	2640	1760	2680	1790	2730	1810	2770	1840
			BFL	33.3	2470	2190	1460	2220	1470	2240	1490	2260	1500	2280	1520	2310	1530	2330	1550
HD 400×237	1500	996	TFL	0.00	10700	2980	1980	3080	2050	3170	2110	3270	2170	3360	2240	3460	2300	3560	2370
			2	7.55	8560	2740	1830	2820	1880	2900	1930	2980	1980	3050	2030	3130	2080	3210	2130
			3	15.1	6450	2490	1660	2550	1700	2610	1740	2670	1780	2730	1810	2780	1850	2840	1890
			4	22.7	4330	2230	1480	2270	1510	2310	1540	2350	1560	2390	1590	2420	1610	2460	1640
			BFL	30.2	2210	1950	1300	1970	1310	1990	1320	2010	1340	2030	1350	2050	1360	2070	1380
HD 400×216	1360	906	TFL	0.00	9780	2710	1800	2790	1860	2880	1920	2970	1980	3060	2040	3150	2090	3230	2150
			2	6.93	7840	2490	1660	2560	1700	2630	1750	2700	1800	2770	1850	2840	1890	2910	1940
			3	13.9	5910	2260	1510	2320	1540	2370	1580	2420	1610	2480	1650	2530	1680	2580	1720
			4	20.8	3970	2020	1350	2060	1370	2100	1390	2130	1420	2170	1440	2200	1470	2240	1490
			BFL	27.7	2030	1770	1180	1790	1190	1810	1200	1830	1220	1850	1230	1860	1240	1880	1250
HD 400×187	1160	774	TFL	0.00	8430	2310	1540	2380	1590	2460	1640	2540	1690	2610	1740	2690	1790	2760	1840
			2	6.00	6770	2120	1410	2180	1450	2250	1490	2310	1530	2370	1570	2430	1620	2490	1660
			3	12.0	5100	1930	1280	1980	1310	2020	1350	2070	1380	2110	1410	2160	1440	2210	1470
			4	18.0	3440	1730	1150	1760	1170	1790	1190	1820	1210	1850	1230	1880	1250	1910	1270
			BFL	24.0	1770	1520	1010	1530	1020	1550	1030	1560	1040	1580	1050	1600	1060	1610	1070

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

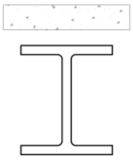
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 360×196	1230	816	TFL	0.00	8890	1890	1260	1970	1310	2050	1360	2130	1420	2210	1470	2290	1520	2370	1570
			2	6.55	7150	1800	1200	1870	1240	1930	1290	2000	1330	2060	1370	2130	1410	2190	1460
			3	13.1	5410	1710	1140	1760	1170	1810	1200	1860	1240	1900	1270	1950	1300	2000	1330
			4	19.7	3670	1610	1070	1640	1090	1670	1110	1710	1130	1740	1160	1770	1180	1800	1200
			BFL	26.2	1930	1490	993	1510	1000	1530	1020	1540	1030	1560	1040	1580	1050	1600	1060
HD 360×179	1110	740	TFL	0.00	8100	1710	1140	1780	1180	1850	1230	1930	1280	2000	1330	2070	1380	2140	1430
			2	5.98	6520	1630	1090	1690	1120	1750	1160	1810	1200	1870	1240	1920	1280	1980	1320
			3	12.0	4940	1550	1030	1590	1060	1640	1090	1680	1120	1730	1150	1770	1180	1810	1210
			4	17.9	3360	1450	968	1490	988	1520	1010	1550	1030	1580	1050	1610	1070	1640	1090
			BFL	23.9	1780	1350	901	1370	911	1390	922	1400	933	1420	943	1430	954	1450	965
HD 360×162	1000	667	TFL	0.00	7320	1530	1020	1600	1060	1660	1110	1730	1150	1790	1190	1860	1240	1920	1280
			2	5.45	5890	1460	972	1510	1010	1570	1040	1620	1080	1670	1110	1730	1150	1780	1180
			3	10.9	4450	1390	922	1430	949	1470	975	1510	1000	1550	1030	1590	1060	1630	1080
			4	16.4	3020	1300	867	1330	885	1360	904	1390	922	1410	940	1440	958	1470	976
			BFL	21.8	1580	1210	808	1230	817	1240	827	1260	836	1270	846	1290	855	1300	865
HD 360×147	907	603	TFL	0	6670	1380	919	1440	959	1500	999	1560	1040	1620	1080	1680	1120	1740	1160
			2	4.95	5370	1320	878	1370	910	1420	942	1460	974	1510	1010	1560	1040	1610	1070
			3	9.9	4070	1250	833	1290	857	1330	882	1360	906	1400	931	1440	955	1470	979
			4	14.9	2770	1180	785	1200	801	1230	818	1250	834	1280	851	1300	867	1330	884
			BFL	19.8	1470	1100	732	1110	741	1130	750	1140	759	1150	767	1170	776	1180	785
HD 360×134	819	545	TFL	0	6060	1240	827	1300	863	1350	899	1410	936	1460	972	1520	1010	1570	1040
			2	4.5	4880	1190	790	1230	819	1280	848	1320	878	1360	907	1410	936	1450	965
			3	9	3700	1130	750	1160	772	1190	794	1230	816	1260	838	1290	861	1330	883
			4	13.5	2520	1060	707	1080	722	1110	737	1130	752	1150	767	1180	782	1200	797
			BFL	18	1340	992	660	1000	668	1020	676	1030	684	1040	692	1050	700	1060	708
HD 320x300	1760	1170	TFL	0	13600	2900	1930	3020	2010	3140	2090	3270	2170	3390	2250	3510	2340	3630	2420
			2	12	10900	2770	1840	2860	1900	2960	1970	3060	2040	3160	2100	3260	2170	3350	2230
			3	24	8230	2600	1730	2680	1780	2750	1830	2820	1880	2900	1930	2970	1980	3050	2030
			4	36	5560	2410	1600	2460	1640	2510	1670	2560	1700	2610	1740	2660	1770	2710	1800
			BFL	48	2900	2190	1460	2220	1470	2240	1490	2270	1510	2290	1530	2320	1540	2350	1560
HD 320×245	1420	943	TFL	0	11100	2290	1520	2390	1590	2490	1650	2590	1720	2690	1790	2790	1850	2890	1920
			2	10	8880	2180	1450	2260	1500	2340	1560	2420	1610	2500	1660	2580	1720	2660	1770
			3	20	6690	2050	1360	2110	1400	2170	1440	2230	1480	2290	1520	2350	1560	2410	1600
			4	30	4490	1900	1270	1940	1290	1980	1320	2020	1350	2060	1370	2100	1400	2150	1430
			BFL	40	2300	1730	1150	1760	1170	1780	1180	1800	1200	1820	1210	1840	1220	1860	1240
HD 320×198	1110	740	TFL	0	8960	1790	1190	1870	1240	1950	1300	2030	1350	2110	1400	2190	1460	2270	1510
			2	8	7220	1700	1130	1770	1170	1830	1220	1900	1260	1960	1300	2030	1350	2090	1390
			3	16	5480	1600	1070	1650	1100	1700	1130	1750	1170	1800	1200	1850	1230	1900	1260
			4	24	3740	1490	994	1530	1020	1560	1040	1600	1060	1630	1080	1660	1110	1700	1130
			BFL	32	2000	1370	913	1390	925	1410	937	1430	949	1440	961	1460	973	1480	985
HD 320×158	868	578	TFL	0.00	7140	1380	920	1450	962	1510	1010	1570	1050	1640	1090	1700	1130	1770	1180
			2	6.38	5770	1320	876	1370	910	1420	945	1470	980	1520	1010	1580	1050	1630	1080
			3	12.8	4400	1240	827	1280	853	1320	880	1360	906	1400	932	1440	959	1480	985
			4	19.1	3030	1160	773	1190	791	1220	809	1240	827	1270	845	1300	863	1330	882
			BFL	25.5	1660	1070	713	1090	723	1100	733	1120	743	1130	753	1150	763	1160	773
HD 320×127	687	457	TFL	0.00	5730	1080	720	1130	754	1190	789	1240	823	1290	857	1340	891	1390	926
			2	5.13	4630	1030	686	1070	713	1110	741	1160	769	1200	797	1240	824	1280	852
			3	10.3	3540	974	648	1010	669	1040	690	1070	712	1100	733	1130	754	1170	775
			4	15.4	2450	912	607	934	622	956	636	978	651	1000	666	1020	680	1040	695
			BFL	20.5	1360	845	563	858	571	870	579	882	587	894	595	907	603	919	611

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

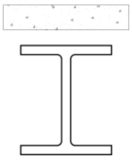
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 360×196	1230	816	TFL	0.00	8890	2450	1630	2530	1680	2610	1730	2690	1790	2770	1840	2850	1890	2930	1950
			2	6.55	7150	2250	1500	2320	1540	2380	1590	2450	1630	2510	1670	2580	1710	2640	1760
			3	13.1	5410	2050	1360	2100	1400	2150	1430	2200	1460	2250	1490	2290	1530	2340	1560
			4	19.7	3670	1840	1220	1870	1240	1900	1270	1940	1290	1970	1310	2000	1330	2040	1350
			BFL	26.2	1930	1610	1070	1630	1090	1650	1100	1670	1110	1680	1120	1700	1130	1720	1140
HD 360×179	1110	740	TFL	0.00	8100	2220	1480	2290	1520	2360	1570	2440	1620	2510	1670	2580	1720	2660	1770
			2	5.98	6520	2040	1360	2100	1400	2160	1440	2220	1480	2280	1520	2340	1550	2390	1590
			3	12.0	4940	1860	1240	1900	1270	1950	1300	1990	1330	2040	1350	2080	1380	2130	1410
			4	17.9	3360	1670	1110	1700	1130	1730	1150	1760	1170	1790	1190	1820	1210	1850	1230
			BFL	23.9	1780	1470	975	1480	986	1500	996	1510	1010	1530	1020	1550	1030	1560	1040
HD 360×162	1000	667	TFL	0.00	7320	1990	1320	2060	1370	2120	1410	2190	1460	2250	1500	2320	1540	2390	1590
			2	5.45	5890	1830	1220	1880	1250	1940	1290	1990	1320	2040	1360	2100	1400	2150	1430
			3	10.9	4450	1670	1110	1710	1140	1750	1160	1790	1190	1830	1220	1870	1240	1910	1270
			4	16.4	3020	1490	994	1520	1010	1550	1030	1580	1050	1600	1070	1630	1080	1660	1100
			BFL	21.8	1580	1310	874	1330	884	1340	893	1360	903	1370	912	1390	922	1400	931
HD 360×147	907	603	TFL	0.00	6670	1380	919	1440	959	1500	999	1560	1040	1620	1080	1680	1120	1740	1160
			2	4.95	5370	1320	878	1370	910	1420	942	1460	974	1510	1010	1560	1040	1610	1070
			3	9.90	4070	1250	833	1290	857	1330	882	1360	906	1400	931	1440	955	1470	979
			4	14.9	2770	1180	785	1200	801	1230	818	1250	834	1280	851	1300	867	1330	884
			BFL	19.8	1470	1100	732	1110	741	1130	750	1140	759	1150	767	1170	776	1180	785
HD 360×134	819	545	TFL	0.00	6060	1240	827	1300	863	1350	899	1410	936	1460	972	1520	1010	1570	1040
			2	4.50	4880	1190	790	1230	819	1280	848	1320	878	1360	907	1410	936	1450	965
			3	9.00	3700	1130	750	1160	772	1190	794	1230	816	1260	838	1290	861	1330	883
			4	13.5	2520	1060	707	1080	722	1110	737	1130	752	1150	767	1180	782	1200	797
			BFL	18.0	1340	992	660	1000	668	1020	676	1030	684	1040	692	1050	700	1060	708
HD 320×300	1760	1170	TFL	0.00	13600	2900	1930	3020	2010	3140	2090	3270	2170	3390	2250	3510	2340	3630	2420
			2	12.0	10900	2770	1840	2860	1900	2960	1970	3060	2040	3160	2100	3260	2170	3350	2230
			3	24.0	8230	2600	1730	2680	1780	2750	1830	2820	1880	2900	1930	2970	1980	3050	2030
			4	36.0	5560	2410	1600	2460	1640	2510	1670	2560	1700	2610	1740	2660	1770	2710	1800
			BFL	48.0	2900	2190	1460	2220	1470	2240	1490	2270	1510	2290	1530	2320	1540	2350	1560
HD 320×245	1420	943	TFL	0.00	11100	2290	1520	2390	1590	2490	1650	2590	1720	2690	1790	2790	1850	2890	1920
			2	10.0	8880	2180	1450	2260	1500	2340	1560	2420	1610	2500	1660	2580	1720	2660	1770
			3	20.0	6690	2050	1360	2110	1400	2170	1440	2230	1480	2290	1520	2350	1560	2410	1600
			4	30.0	4490	1900	1270	1940	1290	1980	1320	2020	1350	2060	1370	2100	1400	2150	1430
			BFL	40.0	2300	1730	1150	1760	1170	1780	1180	1800	1200	1820	1210	1840	1220	1860	1240
HD 320×198	1110	740	TFL	0.00	8960	1790	1190	1870	1240	1950	1300	2030	1350	2110	1400	2190	1460	2270	1510
			2	8.00	7220	1700	1130	1770	1170	1830	1220	1900	1260	1960	1300	2030	1350	2090	1390
			3	16.0	5480	1600	1070	1650	1100	1700	1130	1750	1170	1800	1200	1850	1230	1900	1260
			4	24.0	3740	1490	994	1530	1020	1560	1040	1600	1060	1630	1080	1660	1110	1700	1130
			BFL	32.0	2000	1370	913	1390	925	1410	937	1430	949	1440	961	1460	973	1480	985
HD 320x158	868	578	TFL	0.00	7140	1830	1220	1900	1260	1960	1300	2020	1350	2090	1390	2150	1430	2220	1480
			2	6.38	5770	1680	1120	1730	1150	1780	1190	1840	1220	1890	1260	1940	1290	1990	1330
			3	12.8	4400	1520	1010	1560	1040	1600	1060	1640	1090	1680	1120	1720	1140	1760	1170
			4	19.1	3030	1350	900	1380	918	1410	936	1430	954	1460	972	1490	990	1520	1010
			BFL	25.5	1660	1180	783	1190	793	1210	803	1220	813	1240	823	1250	832	1270	842
HD 320×127	687	457	TFL	0.00	5730	1440	960	1490	994	1550	1030	1600	1060	1650	1100	1700	1130	1750	1170
			2	5.13	4630	1320	880	1360	908	1410	935	1450	963	1490	991	1530	1020	1570	1050
			3	10.3	3540	1200	796	1230	818	1260	839	1290	860	1320	881	1360	903	1390	924
			4	15.4	2450	1070	710	1090	724	1110	739	1130	754	1150	768	1180	783	1200	798
			BFL	20.5	1360	931	620	943	628	956	636	968	644	980	652	992	660	1000	668

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

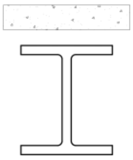
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA^c	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 320×97.6	520	346	TFL	0.00	4420	815	542	855	569	894	595	934	621	974	648	1010	674	1050	701
			2	3.88	3590	776	516	809	538	841	559	873	581	905	602	938	624	970	645
			3	7.75	2770	735	489	760	505	785	522	809	539	834	555	859	572	884	588
			4	11.6	1940	690	459	708	471	725	483	743	494	760	506	778	517	795	529
			BFL	15.5	1110	643	428	653	435	663	441	673	448	683	455	693	461	703	468
			6	15.9	1110	643	428	653	434	663	441	673	448	683	454	693	461	703	468
			7	16.2	1100	643	428	652	434	662	441	672	447	682	454	692	461	702	467
HD 320×74.2	382	254	TFL	0.00	3360	606	403	636	423	666	443	697	463	727	484	757	504	787	524
			2	2.75	2770	579	385	604	402	629	418	654	435	679	451	704	468	728	485
			3	5.50	2190	550	366	570	379	590	392	609	405	629	418	649	432	668	445
			4	8.25	1600	520	346	535	356	549	365	563	375	578	384	592	394	607	404
			BFL	11.0	1010	489	325	498	331	507	337	516	343	525	350	535	356	544	362
			6	17.3	927	484	322	492	327	500	333	509	339	517	344	526	350	534	355
			7	23.6	839	478	318	486	323	493	328	501	333	508	338	516	343	524	348
HD 260×172	806	537	TFL	0.00	7800	1370	910	1440	957	1510	1000	1580	1050	1650	1100	1720	1140	1790	1190
			2	8.13	6250	1290	860	1350	898	1410	935	1460	973	1520	1010	1570	1050	1630	1080
			3	16.3	4700	1210	803	1250	831	1290	859	1330	887	1380	915	1420	943	1460	972
			4	24.4	3160	1110	738	1140	756	1170	775	1190	794	1220	813	1250	832	1280	851
			BFL	32.5	1610	999	665	1010	675	1030	684	1040	694	1060	704	1070	713	1090	723
HD 260×142	644	428	TFL	0.00	6400	1090	724	1150	763	1200	801	1260	839	1320	878	1380	916	1430	954
			2	6.63	5150	1030	685	1080	715	1120	746	1170	777	1210	808	1260	839	1310	870
			3	13.3	3910	962	640	997	663	1030	687	1070	710	1100	733	1140	757	1170	780
			4	19.9	2660	887	590	911	606	935	622	959	638	983	654	1010	670	1030	686
			BFL	26.5	1410	805	536	818	544	830	552	843	561	856	569	869	578	881	586
HD 260×114	511	340	TFL	0.00	5170	857	570	903	601	950	632	996	663	1040	694	1090	725	1140	756
			2	5.38	4170	809	538	847	563	884	588	922	613	959	638	997	663	1030	688
			3	10.8	3170	757	504	785	523	814	542	843	561	871	580	900	599	928	618
			4	16.1	2170	700	466	719	479	739	492	758	505	778	518	798	531	817	544
			BFL	21.5	1170	638	424	648	431	659	438	670	445	680	452	691	460	701	467
HD 260×93	410	273	TFL	0.00	4200	681	453	719	478	757	503	794	529	832	554	870	579	908	604
			2	4.38	3400	643	428	674	448	704	468	735	489	765	509	796	529	826	550
			3	8.75	2590	602	400	625	416	648	431	672	447	695	462	718	478	742	493
			4	13.1	1780	558	371	574	382	590	392	606	403	622	414	638	424	654	435
			BFL	17.5	973	510	339	519	345	528	351	536	357	545	363	554	369	563	374
HD260×68.2	294	196	TFL	0.00	3080	485	323	513	341	541	360	569	378	596	397	624	415	652	434
			2	3.13	2510	459	305	481	320	504	335	526	350	549	365	571	380	594	395
			3	6.25	1930	430	286	448	298	465	309	482	321	500	332	517	344	534	356
			4	9.38	1350	400	266	412	274	425	282	437	291	449	299	461	307	473	315
			BFL	12.5	775	369	245	376	250	383	255	390	259	397	264	403	268	410	273
			6	12.7	773	369	245	375	250	382	254	389	259	396	264	403	268	410	273
			7	12.8	771	368	245	375	250	382	254	389	259	396	264	403	268	410	273
HD 260×54.1	228	152	TFL	0.00	2450	379	252	401	267	423	281	445	296	467	311	489	325	511	340
			2	2.38	2010	359	239	377	251	395	263	413	275	431	287	449	299	467	311
			3	4.75	1570	338	225	352	234	366	243	380	253	394	262	408	272	423	281
			4	7.13	1130	316	210	326	217	336	224	346	230	356	237	367	244	377	251
			BFL	9.50	695	293	195	299	199	305	203	311	207	318	211	324	215	330	220
			6	13.0	653	290	193	296	197	302	201	308	205	314	209	320	213	326	217
			7	16.4	612	288	192	293	195	299	199	304	203	310	206	315	210	321	214

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

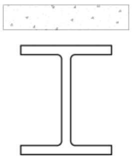
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HD Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 320×97.6	520	346	TFL	0.00	4420	1090	727	1130	754	1170	780	1210	807	1250	833	1290	859	1330	886
			2	3.88	3590	1000	667	1030	688	1070	710	1100	731	1130	753	1160	774	1200	796
			3	7.75	2770	909	605	934	621	959	638	984	654	1010	671	1030	688	1060	704
			4	11.6	1940	813	541	830	552	848	564	865	576	882	587	900	599	917	610
			BFL	15.5	1110	713	475	723	481	733	488	744	495	754	501	764	508	774	515
			6	15.9	1110	713	474	723	481	733	488	743	494	753	501	763	507	773	514
			7	16.2	1100	712	474	722	480	732	487	742	494	752	500	762	507	772	513
HD 320×74.2	382	254	TFL	0.00	3360	817	544	848	564	878	584	908	604	938	624	968	644	999	664
			2	2.75	2770	753	501	778	518	803	534	828	551	853	568	878	584	903	601
			3	5.50	2190	688	458	708	471	727	484	747	497	767	510	786	523	806	536
			4	8.25	1600	621	413	636	423	650	432	664	442	679	452	693	461	708	471
			BFL	11.0	1010	553	368	562	374	571	380	580	386	589	392	598	398	608	404
			6	17.3	927	542	361	551	366	559	372	567	377	576	383	584	388	592	394
			7	23.6	839	531	353	539	358	546	363	554	368	561	373	569	379	576	384
HD 260×172	806	537	TFL	0.00	7800	1860	1240	1930	1280	2000	1330	2070	1380	2140	1420	2210	1470	2280	1520
			2	8.13	6250	1690	1120	1740	1160	1800	1200	1860	1230	1910	1270	1970	1310	2020	1350
			3	16.3	4700	1500	1000	1550	1030	1590	1060	1630	1080	1670	1110	1710	1140	1760	1170
			4	24.4	3160	1310	870	1340	889	1360	908	1390	927	1420	946	1450	964	1480	983
			BFL	32.5	1610	1100	733	1120	742	1130	752	1140	761	1160	771	1170	781	1190	790
HD 260×142	644	428	TFL	0.00	6400	1490	993	1550	1030	1610	1070	1660	1110	1720	1150	1780	1180	1840	1220
			2	6.63	5150	1350	901	1400	931	1450	962	1490	993	1540	1020	1590	1050	1630	1090
			3	13.3	3910	1210	804	1240	827	1280	850	1310	874	1350	897	1380	921	1420	944
			4	19.9	2660	1050	702	1080	718	1100	734	1130	750	1150	765	1170	781	1200	797
			BFL	26.5	1410	894	595	907	603	920	612	932	620	945	629	958	637	970	646
HD 260×114	511	340	TFL	0.00	5170	1180	787	1230	818	1280	849	1320	880	1370	911	1420	942	1460	973
			2	5.38	4170	1070	713	1110	738	1150	763	1180	788	1220	813	1260	838	1300	863
			3	10.8	3170	957	637	985	656	1010	675	1040	694	1070	713	1100	732	1130	751
			4	16.1	2170	837	557	856	570	876	583	895	596	915	609	934	622	954	635
			BFL	21.5	1170	712	474	722	481	733	488	743	495	754	502	765	509	775	516
HD 260×93	410	273	TFL	0.00	4200	946	629	984	654	1020	680	1060	705	1100	730	1130	755	1170	780
			2	4.38	3400	857	570	887	590	918	611	949	631	979	651	1010	672	1040	692
			3	8.75	2590	765	509	788	524	811	540	835	555	858	571	881	586	905	602
			4	13.1	1780	670	446	686	456	702	467	718	478	734	488	750	499	766	510
			BFL	17.5	973	571	380	580	386	589	392	598	398	606	403	615	409	624	415
HD260×68.2	294	196	TFL	0.00	3080	680	452	707	471	735	489	763	508	791	526	818	544	846	563
			2	3.13	2510	616	410	639	425	662	440	684	455	707	470	729	485	752	500
			3	6.25	1930	552	367	569	379	586	390	604	402	621	413	639	425	656	436
			4	9.38	1350	485	323	498	331	510	339	522	347	534	355	546	363	558	372
			BFL	12.5	775	417	278	424	282	431	287	438	292	445	296	452	301	459	306
			6	12.7	773	417	278	424	282	431	287	438	291	445	296	452	301	459	305
			7	12.8	771	417	277	424	282	431	287	438	291	445	296	452	300	459	305
HD 260×54.1	228	152	TFL	0.00	2450	533	355	555	369	577	384	599	399	621	413	643	428	665	443
			2	2.38	2010	485	323	504	335	522	347	540	359	558	371	576	383	594	395
			3	4.75	1570	437	291	451	300	465	309	479	319	493	328	507	338	522	347
			4	7.13	1130	387	257	397	264	407	271	418	278	428	285	438	291	448	298
			BFL	9.50	695	336	224	343	228	349	232	355	236	361	240	368	245	374	249
			6	13.0	653	331	221	337	224	343	228	349	232	355	236	361	240	367	244
			7	16.4	612	326	217	332	221	338	225	343	228	349	232	354	236	360	239

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

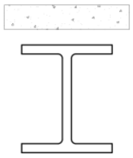
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 1000	2710	1800	TFL	0.00	8150	4000	2660	4070	2710	4140	2760	4220	2810	4290	2850	4360	2900	4440	2950
			2	7.75	7060	3940	2620	4010	2670	4070	2710	4140	2750	4200	2790	4260	2840	4330	2880
			3	15.5	5960	3880	2580	3940	2620	3990	2660	4040	2690	4100	2730	4150	2760	4210	2800
			4	23.3	4870	3820	2540	3860	2570	3900	2600	3950	2630	3990	2660	4030	2680	4080	2710
			BFL	31.0	3780	3740	2490	3770	2510	3810	2530	3840	2560	3880	2580	3910	2600	3940	2620
			6	120	2910	3650	2430	3670	2440	3700	2460	3720	2480	3750	2500	3780	2510	3800	2530
			7	232	2040	3470	2310	3490	2320	3510	2330	3520	2340	3540	2360	3560	2370	3580	2380
HEA 900	2290	1520	TFL	0.00	7530	3360	2230	3420	2280	3490	2320	3560	2370	3630	2410	3690	2460	3760	2500
			2	7.50	6470	3300	2200	3360	2240	3420	2280	3480	2310	3540	2350	3600	2390	3650	2430
			3	15.0	5420	3250	2160	3290	2190	3340	2220	3390	2260	3440	2290	3490	2320	3540	2350
			4	22.5	4360	3180	2120	3220	2140	3260	2170	3300	2190	3340	2220	3380	2250	3420	2270
			BFL	30.0	3300	3110	2070	3140	2090	3170	2110	3200	2130	3230	2150	3260	2170	3290	2190
			6	100	2590	3040	2020	3060	2040	3080	2050	3110	2070	3130	2080	3150	2100	3180	2110
			7	195	1880	2910	1940	2930	1950	2950	1960	2960	1970	2980	1980	3000	1990	3010	2000
HEA 800	1840	1220	TFL	0.00	6720	2690	1790	2750	1830	2810	1870	2870	1910	2930	1950	2990	1990	3050	2030
			2	7.00	5730	2640	1760	2690	1790	2750	1830	2800	1860	2850	1900	2900	1930	2950	1960
			3	14.0	4740	2590	1720	2630	1750	2670	1780	2720	1810	2760	1840	2800	1860	2840	1890
			4	21.0	3760	2530	1680	2560	1700	2600	1730	2630	1750	2660	1770	2700	1790	2730	1820
			BFL	28.0	2770	2460	1640	2490	1650	2510	1670	2540	1690	2560	1700	2590	1720	2610	1740
			6	79.6	2220	2410	1610	2430	1620	2450	1630	2470	1650	2490	1660	2510	1670	2530	1690
			7	157	1680	2330	1550	2350	1560	2360	1570	2380	1580	2390	1590	2410	1600	2420	1610
HEA 700	1490	990	TFL	0.00	6120	2180	1450	2230	1480	2290	1520	2340	1560	2400	1590	2450	1630	2510	1670
			2	6.75	5170	2130	1420	2180	1450	2220	1480	2270	1510	2320	1540	2360	1570	2410	1600
			3	13.5	4220	2080	1380	2120	1410	2150	1430	2190	1460	2230	1480	2270	1510	2310	1530
			4	20.3	3270	2020	1350	2050	1360	2080	1380	2110	1400	2140	1420	2170	1440	2200	1460
			BFL	27.0	2310	1960	1300	1980	1320	2000	1330	2020	1340	2040	1360	2060	1370	2080	1390
			6	62.9	1920	1930	1280	1940	1290	1960	1300	1980	1320	2000	1330	2010	1340	2030	1350
			7	120	1530	1880	1250	1890	1260	1900	1270	1920	1280	1930	1280	1940	1290	1960	1300
HEA 650	1300	863	TFL	0.00	5680	1890	1260	1940	1290	1990	1330	2040	1360	2100	1390	2150	1430	2200	1460
			2	6.50	4760	1850	1230	1890	1260	1930	1290	1980	1310	2020	1340	2060	1370	2100	1400
			3	13.0	3840	1800	1200	1830	1220	1870	1240	1900	1260	1940	1290	1970	1310	2010	1330
			4	19.5	2930	1740	1160	1770	1180	1800	1190	1820	1210	1850	1230	1870	1250	1900	1260
			BFL	26.0	2010	1680	1120	1700	1130	1720	1140	1740	1160	1760	1170	1770	1180	1790	1190
			6	51.2	1720	1660	1100	1670	1110	1690	1120	1710	1130	1720	1140	1740	1160	1750	1170
			7	96.3	1420	1630	1080	1640	1090	1650	1100	1660	1110	1680	1120	1690	1120	1700	1130
HEA 600	1130	753	TFL	0.00	5320	1650	1100	1700	1130	1750	1160	1800	1200	1840	1230	1890	1260	1940	1290
			2	6.25	4440	1610	1070	1650	1100	1690	1120	1730	1150	1770	1180	1810	1200	1850	1230
			3	12.5	3560	1560	1040	1600	1060	1630	1080	1660	1100	1690	1130	1720	1150	1760	1170
			4	18.8	2680	1510	1010	1540	1020	1560	1040	1580	1050	1610	1070	1630	1090	1660	1100
			BFL	25.0	1800	1450	968	1470	978	1490	989	1500	1000	1520	1010	1540	1020	1550	1030
			6	45.1	1560	1440	956	1450	965	1460	975	1480	984	1490	993	1510	1000	1520	1010
			7	77.2	1330	1410	941	1430	948	1440	956	1450	964	1460	972	1470	980	1490	988
HEA 550	978	650	TFL	0.00	4980	1430	954	1480	984	1520	1010	1570	1040	1610	1070	1660	1100	1700	1130
			2	6.00	4130	1390	927	1430	952	1470	976	1500	1000	1540	1030	1580	1050	1620	1080
			3	12.0	3290	1350	897	1380	917	1410	936	1440	956	1470	976	1500	995	1530	1020
			4	18.0	2440	1300	864	1320	879	1340	893	1360	908	1390	922	1410	937	1430	952
			BFL	24.0	1590	1240	828	1260	838	1270	847	1290	857	1300	866	1320	876	1330	885
			6	39.4	1420	1230	820	1240	828	1260	837	1270	845	1280	854	1300	862	1310	871
			7	58.2	1240	1220	809	1230	817	1240	824	1250	832	1260	839	1270	847	1280	854
HEA 500	835	556	TFL	0.00	4640	1230	820	1270	848	1320	875	1360	903	1400	931	1440	959	1480	987
			2	5.75	3830	1190	794	1230	817	1260	840	1300	863	1330	886	1370	909	1400	932
			3	11.5	3020	1150	766	1180	784	1210	802	1230	820	1260	838	1290	856	1310	874
			4	17.3	2210	1100	734	1120	748	1140	761	1160	774	1180	787	1200	801	1220	814
			BFL	23.0	1400	1050	700	1070	709	1080	717	1090	726	1100	734	1120	742	1130	751
			6	33.8	1280	1040	695	1060	703	1070	710	1080	718	1090	725	1100	733	1110	741
			7	44.5	1160	1030	688	1050	695	1060	702	1070	709	1080	716	1090	723	1100	730

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

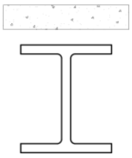
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 235 MPa

Shapes	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 1000	2710	1800	TFL	0.00	8150	4510	3000	4580	3050	4660	3100	4730	3150	4800	3200	4880	3250	4950	3290
			2	7.75	7060	4390	2920	4450	2960	4520	3000	4580	3050	4640	3090	4710	3130	4770	3170
			3	15.5	5960	4260	2830	4310	2870	4370	2910	4420	2940	4470	2980	4530	3010	4580	3050
			4	23.3	4870	4120	2740	4170	2770	4210	2800	4250	2830	4300	2860	4340	2890	4390	2920
			BFL	31.0	3780	3980	2650	4010	2670	4050	2690	4080	2710	4110	2740	4150	2760	4180	2780
			6	120	2910	3830	2550	3860	2570	3880	2580	3910	2600	3930	2620	3960	2630	3990	2650
			7	232	2040	3600	2390	3620	2410	3630	2420	3650	2430	3670	2440	3690	2450	3710	2470
HEA 900	2290	1520	TFL	0.00	7530	3830	2550	3900	2590	3970	2640	4030	2680	4100	2730	4170	2770	4240	2820
			2	7.50	6470	3710	2470	3770	2510	3830	2550	3890	2590	3950	2620	4000	2660	4060	2700
			3	15.0	5420	3590	2390	3640	2420	3680	2450	3730	2480	3780	2520	3830	2550	3880	2580
			4	22.5	4360	3460	2300	3490	2320	3530	2350	3570	2380	3610	2400	3650	2430	3690	2460
			BFL	30.0	3300	3320	2210	3350	2230	3380	2250	3410	2270	3430	2290	3460	2310	3490	2320
			6	100	2590	3200	2130	3220	2150	3250	2160	3270	2180	3290	2190	3320	2210	3340	2220
			7	195	1880	3030	2020	3050	2030	3060	2040	3080	2050	3100	2060	3120	2070	3130	2080
HEA 800	1840	1220	TFL	0.00	6720	3110	2070	3170	2110	3230	2150	3290	2190	3350	2230	3420	2270	3480	2310
			2	7.00	5730	3000	2000	3050	2030	3110	2070	3160	2100	3210	2140	3260	2170	3310	2200
			3	14.0	4740	2890	1920	2930	1950	2970	1980	3020	2010	3060	2030	3100	2060	3140	2090
			4	21.0	3760	2770	1840	2800	1860	2830	1880	2870	1910	2900	1930	2930	1950	2970	1970
			BFL	28.0	2770	2640	1750	2660	1770	2690	1790	2710	1800	2740	1820	2760	1840	2790	1850
			6	79.6	2220	2550	1700	2570	1710	2590	1730	2610	1740	2630	1750	2650	1770	2670	1780
			7	157	1680	2440	1620	2450	1630	2470	1640	2480	1650	2500	1660	2510	1670	2530	1680
HEA 700	1490	990	TFL	0.00	6120	2560	1700	2620	1740	2670	1780	2730	1810	2780	1850	2840	1890	2890	1920
			2	6.75	5170	2460	1630	2500	1670	2550	1700	2600	1730	2640	1760	2690	1790	2740	1820
			3	13.5	4220	2340	1560	2380	1590	2420	1610	2460	1640	2500	1660	2530	1690	2570	1710
			4	20.3	3270	2230	1480	2260	1500	2290	1520	2320	1540	2350	1560	2370	1580	2400	1600
			BFL	27.0	2310	2100	1400	2130	1410	2150	1430	2170	1440	2190	1460	2210	1470	2230	1480
			6	62.9	1920	2050	1360	2060	1370	2080	1380	2100	1400	2120	1410	2130	1420	2150	1430
			7	120	1530	1970	1310	1990	1320	2000	1330	2010	1340	2030	1350	2040	1360	2050	1370
HEA 650	1300	863	TFL	0.00	5680	2250	1500	2300	1530	2350	1560	2400	1600	2450	1630	2500	1670	2550	1700
			2	6.50	4760	2150	1430	2190	1460	2230	1490	2280	1510	2320	1540	2360	1570	2400	1600
			3	13.0	3840	2040	1360	2070	1380	2110	1400	2140	1430	2180	1450	2210	1470	2250	1500
			4	19.5	2930	1930	1280	1950	1300	1980	1320	2010	1330	2030	1350	2060	1370	2090	1390
			BFL	26.0	2010	1810	1200	1830	1220	1850	1230	1860	1240	1880	1250	1900	1260	1920	1280
			6	51.2	1720	1770	1180	1780	1190	1800	1200	1810	1210	1830	1220	1840	1230	1860	1240
			7	96.3	1420	1720	1140	1730	1150	1740	1160	1750	1170	1770	1180	1780	1180	1790	1190
HEA 600	1130	753	TFL	0.00	5320	1990	1320	2040	1350	2080	1390	2130	1420	2180	1450	2230	1480	2280	1510
			2	6.25	4440	1890	1260	1930	1280	1970	1310	2010	1340	2050	1360	2090	1390	2130	1420
			3	12.5	3560	1790	1190	1820	1210	1850	1230	1880	1250	1920	1270	1950	1300	1980	1320
			4	18.8	2680	1680	1120	1700	1130	1730	1150	1750	1170	1780	1180	1800	1200	1820	1210
			BFL	25.0	1800	1570	1040	1580	1050	1600	1060	1620	1080	1630	1090	1650	1100	1660	1110
			6	45.1	1560	1540	1020	1550	1030	1560	1040	1580	1050	1590	1060	1610	1070	1620	1080
			7	77.2	1330	1500	996	1510	1000	1520	1010	1530	1020	1550	1030	1560	1040	1570	1040
HEA 550	978	650	TFL	0.00	4980	1750	1160	1790	1190	1840	1220	1880	1250	1930	1280	1970	1310	2020	1340
			2	6.00	4130	1650	1100	1690	1120	1730	1150	1760	1170	1800	1200	1840	1220	1880	1250
			3	12.0	3290	1560	1030	1580	1050	1610	1070	1640	1090	1670	1110	1700	1130	1730	1150
			4	18.0	2440	1450	966	1470	981	1500	996	1520	1010	1540	1020	1560	1040	1580	1050
			BFL	24.0	1590	1350	895	1360	904	1370	914	1390	924	1400	933	1420	943	1430	952
			6	39.4	1420	1320	879	1330	888	1350	896	1360	905	1370	913	1390	922	1400	930
			7	58.2	1240	1290	862	1310	869	1320	876	1330	884	1340	891	1350	899	1360	906
HEA 500	835	556	TFL	0.00	4640	1520	1010	1570	1040	1610	1070	1650	1100	1690	1130	1730	1150	1780	1180
			2	5.75	3830	1430	955	1470	978	1500	1000	1540	1020	1570	1050	1610	1070	1640	1090
			3	11.5	3020	1340	892	1370	910	1400	928	1420	947	1450	965	1480	983	1500	1000
			4	17.3	2210	1240	827	1260	840	1280	854	1300	867	1320	880	1340	893	1360	906
			BFL	23.0	1400	1140	759	1150	767	1170	776	1180	784	1190	793	1200	801	1220	809
			6	33.8	1280	1120	748	1140	756	1150	764	1160	771	1170	779	1180	787	1190	794
			7	44.5	1160	1110	737	1120	744	1130	751	1140	758	1150	765	1160	772	1170	779

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

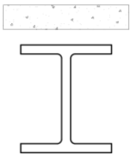
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 450	680	453	TFL	0.00	4180	1020	676	1050	701	1090	726	1130	751	1170	776	1200	802	1240	827
			2	5.25	3440	981	653	1010	674	1040	694	1070	715	1110	735	1140	756	1170	777
			3	10.5	2700	943	627	967	643	991	660	1020	676	1040	692	1060	708	1090	724
			4	15.8	1960	901	599	918	611	936	623	954	635	971	646	989	658	1010	670
			BFL	21.0	1220	855	569	866	576	877	584	888	591	899	598	910	606	921	613
			6	29.1	1130	849	565	859	572	870	579	880	585	890	592	900	599	911	606
			7	37.3	1050	843	561	852	567	862	573	871	579	880	586	890	592	899	598
HEA 400	542	361	TFL	0.00	3740	824	548	858	571	891	593	925	615	958	638	992	660	1030	682
			2	4.75	3070	792	527	820	546	848	564	875	582	903	601	930	619	958	637
			3	9.50	2400	758	504	779	519	801	533	823	547	844	562	866	576	887	590
			4	14.3	1730	721	479	736	490	752	500	767	510	783	521	798	531	814	541
			BFL	19.0	1060	680	453	690	459	699	465	709	472	719	478	728	484	738	491
			6	24.8	996	676	450	685	456	694	462	703	468	712	474	721	480	730	486
			7	30.6	934	672	447	681	453	689	458	697	464	706	470	714	475	723	481
HEA 360	442	294	TFL	0.00	3360	680	452	710	472	740	492	770	512	800	533	831	553	861	573
			2	4.38	2740	651	433	675	449	700	466	725	482	749	498	774	515	798	531
			3	8.75	2120	619	412	638	425	657	437	676	450	696	463	715	475	734	488
			4	13.1	1510	585	389	599	398	612	407	626	416	640	426	653	435	667	444
			BFL	17.5	888	549	365	557	371	565	376	573	381	581	387	589	392	597	397
			6	19.9	864	548	364	555	369	563	375	571	380	579	385	586	390	594	395
			7	22.3	839	546	363	554	368	561	373	569	378	576	383	584	388	591	393
HEA 340	391	260	TFL	0.00	3140	607	404	635	423	664	441	692	460	720	479	748	498	776	517
			2	4.13	2560	580	386	603	401	626	416	649	432	672	447	695	462	718	478
			3	8.25	1970	550	366	568	378	586	390	604	402	621	413	639	425	657	437
			4	12.4	1390	519	345	531	354	544	362	556	370	569	379	581	387	594	395
			BFL	16.5	811	485	323	492	328	500	332	507	337	514	342	522	347	529	352
			6	17.8	798	484	322	491	327	499	332	506	337	513	341	520	346	527	351
			7	19.2	784	483	322	491	326	498	331	505	336	512	340	519	345	526	350
HEA 320	344	229	TFL	0.00	2920	539	359	566	376	592	394	618	411	645	429	671	446	697	464
			2	3.88	2380	514	342	535	356	557	370	578	385	599	399	621	413	642	427
			3	7.75	1830	486	324	503	335	519	346	536	356	552	367	569	378	585	389
			4	11.6	1280	457	304	469	312	480	319	492	327	503	335	515	343	526	350
			BFL	15.5	738	426	283	432	288	439	292	446	297	452	301	459	305	466	310
			6	15.9	734	426	283	432	288	439	292	445	296	452	301	459	305	465	310
			7	16.2	731	425	283	432	287	439	292	445	296	452	301	458	305	465	309
HEA 300	293	195	TFL	0.00	2640	464	309	488	325	512	340	535	356	559	372	583	388	607	404
			2	3.50	2150	441	293	460	306	480	319	499	332	518	345	538	358	557	371
			3	7.00	1660	416	277	431	287	446	297	461	307	476	317	491	327	506	337
			4	10.5	1160	390	260	401	267	411	274	422	281	432	288	443	295	453	302
			BFL	14.0	670	363	241	369	245	375	249	381	253	387	257	393	261	399	265
			6	14.5	665	362	241	368	245	374	249	380	253	386	257	392	261	398	265
			7	14.9	661	362	241	368	245	374	249	380	253	386	257	392	261	398	265
HEA 280	235	156	TFL	0.00	2290	381	253	401	267	422	281	442	294	463	308	483	322	504	335
			2	3.25	1860	361	240	377	251	394	262	411	273	428	284	444	296	461	307
			3	6.50	1430	340	226	352	234	365	243	378	252	391	260	404	269	417	277
			4	9.75	1000	317	211	326	217	335	223	344	229	353	235	362	241	371	247
			BFL	13.0	575	294	195	299	199	304	202	309	206	314	209	319	213	325	216
			6	13.2	573	293	195	299	199	304	202	309	206	314	209	319	212	324	216
			7	13.4	571	293	195	299	199	304	202	309	205	314	209	319	212	324	216
HEA 260	195	129	TFL	0.00	2040	321	214	340	226	358	238	376	250	395	263	413	275	432	287
			2	3.13	1660	304	202	319	212	333	222	348	232	363	242	378	252	393	262
			3	6.25	1280	285	190	296	197	308	205	319	212	331	220	342	228	354	235
			4	9.38	895	265	176	273	182	281	187	289	192	297	198	305	203	313	208
			BFL	12.5	513	244	162	249	165	253	168	258	172	262	175	267	178	272	181
			6	12.7	511	244	162	249	165	253	168	258	171	262	175	267	178	272	181
			7	12.8	510	244	162	248	165	253	168	258	171	262	174	267	178	271	181

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

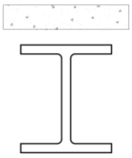
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shape Available Strength in Flexure, kN·m

$F_y = 235$ MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 450	680	453	TFL	0.00	4180	1280	852	1320	877	1360	902	1390	927	1430	952	1470	977	1510	1000
			2	5.25	3440	1200	797	1230	818	1260	839	1290	859	1320	880	1350	900	1380	921
			3	10.5	2700	1110	741	1140	757	1160	773	1190	789	1210	805	1230	822	1260	838
			4	15.8	1960	1020	682	1040	693	1060	705	1080	717	1100	729	1110	740	1130	752
			BFL	21.0	1220	932	620	943	628	954	635	965	642	976	650	987	657	998	664
			6	29.1	1130	921	613	931	619	941	626	951	633	962	640	972	647	982	653
			7	37.3	1050	909	605	918	611	927	617	937	623	946	630	956	636	965	642
HEA 400	542	361	TFL	0.00	3740	1060	705	1090	727	1130	750	1160	772	1190	794	1230	817	1260	839
			2	4.75	3070	986	656	1010	674	1040	692	1070	711	1100	729	1120	748	1150	766
			3	9.50	2400	909	605	930	619	952	633	974	648	995	662	1020	676	1040	691
			4	14.3	1730	829	552	845	562	861	573	876	583	892	593	907	604	923	614
			BFL	19.0	1060	747	497	757	503	766	510	776	516	785	522	795	529	804	535
			6	24.8	996	739	492	748	498	757	504	766	510	775	516	784	522	793	528
			7	30.6	934	731	486	739	492	748	498	756	503	765	509	773	514	781	520
HEA 360	442	294	TFL	0.00	3360	891	593	921	613	951	633	982	653	1010	673	1040	693	1070	713
			2	4.38	2740	823	548	848	564	872	580	897	597	922	613	946	630	971	646
			3	8.75	2120	753	501	772	514	791	526	810	539	829	552	848	564	867	577
			4	13.1	1510	680	453	694	462	707	471	721	480	734	489	748	498	761	507
			BFL	17.5	888	605	403	613	408	621	413	629	419	637	424	645	429	653	434
			6	19.9	864	602	401	610	406	618	411	625	416	633	421	641	426	649	432
			7	22.3	839	599	398	606	403	614	408	621	413	629	419	637	424	644	429
HEA 340	391	260	TFL	0.00	3140	805	535	833	554	861	573	889	592	918	611	946	629	974	648
			2	4.13	2560	741	493	764	508	787	523	810	539	833	554	856	569	879	585
			3	8.25	1970	675	449	693	461	710	473	728	484	746	496	764	508	781	520
			4	12.4	1390	607	404	619	412	632	420	644	429	657	437	669	445	682	454
			BFL	16.5	811	536	357	543	362	551	366	558	371	565	376	573	381	580	386
			6	17.8	798	535	356	542	360	549	365	556	370	563	375	570	380	578	384
			7	19.2	784	533	355	540	359	547	364	554	369	561	373	568	378	575	383
HEA 320	344	229	TFL	0.00	2920	724	481	750	499	776	516	802	534	829	551	855	569	881	586
			2	3.88	2380	664	442	685	456	706	470	728	484	749	498	771	513	792	527
			3	7.75	1830	602	400	618	411	635	422	651	433	668	444	684	455	701	466
			4	11.6	1280	538	358	549	366	561	373	573	381	584	389	596	396	607	404
			BFL	15.5	738	472	314	479	319	486	323	492	327	499	332	505	336	512	341
			6	15.9	734	472	314	478	318	485	323	492	327	498	332	505	336	511	340
			7	16.2	731	471	314	478	318	485	322	491	327	498	331	504	336	511	340
HEA 300	293	195	TFL	0.00	2640	631	420	654	435	678	451	702	467	726	483	750	499	773	515
			2	3.50	2150	576	384	596	396	615	409	635	422	654	435	673	448	693	461
			3	7.00	1660	521	347	536	356	551	366	566	376	580	386	595	396	610	406
			4	10.5	1160	464	308	474	315	485	322	495	329	506	336	516	343	526	350
			BFL	14.0	670	405	269	411	273	417	277	423	281	429	285	435	289	441	293
			6	14.5	665	404	269	410	273	416	277	422	281	428	285	434	289	440	293
			7	14.9	661	404	269	410	273	416	277	422	281	428	285	434	288	440	292
HEA 280	235	156	TFL	0.00	2290	525	349	545	363	566	376	586	390	607	404	627	417	648	431
			2	3.25	1860	478	318	494	329	511	340	528	351	545	362	561	373	578	385
			3	6.50	1430	430	286	443	294	455	303	468	312	481	320	494	329	507	337
			4	9.75	1000	380	253	389	259	398	265	407	271	416	277	425	283	434	289
			BFL	13.0	575	330	219	335	223	340	226	345	230	350	233	356	237	361	240
			6	13.2	573	330	219	335	223	340	226	345	230	350	233	355	236	361	240
			7	13.4	571	329	219	335	223	340	226	345	229	350	233	355	236	360	240
HEA 260	195	129	TFL	0.00	2040	450	299	468	312	487	324	505	336	523	348	542	360	560	373
			2	3.13	1660	408	272	423	281	438	291	453	301	468	311	483	321	498	331
			3	6.25	1280	365	243	377	251	388	258	400	266	411	274	423	281	434	289
			4	9.38	895	321	214	329	219	337	224	345	230	354	235	362	241	370	246
			BFL	12.5	513	276	184	281	187	286	190	290	193	295	196	299	199	304	202
			6	12.7	511	276	184	281	187	285	190	290	193	295	196	299	199	304	202
			7	12.8	510	276	184	281	187	285	190	290	193	294	196	299	199	304	202

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

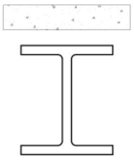
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 240	157	105	TFL	0.00	1810	268	178	284	189	301	200	317	211	333	222	349	232	366	243
			2	3.00	1470	252	168	266	177	279	186	292	194	305	203	318	212	332	221
			3	6.00	1130	236	157	246	164	256	170	266	177	277	184	287	191	297	197
			4	9.00	791	218	145	225	150	233	155	240	159	247	164	254	169	261	174
			BFL	12.0	452	200	133	204	136	208	138	212	141	216	144	220	147	224	149
			6	12.0	452	200	133	204	136	208	138	212	141	216	144	220	147	224	149
			7	12.1	451	200	133	204	136	208	138	212	141	216	144	220	147	224	149
HEA 220	120	80	TFL	0.00	1510	211	140	225	149	238	158	252	167	265	177	279	186	293	195
			2	2.75	1230	198	132	209	139	220	146	231	154	242	161	253	168	264	176
			3	5.50	943	184	122	192	128	201	134	209	139	218	145	226	151	235	156
			4	8.25	659	169	113	175	117	181	121	187	125	193	128	199	132	205	136
			BFL	11.0	375	154	103	157	105	161	107	164	109	168	112	171	114	174	116
HEA 200	90.8	60.4	TFL	0.00	1270	165	110	176	117	188	125	199	133	211	140	222	148	233	155
			2	2.50	1030	154	103	164	109	173	115	182	121	191	127	201	133	210	140
			3	5.00	795	143	95.1	150	99.8	157	105	164	109	171	114	179	119	186	124
			4	7.50	560	131	87.1	136	90.5	141	93.9	146	97.2	151	101	156	104	161	107
			BFL	10.0	325	119	78.9	121	80.8	124	82.8	127	84.7	130	86.7	133	88.6	136	90.6
			6	10.7	321	118	78.7	121	80.6	124	82.6	127	84.5	130	86.4	133	88.3	136	90.2
			7	11.3	316	118	78.6	121	80.5	124	82.3	127	84.2	129	86.1	132	88.0	135	89.9
HEA 180	68.7	45.7	TFL	0.00	1060	130	86.3	139	92.6	149	99.0	158	105	168	112	178	118	187	124
			2	2.38	862	120	80.1	128	85.3	136	90.4	144	95.6	151	101	159	106	167	111
			3	4.75	662	111	73.7	117	77.6	123	81.6	129	85.6	135	89.5	141	93.5	146	97.4
			4	7.13	461	101	66.9	105	69.7	109	72.5	113	75.2	117	78.0	121	80.7	125	83.5
			BFL	9.50	260	90.1	59.9	92.4	61.5	94.8	63.0	97.1	64.6	99.4	66.2	102	67.7	104	69.3
HEA 160	51.8	34.5	TFL	0.00	911	103	68.7	112	74.2	120	79.7	128	85.1	136	90.6	144	96.0	153	101
			2	2.25	742	95.5	63.6	102	68.0	109	72.4	116	76.9	122	81.3	129	85.8	136	90.2
			3	4.50	573	87.4	58.2	92.6	61.6	97.7	65.0	103	68.4	108	71.9	113	75.3	118	78.7
			4	6.75	403	78.9	52.5	82.6	54.9	86.2	57.4	89.8	59.8	93.5	62.2	97.1	64.6	101	67.0
			BFL	9.00	234	70.1	46.7	72.2	48.1	74.3	49.5	76.4	50.9	78.6	52.3	80.7	53.7	82.8	55.1
			6	9.56	231	69.9	46.5	72.0	47.9	74.1	49.3	76.2	50.7	78.3	52.1	80.3	53.5	82.4	54.8
			7	10.1	228	69.8	46.4	71.8	47.8	73.9	49.1	75.9	50.5	78.0	51.9	80.0	53.2	82.1	54.6
HEA140	36.7	24.4	TFL	0.00	738	77.4	51.5	84.1	55.9	90.7	60.4	97.4	64.8	104	69.2	111	73.6	117	78.0
			2	2.13	599	71.0	47.2	76.4	50.8	81.8	54.4	87.2	58.0	92.5	61.6	97.9	65.2	103	68.7
			3	4.25	459	64.3	42.8	68.4	45.5	72.6	48.3	76.7	51.0	80.8	53.8	84.9	56.5	89.1	59.3
			4	6.38	319	57.3	38.1	60.2	40.1	63.1	42.0	65.9	43.9	68.8	45.8	71.7	47.7	74.6	49.6
			BFL	8.50	179	50.1	33.3	51.7	34.4	53.3	35.5	54.9	36.6	56.6	37.6	58.2	38.7	59.8	39.8
HEA 120	25.3	16.8	TFL	0.00	595	57.3	38.2	62.7	41.7	68.1	45.3	73.4	48.9	78.8	52.4	84.1	56.0	89.5	59.5
			2	2.00	483	52.2	34.7	56.5	37.6	60.9	40.5	65.2	43.4	69.5	46.3	73.9	49.2	78.2	52.1
			3	4.00	370	46.8	31.1	50.1	33.3	53.4	35.6	56.8	37.8	60.1	40.0	63.4	42.2	66.8	44.4
			4	6.00	257	41.2	27.4	43.5	29.0	45.8	30.5	48.1	32.0	50.5	33.6	52.8	35.1	55.1	36.7
			BFL	8.00	144	35.4	23.6	36.7	24.4	38.0	25.3	39.3	26.2	40.6	27.0	41.9	27.9	43.2	28.7
HEA 100	17.6	11.7	TFL	0.00	499	44.0	29.3	48.5	32.3	53.0	35.3	57.5	38.3	62.0	41.2	66.5	44.2	71.0	47.2
			2	2.00	405	39.7	26.4	43.4	28.8	47.0	31.3	50.6	33.7	54.3	36.1	57.9	38.6	61.6	41.0
			3	4.00	311	35.2	23.4	38.0	25.3	40.8	27.2	43.6	29.0	46.4	30.9	49.2	32.8	52.0	34.6
			4	6.00	217	30.6	20.3	32.5	21.6	34.5	22.9	36.4	24.2	38.4	25.5	40.3	26.8	42.3	28.1
			BFL	8.00	123	25.8	17.1	26.9	17.9	28.0	18.6	29.1	19.3	30.2	20.1	31.3	20.8	32.4	21.6

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

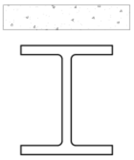
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA^{c}	$Y1^{a}$	ΣQ_n^{d}	$Y2^{b}$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 240	157	105	TFL	0.00	1810	382	254	398	265	414	276	431	287	447	297	463	308	479	319
			2	3.00	1470	345	229	358	238	371	247	385	256	398	265	411	273	424	282
			3	6.00	1130	307	204	317	211	327	218	337	225	348	231	358	238	368	245
			4	9.00	791	268	178	275	183	282	188	290	193	297	197	304	202	311	207
			BFL	12.0	452	228	152	232	155	237	157	241	160	245	163	249	166	253	168
			6	12.0	452	228	152	232	155	237	157	241	160	245	163	249	165	253	168
			7	12.1	451	228	152	232	155	236	157	241	160	245	163	249	165	253	168
HEA 220	120	80	TFL	0.00	1510	306	204	320	213	333	222	347	231	361	240	374	249	388	258
			2	2.75	1230	275	183	286	190	297	198	308	205	319	212	330	220	341	227
			3	5.50	943	243	162	252	168	260	173	269	179	277	185	286	190	294	196
			4	8.25	659	211	140	217	144	223	148	229	152	235	156	241	160	246	164
			BFL	11.0	375	178	118	181	120	184	123	188	125	191	127	195	129	198	132
HEA 200	90.8	60.4	TFL	0.00	1270	245	163	256	170	268	178	279	186	290	193	302	201	313	208
			2	2.50	1030	219	146	228	152	238	158	247	164	256	170	265	177	275	183
			3	5.00	795	193	128	200	133	207	138	214	143	222	147	229	152	236	157
			4	7.50	560	166	111	171	114	176	117	181	121	186	124	191	127	196	131
			BFL	10.0	325	139	92.5	142	94.4	145	96.4	148	98.3	151	100	154	102	157	104
			6	10.7	321	139	92.2	141	94.1	144	96.0	147	97.9	150	99.8	153	102	156	104
			7	11.3	316	138	91.8	141	93.7	144	95.6	147	97.5	149	99.4	152	101	155	103
HEA 180	68.7	45.7	TFL	0.00	1060	197	131	206	137	216	144	225	150	235	156	245	163	254	169
			2	2.38	862	175	116	183	121	190	127	198	132	206	137	214	142	221	147
			3	4.75	662	152	101	158	105	164	109	170	113	176	117	182	121	188	125
			4	7.13	461	130	86.3	134	89.0	138	91.8	142	94.5	146	97.3	150	100	155	103
			BFL	9.50	260	106	70.8	109	72.4	111	73.9	113	75.5	116	77.0	118	78.6	120	80.1
HEA 160	51.8	34.5	TFL	0.00	911	161	107	169	112	177	118	185	123	194	129	202	134	210	140
			2	2.25	742	142	94.7	149	99.1	156	104	162	108	169	112	176	117	182	121
			3	4.50	573	123	82.2	129	85.6	134	89.0	139	92.4	144	95.9	149	99.3	154	103
			4	6.75	403	104	69.4	108	71.8	112	74.3	115	76.7	119	79.1	123	81.5	126	83.9
			BFL	9.00	234	84.9	56.5	87.0	57.9	89.1	59.3	91.2	60.7	93.3	62.1	95.4	63.5	97.5	64.9
			6	9.56	231	84.5	56.2	86.6	57.6	88.7	59.0	90.7	60.4	92.8	61.8	94.9	63.1	97.0	64.5
			7	10.1	228	84.1	56.0	86.2	57.3	88.2	58.7	90.3	60.1	92.3	61.4	94.4	62.8	96.4	64.2
HEA140	36.7	24.4	TFL	0.00	738	124	82.5	131	86.9	137	91.3	144	95.7	151	100	157	105	164	109
			2	2.13	599	109	72.3	114	75.9	119	79.5	125	83.1	130	86.7	136	90.2	141	93.8
			3	4.25	459	93.2	62.0	97.3	64.8	101	67.5	106	70.2	110	73.0	114	75.7	118	78.5
			4	6.38	319	77.4	51.5	80.3	53.4	83.2	55.3	86.0	57.2	88.9	59.2	91.8	61.1	94.6	63.0
			BFL	8.50	179	61.4	40.8	63.0	41.9	64.6	43.0	66.2	44.1	67.8	45.1	69.4	46.2	71.1	47.3
HEA 120	25.3	16.8	TFL	0.00	595	94.9	63.1	100	66.7	106	70.2	111	73.8	116	77.4	122	80.9	127	84.5
			2	2.00	483	82.6	54.9	86.9	57.8	91.3	60.7	95.6	63.6	100	66.5	104	69.4	109	72.3
			3	4.00	370	70.1	46.6	73.4	48.8	76.7	51.1	80.1	53.3	83.4	55.5	86.7	57.7	90.1	59.9
			4	6.00	257	57.4	38.2	59.7	39.7	62.0	41.3	64.3	42.8	66.7	44.3	69.0	45.9	71.3	47.4
			BFL	8.00	144	44.5	29.6	45.8	30.5	47.1	31.3	48.4	32.2	49.7	33.1	51.0	33.9	52.3	34.8
HEA 100	17.6	11.7	TFL	0.00	499	75.5	50.2	80.0	53.2	84.5	56.2	88.9	59.2	93.4	62.2	97.9	65.2	102	68.1
			2	2.00	405	65.2	43.4	68.9	45.8	72.5	48.3	76.2	50.7	79.8	53.1	83.5	55.5	87.1	58.0
			3	4.00	311	54.8	36.5	57.6	38.3	60.4	40.2	63.2	42.1	66.0	43.9	68.8	45.8	71.6	47.7
			4	6.00	217	44.3	29.4	46.2	30.7	48.2	32.0	50.1	33.3	52.1	34.6	54.0	35.9	56.0	37.2
			BFL	8.00	123	33.5	22.3	34.6	23.0	35.7	23.8	36.8	24.5	37.9	25.2	39.0	26.0	40.2	26.7

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

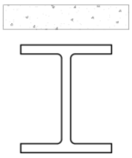
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 1000	3170	2110	TFL	0.00	9540	4680	3110	4760	3170	4850	3230	4940	3280	5020	3340	5110	3400	5190	3460
			2	7.75	8260	4620	3070	4690	3120	4760	3170	4840	3220	4910	3270	4990	3320	5060	3370
			3	15.5	6980	4540	3020	4610	3070	4670	3110	4730	3150	4800	3190	4860	3230	4920	3270
			4	23.3	5700	4470	2970	4520	3000	4570	3040	4620	3070	4670	3110	4720	3140	4770	3180
			BFL	31.0	4420	4380	2910	4420	2940	4460	2960	4500	2990	4540	3020	4580	3040	4620	3070
			6	120	3400	4270	2840	4300	2860	4330	2880	4360	2900	4390	2920	4420	2940	4450	2960
			7	232	2380	4060	2700	4080	2720	4100	2730	4120	2740	4150	2760	4170	2770	4190	2790
HEA 900	2680	1780	TFL	0.00	8810	3930	2610	4010	2670	4090	2720	4160	2770	4240	2820	4320	2880	4400	2930
			2	7.50	7580	3870	2570	3930	2620	4000	2660	4070	2710	4140	2750	4210	2800	4280	2840
			3	15.0	6340	3800	2530	3860	2570	3910	2600	3970	2640	4030	2680	4080	2720	4140	2750
			4	22.5	5100	3720	2480	3770	2510	3810	2540	3860	2570	3910	2600	3950	2630	4000	2660
			BFL	30.0	3860	3640	2420	3670	2440	3710	2470	3740	2490	3780	2510	3810	2540	3850	2560
			6	100	3030	3550	2370	3580	2380	3610	2400	3640	2420	3660	2440	3690	2460	3720	2470
			7	195	2200	3410	2270	3430	2280	3450	2290	3470	2310	3490	2320	3510	2330	3530	2350
HEA 800	2150	1430	TFL	0.00	7860	3150	2090	3220	2140	3290	2190	3360	2240	3430	2280	3500	2330	3570	2380
			2	7.00	6700	3090	2060	3150	2100	3210	2140	3270	2180	3330	2220	3390	2260	3450	2300
			3	14.0	5550	3030	2020	3080	2050	3130	2080	3180	2120	3230	2150	3280	2180	3330	2210
			4	21.0	4390	2960	1970	3000	2000	3040	2020	3080	2050	3120	2070	3160	2100	3200	2130
			BFL	28.0	3240	2880	1920	2910	1940	2940	1960	2970	1980	3000	1990	3030	2010	3060	2030
			6	79.6	2600	2820	1880	2850	1890	2870	1910	2890	1930	2920	1940	2940	1960	2960	1970
			7	157	1960	2730	1810	2750	1830	2760	1840	2780	1850	2800	1860	2820	1870	2830	1890
HEA 700	1740	1160	TFL	0.00	7160	2550	1690	2610	1740	2680	1780	2740	1820	2800	1870	2870	1910	2930	1950
			2	6.75	6050	2490	1660	2550	1700	2600	1730	2660	1770	2710	1800	2770	1840	2820	1880
			3	13.5	4940	2430	1620	2480	1650	2520	1680	2570	1710	2610	1740	2660	1770	2700	1800
			4	20.3	3820	2370	1570	2400	1600	2430	1620	2470	1640	2500	1670	2540	1690	2570	1710
			BFL	27.0	2710	2290	1530	2320	1540	2340	1560	2370	1570	2390	1590	2410	1610	2440	1620
			6	62.9	2250	2250	1500	2270	1510	2290	1530	2310	1540	2330	1550	2350	1570	2380	1580
			7	120	1790	2200	1460	2210	1470	2230	1480	2240	1490	2260	1500	2280	1510	2290	1520
HEA 650	1520	1010	TFL	0.00	6640	2210	1470	2270	1510	2330	1550	2390	1590	2450	1630	2510	1670	2570	1710
			2	6.50	5570	2160	1440	2210	1470	2260	1500	2310	1540	2360	1570	2410	1600	2460	1640
			3	13.0	4500	2100	1400	2140	1430	2180	1450	2220	1480	2270	1510	2310	1530	2350	1560
			4	19.5	3430	2040	1360	2070	1380	2100	1400	2130	1420	2160	1440	2190	1460	2220	1480
			BFL	26.0	2350	1970	1310	1990	1320	2010	1340	2030	1350	2050	1370	2080	1380	2100	1390
			6	51.2	2010	1940	1290	1960	1300	1980	1320	2000	1330	2010	1340	2030	1350	2050	1360
			7	96.3	1660	1900	1270	1920	1280	1930	1290	1950	1300	1960	1310	1980	1320	1990	1330
HEA 600	1320	881	TFL	0.00	6230	1930	1290	1990	1320	2050	1360	2100	1400	2160	1440	2210	1470	2270	1510
			2	6.25	5200	1880	1250	1930	1290	1980	1320	2030	1350	2070	1380	2120	1410	2170	1440
			3	12.5	4170	1830	1220	1870	1240	1900	1270	1940	1290	1980	1320	2020	1340	2050	1370
			4	18.8	3140	1770	1180	1800	1200	1830	1210	1850	1230	1880	1250	1910	1270	1940	1290
			BFL	25.0	2100	1700	1130	1720	1140	1740	1160	1760	1170	1780	1180	1800	1200	1820	1210
			6	45.1	1830	1680	1120	1700	1130	1710	1140	1730	1150	1750	1160	1760	1170	1780	1180
			7	77.2	1560	1650	1100	1670	1110	1680	1120	1700	1130	1710	1140	1720	1150	1740	1160
HEA 550	1140	761	TFL	0.00	5820	1680	1120	1730	1150	1780	1190	1830	1220	1890	1260	1940	1290	1990	1330
			2	6.00	4830	1630	1080	1670	1110	1720	1140	1760	1170	1800	1200	1850	1230	1890	1260
			3	12.0	3840	1580	1050	1610	1070	1650	1100	1680	1120	1720	1140	1750	1160	1790	1190
			4	18.0	2850	1520	1010	1550	1030	1570	1050	1600	1060	1620	1080	1650	1100	1670	1110
			BFL	24.0	1860	1460	969	1470	980	1490	991	1510	1000	1520	1010	1540	1020	1560	1040
			6	39.4	1660	1440	959	1460	969	1470	979	1490	989	1500	999	1520	1010	1530	1020
			7	58.2	1460	1420	947	1440	956	1450	965	1460	973	1480	982	1490	991	1500	999
HEA 500	977	650	TFL	0.00	5430	1440	959	1490	992	1540	1020	1590	1060	1640	1090	1690	1120	1740	1150
			2	5.75	4480	1400	929	1440	956	1480	983	1520	1010	1560	1040	1600	1060	1640	1090
			3	11.5	3530	1350	896	1380	917	1410	938	1440	960	1470	981	1510	1000	1540	1020
			4	17.3	2580	1290	859	1320	875	1340	890	1360	906	1380	921	1410	937	1430	952
			BFL	23.0	1640	1230	820	1250	829	1260	839	1280	849	1290	859	1310	869	1320	878
			6	33.8	1500	1220	813	1240	822	1250	831	1260	840	1280	849	1290	858	1300	867
			7	44.5	1360	1210	806	1220	814	1240	822	1250	830	1260	838	1270	846	1280	854

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

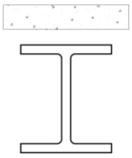
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 275 MPa

Shapes	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 1000	3170	2110	TFL	0.00	9540	5280	3510	5360	3570	5450	3630	5540	3680	5620	3740	5710	3800	5790	3850
			2	7.75	8260	5140	3420	5210	3470	5280	3520	5360	3570	5430	3620	5510	3660	5580	3710
			3	15.5	6980	4980	3320	5050	3360	5110	3400	5170	3440	5240	3480	5300	3530	5360	3570
			4	23.3	5700	4820	3210	4880	3240	4930	3280	4980	3310	5030	3350	5080	3380	5130	3410
			BFL	31.0	4420	4650	3100	4690	3120	4730	3150	4770	3180	4810	3200	4850	3230	4890	3260
			6	120	3400	4480	2980	4510	3000	4540	3020	4570	3040	4600	3060	4630	3080	4670	3100
			7	232	2380	4210	2800	4230	2820	4250	2830	4270	2840	4300	2860	4320	2870	4340	2890
HEA 900	2680	1780	TFL	0.00	8810	4480	2980	4560	3030	4640	3090	4720	3140	4800	3190	4880	3250	4960	3300
			2	7.50	7580	4340	2890	4410	2940	4480	2980	4550	3030	4620	3070	4680	3120	4750	3160
			3	15.0	6340	4200	2790	4250	2830	4310	2870	4370	2910	4430	2940	4480	2980	4540	3020
			4	22.5	5100	4040	2690	4090	2720	4140	2750	4180	2780	4230	2810	4270	2840	4320	2870
			BFL	30.0	3860	3880	2580	3920	2600	3950	2630	3980	2650	4020	2670	4050	2700	4090	2720
			6	100	3030	3750	2490	3770	2510	3800	2530	3830	2550	3860	2560	3880	2580	3910	2600
			7	195	2200	3550	2360	3570	2370	3590	2390	3610	2400	3630	2410	3650	2430	3670	2440
HEA 800	2150	1430	TFL	0.00	7860	3640	2420	3710	2470	3780	2520	3860	2560	3930	2610	4000	2660	4070	2710
			2	7.00	6700	3510	2340	3570	2380	3640	2420	3700	2460	3760	2500	3820	2540	3880	2580
			3	14.0	5550	3380	2250	3430	2280	3480	2310	3530	2350	3580	2380	3630	2410	3680	2450
			4	21.0	4390	3240	2150	3280	2180	3320	2210	3350	2230	3390	2260	3430	2280	3470	2310
			BFL	28.0	3240	3090	2050	3110	2070	3140	2090	3170	2110	3200	2130	3230	2150	3260	2170
			6	79.6	2600	2990	1990	3010	2000	3030	2020	3060	2030	3080	2050	3110	2070	3130	2080
			7	157	1960	2850	1900	2870	1910	2890	1920	2900	1930	2920	1940	2940	1960	2960	1970
HEA 700	1740	1160	TFL	0.00	7160	3000	1990	3060	2040	3130	2080	3190	2120	3260	2170	3320	2210	3380	2250
			2	6.75	6050	2870	1910	2930	1950	2980	1980	3040	2020	3090	2060	3150	2090	3200	2130
			3	13.5	4940	2740	1830	2790	1860	2830	1880	2880	1910	2920	1940	2970	1970	3010	2000
			4	20.3	3820	2610	1730	2640	1760	2680	1780	2710	1800	2740	1830	2780	1850	2810	1870
			BFL	27.0	2710	2460	1640	2490	1650	2510	1670	2540	1690	2560	1700	2580	1720	2610	1740
			6	62.9	2250	2400	1590	2420	1610	2440	1620	2460	1630	2480	1650	2500	1660	2520	1670
			7	120	1790	2310	1540	2320	1550	2340	1560	2360	1570	2370	1580	2390	1590	2400	1600
HEA 650	1520	1010	TFL	0.00	6640	2630	1750	2690	1790	2750	1830	2810	1870	2870	1910	2930	1950	2990	1990
			2	6.50	5570	2510	1670	2560	1700	2610	1740	2660	1770	2710	1800	2760	1840	2810	1870
			3	13.0	4500	2390	1590	2430	1610	2470	1640	2510	1670	2550	1700	2590	1720	2630	1750
			4	19.5	3430	2260	1500	2290	1520	2320	1540	2350	1560	2380	1580	2410	1600	2440	1620
			BFL	26.0	2350	2120	1410	2140	1420	2160	1440	2180	1450	2200	1470	2220	1480	2240	1490
			6	51.2	2010	2070	1380	2090	1390	2100	1400	2120	1410	2140	1420	2160	1440	2180	1450
			7	96.3	1660	2010	1340	2020	1350	2040	1360	2050	1370	2070	1380	2080	1390	2100	1400
HEA 600	1320	881	TFL	0.00	6230	2330	1550	2380	1590	2440	1620	2490	1660	2550	1700	2610	1730	2660	1770
			2	6.25	5200	2210	1470	2260	1500	2310	1530	2350	1570	2400	1600	2450	1630	2490	1660
			3	12.5	4170	2090	1390	2130	1420	2170	1440	2200	1470	2240	1490	2280	1520	2320	1540
			4	18.8	3140	1970	1310	1990	1330	2020	1350	2050	1360	2080	1380	2110	1400	2140	1420
			BFL	25.0	2100	1830	1220	1850	1230	1870	1250	1890	1260	1910	1270	1930	1280	1950	1300
			6	45.1	1830	1800	1200	1810	1210	1830	1220	1850	1230	1860	1240	1880	1250	1900	1260
			7	77.2	1560	1750	1170	1770	1180	1780	1180	1790	1190	1810	1200	1820	1210	1840	1220
HEA 550	1140	761	TFL	0.00	5820	2040	1360	2100	1400	2150	1430	2200	1460	2250	1500	2310	1530	2360	1570
			2	6.00	4830	1930	1290	1980	1320	2020	1350	2070	1370	2110	1400	2150	1430	2200	1460
			3	12.0	3840	1820	1210	1850	1230	1890	1260	1920	1280	1960	1300	1990	1330	2030	1350
			4	18.0	2850	1700	1130	1730	1150	1750	1160	1780	1180	1800	1200	1830	1220	1850	1230
			BFL	24.0	1860	1570	1050	1590	1060	1610	1070	1620	1080	1640	1090	1660	1100	1670	1110
			6	39.4	1660	1550	1030	1560	1040	1580	1050	1590	1060	1610	1070	1620	1080	1640	1090
			7	58.2	1460	1520	1010	1530	1020	1540	1030	1550	1030	1570	1040	1580	1050	1590	1060
HEA 500	977	650	TFL	0.00	5430	1780	1190	1830	1220	1880	1250	1930	1280	1980	1320	2030	1350	2080	1380
			2	5.75	4480	1680	1120	1720	1140	1760	1170	1800	1200	1840	1220	1880	1250	1920	1280
			3	11.5	3530	1570	1040	1600	1070	1630	1090	1660	1110	1700	1130	1730	1150	1760	1170
			4	17.3	2580	1450	968	1480	983	1500	999	1520	1010	1550	1030	1570	1050	1590	1060
			BFL	23.0	1640	1340	888	1350	898	1360	908	1380	918	1390	927	1410	937	1420	947
			6	33.8	1500	1320	876	1330	885	1340	894	1360	903	1370	912	1380	921	1400	930
			7	44.5	1360	1300	863	1310	871	1320	879	1330	887	1350	895	1360	903	1370	911

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

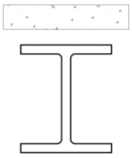
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 450	796	530	TFL	0.00	4900	1190	791	1230	821	1280	850	1320	879	1370	909	1410	938	1450	967
			2	5.25	4030	1150	764	1180	788	1220	812	1260	836	1290	861	1330	885	1370	909
			3	10.5	3160	1100	734	1130	753	1160	772	1190	791	1220	810	1250	829	1270	848
			4	15.8	2300	1050	701	1070	715	1100	729	1120	743	1140	756	1160	770	1180	784
			BFL	21.0	1430	1000	666	1010	674	1030	683	1040	692	1050	700	1070	709	1080	717
			6	29.1	1330	994	661	1010	669	1020	677	1030	685	1040	693	1050	701	1070	709
			7	37.3	1220	986	656	997	663	1010	671	1020	678	1030	685	1040	693	1050	700
HEA 400	634	422	TFL	0.00	4370	964	641	1000	668	1040	694	1080	720	1120	746	1160	772	1200	799
			2	4.75	3590	927	617	959	638	992	660	1020	681	1060	703	1090	724	1120	746
			3	9.50	2810	887	590	912	607	937	624	963	640	988	657	1010	674	1040	691
			4	14.3	2020	843	561	861	573	880	585	898	597	916	609	934	622	952	634
			BFL	19.0	1240	796	530	807	537	819	545	830	552	841	559	852	567	863	574
			6	24.8	1170	792	527	802	534	813	541	823	548	834	555	844	562	855	569
			7	30.6	1090	787	523	796	530	806	536	816	543	826	549	836	556	846	563
HEA 360	517	344	TFL	0.00	3930	795	529	831	553	866	576	901	600	937	623	972	647	1010	670
			2	4.38	3210	761	507	790	526	819	545	848	564	877	583	906	602	934	622
			3	8.75	2480	725	482	747	497	769	512	792	527	814	542	836	556	859	571
			4	13.1	1760	685	456	701	466	717	477	733	487	748	498	764	508	780	519
			BFL	17.5	1040	643	428	652	434	661	440	671	446	680	452	689	459	699	465
			6	19.9	1010	641	426	650	432	659	438	668	444	677	451	686	457	695	463
			7	22.3	982	639	425	648	431	657	437	665	443	674	449	683	454	692	460
HEA 340	458	305	TFL	0.00	3670	710	473	743	495	776	517	810	539	843	561	876	583	909	605
			2	4.13	2990	678	451	705	469	732	487	759	505	786	523	813	541	840	559
			3	8.25	2310	644	429	665	442	686	456	706	470	727	484	748	498	769	512
			4	12.4	1630	607	404	622	414	636	423	651	433	666	443	680	453	695	462
			BFL	16.5	949	568	378	576	383	585	389	593	395	602	400	610	406	619	412
			6	17.8	933	567	377	575	383	584	388	592	394	600	399	609	405	617	411
			7	19.2	918	566	376	574	382	582	387	591	393	599	398	607	404	615	409
HEA 320	403	268	TFL	0.00	3420	631	420	662	440	693	461	724	481	754	502	785	522	816	543
			2	3.88	2780	601	400	626	417	651	433	676	450	701	467	726	483	751	500
			3	7.75	2140	569	379	588	392	608	404	627	417	646	430	666	443	685	456
			4	11.6	1500	535	356	548	365	562	374	575	383	589	392	602	401	616	410
			BFL	15.5	864	498	332	506	337	514	342	522	347	529	352	537	357	545	363
			6	15.9	859	498	331	506	336	513	342	521	347	529	352	537	357	544	362
			7	16.2	855	498	331	505	336	513	341	521	347	529	352	536	357	544	362
HEA 300	342	228	TFL	0.00	3090	543	361	571	380	599	398	626	417	654	435	682	454	710	472
			2	3.50	2520	516	343	539	358	561	373	584	389	607	404	629	419	652	434
			3	7.00	1940	487	324	505	336	522	347	540	359	557	371	575	382	592	394
			4	10.5	1360	457	304	469	312	481	320	494	328	506	337	518	345	530	353
			BFL	14.0	784	424	282	432	287	439	292	446	296	453	301	460	306	467	311
			6	14.5	779	424	282	431	287	438	292	445	296	452	301	459	306	466	310
			7	14.9	773	424	282	431	287	438	291	445	296	452	301	459	305	466	310
HEA 280	275	183	TFL	0.00	2670	445	296	469	312	493	328	518	344	542	360	566	376	590	392
			2	3.25	2170	422	281	442	294	461	307	481	320	500	333	520	346	539	359
			3	6.50	1670	397	264	412	274	427	284	443	294	458	304	473	314	488	325
			4	9.75	1170	371	247	382	254	392	261	403	268	413	275	424	282	435	289
			BFL	13.0	673	344	229	350	233	356	237	362	241	368	245	374	249	380	253
			6	13.2	671	343	228	349	233	355	237	362	241	368	245	374	249	380	253
			7	13.4	669	343	228	349	232	355	236	361	240	367	244	373	248	379	252
HEA 260	228	151	TFL	0.00	2390	376	250	398	264	419	279	441	293	462	307	483	322	505	336
			2	3.13	1940	355	236	373	248	390	260	408	271	425	283	443	294	460	306
			3	6.25	1490	333	222	347	231	360	240	374	249	387	258	401	266	414	275
			4	9.38	1050	310	206	319	213	329	219	338	225	348	231	357	238	367	244
			BFL	12.5	600	286	190	291	194	296	197	302	201	307	204	313	208	318	212
			6	12.7	598	285	190	291	194	296	197	302	201	307	204	312	208	318	211
			7	12.8	597	285	190	291	193	296	197	301	201	307	204	312	208	318	211

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

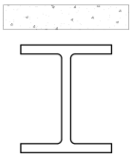
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shape Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 450	796	530	TFL	0.00	4900	1500	997	1540	1030	1590	1060	1630	1080	1670	1110	1720	1140	1760	1170
			2	5.25	4030	1400	933	1440	957	1470	981	1510	1010	1550	1030	1580	1050	1620	1080
			3	10.5	3160	1300	867	1330	886	1360	905	1390	923	1420	942	1440	961	1470	980
			4	15.8	2300	1200	798	1220	811	1240	825	1260	839	1280	853	1300	866	1320	880
			BFL	21.0	1430	1090	726	1100	734	1120	743	1130	752	1140	760	1160	769	1170	777
			6	29.1	1330	1080	717	1090	725	1100	733	1110	741	1130	749	1140	757	1150	765
			7	37.3	1220	1060	707	1070	715	1090	722	1100	729	1110	737	1120	744	1130	751
HEA 400	634	422	TFL	0.00	4370	1240	825	1280	851	1320	877	1360	903	1400	929	1440	956	1480	982
			2	4.75	3590	1150	767	1190	789	1220	810	1250	832	1280	853	1310	875	1350	896
			3	9.50	2810	1060	708	1090	724	1110	741	1140	758	1160	775	1190	792	1220	808
			4	14.3	2020	971	646	989	658	1010	670	1030	682	1040	694	1060	706	1080	718
			BFL	19.0	1240	874	582	885	589	896	596	908	604	919	611	930	619	941	626
			6	24.8	1170	865	576	875	582	886	589	896	596	907	603	917	610	928	617
			7	30.6	1090	855	569	865	576	875	582	885	589	895	595	905	602	914	608
HEA 360	517	344	TFL	0.00	3930	1040	694	1080	717	1110	741	1150	764	1180	788	1220	811	1250	835
			2	4.38	3210	963	641	992	660	1020	679	1050	698	1080	718	1110	737	1140	756
			3	8.75	2480	881	586	903	601	926	616	948	631	970	646	993	661	1020	675
			4	13.1	1760	796	530	812	540	828	551	843	561	859	572	875	582	891	593
			BFL	17.5	1040	708	471	717	477	727	484	736	490	745	496	755	502	764	508
			6	19.9	1010	704	469	714	475	723	481	732	487	741	493	750	499	759	505
			7	22.3	982	701	466	710	472	718	478	727	484	736	490	745	496	754	502
HEA 340	458	305	TFL	0.00	3670	942	627	975	649	1010	670	1040	692	1070	714	1110	736	1140	758
			2	4.13	2990	867	577	894	595	921	613	948	631	975	648	1000	666	1030	684
			3	8.25	2310	790	525	810	539	831	553	852	567	873	581	894	595	914	608
			4	12.4	1630	710	472	724	482	739	492	754	502	768	511	783	521	798	531
			BFL	16.5	949	627	417	636	423	645	429	653	434	662	440	670	446	679	452
			6	17.8	933	626	416	634	422	642	427	651	433	659	439	668	444	676	450
			7	19.2	918	624	415	632	420	640	426	648	431	657	437	665	442	673	448
HEA 320	403	268	TFL	0.00	3420	847	563	877	584	908	604	939	625	970	645	1000	666	1030	686
			2	3.88	2780	777	517	802	533	827	550	852	567	877	583	902	600	927	617
			3	7.75	2140	704	468	723	481	743	494	762	507	781	520	801	533	820	545
			4	11.6	1500	630	419	643	428	657	437	670	446	684	455	697	464	711	473
			BFL	15.5	864	553	368	560	373	568	378	576	383	584	388	592	394	599	399
			6	15.9	859	552	367	560	373	568	378	575	383	583	388	591	393	599	398
			7	16.2	855	552	367	559	372	567	377	575	382	582	388	590	393	598	398
HEA 300	342	228	TFL	0.00	3090	738	491	766	509	794	528	821	547	849	565	877	584	905	602
			2	3.50	2520	675	449	697	464	720	479	743	494	765	509	788	524	810	539
			3	7.00	1940	609	406	627	417	644	429	662	440	679	452	697	464	714	475
			4	10.5	1360	543	361	555	369	567	377	579	385	592	394	604	402	616	410
			BFL	14.0	784	474	315	481	320	488	325	495	329	502	334	509	339	516	343
			6	14.5	779	473	315	480	320	487	324	494	329	501	333	508	338	515	343
			7	14.9	773	473	314	480	319	487	324	493	328	500	333	507	338	514	342
HEA 280	275	183	TFL	0.00	2670	614	408	638	424	662	440	686	456	710	472	734	488	758	504
			2	3.25	2170	559	372	579	385	598	398	618	411	637	424	657	437	676	450
			3	6.50	1670	503	335	518	345	533	355	548	365	563	375	578	385	593	395
			4	9.75	1170	445	296	456	303	466	310	477	317	487	324	498	331	508	338
			BFL	13.0	673	386	257	392	261	398	265	404	269	410	273	416	277	422	281
			6	13.2	671	386	257	392	261	398	265	404	269	410	273	416	277	422	281
			7	13.4	669	385	256	391	260	397	264	403	268	409	272	416	276	422	280
HEA 260	228	151	TFL	0.00	2390	526	350	548	365	569	379	591	393	612	407	634	422	655	436
			2	3.13	1940	478	318	495	329	512	341	530	353	547	364	565	376	582	387
			3	6.25	1490	427	284	441	293	454	302	468	311	481	320	495	329	508	338
			4	9.38	1050	376	250	385	256	395	263	404	269	414	275	423	282	433	288
			BFL	12.5	600	323	215	329	219	334	222	340	226	345	230	350	233	356	237
			6	12.7	598	323	215	329	219	334	222	339	226	345	229	350	233	355	237
			7	12.8	597	323	215	328	218	334	222	339	226	344	229	350	233	355	236

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

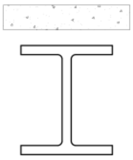
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

$F_y = 275$ MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 240	184	123	TFL	0.00	2110	314	209	333	221	352	234	371	247	390	259	409	272	428	285
			2	3.00	1720	295	197	311	207	326	217	342	227	357	238	373	248	388	258
			3	6.00	1320	276	184	288	192	300	199	312	207	324	215	335	223	347	231
			4	9.00	925	256	170	264	176	272	181	281	187	289	192	297	198	305	203
			BFL	12.0	529	234	156	239	159	243	162	248	165	253	168	258	172	263	175
			6	12.0	529	234	156	239	159	243	162	248	165	253	168	258	171	262	175
			7	12.1	528	234	156	239	159	243	162	248	165	253	168	258	171	262	175
HEA 220	141	93.6	TFL	0.00	1770	247	164	263	175	279	185	295	196	311	207	326	217	342	228
			2	2.75	1440	231	154	244	163	257	171	270	180	283	188	296	197	309	206
			3	5.50	1100	215	143	225	150	235	156	245	163	255	170	265	176	275	183
			4	8.25	771	198	132	205	136	212	141	219	146	226	150	233	155	240	160
			BFL	11.0	438	180	120	184	123	188	125	192	128	196	130	200	133	204	136
HEA 200	106	70.7	TFL	0.00	1480	193	129	207	137	220	146	233	155	246	164	260	173	273	182
			2	2.50	1210	180	120	191	127	202	135	213	142	224	149	235	156	246	163
			3	5.00	930	167	111	176	117	184	122	192	128	201	134	209	139	217	145
			4	7.50	655	153	102	159	106	165	110	171	114	177	118	183	122	189	126
			BFL	10.0	380	139	92.3	142	94.6	146	96.9	149	99.1	152	101	156	104	159	106
			6	10.7	375	138	92.1	142	94.4	145	96.6	149	98.9	152	101	155	103	159	106
			7	11.3	370	138	91.9	142	94.1	145	96.4	148	98.6	151	101	155	103	158	105
HEA 180	80.4	53.5	TFL	0.00	1240	152	101	163	108	174	116	185	123	197	131	208	138	219	146
			2	2.38	1010	141	93.8	150	99.8	159	106	168	112	177	118	186	124	195	130
			3	4.75	774	130	86.2	137	90.9	144	95.5	150	100	157	105	164	109	171	114
			4	7.13	539	118	78.3	123	81.6	127	84.8	132	88.0	137	91.3	142	94.5	147	97.7
			BFL	9.50	304	105	70.1	108	72.0	111	73.8	114	75.6	116	77.4	119	79.2	122	81.0
HEA 160	60.7	40.4	TFL	0.00	1070	121	80.4	130	86.8	140	93.2	150	99.6	159	106	169	112	178	119
			2	2.25	868	112	74.4	120	79.6	127	84.8	135	90.0	143	95.2	151	100	159	106
			3	4.50	670	102	68.1	108	72.1	114	76.1	120	80.1	126	84.1	132	88.1	138	92.1
			4	6.75	472	92.4	61.5	96.6	64.3	101	67.1	105	69.9	109	72.8	114	75.6	118	78.4
			BFL	9.00	274	82.1	54.6	84.5	56.2	87.0	57.9	89.5	59.5	91.9	61.2	94.4	62.8	96.9	64.4
			6	9.56	270	81.9	54.5	84.3	56.1	86.7	57.7	89.2	59.3	91.6	60.9	94.0	62.6	96.5	64.2
			7	10.1	267	81.6	54.3	84.0	55.9	86.4	57.5	88.8	59.1	91.2	60.7	93.6	62.3	96.0	63.9
HEA140	42.9	28.6	TFL	0.00	864	90.6	60.3	98.4	65.5	106	70.6	114	75.8	122	81.0	129	86.1	137	91.3
			2	2.13	700	83.1	55.3	89.4	59.5	95.7	63.7	102	67.9	108	72.1	115	76.2	121	80.4
			3	4.25	537	75.2	50.1	80.1	53.3	84.9	56.5	89.7	59.7	94.6	62.9	99.4	66.1	104	69.3
			4	6.38	373	67.1	44.6	70.5	46.9	73.8	49.1	77.2	51.3	80.5	53.6	83.9	55.8	87.2	58.1
			BFL	8.50	210	58.6	39.0	60.5	40.3	62.4	41.5	64.3	42.8	66.2	44.0	68.1	45.3	70.0	46.5
HEA 120	29.6	19.7	TFL	0.00	697	67.1	44.6	73.4	48.8	79.6	53.0	85.9	57.2	92.2	61.3	98.5	65.5	105	69.7
			2	2.00	565	61.0	40.6	66.1	44.0	71.2	47.4	76.3	50.8	81.4	54.1	86.5	57.5	91.5	60.9
			3	4.00	433	54.8	36.4	58.6	39.0	62.5	41.6	66.4	44.2	70.3	46.8	74.2	49.4	78.1	52.0
			4	6.00	301	48.2	32.1	50.9	33.9	53.6	35.7	56.3	37.5	59.0	39.3	61.8	41.1	64.5	42.9
			BFL	8.00	169	41.4	27.6	43.0	28.6	44.5	29.6	46.0	30.6	47.5	31.6	49.0	32.6	50.6	33.6
HEA 100	20.5	13.7	TFL	0.00	584	51.5	34.3	56.8	37.8	62.0	41.3	67.3	44.8	72.5	48.3	77.8	51.8	83.1	55.3
			2	2.00	474	46.5	30.9	50.7	33.8	55.0	36.6	59.3	39.4	63.5	42.3	67.8	45.1	72.1	48.0
			3	4.00	364	41.2	27.4	44.5	29.6	47.8	31.8	51.1	34.0	54.3	36.1	57.6	38.3	60.9	40.5
			4	6.00	254	35.8	23.8	38.1	25.3	40.4	26.8	42.6	28.4	44.9	29.9	47.2	31.4	49.5	32.9
			BFL	8.00	144	30.1	20.0	31.4	20.9	32.7	21.8	34.0	22.6	35.3	23.5	36.6	24.4	37.9	25.2

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

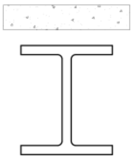
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 240	184	123	TFL	0.00	2110	447	297	466	310	485	323	504	335	523	348	542	361	561	373
			2	3.00	1720	404	269	419	279	435	289	450	299	465	310	481	320	496	330
			3	6.00	1320	359	239	371	247	383	255	395	263	407	271	419	279	431	286
			4	9.00	925	314	209	322	214	330	220	339	225	347	231	355	236	364	242
			BFL	12.0	529	267	178	272	181	277	184	282	187	286	191	291	194	296	197
			6	12.0	529	267	178	272	181	277	184	282	187	286	190	291	194	296	197
			7	12.1	528	267	178	272	181	277	184	281	187	286	190	291	194	296	197
HEA 220	141	93.6	TFL	0.00	1770	358	238	374	249	390	260	406	270	422	281	438	291	454	302
			2	2.75	1440	322	214	335	223	348	231	361	240	374	249	387	257	400	266
			3	5.50	1100	285	189	295	196	305	203	315	209	325	216	334	223	344	229
			4	8.25	771	247	164	254	169	261	173	268	178	275	183	281	187	288	192
			BFL	11.0	438	208	138	212	141	216	144	220	146	224	149	228	151	232	154
HEA 200	106	70.7	TFL	0.00	1480	286	191	300	199	313	208	326	217	340	226	353	235	366	244
			2	2.50	1210	256	171	267	178	278	185	289	192	300	199	311	207	322	214
			3	5.00	930	226	150	234	156	243	161	251	167	259	173	268	178	276	184
			4	7.50	655	195	129	200	133	206	137	212	141	218	145	224	149	230	153
			BFL	10.0	380	163	108	166	111	170	113	173	115	176	117	180	120	183	122
			6	10.7	375	162	108	165	110	169	112	172	115	176	117	179	119	182	121
			7	11.3	370	161	107	165	110	168	112	171	114	175	116	178	119	181	121
HEA 180	80.4	53.5	TFL	0.00	1240	230	153	241	161	253	168	264	175	275	183	286	190	297	198
			2	2.38	1010	205	136	214	142	223	148	232	154	241	160	250	166	259	172
			3	4.75	774	178	119	185	123	192	128	199	133	206	137	213	142	220	146
			4	7.13	539	152	101	157	104	161	107	166	111	171	114	176	117	181	120
			BFL	9.50	304	125	82.9	127	84.7	130	86.5	133	88.3	135	90.1	138	92.0	141	93.8
HEA 160	60.7	40.4	TFL	0.00	1070	188	125	198	132	207	138	217	144	226	151	236	157	246	163
			2	2.25	868	166	111	174	116	182	121	190	126	198	132	206	137	213	142
			3	4.50	670	145	96.1	151	100	157	104	163	108	169	112	175	116	181	120
			4	6.75	472	122	81.2	126	84.1	131	86.9	135	89.7	139	92.6	143	95.4	148	98.2
			BFL	9.00	274	99.3	66.1	102	67.7	104	69.4	107	71.0	109	72.7	112	74.3	114	75.9
			6	9.56	270	98.9	65.8	101	67.4	104	69.0	106	70.6	109	72.3	111	73.9	113	75.5
			7	10.1	267	98.4	65.5	101	67.1	103	68.7	106	70.3	108	71.9	110	73.5	113	75.1
HEA140	42.9	28.6	TFL	0.00	864	145	96.5	153	102	161	107	168	112	176	117	184	122	192	128
			2	2.13	700	127	84.6	134	88.8	140	93.0	146	97.2	152	101	159	106	165	110
			3	4.25	537	109	72.6	114	75.8	119	79.0	124	82.2	128	85.4	133	88.6	138	91.8
			4	6.38	373	90.6	60.3	94.0	62.5	97.3	64.8	101	67.0	104	69.2	107	71.5	111	73.7
			BFL	8.50	210	71.8	47.8	73.7	49.1	75.6	50.3	77.5	51.6	79.4	52.8	81.3	54.1	83.2	55.3
HEA 120	29.6	19.7	TFL	0.00	697	111	73.9	117	78.0	124	82.2	130	86.4	136	90.5	142	94.7	149	98.9
			2	2.00	565	96.6	64.3	102	67.7	107	71.1	112	74.4	117	77.8	122	81.2	127	84.6
			3	4.00	433	82.0	54.6	85.9	57.2	89.8	59.8	93.7	62.3	97.6	64.9	101	67.5	105	70.1
			4	6.00	301	67.2	44.7	69.9	46.5	72.6	48.3	75.3	50.1	78.0	51.9	80.7	53.7	83.4	55.5
			BFL	8.00	169	52.1	34.7	53.6	35.7	55.1	36.7	56.6	37.7	58.2	38.7	59.7	39.7	61.2	40.7
HEA 100	20.5	13.7	TFL	0.00	584	88.3	58.8	93.6	62.3	98.8	65.8	104	69.3	109	72.8	115	76.2	120	79.7
			2	2.00	474	76.3	50.8	80.6	53.6	84.9	56.5	89.1	59.3	93.4	62.1	97.7	65.0	102	67.8
			3	4.00	364	64.2	42.7	67.4	44.9	70.7	47.0	74.0	49.2	77.3	51.4	80.5	53.6	83.8	55.8
			4	6.00	254	51.8	34.5	54.1	36.0	56.4	37.5	58.6	39.0	60.9	40.5	63.2	42.1	65.5	43.6
			BFL	8.00	144	39.2	26.1	40.5	27.0	41.8	27.8	43.1	28.7	44.4	29.5	45.7	30.4	47.0	31.3

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

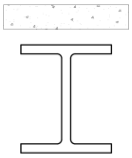
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 1000	4100	2730	TFL	0.00	12300	6040	4020	6150	4090	6260	4170	6370	4240	6480	4310	6590	4390	6700	4460
			2	7.75	10700	5960	3960	6050	4030	6150	4090	6250	4160	6340	4220	6440	4280	6530	4350
			3	15.5	9010	5870	3900	5950	3960	6030	4010	6110	4070	6190	4120	6270	4170	6350	4230
			4	23.3	7360	5760	3840	5830	3880	5900	3920	5960	3970	6030	4010	6100	4060	6160	4100
			BFL	31.0	5710	5650	3760	5700	3790	5750	3830	5800	3860	5850	3900	5910	3930	5960	3960
			6	120	4390	5510	3660	5550	3690	5590	3720	5630	3740	5670	3770	5710	3800	5750	3820
			7	232	3080	5240	3490	5270	3510	5300	3520	5320	3540	5350	3560	5380	3580	5410	3600
HEA 900	3450	2300	TFL	0.00	11400	5070	3370	5170	3440	5270	3510	5380	3580	5480	3640	5580	3710	5680	3780
			2	7.50	9780	4990	3320	5080	3380	5170	3440	5260	3500	5340	3560	5430	3610	5520	3670
			3	15.0	8180	4900	3260	4980	3310	5050	3360	5120	3410	5200	3460	5270	3510	5350	3560
			4	22.5	6590	4800	3200	4860	3240	4920	3280	4980	3310	5040	3350	5100	3390	5160	3430
			BFL	30.0	4990	4690	3120	4740	3150	4780	3180	4830	3210	4870	3240	4920	3270	4960	3300
			6	100	3920	4590	3050	4620	3080	4660	3100	4690	3120	4730	3150	4770	3170	4800	3190
			7	195	2840	4400	2930	4420	2940	4450	2960	4480	2980	4500	2990	4530	3010	4550	3030
HEA 800	2780	1850	TFL	0.00	10100	4060	2700	4150	2760	4250	2830	4340	2890	4430	2950	4520	3010	4610	3070
			2	7.00	8650	3990	2660	4070	2710	4150	2760	4230	2810	4300	2860	4380	2910	4460	2970
			3	14.0	7160	3910	2600	3970	2640	4040	2690	4100	2730	4170	2770	4230	2820	4300	2860
			4	21.0	5670	3820	2540	3870	2580	3920	2610	3970	2640	4020	2680	4080	2710	4130	2750
			BFL	28.0	4180	3720	2470	3760	2500	3800	2530	3830	2550	3870	2580	3910	2600	3950	2630
			6	79.6	3360	3650	2430	3680	2450	3710	2470	3740	2490	3770	2510	3800	2530	3830	2550
			7	157	2540	3520	2340	3540	2360	3570	2370	3590	2390	3610	2400	3640	2420	3660	2430
HEA 700	2250	1490	TFL	0.00	9250	3290	2190	3370	2240	3450	2300	3540	2350	3620	2410	3700	2460	3790	2520
			2	6.75	7810	3220	2140	3290	2190	3360	2230	3430	2280	3500	2330	3570	2380	3640	2420
			3	13.5	6370	3140	2090	3200	2130	3260	2170	3310	2200	3370	2240	3430	2280	3480	2320
			4	20.3	4930	3050	2030	3100	2060	3140	2090	3190	2120	3230	2150	3280	2180	3320	2210
			BFL	27.0	3500	2960	1970	2990	1990	3020	2010	3050	2030	3080	2050	3120	2070	3150	2090
			6	62.9	2900	2910	1940	2940	1950	2960	1970	2990	1990	3010	2010	3040	2020	3070	2040
			7	120	2310	2830	1890	2850	1900	2880	1910	2900	1930	2920	1940	2940	1950	2960	1970
HEA 650	1960	1300	TFL	0.00	8580	2860	1900	2930	1950	3010	2000	3090	2050	3160	2110	3240	2160	3320	2210
			2	6.50	7190	2790	1860	2850	1900	2920	1940	2980	1990	3050	2030	3110	2070	3180	2110
			3	13.0	5810	2720	1810	2770	1840	2820	1880	2870	1910	2920	1950	2980	1980	3030	2020
			4	19.5	4420	2630	1750	2670	1780	2710	1800	2750	1830	2790	1860	2830	1880	2870	1910
			BFL	26.0	3040	2540	1690	2570	1710	2600	1730	2620	1750	2650	1760	2680	1780	2710	1800
			6	51.2	2590	2510	1670	2530	1680	2550	1700	2580	1710	2600	1730	2620	1750	2650	1760
			7	96.3	2140	2460	1630	2480	1650	2500	1660	2510	1670	2530	1690	2550	1700	2570	1710
HEA 600	1710	1140	TFL	0.00	8040	2500	1660	2570	1710	2640	1760	2710	1810	2790	1850	2860	1900	2930	1950
			2	6.25	6710	2430	1620	2490	1660	2550	1700	2610	1740	2670	1780	2730	1820	2800	1860
			3	12.5	5380	2360	1570	2410	1600	2460	1640	2510	1670	2560	1700	2600	1730	2650	1760
			4	18.8	4050	2280	1520	2320	1540	2360	1570	2390	1590	2430	1620	2470	1640	2500	1660
			BFL	25.0	2720	2200	1460	2220	1480	2250	1490	2270	1510	2290	1530	2320	1540	2340	1560
			6	45.1	2360	2170	1440	2190	1460	2210	1470	2230	1490	2260	1500	2280	1510	2300	1530
			7	77.2	2010	2140	1420	2150	1430	2170	1440	2190	1460	2210	1470	2230	1480	2240	1490
HEA 550	1480	983	TFL	0.00	7520	2170	1440	2230	1490	2300	1530	2370	1580	2440	1620	2500	1670	2570	1710
			2	6.00	6240	2100	1400	2160	1440	2220	1470	2270	1510	2330	1550	2390	1590	2440	1620
			3	12.0	4960	2040	1360	2080	1380	2130	1410	2170	1440	2220	1470	2260	1500	2300	1530
			4	18.0	3680	1960	1310	2000	1330	2030	1350	2060	1370	2090	1390	2130	1420	2160	1440
			BFL	24.0	2410	1880	1250	1900	1270	1920	1280	1950	1290	1970	1310	1990	1320	2010	1340
			6	39.4	2140	1860	1240	1880	1250	1900	1260	1920	1280	1940	1290	1960	1300	1980	1320
			7	58.2	1880	1840	1220	1850	1230	1870	1250	1890	1260	1910	1270	1920	1280	1940	1290
HEA 500	1260	839	TFL	0.00	7010	1860	1240	1920	1280	1990	1320	2050	1360	2110	1410	2180	1450	2240	1490
			2	5.75	5790	1800	1200	1860	1230	1910	1270	1960	1300	2010	1340	2060	1370	2120	1410
			3	11.5	4560	1740	1160	1780	1180	1820	1210	1860	1240	1900	1270	1940	1290	1980	1320
			4	17.3	3340	1670	1110	1700	1130	1730	1150	1760	1170	1790	1190	1820	1210	1850	1230
			BFL	23.0	2110	1590	1060	1610	1070	1630	1080	1650	1100	1670	1110	1690	1120	1700	1130
			6	33.8	1930	1580	1050	1600	1060	1610	1070	1630	1080	1650	1100	1660	1110	1680	1120
			7	44.5	1750	1560	1040	1580	1050	1590	1060	1610	1070	1630	1080	1640	1090	1660	1100

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

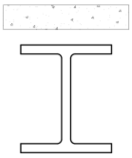
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 1000	4100	2730	TFL	0.00	12300	6810	4530	6930	4610	7040	4680	7150	4760	7260	4830	7370	4900	7480	4980
			2	7.75	10700	6630	4410	6730	4480	6820	4540	6920	4600	7010	4670	7110	4730	7210	4790
			3	15.5	9010	6430	4280	6520	4340	6600	4390	6680	4440	6760	4500	6840	4550	6920	4600
			4	23.3	7360	6230	4140	6290	4190	6360	4230	6430	4280	6490	4320	6560	4360	6630	4410
			BFL	31.0	5710	6010	4000	6060	4030	6110	4070	6160	4100	6210	4130	6270	4170	6320	4200
			6	120	4390	5780	3850	5820	3880	5860	3900	5900	3930	5940	3950	5980	3980	6020	4010
			7	232	3080	5430	3620	5460	3630	5490	3650	5520	3670	5550	3690	5570	3710	5600	3730
HEA 900	3450	2300	TFL	0.00	11400	5790	3850	5890	3920	5990	3990	6090	4050	6200	4120	6300	4190	6400	4260
			2	7.50	9780	5610	3730	5700	3790	5780	3850	5870	3910	5960	3970	6050	4020	6140	4080
			3	15.0	8180	5420	3610	5490	3650	5570	3700	5640	3750	5710	3800	5790	3850	5860	3900
			4	22.5	6590	5220	3470	5280	3510	5340	3550	5400	3590	5460	3630	5520	3670	5580	3710
			BFL	30.0	4990	5010	3330	5050	3360	5100	3390	5140	3420	5190	3450	5230	3480	5280	3510
			6	100	3920	4840	3220	4870	3240	4910	3260	4940	3290	4980	3310	5010	3330	5050	3360
			7	195	2840	4580	3050	4600	3060	4630	3080	4650	3100	4680	3110	4710	3130	4730	3150
HEA 800	2780	1850	TFL	0.00	10100	4700	3130	4790	3190	4890	3250	4980	3310	5070	3370	5160	3430	5250	3490
			2	7.00	8650	4540	3020	4610	3070	4690	3120	4770	3170	4850	3230	4930	3280	5000	3330
			3	14.0	7160	4360	2900	4430	2940	4490	2990	4560	3030	4620	3070	4680	3120	4750	3160
			4	21.0	5670	4180	2780	4230	2810	4280	2850	4330	2880	4380	2920	4430	2950	4480	2980
			BFL	28.0	4180	3980	2650	4020	2680	4060	2700	4100	2730	4130	2750	4170	2780	4210	2800
			6	79.6	3360	3860	2570	3890	2590	3920	2610	3950	2630	3980	2650	4010	2670	4040	2690
			7	157	2540	3680	2450	3700	2460	3730	2480	3750	2490	3770	2510	3800	2530	3820	2540
HEA 700	2250	1490	TFL	0.00	9250	3870	2570	3950	2630	4040	2690	4120	2740	4200	2800	4290	2850	4370	2910
			2	6.75	7810	3710	2470	3780	2520	3850	2560	3920	2610	3990	2660	4060	2700	4130	2750
			3	13.5	6370	3540	2360	3600	2390	3660	2430	3710	2470	3770	2510	3830	2550	3890	2590
			4	20.3	4930	3370	2240	3410	2270	3450	2300	3500	2330	3540	2360	3590	2390	3630	2420
			BFL	27.0	3500	3180	2120	3210	2140	3240	2160	3270	2180	3310	2200	3340	2220	3370	2240
			6	62.9	2900	3090	2060	3120	2070	3140	2090	3170	2110	3200	2130	3220	2140	3250	2160
			7	120	2310	2980	1980	3000	2000	3020	2010	3040	2020	3060	2040	3080	2050	3100	2070
HEA 650	1960	1300	TFL	0.00	8580	3400	2260	3470	2310	3550	2360	3630	2410	3710	2470	3780	2520	3860	2570
			2	6.50	7190	3240	2160	3310	2200	3370	2240	3440	2290	3500	2330	3570	2370	3630	2420
			3	13.0	5810	3080	2050	3130	2080	3190	2120	3240	2150	3290	2190	3340	2220	3390	2260
			4	19.5	4420	2910	1940	2950	1960	2990	1990	3030	2020	3070	2040	3110	2070	3150	2100
			BFL	26.0	3040	2730	1820	2760	1840	2790	1860	2820	1870	2840	1890	2870	1910	2900	1930
			6	51.2	2590	2670	1780	2690	1790	2720	1810	2740	1820	2760	1840	2790	1850	2810	1870
			7	96.3	2140	2590	1720	2610	1740	2630	1750	2650	1760	2670	1780	2690	1790	2710	1800
HEA 600	1710	1140	TFL	0.00	8040	3000	2000	3080	2050	3150	2090	3220	2140	3290	2190	3370	2240	3440	2290
			2	6.25	6710	2860	1900	2920	1940	2980	1980	3040	2020	3100	2060	3160	2100	3220	2140
			3	12.5	5380	2700	1800	2750	1830	2800	1860	2850	1890	2890	1930	2940	1960	2990	1990
			4	18.8	4050	2540	1690	2570	1710	2610	1740	2650	1760	2680	1790	2720	1810	2760	1830
			BFL	25.0	2720	2370	1580	2390	1590	2420	1610	2440	1620	2470	1640	2490	1660	2510	1670
			6	45.1	2360	2320	1540	2340	1560	2360	1570	2380	1590	2400	1600	2430	1610	2450	1630
			7	77.2	2010	2260	1510	2280	1520	2300	1530	2320	1540	2330	1550	2350	1570	2370	1580
HEA 550	1480	983	TFL	0.00	7520	2640	1760	2710	1800	2770	1850	2840	1890	2910	1940	2980	1980	3050	2030
			2	6.00	6240	2500	1660	2550	1700	2610	1740	2670	1770	2720	1810	2780	1850	2830	1890
			3	12.0	4960	2350	1560	2390	1590	2440	1620	2480	1650	2530	1680	2570	1710	2620	1740
			4	18.0	3680	2190	1460	2230	1480	2260	1500	2290	1530	2330	1550	2360	1570	2390	1590
			BFL	24.0	2410	2030	1350	2050	1370	2080	1380	2100	1400	2120	1410	2140	1420	2160	1440
			6	39.4	2140	2000	1330	2020	1340	2030	1350	2050	1370	2070	1380	2090	1390	2110	1400
			7	58.2	1880	1960	1300	1970	1310	1990	1320	2010	1340	2020	1350	2040	1360	2060	1370
HEA 500	1260	839	TFL	0.00	7010	2300	1530	2370	1570	2430	1620	2490	1660	2560	1700	2620	1740	2680	1780
			2	5.75	5790	2170	1440	2220	1480	2270	1510	2320	1550	2380	1580	2430	1620	2480	1650
			3	11.5	4560	2030	1350	2070	1380	2110	1400	2150	1430	2190	1460	2230	1480	2270	1510
			4	17.3	3340	1880	1250	1910	1270	1940	1290	1970	1310	2000	1330	2030	1350	2060	1370
			BFL	23.0	2110	1720	1150	1740	1160	1760	1170	1780	1180	1800	1200	1820	1210	1840	1220
			6	33.8	1930	1700	1130	1720	1140	1730	1150	1750	1170	1770	1180	1790	1190	1800	1200
			7	44.5	1750	1670	1110	1690	1120	1710	1130	1720	1150	1740	1160	1750	1170	1770	1180

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

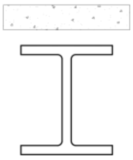
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 450	1030	684	TFL	0.00	6320	1540	1020	1590	1060	1650	1100	1710	1140	1760	1170	1820	1210	1880	1250
			2	5.25	5200	1480	986	1530	1020	1580	1050	1620	1080	1670	1110	1720	1140	1760	1170
			3	10.5	4080	1420	948	1460	972	1500	997	1530	1020	1570	1050	1610	1070	1640	1090
			4	15.8	2960	1360	905	1390	923	1410	941	1440	959	1470	976	1490	994	1520	1010
			BFL	21.0	1850	1290	860	1310	871	1330	882	1340	893	1360	904	1380	915	1390	926
			6	29.1	1710	1280	854	1300	864	1310	874	1330	884	1340	895	1360	905	1380	915
			7	37.3	1580	1270	847	1290	856	1300	866	1320	875	1330	885	1340	894	1360	904
HEA 400	819	545	TFL	0.00	5640	1240	828	1300	862	1350	896	1400	929	1450	963	1500	997	1550	1030
			2	4.75	4630	1200	796	1240	824	1280	852	1320	880	1360	907	1410	935	1450	963
			3	9.50	3620	1140	762	1180	783	1210	805	1240	827	1280	848	1310	870	1340	892
			4	14.3	2610	1090	724	1110	740	1140	756	1160	771	1180	787	1210	802	1230	818
			BFL	19.0	1600	1030	684	1040	693	1060	703	1070	713	1090	722	1100	732	1110	741
			6	24.8	1500	1020	680	1040	689	1050	698	1060	707	1080	716	1090	725	1100	734
			7	30.6	1410	1020	676	1030	684	1040	692	1050	701	1070	709	1080	718	1090	726
HEA 360	667	444	TFL	0.00	5070	1030	683	1070	713	1120	744	1160	774	1210	804	1250	835	1300	865
			2	4.38	4140	983	654	1020	679	1060	703	1090	728	1130	753	1170	778	1210	803
			3	8.75	3210	935	622	964	642	993	661	1020	680	1050	699	1080	718	1110	737
			4	13.1	2270	884	588	905	602	925	616	946	629	966	643	987	656	1010	670
			BFL	17.5	1340	829	552	842	560	854	568	866	576	878	584	890	592	902	600
			6	19.9	1300	827	550	839	558	851	566	862	574	874	582	886	589	898	597
			7	22.3	1270	825	549	836	556	848	564	859	572	870	579	882	587	893	594
HEA 340	591	393	TFL	0.00	4740	917	610	960	639	1000	667	1050	695	1090	724	1130	752	1170	780
			2	4.13	3860	876	583	911	606	945	629	980	652	1010	675	1050	698	1080	721
			3	8.25	2980	831	553	858	571	885	589	912	607	939	625	966	642	992	660
			4	12.4	2100	784	521	803	534	822	547	841	559	859	572	878	584	897	597
			BFL	16.5	1220	733	488	744	495	755	502	766	510	777	517	788	524	799	532
			6	17.8	1200	732	487	742	494	753	501	764	508	775	516	786	523	797	530
			7	19.2	1180	730	486	741	493	752	500	762	507	773	514	784	521	794	529
HEA 320	520	346	TFL	0.00	4420	815	542	855	569	894	595	934	621	974	648	1010	674	1050	701
			2	3.88	3590	776	516	809	538	841	559	873	581	905	602	938	624	970	645
			3	7.75	2770	735	489	760	505	785	522	809	539	834	555	859	572	884	588
			4	11.6	1940	690	459	708	471	725	483	743	494	760	506	778	517	795	529
			BFL	15.5	1110	643	428	653	435	663	441	673	448	683	455	693	461	703	468
			6	15.9	1110	643	428	653	434	663	441	673	448	683	454	693	461	703	468
			7	16.2	1100	643	428	652	434	662	441	672	447	682	454	692	461	702	467
HEA 300	442	294	TFL	0.00	3990	701	466	737	490	773	514	809	538	845	562	881	586	917	610
			2	3.50	3250	666	443	695	463	725	482	754	502	783	521	812	540	842	560
			3	7.00	2500	629	419	652	434	674	449	697	464	719	479	742	494	764	508
			4	10.5	1760	590	392	606	403	621	413	637	424	653	434	669	445	685	455
			BFL	14.0	1010	548	365	557	371	566	377	575	383	584	389	593	395	603	401
			6	14.5	1010	548	364	557	370	566	376	575	382	584	388	593	394	602	400
			7	14.9	998	547	364	556	370	565	376	574	382	583	388	592	394	601	400
HEA 280	355	236	TFL	0.00	3450	575	382	606	403	637	424	668	445	699	465	730	486	761	507
			2	3.25	2810	545	363	570	379	595	396	621	413	646	430	671	447	696	463
			3	6.50	2160	513	341	532	354	552	367	571	380	591	393	610	406	630	419
			4	9.75	1510	479	319	493	328	506	337	520	346	534	355	547	364	561	373
			BFL	13.0	868	443	295	451	300	459	305	467	311	475	316	483	321	490	326
			6	13.2	866	443	295	451	300	459	305	467	311	474	316	482	321	490	326
			7	13.4	863	443	295	451	300	459	305	466	310	474	316	482	321	490	326
HEA 260	294	196	TFL	0.00	3080	485	323	513	341	541	360	569	378	596	397	624	415	652	434
			2	3.13	2510	459	305	481	320	504	335	526	350	549	365	571	380	594	395
			3	6.25	1930	430	286	448	298	465	309	482	321	500	332	517	344	534	356
			4	9.38	1350	400	266	412	274	425	282	437	291	449	299	461	307	473	315
			BFL	12.5	775	369	245	376	250	383	255	390	259	397	264	403	268	410	273
			6	12.7	773	369	245	375	250	382	254	389	259	396	264	403	268	410	273
			7	12.8	771	368	245	375	250	382	254	389	259	396	264	403	268	410	273

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

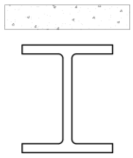
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes
Available Strength in Flexure, kN·m

$F_y = 355$ MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 450	1030	684	TFL	0.00	6320	1930	1290	1990	1320	2050	1360	2100	1400	2160	1440	2220	1480	2270	1510
			2	5.25	5200	1810	1200	1860	1240	1900	1270	1950	1300	2000	1330	2040	1360	2090	1390
			3	10.5	4080	1680	1120	1720	1140	1750	1170	1790	1190	1830	1220	1870	1240	1900	1270
			4	15.8	2960	1550	1030	1570	1050	1600	1070	1630	1080	1650	1100	1680	1120	1710	1140
			BFL	21.0	1850	1410	937	1420	948	1440	959	1460	970	1470	981	1490	992	1510	1000
			6	29.1	1710	1390	925	1410	936	1420	946	1440	956	1450	966	1470	977	1480	987
			7	37.3	1580	1370	913	1390	923	1400	932	1420	942	1430	951	1440	960	1460	970
HEA 400	819	545	TFL	0.00	5640	1600	1060	1650	1100	1700	1130	1750	1170	1800	1200	1850	1230	1910	1270
			2	4.75	4630	1490	991	1530	1020	1570	1050	1610	1070	1660	1100	1700	1130	1740	1160
			3	9.50	3620	1370	914	1410	935	1440	957	1470	979	1500	1000	1540	1020	1570	1040
			4	14.3	2610	1250	834	1280	849	1300	865	1320	881	1350	896	1370	912	1390	927
			BFL	19.0	1600	1130	751	1140	760	1160	770	1170	780	1190	789	1200	799	1210	808
			6	24.8	1500	1120	743	1130	752	1140	761	1160	770	1170	779	1180	788	1200	797
			7	30.6	1410	1100	735	1120	743	1130	752	1140	760	1160	768	1170	777	1180	785
HEA 360	667	444	TFL	0.00	5070	1350	895	1390	926	1440	956	1480	987	1530	1020	1570	1050	1620	1080
			2	4.38	4140	1240	827	1280	852	1320	877	1360	902	1390	926	1430	951	1470	976
			3	8.75	3210	1140	757	1170	776	1200	795	1220	814	1250	833	1280	853	1310	872
			4	13.1	2270	1030	684	1050	697	1070	711	1090	724	1110	738	1130	752	1150	765
			BFL	17.5	1340	914	608	926	616	938	624	950	632	962	640	974	648	986	656
			6	19.9	1300	909	605	921	613	933	621	945	628	956	636	968	644	980	652
			7	22.3	1270	905	602	916	609	927	617	939	625	950	632	962	640	973	647
HEA 340	591	393	TFL	0.00	4740	1220	809	1260	837	1300	866	1340	894	1390	922	1430	951	1470	979
			2	4.13	3860	1120	745	1150	768	1190	791	1220	814	1260	837	1290	860	1330	883
			3	8.25	2980	1020	678	1050	696	1070	714	1100	732	1130	750	1150	767	1180	785
			4	12.4	2100	916	610	935	622	954	635	973	647	992	660	1010	673	1030	685
			BFL	16.5	1220	810	539	821	546	832	554	843	561	854	568	865	576	876	583
			6	17.8	1200	807	537	818	544	829	552	840	559	851	566	862	573	873	581
			7	19.2	1180	805	536	816	543	826	550	837	557	848	564	858	571	869	578
HEA 320	520	346	TFL	0.00	4420	1090	727	1130	754	1170	780	1210	807	1250	833	1290	859	1330	886
			2	3.88	3590	1000	667	1030	688	1070	710	1100	731	1130	753	1160	774	1200	796
			3	7.75	2770	909	605	934	621	959	638	984	654	1010	671	1030	688	1060	704
			4	11.6	1940	813	541	830	552	848	564	865	576	882	587	900	599	917	610
			BFL	15.5	1110	713	475	723	481	733	488	744	495	754	501	764	508	774	515
			6	15.9	1110	713	474	723	481	733	488	743	494	753	501	763	507	773	514
			7	16.2	1100	712	474	722	480	732	487	742	494	752	500	762	507	772	513
HEA 300	442	294	TFL	0.00	3990	953	634	988	658	1020	682	1060	705	1100	729	1130	753	1170	777
			2	3.50	3250	871	579	900	599	929	618	959	638	988	657	1020	677	1050	696
			3	7.00	2500	787	523	809	538	832	553	854	568	877	583	899	598	922	613
			4	10.5	1760	700	466	716	477	732	487	748	498	764	508	779	519	795	529
			BFL	14.0	1010	612	407	621	413	630	419	639	425	648	431	657	437	666	443
			6	14.5	1010	611	406	620	412	629	418	638	424	647	431	656	437	665	443
			7	14.9	998	610	406	619	412	628	418	637	424	646	430	655	436	664	442
HEA 280	355	236	TFL	0.00	3450	792	527	823	548	855	569	886	589	917	610	948	631	979	651
			2	3.25	2810	722	480	747	497	772	514	797	531	823	547	848	564	873	581
			3	6.50	2160	649	432	669	445	688	458	707	471	727	484	746	497	766	509
			4	9.75	1510	575	382	588	391	602	400	615	409	629	419	643	428	656	437
			BFL	13.0	868	498	331	506	337	514	342	522	347	529	352	537	357	545	363
			6	13.2	866	498	331	506	336	513	342	521	347	529	352	537	357	545	362
			7	13.4	863	498	331	505	336	513	341	521	347	529	352	536	357	544	362
HEA 260	294	196	TFL	0.00	3080	680	452	707	471	735	489	763	508	791	526	818	544	846	563
			2	3.13	2510	616	410	639	425	662	440	684	455	707	470	729	485	752	500
			3	6.25	1930	552	367	569	379	586	390	604	402	621	413	639	425	656	436
			4	9.38	1350	485	323	498	331	510	339	522	347	534	355	546	363	558	372
			BFL	12.5	775	417	278	424	282	431	287	438	292	445	296	452	301	459	306
			6	12.7	773	417	278	424	282	431	287	438	291	445	296	452	301	459	305
			7	12.8	771	417	277	424	282	431	287	438	291	445	296	452	300	459	305

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

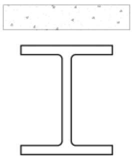
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 240	238	158	TFL	0.00	2730	405	270	430	286	454	302	479	319	503	335	528	351	552	368
			2	3.00	2220	381	254	401	267	421	280	441	294	461	307	481	320	501	333
			3	6.00	1710	356	237	372	247	387	257	402	268	418	278	433	288	448	298
			4	9.00	1190	330	219	341	227	351	234	362	241	373	248	384	255	394	262
			BFL	12.0	683	302	201	308	205	314	209	320	213	327	217	333	221	339	225
			6	12.0	682	302	201	308	205	314	209	320	213	327	217	333	221	339	225
			7	12.1	682	302	201	308	205	314	209	320	213	327	217	333	221	339	225
HEA 220	182	121	TFL	0.00	2280	319	212	339	226	360	239	380	253	401	267	421	280	442	294
			2	2.75	1850	299	199	315	210	332	221	349	232	366	243	382	254	399	265
			3	5.50	1420	278	185	291	193	303	202	316	210	329	219	342	228	355	236
			4	8.25	995	256	170	265	176	274	182	283	188	292	194	301	200	310	206
			BFL	11.0	566	233	155	238	158	243	162	248	165	253	168	258	172	263	175
HEA 200	137	91.3	TFL	0.00	1910	249	166	267	177	284	189	301	200	318	212	335	223	353	235
			2	2.50	1560	233	155	247	164	261	174	275	183	289	192	303	202	317	211
			3	5.00	1200	216	144	227	151	237	158	248	165	259	172	270	180	281	187
			4	7.50	846	198	132	205	137	213	142	221	147	228	152	236	157	244	162
			BFL	10.0	491	179	119	184	122	188	125	192	128	197	131	201	134	206	137
			6	10.7	484	179	119	183	122	187	125	192	128	196	131	201	133	205	136
			7	11.3	478	178	119	183	122	187	124	191	127	196	130	200	133	204	136
HEA 180	104	69.1	TFL	0.00	1610	196	130	210	140	225	150	239	159	254	169	268	178	283	188
			2	2.38	1300	182	121	194	129	205	137	217	144	229	152	241	160	252	168
			3	4.75	999	167	111	176	117	185	123	194	129	203	135	212	141	221	147
			4	7.13	696	152	101	158	105	165	109	171	114	177	118	183	122	190	126
			BFL	9.50	392	136	90.5	140	92.9	143	95.2	147	97.6	150	99.9	154	102	157	105
HEA 160	78.3	52.1	TFL	0.00	1380	156	104	168	112	181	120	193	129	206	137	218	145	230	153
			2	2.25	1120	144	96.0	154	103	164	109	175	116	185	123	195	130	205	136
			3	4.50	865	132	87.8	140	93.0	148	98.2	155	103	163	109	171	114	179	119
			4	6.75	610	119	79.3	125	83.0	130	86.6	136	90.3	141	93.9	147	97.6	152	101
			BFL	9.00	354	106	70.5	109	72.6	112	74.7	115	76.8	119	79.0	122	81.1	125	83.2
			6	9.56	349	106	70.3	109	72.4	112	74.5	115	76.6	118	78.7	121	80.8	125	82.8
			7	10.1	344	105	70.1	108	72.2	112	74.2	115	76.3	118	78.4	121	80.4	124	82.5
HEA140	55.4	36.9	TFL	0.00	1120	117	77.8	127	84.5	137	91.2	147	97.8	157	105	167	111	177	118
			2	2.13	904	107	71.4	115	76.8	124	82.2	132	87.6	140	93.0	148	98.4	156	104
			3	4.25	693	97.1	64.6	103	68.8	110	72.9	116	77.1	122	81.2	128	85.4	135	89.5
			4	6.38	482	86.6	57.6	91.0	60.5	95.3	63.4	99.6	66.3	104	69.2	108	72.1	113	74.9
			BFL	8.50	271	75.7	50.4	78.1	52.0	80.6	53.6	83.0	55.2	85.4	56.8	87.9	58.5	90.3	60.1
HEA 120	38.2	25.4	TFL	0.00	900	86.6	57.6	94.7	63.0	103	68.4	111	73.8	119	79.2	127	84.6	135	90.0
			2	2.00	729	78.8	52.4	85.4	56.8	91.9	61.2	98.5	65.5	105	69.9	112	74.3	118	78.6
			3	4.00	559	70.7	47.0	75.7	50.4	80.7	53.7	85.8	57.1	90.8	60.4	95.8	63.8	101	67.1
			4	6.00	388	62.2	41.4	65.7	43.7	69.2	46.1	72.7	48.4	76.2	50.7	79.7	53.0	83.2	55.4
			BFL	8.00	218	53.5	35.6	55.5	36.9	57.4	38.2	59.4	39.5	61.3	40.8	63.3	42.1	65.3	43.4
HEA 100	26.5	17.6	TFL	0.00	754	66.5	44.2	73.3	48.8	80.1	53.3	86.9	57.8	93.6	62.3	100	66.8	107	71.3
			2	2.00	612	60.0	39.9	65.5	43.6	71.0	47.2	76.5	50.9	82.0	54.6	87.5	58.2	93.0	61.9
			3	4.00	470	53.2	35.4	57.4	38.2	61.7	41.0	65.9	43.8	70.1	46.7	74.4	49.5	78.6	52.3
			4	6.00	328	46.2	30.7	49.1	32.7	52.1	34.7	55.0	36.6	58.0	38.6	60.9	40.5	63.9	42.5
			BFL	8.00	186	38.9	25.9	40.6	27.0	42.2	28.1	43.9	29.2	45.6	30.3	47.3	31.5	48.9	32.6

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

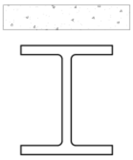
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEA Shapes Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA[c]	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEA 240	238	158	TFL	0.00	2730	577	384	601	400	626	417	651	433	675	449	700	466	724	482
			2	3.00	2220	521	347	541	360	561	373	581	386	601	400	621	413	641	426
			3	6.00	1710	464	309	479	319	494	329	510	339	525	349	540	360	556	370
			4	9.00	1190	405	270	416	277	427	284	437	291	448	298	459	305	470	312
			BFL	12.0	683	345	230	351	234	357	238	363	242	370	246	376	250	382	254
			6	12.0	682	345	230	351	234	357	238	363	242	370	246	376	250	382	254
			7	12.1	682	345	229	351	234	357	238	363	242	369	246	376	250	382	254
HEA 220	182	121	TFL	0.00	2280	463	308	483	321	504	335	524	349	545	362	565	376	586	390
			2	2.75	1850	416	277	432	288	449	299	466	310	482	321	499	332	516	343
			3	5.50	1420	368	245	380	253	393	262	406	270	419	279	432	287	445	296
			4	8.25	995	319	212	328	218	336	224	345	230	354	236	363	242	372	248
			BFL	11.0	566	268	179	274	182	279	185	284	189	289	192	294	196	299	199
HEA 200	137	91.3	TFL	0.00	1910	370	246	387	257	404	269	421	280	439	292	456	303	473	315
			2	2.50	1560	331	220	345	230	359	239	373	248	387	258	401	267	415	276
			3	5.00	1200	291	194	302	201	313	208	324	216	335	223	346	230	356	237
			4	7.50	846	251	167	259	172	266	177	274	182	282	187	289	192	297	197
			BFL	10.0	491	210	140	214	143	219	146	223	149	228	151	232	154	237	157
			6	10.7	484	209	139	214	142	218	145	222	148	227	151	231	154	235	157
			7	11.3	478	208	139	213	142	217	144	221	147	226	150	230	153	234	156
HEA 180	104	69.1	TFL	0.00	1610	297	198	312	207	326	217	340	227	355	236	369	246	384	255
			2	2.38	1300	264	176	276	183	287	191	299	199	311	207	323	215	334	222
			3	4.75	999	230	153	239	159	248	165	257	171	266	177	275	183	284	189
			4	7.13	696	196	130	202	134	208	139	215	143	221	147	227	151	233	155
			BFL	9.50	392	161	107	164	109	168	112	171	114	175	116	178	119	182	121
HEA 160	78.3	52.1	TFL	0.00	1380	243	162	255	170	268	178	280	186	292	195	305	203	317	211
			2	2.25	1120	215	143	225	150	235	156	245	163	255	170	265	177	275	183
			3	4.50	865	187	124	194	129	202	134	210	140	218	145	225	150	233	155
			4	6.75	610	158	105	163	109	169	112	174	116	180	119	185	123	191	127
			BFL	9.00	354	128	85.3	131	87.4	135	89.6	138	91.7	141	93.8	144	95.9	147	98.0
			6	9.56	349	128	84.9	131	87.0	134	89.1	137	91.2	140	93.3	143	95.4	146	97.5
			7	10.1	344	127	84.5	130	86.6	133	88.7	136	90.7	139	92.8	143	94.9	146	96.9
HEA140	55.4	36.9	TFL	0.00	1120	187	125	197	131	207	138	217	145	227	151	237	158	247	165
			2	2.13	904	164	109	172	115	180	120	189	125	197	131	205	136	213	142
			3	4.25	693	141	93.7	147	97.8	153	102	159	106	166	110	172	114	178	119
			4	6.38	482	117	77.8	121	80.7	126	83.6	130	86.5	134	89.4	139	92.2	143	95.1
			BFL	8.50	271	92.7	61.7	95.2	63.3	97.6	64.9	100	66.6	102	68.2	105	69.8	107	71.4
HEA 120	38.2	25.4	TFL	0.00	900	143	95.3	151	101	159	106	168	112	176	117	184	122	192	128
			2	2.00	729	125	83.0	131	87.4	138	91.7	144	96.1	151	100	158	105	164	109
			3	4.00	559	106	70.4	111	73.8	116	77.1	121	80.5	126	83.8	131	87.2	136	90.5
			4	6.00	388	86.7	57.7	90.2	60.0	93.7	62.3	97.2	64.7	101	67.0	104	69.3	108	71.6
			BFL	8.00	218	67.2	44.7	69.2	46.0	71.2	47.3	73.1	48.6	75.1	50.0	77.0	51.3	79.0	52.6
HEA 100	26.5	17.6	TFL	0.00	754	114	75.9	121	80.4	128	84.9	134	89.4	141	93.9	148	98.4	155	103
			2	2.00	612	98.5	65.6	104	69.2	110	72.9	115	76.6	121	80.2	126	83.9	132	87.6
			3	4.00	470	82.8	55.1	87.1	57.9	91.3	60.7	95.5	63.5	99.7	66.4	104	69.2	108	72.0
			4	6.00	328	66.8	44.5	69.8	46.4	72.8	48.4	75.7	50.4	78.7	52.3	81.6	54.3	84.6	56.3
			BFL	8.00	186	50.6	33.7	52.3	34.8	54.0	35.9	55.6	37.0	57.3	38.1	59.0	39.2	60.7	40.4

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

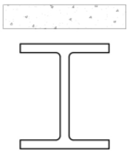
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	kN·m		PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 1000	3140	2090	TFL	0.00	9400	4650	3100	4740	3150	4820	3210	4910	3260	4990	3320	5080	3380	5160	3430
			2	9.00	8130	4590	3050	4660	3100	4740	3150	4810	3200	4880	3250	4960	3300	5030	3350
			3	18.0	6860	4520	3010	4580	3050	4640	3090	4700	3130	4770	3170	4830	3210	4890	3250
			4	27.0	5590	4440	2950	4490	2980	4540	3020	4590	3050	4640	3090	4690	3120	4740	3150
			BFL	36.0	4320	4340	2890	4380	2920	4420	2940	4460	2970	4500	2990	4540	3020	4580	3040
			6	126	3340	4230	2810	4260	2830	4290	2850	4320	2870	4350	2890	4380	2910	4410	2930
			7	237	2350	4030	2680	4050	2690	4070	2710	4090	2720	4110	2730	4130	2750	4150	2760
HEB 900	2660	1770	TFL	0.00	8730	3930	2610	4010	2660	4080	2720	4160	2770	4240	2820	4320	2870	4400	2930
			2	8.75	7490	3870	2570	3930	2620	4000	2660	4070	2710	4140	2750	4200	2800	4270	2840
			3	17.5	6260	3800	2530	3850	2560	3910	2600	3960	2640	4020	2680	4080	2710	4130	2750
			4	26.3	5020	3720	2470	3760	2500	3810	2530	3850	2560	3900	2590	3940	2620	3990	2650
			BFL	35.0	3790	3630	2410	3660	2440	3690	2460	3730	2480	3760	2500	3800	2530	3830	2550
			6	107	2990	3540	2360	3570	2370	3600	2390	3620	2410	3650	2430	3680	2450	3700	2460
			7	199	2180	3400	2260	3420	2270	3440	2290	3450	2300	3470	2310	3490	2320	3510	2340
HEB 800	2160	1440	TFL	0	7850	3180	2120	3250	2160	3320	2210	3390	2260	3460	2300	3530	2350	3600	2400
			2	8.25	6690	3120	2080	3180	2120	3240	2160	3300	2200	3360	2240	3430	2280	3490	2320
			3	16.5	5530	3060	2040	3110	2070	3160	2100	3210	2130	3260	2170	3310	2200	3360	2230
			4	24.8	4360	2980	1990	3020	2010	3060	2040	3100	2060	3140	2090	3180	2120	3220	2140
			BFL	33	3200	2900	1930	2930	1950	2960	1970	2990	1990	3020	2010	3050	2030	3080	2050
			6	86.1	2580	2840	1890	2870	1910	2890	1920	2910	1940	2940	1950	2960	1970	2980	1980
			7	161	1960	2750	1830	2760	1840	2780	1850	2800	1860	2820	1870	2830	1890	2850	1900
HEB 700	1760	1170	TFL	0	7200	2590	1720	2660	1770	2720	1810	2790	1850	2850	1900	2920	1940	2980	1980
			2	8	6070	2540	1690	2590	1720	2650	1760	2700	1800	2760	1830	2810	1870	2870	1910
			3	16	4940	2470	1650	2520	1680	2560	1710	2610	1740	2650	1760	2700	1790	2740	1820
			4	24	3820	2400	1600	2440	1620	2470	1640	2510	1670	2540	1690	2580	1710	2610	1740
			BFL	32	2690	2320	1550	2350	1560	2370	1580	2400	1590	2420	1610	2450	1630	2470	1640
			6	69.1	2240	2280	1520	2300	1530	2330	1550	2350	1560	2370	1570	2390	1590	2410	1600
			7	125	1800	2230	1480	2240	1490	2260	1500	2270	1510	2290	1520	2310	1530	2320	1550
HEB 650	1550	1030	TFL	0.00	6730	2270	1510	2330	1550	2390	1590	2450	1630	2510	1670	2570	1710	2630	1750
			2	7.75	5640	2220	1480	2270	1510	2320	1540	2370	1580	2420	1610	2470	1640	2520	1680
			3	15.5	4540	2160	1440	2200	1460	2240	1490	2280	1520	2320	1540	2360	1570	2400	1600
			4	23.3	3450	2090	1390	2120	1410	2150	1430	2180	1450	2210	1470	2240	1490	2280	1510
			BFL	31.0	2360	2010	1340	2030	1350	2060	1370	2080	1380	2100	1400	2120	1410	2140	1420
			6	57.1	2020	1980	1320	2000	1330	2020	1340	2040	1360	2060	1370	2080	1380	2090	1390
			7	101	1680	1950	1290	1960	1300	1980	1310	1990	1320	2010	1330	2020	1340	2040	1350
HEB 600	1360	904	TFL	0.00	6350	2000	1330	2060	1370	2110	1410	2170	1440	2230	1480	2280	1520	2340	1560
			2	7.50	5290	1950	1300	2000	1330	2040	1360	2090	1390	2140	1420	2190	1450	2230	1490
			3	15.0	4230	1890	1260	1930	1280	1970	1310	2000	1330	2040	1360	2080	1380	2120	1410
			4	22.5	3170	1820	1210	1850	1230	1880	1250	1910	1270	1940	1290	1970	1310	2000	1330
			BFL	30.0	2120	1750	1170	1770	1180	1790	1190	1810	1200	1830	1220	1850	1230	1870	1240
			6	50.7	1850	1730	1150	1750	1160	1760	1170	1780	1180	1800	1200	1810	1210	1830	1220
			7	82.3	1590	1700	1130	1720	1140	1730	1150	1750	1160	1760	1170	1770	1180	1790	1190
HEB 550	1180	787	TFL	0.00	5970	1750	1160	1800	1200	1850	1230	1910	1270	1960	1310	2020	1340	2070	1380
			2	7.25	4950	1700	1130	1740	1160	1790	1190	1830	1220	1880	1250	1920	1280	1960	1310
			3	14.5	3930	1640	1090	1680	1120	1710	1140	1750	1160	1780	1190	1820	1210	1850	1230
			4	21.8	2900	1580	1050	1600	1070	1630	1090	1660	1100	1680	1120	1710	1140	1740	1150
			BFL	29.0	1880	1510	1000	1530	1020	1540	1030	1560	1040	1580	1050	1590	1060	1610	1070
			6	44.5	1690	1490	994	1510	1000	1520	1010	1540	1020	1550	1030	1570	1040	1590	1050
			7	63.3	1490	1480	982	1490	991	1500	1000	1520	1010	1530	1020	1540	1030	1560	1040
HEB 500	1020	678	TFL	0.00	5610	1510	1010	1560	1040	1610	1070	1670	1110	1720	1140	1770	1180	1820	1210
			2	7.00	4620	1470	976	1510	1000	1550	1030	1590	1060	1630	1090	1670	1110	1720	1140
			3	14.0	3630	1410	940	1450	962	1480	983	1510	1010	1540	1030	1580	1050	1610	1070
			4	21.0	2650	1350	900	1380	916	1400	932	1420	948	1450	963	1470	979	1500	995
			BFL	28.0	1660	1290	856	1300	866	1320	876	1330	886	1350	896	1360	906	1380	916
			6	38.5	1530	1280	850	1290	859	1300	868	1320	877	1330	886	1350	895	1360	905
			7	49.0	1400	1270	842	1280	851	1290	859	1300	868	1320	876	1330	884	1340	893

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

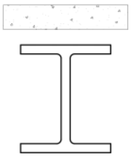
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	kN·m		PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 1000	3140	2090	TFL	0.00	9400	4650	3100	4740	3150	4820	3210	4910	3260	4990	3320	5080	3380	5160	3430
			2	9.00	8130	4590	3050	4660	3100	4740	3150	4810	3200	4880	3250	4960	3300	5030	3350
			3	18.0	6860	4520	3010	4580	3050	4640	3090	4700	3130	4770	3170	4830	3210	4890	3250
			4	27.0	5590	4440	2950	4490	2980	4540	3020	4590	3050	4640	3090	4690	3120	4740	3150
			BFL	36.0	4320	4340	2890	4380	2920	4420	2940	4460	2970	4500	2990	4540	3020	4580	3040
			6	126	3340	4230	2810	4260	2830	4290	2850	4320	2870	4350	2890	4380	2910	4410	2930
			7	237	2350	4030	2680	4050	2690	4070	2710	4090	2720	4110	2730	4130	2750	4150	2760
HEB 900	2660	1770	TFL	0.00	8730	3930	2610	4010	2660	4080	2720	4160	2770	4240	2820	4320	2870	4400	2930
			2	8.75	7490	3870	2570	3930	2620	4000	2660	4070	2710	4140	2750	4200	2800	4270	2840
			3	17.5	6260	3800	2530	3850	2560	3910	2600	3960	2640	4020	2680	4080	2710	4130	2750
			4	26.3	5020	3720	2470	3760	2500	3810	2530	3850	2560	3900	2590	3940	2620	3990	2650
			BFL	35.0	3790	3630	2410	3660	2440	3690	2460	3730	2480	3760	2500	3800	2530	3830	2550
			6	107	2990	3540	2360	3570	2370	3600	2390	3620	2410	3650	2430	3680	2450	3700	2460
			7	199	2180	3400	2260	3420	2270	3440	2290	3450	2300	3470	2310	3490	2320	3510	2340
HEB 800	2160	1440	TFL	0.00	7850	3180	2120	3250	2160	3320	2210	3390	2260	3460	2300	3530	2350	3600	2400
			2	8.25	6690	3120	2080	3180	2120	3240	2160	3300	2200	3360	2240	3430	2280	3490	2320
			3	16.5	5530	3060	2040	3110	2070	3160	2100	3210	2130	3260	2170	3310	2200	3360	2230
			4	24.8	4360	2980	1990	3020	2010	3060	2040	3100	2060	3140	2090	3180	2120	3220	2140
			BFL	33.0	3200	2900	1930	2930	1950	2960	1970	2990	1990	3020	2010	3050	2030	3080	2050
			6	86.1	2580	2840	1890	2870	1910	2890	1920	2910	1940	2940	1950	2960	1970	2980	1980
			7	161	1960	2750	1830	2760	1840	2780	1850	2800	1860	2820	1870	2830	1890	2850	1900
HEB 700	1760	1170	TFL	0.00	7200	2590	1720	2660	1770	2720	1810	2790	1850	2850	1900	2920	1940	2980	1980
			2	8.00	6070	2540	1690	2590	1720	2650	1760	2700	1800	2760	1830	2810	1870	2870	1910
			3	16.0	4940	2470	1650	2520	1680	2560	1710	2610	1740	2650	1760	2700	1790	2740	1820
			4	24.0	3820	2400	1600	2440	1620	2470	1640	2510	1670	2540	1690	2580	1710	2610	1740
			BFL	32.0	2690	2320	1550	2350	1560	2370	1580	2400	1590	2420	1610	2450	1630	2470	1640
			6	69.1	2240	2280	1520	2300	1530	2330	1550	2350	1560	2370	1570	2390	1590	2410	1600
			7	125	1800	2230	1480	2240	1490	2260	1500	2270	1510	2290	1520	2310	1530	2320	1550
HEB 650	1550	1030	TFL	0.00	6730	2690	1790	2760	1830	2820	1870	2880	1910	2940	1950	3000	1990	3060	2030
			2	7.75	5640	2570	1710	2620	1750	2670	1780	2720	1810	2780	1850	2830	1880	2880	1910
			3	15.5	4540	2440	1630	2480	1650	2530	1680	2570	1710	2610	1730	2650	1760	2690	1790
			4	23.3	3450	2310	1530	2340	1560	2370	1580	2400	1600	2430	1620	2460	1640	2490	1660
			BFL	31.0	2360	2160	1440	2180	1450	2200	1470	2230	1480	2250	1490	2270	1510	2290	1520
			6	57.1	2020	2110	1400	2130	1420	2150	1430	2170	1440	2180	1450	2200	1470	2220	1480
			7	101	1680	2050	1360	2070	1370	2080	1380	2100	1400	2110	1410	2130	1420	2140	1430
HEB 600	1360	904	TFL	0.00	6350	2400	1600	2460	1630	2510	1670	2570	1710	2630	1750	2680	1790	2740	1820
			2	7.50	5290	2280	1520	2330	1550	2380	1580	2420	1610	2470	1640	2520	1680	2570	1710
			3	15.0	4230	2160	1430	2190	1460	2230	1480	2270	1510	2310	1540	2350	1560	2380	1590
			4	22.5	3170	2020	1350	2050	1370	2080	1380	2110	1400	2140	1420	2170	1440	2190	1460
			BFL	30.0	2120	1880	1250	1900	1270	1920	1280	1940	1290	1960	1300	1980	1320	2000	1330
			6	50.7	1850	1850	1230	1860	1240	1880	1250	1900	1260	1910	1270	1930	1280	1950	1290
			7	82.3	1590	1800	1200	1820	1210	1830	1220	1850	1230	1860	1240	1870	1250	1890	1260
HEB 550	1180	787	TFL	0.00	5970	2120	1410	2180	1450	2230	1480	2280	1520	2340	1560	2390	1590	2450	1630
			2	7.25	4950	2010	1340	2050	1370	2100	1400	2140	1430	2190	1460	2230	1480	2280	1510
			3	14.5	3930	1890	1260	1920	1280	1960	1300	1990	1330	2030	1350	2070	1370	2100	1400
			4	21.8	2900	1760	1170	1790	1190	1810	1210	1840	1220	1870	1240	1890	1260	1920	1280
			BFL	29.0	1880	1630	1080	1640	1090	1660	1110	1680	1120	1700	1130	1710	1140	1730	1150
			6	44.5	1690	1600	1060	1620	1070	1630	1080	1650	1100	1660	1110	1680	1120	1690	1130
			7	63.3	1490	1570	1040	1580	1050	1600	1060	1610	1070	1620	1080	1640	1090	1650	1100
HEB 500	1020	678	TFL	0.00	5610	1870	1240	1920	1280	1970	1310	2020	1340	2070	1380	2120	1410	2170	1440
			2	7.00	4620	1760	1170	1800	1200	1840	1220	1880	1250	1920	1280	1970	1310	2010	1340
			3	14.0	3630	1640	1090	1670	1110	1710	1140	1740	1160	1770	1180	1810	1200	1840	1220
			4	21.0	2650	1520	1010	1540	1030	1570	1040	1590	1060	1610	1070	1640	1090	1660	1110
			BFL	28.0	1660	1390	926	1410	935	1420	945	1440	955	1450	965	1470	975	1480	985
			6	38.5	1530	1370	914	1390	923	1400	932	1410	941	1430	950	1440	960	1460	969
			7	49.0	1400	1350	901	1370	909	1380	918	1390	926	1400	935	1420	943	1430	951

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

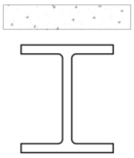
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	kN·m		PNA	$Y1^{a}$	$\Sigma Q_n{}^{d}$	$Y2^{b}$, mm													
	$\phi_b M_p$	M_p/Ω_b				50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 450	842	560	TFL	0.00	5120	1270	844	1310	874	1360	905	1410	936	1450	966	1500	997	1540	1030
			2	6.50	4210	1220	814	1260	840	1300	865	1340	890	1380	915	1410	940	1450	966
			3	13.0	3290	1170	782	1200	801	1230	821	1260	841	1290	860	1320	880	1350	900
			4	19.5	2370	1120	745	1140	759	1160	774	1180	788	1210	802	1230	816	1250	831
			BFL	26.0	1460	1060	705	1070	714	1090	723	1100	731	1110	740	1130	749	1140	758
			6	33.3	1370	1050	701	1070	709	1080	717	1090	726	1100	734	1120	742	1130	750
			7	40.6	1280	1050	697	1060	704	1070	712	1080	720	1090	727	1100	735	1120	743
HEB 400	684	455	TFL	0.00	4650	1050	696	1090	724	1130	752	1170	779	1210	807	1260	835	1300	863
			2	6.00	3800	1010	669	1040	692	1070	715	1110	737	1140	760	1180	783	1210	806
			3	12.0	2960	961	639	987	657	1010	675	1040	692	1070	710	1090	728	1120	745
			4	18.0	2110	911	606	930	619	949	631	968	644	987	657	1010	669	1030	682
			BFL	24.0	1260	857	570	868	578	880	585	891	593	903	601	914	608	925	616
			6	28.3	1210	854	568	864	575	875	582	886	590	897	597	908	604	919	611
			7	32.7	1160	850	565	860	572	871	579	881	586	892	593	902	600	913	607
HEB 360	567	378	TFL	0.00	4240	879	585	917	610	955	635	993	661	1030	686	1070	712	1110	737
			2	5.63	3450	841	559	872	580	903	601	934	621	965	642	996	663	1030	683
			3	11.3	2660	799	532	823	548	847	564	871	579	895	595	919	611	943	627
			4	16.9	1860	753	501	770	512	787	524	804	535	821	546	837	557	854	568
			BFL	22.5	1070	704	468	713	475	723	481	733	487	742	494	752	500	762	507
			6	23.0	1070	703	468	713	474	722	481	732	487	742	493	751	500	761	506
			7	23.4	1060	703	468	712	474	722	480	732	487	741	493	751	499	760	506
HEB 340	509	339	TFL	0.00	4020	795	529	831	553	867	577	904	601	940	625	976	649	1010	673
			2	5.38	3260	759	505	789	525	818	544	847	564	877	583	906	603	935	622
			3	10.8	2500	720	479	742	494	765	509	787	524	810	539	832	554	855	569
			4	16.1	1740	676	450	692	460	708	471	723	481	739	492	755	502	770	513
			BFL	21.5	985	629	419	638	425	647	431	656	436	665	442	674	448	683	454
HEB 320	455	302	TFL	0.00	3790	716	477	751	499	785	522	819	545	853	567	887	590	921	613
			2	5.13	3070	682	454	710	472	737	491	765	509	793	527	820	546	848	564
			3	10.3	2350	645	429	666	443	687	457	708	471	729	485	750	499	771	513
			4	15.4	1620	604	402	618	411	633	421	648	431	662	441	677	450	691	460
			BFL	20.5	900	560	372	568	378	576	383	584	389	592	394	600	399	608	405
HEB 300	395	263	TFL	0.00	3500	631	420	662	441	694	462	725	483	757	504	788	525	820	546
			2	4.75	2830	599	399	625	416	650	433	676	450	701	467	727	483	752	500
			3	9.50	2160	565	376	584	389	604	402	623	415	643	428	662	441	682	453
			4	14.3	1490	527	351	541	360	554	369	568	378	581	387	595	396	608	405
			BFL	19.0	825	487	324	495	329	502	334	510	339	517	344	524	349	532	354
HEB 280	324	216	TFL	0.00	3090	528	351	556	370	584	388	611	407	639	425	667	444	695	462
			2	4.50	2500	500	333	523	348	545	363	568	378	590	393	612	408	635	422
			3	9.00	1900	470	313	487	324	504	335	521	347	538	358	556	370	573	381
			4	13.5	1310	437	291	449	299	461	307	473	315	484	322	496	330	508	338
			BFL	18.0	719	402	268	409	272	415	276	422	281	428	285	435	289	441	293
HEB 260	271	181	TFL	0.00	2780	451	300	476	317	501	333	526	350	551	367	576	383	601	400
			2	4.38	2250	426	283	446	297	466	310	486	324	507	337	527	350	547	364
			3	8.75	1710	398	265	414	275	429	286	445	296	460	306	476	316	491	327
			4	13.1	1180	369	246	380	253	390	260	401	267	412	274	422	281	433	288
			BFL	17.5	644	338	225	343	229	349	232	355	236	361	240	367	244	372	248

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

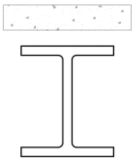
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	kN·m		PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 450	842	560	TFL	0.00	5120	1590	1060	1640	1090	1680	1120	1730	1150	1780	1180	1820	1210	1870	1240
			2	6.50	4210	1490	991	1530	1020	1560	1040	1600	1070	1640	1090	1680	1120	1720	1140
			3	13.0	3290	1380	919	1410	939	1440	959	1470	979	1500	998	1530	1020	1560	1040
			4	19.5	2370	1270	845	1290	859	1310	873	1330	887	1360	902	1380	916	1400	930
			BFL	26.0	1460	1150	766	1160	775	1180	784	1190	793	1200	801	1220	810	1230	819
			6	33.3	1370	1140	758	1150	767	1160	775	1180	783	1190	791	1200	799	1210	808
			7	40.6	1280	1130	750	1140	758	1150	766	1160	773	1170	781	1190	789	1200	796
HEB 400	684	455	TFL	0.00	4650	1340	891	1380	919	1420	946	1460	974	1510	1000	1550	1030	1590	1060
			2	6.00	3800	1250	828	1280	851	1310	874	1350	897	1380	919	1420	942	1450	965
			3	12.0	2960	1150	763	1170	781	1200	798	1230	816	1250	834	1280	852	1310	869
			4	18.0	2110	1040	695	1060	707	1080	720	1100	733	1120	745	1140	758	1160	770
			BFL	24.0	1260	937	623	948	631	959	638	971	646	982	653	994	661	1000	669
			6	28.3	1210	930	619	941	626	952	633	963	641	974	648	985	655	995	662
			7	32.7	1160	923	614	934	621	944	628	954	635	965	642	975	649	986	656
HEB 360	567	378	TFL	0.00	4240	1150	762	1180	788	1220	813	1260	839	1300	864	1340	889	1380	915
			2	5.63	3450	1060	704	1090	725	1120	745	1150	766	1180	787	1210	807	1240	828
			3	11.3	2660	967	643	990	659	1010	675	1040	691	1060	707	1090	723	1110	739
			4	16.9	1860	871	579	888	591	904	602	921	613	938	624	955	635	972	646
			BFL	22.5	1070	771	513	781	519	790	526	800	532	810	539	819	545	829	552
			6	23.0	1070	770	513	780	519	790	525	799	532	809	538	818	545	828	551
			7	23.4	1060	770	512	779	519	789	525	798	531	808	538	818	544	827	550
HEB 340	509	339	TFL	0.00	4020	1050	697	1080	721	1120	746	1160	770	1190	794	1230	818	1270	842
			2	5.38	3260	965	642	994	661	1020	681	1050	700	1080	720	1110	739	1140	759
			3	10.8	2500	877	584	900	599	922	614	945	629	967	644	990	658	1010	673
			4	16.1	1740	786	523	802	533	818	544	833	554	849	565	865	575	880	586
			BFL	21.5	985	691	460	700	466	709	472	718	478	727	484	736	490	745	495
HEB 320	455	302	TFL	0.00	3790	955	636	989	658	1020	681	1060	704	1090	726	1130	749	1160	772
			2	5.13	3070	876	583	903	601	931	619	958	638	986	656	1010	674	1040	693
			3	10.3	2350	792	527	814	541	835	555	856	569	877	583	898	597	919	612
			4	15.4	1620	706	470	721	480	735	489	750	499	765	509	779	518	794	528
			BFL	20.5	900	616	410	624	415	633	421	641	426	649	432	657	437	665	442
HEB 300	395	263	TFL	0.00	3500	851	566	883	587	915	608	946	629	978	650	1010	671	1040	692
			2	4.75	2830	778	517	803	534	829	551	854	568	880	585	905	602	931	619
			3	9.50	2160	701	466	721	479	740	492	759	505	779	518	798	531	818	544
			4	14.3	1490	622	414	635	422	648	431	662	440	675	449	689	458	702	467
			BFL	19.0	825	539	359	547	364	554	369	561	374	569	379	576	383	584	388
HEB 280	324	216	TFL	0.00	3090	723	481	750	499	778	518	806	536	834	555	862	573	889	592
			2	4.50	2500	657	437	680	452	702	467	725	482	747	497	770	512	792	527
			3	9.00	1900	590	392	607	404	624	415	641	427	658	438	676	449	693	461
			4	13.5	1310	520	346	532	354	544	362	555	369	567	377	579	385	591	393
			BFL	18.0	719	448	298	454	302	460	306	467	311	473	315	480	319	486	324
HEB 260	271	181	TFL	0.00	2780	626	417	651	433	676	450	701	467	726	483	751	500	776	516
			2	4.38	2250	567	377	587	391	608	404	628	418	648	431	668	445	689	458
			3	8.75	1710	506	337	522	347	537	357	553	368	568	378	583	388	599	398
			4	13.1	1180	443	295	454	302	465	309	475	316	486	323	496	330	507	337
			BFL	17.5	644	378	252	384	256	390	259	396	263	401	267	407	271	413	275

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

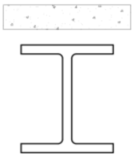
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	kN·m		PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 240	223	148	TFL	0.00	2490	381	254	404	268	426	283	448	298	471	313	493	328	516	343
			2	4.25	2010	359	239	377	251	395	263	413	275	431	287	449	299	467	311
			3	8.50	1530	334	222	348	232	362	241	376	250	389	259	403	268	417	277
			4	12.8	1050	308	205	318	211	327	218	337	224	346	230	356	237	365	243
			BFL	17.0	573	280	186	285	190	290	193	296	197	301	200	306	204	311	207
HEB 220	175	116	TFL	0.00	2140	308	205	327	218	347	231	366	243	385	256	404	269	424	282
			2	4.00	1730	289	192	304	202	320	213	335	223	351	233	366	244	382	254
			3	8.00	1310	268	178	280	186	291	194	303	202	315	210	327	218	339	225
			4	12.0	899	246	163	254	169	262	174	270	180	278	185	286	190	294	196
			BFL	16.0	485	222	148	226	150	230	153	235	156	239	159	244	162	248	165
HEB 200	136	90.4	TFL	0.00	1830	248	165	264	176	281	187	297	198	314	209	330	220	347	231
			2	3.75	1480	231	154	245	163	258	172	271	180	285	189	298	198	311	207
			3	7.50	1130	214	142	224	149	234	156	244	162	254	169	264	176	275	183
			4	11.3	777	195	130	202	134	209	139	216	144	223	148	230	153	237	158
			BFL	15.0	425	175	116	179	119	182	121	186	124	190	126	194	129	198	132
HEB180	102	67.7	TFL	0.00	1530	193	129	207	138	221	147	235	156	248	165	262	174	276	184
			2	3.50	1240	179	119	191	127	202	134	213	142	224	149	235	156	246	164
			3	7.00	941	165	110	173	115	182	121	190	126	199	132	207	138	216	143
			4	10.5	645	149	99.2	155	103	161	107	166	111	172	115	178	118	184	122
			BFL	14.0	349	132	88.1	136	90.2	139	92.3	142	94.4	145	96.5	148	98.6	151	101
HEB 160	74.9	49.8	TFL	0.00	1270	149	99.2	161	107	172	115	184	122	195	130	207	137	218	145
			2	3.25	1030	138	91.7	147	97.9	156	104	166	110	175	116	184	123	193	129
			3	6.50	786	126	83.7	133	88.4	140	93.1	147	97.8	154	102	161	107	168	112
			4	9.75	542	113	75.1	118	78.4	123	81.6	128	84.9	132	88.1	137	91.4	142	94.6
			BFL	13.0	297	99.4	66.2	102	67.9	105	69.7	107	71.5	110	73.3	113	75.1	116	76.8
HEB 140	51.9	34.5	TFL	0.00	1010	109	72.5	118	78.6	127	84.6	136	90.7	145	96.7	154	103	164	109
			2	3.00	812	99.9	66.5	107	71.3	115	76.2	122	81.0	129	85.9	136	90.8	144	95.6
			3	6.00	615	90.2	60.0	95.7	63.7	101	67.4	107	71.1	112	74.7	118	78.4	123	82.1
			4	9.00	417	80.0	53.2	83.7	55.7	87.5	58.2	91.3	60.7	95.0	63.2	98.8	65.7	103	68.2
			BFL	12.0	220	69.2	46.1	71.2	47.4	73.2	48.7	75.2	50.0	77.2	51.3	79.1	52.7	81.1	54.0
HEB 120	34.9	23.2	TFL	0.00	799	79.1	52.6	86.3	57.4	93.5	62.2	101	67.0	108	71.8	115	76.6	122	81.4
			2	2.75	644	72.0	47.9	77.8	51.7	83.5	55.6	89.3	59.4	95.1	63.3	101	67.2	107	71.0
			3	5.50	489	64.4	42.8	68.8	45.8	73.2	48.7	77.6	51.6	82.0	54.6	86.4	57.5	90.8	60.4
			4	8.25	334	56.5	37.6	59.5	39.6	62.5	41.6	65.5	43.6	68.5	45.6	71.5	47.6	74.5	49.6
			BFL	11.0	179	48.1	32.0	49.7	33.1	51.4	34.2	53.0	35.2	54.6	36.3	56.2	37.4	57.8	38.5
HEB 100	22	14.7	TFL	0.00	612	55.1	36.6	60.6	40.3	66.1	44.0	71.6	47.6	77.1	51.3	82.6	55.0	88.1	58.6
			2	2.50	494	49.7	33.0	54.1	36.0	58.6	39.0	63.0	41.9	67.5	44.9	71.9	47.8	76.4	50.8
			3	5.00	377	44.0	29.3	47.4	31.5	50.8	33.8	54.1	36.0	57.5	38.3	60.9	40.5	64.3	42.8
			4	7.50	259	38.0	25.3	40.4	26.9	42.7	28.4	45.0	30.0	47.4	31.5	49.7	33.1	52.0	34.6
			BFL	10.0	142	31.8	21.2	33.1	22.0	34.4	22.9	35.6	23.7	36.9	24.6	38.2	25.4	39.5	26.3

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

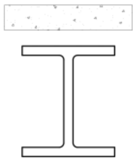
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	kN·m		PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 240	223	148	TFL	0.00	2490	538	358	560	373	583	388	605	403	628	418	650	433	673	447
			2	4.25	2010	485	323	503	335	522	347	540	359	558	371	576	383	594	395
			3	8.50	1530	431	287	445	296	458	305	472	314	486	323	500	333	514	342
			4	12.8	1050	374	249	384	255	393	262	403	268	412	274	422	281	431	287
			BFL	17.0	573	316	210	321	214	327	217	332	221	337	224	342	228	347	231
HEB 220	175	116	TFL	0.00	2140	443	295	462	307	481	320	501	333	520	346	539	359	558	372
			2	4.00	1730	397	264	413	275	429	285	444	295	460	306	475	316	491	326
			3	8.00	1310	351	233	362	241	374	249	386	257	398	265	410	273	421	280
			4	12.0	899	302	201	310	206	318	212	326	217	335	223	343	228	351	233
			BFL	16.0	485	252	168	257	171	261	174	265	177	270	179	274	182	278	185
HEB 200	136	90.4	TFL	0.00	1830	363	242	380	253	396	264	413	275	429	286	446	297	462	308
			2	3.75	1480	325	216	338	225	351	234	365	243	378	252	391	260	405	269
			3	7.50	1130	285	189	295	196	305	203	315	210	325	217	336	223	346	230
			4	11.3	777	244	162	251	167	258	171	265	176	272	181	279	185	286	190
			BFL	15.0	425	202	134	205	137	209	139	213	142	217	144	221	147	224	149
HEB180	102	67.7	TFL	0.00	1530	290	193	304	202	317	211	331	220	345	230	359	239	373	248
			2	3.50	1240	257	171	268	179	280	186	291	193	302	201	313	208	324	216
			3	7.00	941	224	149	232	155	241	160	249	166	258	172	266	177	275	183
			4	10.5	645	190	126	195	130	201	134	207	138	213	142	219	146	225	149
			BFL	14.0	349	154	103	158	105	161	107	164	109	167	111	170	113	173	115
HEB 160	74.9	49.8	TFL	0.00	1270	229	153	241	160	252	168	264	176	275	183	287	191	298	198
			2	3.25	1030	203	135	212	141	221	147	231	153	240	160	249	166	258	172
			3	6.50	786	175	117	182	121	189	126	196	131	204	135	211	140	218	145
			4	9.75	542	147	97.9	152	101	157	104	162	108	167	111	171	114	176	117
			BFL	13.0	297	118	78.6	121	80.4	124	82.2	126	84.0	129	85.7	132	87.5	134	89.3
HEB 140	51.9	34.5	TFL	0.00	1010	173	115	182	121	191	127	200	133	209	139	218	145	227	151
			2	3.00	812	151	100	158	105	166	110	173	115	180	120	188	125	195	130
			3	6.00	615	129	85.8	134	89.5	140	93.1	146	96.8	151	101	157	104	162	108
			4	9.00	417	106	70.7	110	73.2	114	75.7	118	78.2	121	80.7	125	83.2	129	85.7
			BFL	12.0	220	83.1	55.3	85.1	56.6	87.1	57.9	89.0	59.2	91.0	60.6	93.0	61.9	95.0	63.2
HEB 120	34.9	23.2	TFL	0.00	799	129	86.1	137	90.9	144	95.7	151	101	158	105	165	110	173	115
			2	2.75	644	113	74.9	118	78.7	124	82.6	130	86.4	136	90.3	142	94.2	147	98.0
			3	5.50	489	95.2	63.3	99.6	66.3	104	69.2	108	72.1	113	75.1	117	78.0	122	80.9
			4	8.25	334	77.5	51.6	80.5	53.6	83.5	55.6	86.5	57.6	89.5	59.6	92.5	61.6	95.5	63.6
			BFL	11.0	179	59.4	39.5	61.0	40.6	62.6	41.7	64.2	42.7	65.8	43.8	67.4	44.9	69.1	45.9
HEB 100	22	14.7	TFL	0.00	612	93.6	62.3	99.1	66.0	105	69.6	110	73.3	116	77.0	121	80.6	127	84.3
			2	2.50	494	80.8	53.8	85.3	56.7	89.7	59.7	94.2	62.6	98.6	65.6	103	68.6	108	71.5
			3	5.00	377	67.7	45.1	71.1	47.3	74.5	49.6	77.9	51.8	81.3	54.1	84.7	56.3	88.1	58.6
			4	7.50	259	54.4	36.2	56.7	37.7	59.0	39.3	61.4	40.8	63.7	42.4	66.0	43.9	68.4	45.5
			BFL	10.0	142	40.8	27.1	42.0	28.0	43.3	28.8	44.6	29.7	45.9	30.5	47.1	31.4	48.4	32.2

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

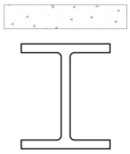
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

$F_y = 275$ MPa

Shape	kN·m		PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 1000	3680	2450	TFL	0.00	11000	5450	3620	5540	3690	5640	3750	5740	3820	5840	3890	5940	3950	6040	4020
			2	9.00	9510	5370	3570	5460	3630	5540	3690	5630	3750	5710	3800	5800	3860	5890	3920
			3	18.0	8030	5290	3520	5360	3570	5430	3610	5500	3660	5580	3710	5650	3760	5720	3810
			4	27.0	6550	5190	3450	5250	3490	5310	3530	5370	3570	5430	3610	5480	3650	5540	3690
			BFL	36.0	5060	5080	3380	5130	3410	5170	3440	5220	3470	5260	3500	5310	3530	5350	3560
			6	126	3910	4950	3290	4990	3320	5020	3340	5060	3360	5090	3390	5130	3410	5160	3430
			7	237	2750	4710	3130	4730	3150	4760	3170	4780	3180	4810	3200	4830	3220	4860	3230
HEB 900	3110	2070	TFL	0.00	10200	4590	3060	4690	3120	4780	3180	4870	3240	4960	3300	5050	3360	5150	3420
			2	8.75	8770	4520	3010	4600	3060	4680	3120	4760	3170	4840	3220	4920	3270	5000	3330
			3	17.5	7320	4440	2960	4510	3000	4570	3040	4640	3090	4710	3130	4770	3170	4840	3220
			4	26.3	5880	4350	2890	4400	2930	4450	2960	4510	3000	4560	3030	4610	3070	4670	3100
			BFL	35.0	4440	4240	2820	4280	2850	4320	2880	4360	2900	4400	2930	4440	2960	4480	2980
			6	107	3490	4150	2760	4180	2780	4210	2800	4240	2820	4270	2840	4300	2860	4330	2880
			7	199	2550	3970	2640	4000	2660	4020	2670	4040	2690	4070	2710	4090	2720	4110	2740
HEB 800	2530	1680	TFL	0.00	9190	3720	2480	3800	2530	3890	2590	3970	2640	4050	2700	4140	2750	4220	2810
			2	8.25	7830	3660	2430	3730	2480	3800	2530	3870	2570	3940	2620	4010	2670	4080	2710
			3	16.5	6470	3580	2380	3640	2420	3700	2460	3750	2500	3810	2540	3870	2580	3930	2610
			4	24.8	5110	3490	2320	3540	2350	3580	2390	3630	2420	3680	2450	3720	2480	3770	2510
			BFL	33.0	3750	3400	2260	3430	2280	3460	2300	3500	2330	3530	2350	3560	2370	3600	2390
			6	86.1	3020	3330	2210	3350	2230	3380	2250	3410	2270	3440	2290	3460	2300	3490	2320
			7	161	2300	3210	2140	3230	2150	3260	2170	3280	2180	3300	2190	3320	2210	3340	2220
HEB 700	2060	1370	TFL	0.00	8430	3030	2020	3110	2070	3190	2120	3260	2170	3340	2220	3410	2270	3490	2320
			2	8.00	7110	2970	1980	3030	2020	3100	2060	3160	2100	3230	2150	3290	2190	3350	2230
			3	16.0	5790	2900	1930	2950	1960	3000	2000	3050	2030	3100	2070	3160	2100	3210	2130
			4	24.0	4470	2810	1870	2850	1900	2890	1920	2930	1950	2970	1980	3010	2000	3050	2030
			BFL	32.0	3150	2720	1810	2750	1830	2780	1850	2800	1870	2830	1880	2860	1900	2890	1920
			6	69.1	2630	2670	1780	2700	1790	2720	1810	2740	1830	2770	1840	2790	1860	2820	1870
			7	125	2110	2600	1730	2620	1750	2640	1760	2660	1770	2680	1780	2700	1800	2720	1810
HEB 650	1810	1210	TFL	0.00	7870	2660	1770	2730	1820	2800	1860	2870	1910	2940	1960	3010	2000	3080	2050
			2	7.75	6590	2600	1730	2650	1770	2710	1810	2770	1850	2830	1880	2890	1920	2950	1960
			3	15.5	5320	2520	1680	2570	1710	2620	1740	2670	1770	2720	1810	2760	1840	2810	1870
			4	23.3	4040	2440	1630	2480	1650	2520	1670	2550	1700	2590	1720	2630	1750	2660	1770
			BFL	31.0	2760	2360	1570	2380	1580	2410	1600	2430	1620	2450	1630	2480	1650	2500	1670
			6	57.1	2360	2320	1550	2340	1560	2360	1570	2390	1590	2410	1600	2430	1620	2450	1630
			7	101	1970	2280	1510	2290	1530	2310	1540	2330	1550	2350	1560	2370	1570	2380	1590
HEB 600	1590	1060	TFL	0.00	7430	2340	1560	2410	1600	2470	1650	2540	1690	2610	1730	2670	1780	2740	1820
			2	7.50	6190	2280	1520	2330	1550	2390	1590	2450	1630	2500	1660	2560	1700	2610	1740
			3	15.0	4950	2210	1470	2260	1500	2300	1530	2340	1560	2390	1590	2430	1620	2480	1650
			4	22.5	3710	2130	1420	2170	1440	2200	1460	2230	1490	2270	1510	2300	1530	2330	1550
			BFL	30.0	2480	2050	1360	2070	1380	2090	1390	2120	1410	2140	1420	2160	1440	2180	1450
			6	50.7	2170	2020	1350	2040	1360	2060	1370	2080	1390	2100	1400	2120	1410	2140	1420
			7	82.3	1860	1990	1330	2010	1340	2030	1350	2040	1360	2060	1370	2080	1380	2090	1390
HEB 550	1380	921	TFL	0.00	6990	2040	1360	2110	1400	2170	1440	2230	1490	2300	1530	2360	1570	2420	1610
			2	7.25	5790	1990	1320	2040	1360	2090	1390	2140	1430	2190	1460	2250	1490	2300	1530
			3	14.5	4600	1920	1280	1960	1310	2000	1330	2040	1360	2090	1390	2130	1420	2170	1440
			4	21.8	3400	1850	1230	1880	1250	1910	1270	1940	1290	1970	1310	2000	1330	2030	1350
			BFL	29.0	2200	1770	1180	1790	1190	1810	1200	1830	1210	1850	1230	1870	1240	1890	1250
			6	44.5	1970	1750	1160	1770	1180	1780	1190	1800	1200	1820	1210	1840	1220	1850	1230
			7	63.3	1750	1730	1150	1740	1160	1760	1170	1770	1180	1790	1190	1810	1200	1820	1210
HEB 500	1190	793	TFL	0.00	6560	1770	1180	1830	1220	1890	1260	1950	1300	2010	1340	2070	1380	2130	1410
			2	7.00	5410	1720	1140	1760	1170	1810	1210	1860	1240	1910	1270	1960	1300	2010	1340
			3	14.0	4250	1650	1100	1690	1130	1730	1150	1770	1180	1810	1200	1840	1230	1880	1250
			4	21.0	3100	1580	1050	1610	1070	1640	1090	1670	1110	1690	1130	1720	1150	1750	1160
			BFL	28.0	1940	1510	1000	1520	1010	1540	1020	1560	1040	1580	1050	1590	1060	1610	1070
			6	38.5	1790	1490	994	1510	1000	1530	1020	1540	1030	1560	1040	1570	1050	1590	1060
			7	49.0	1640	1480	986	1500	996	1510	1010	1530	1020	1540	1020	1560	1030	1570	1040

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

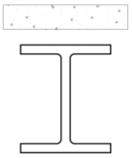
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	kN·m		PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 1000	3680	2450	TFL	0.00	11000	6140	4080	6240	4150	6340	4220	6440	4280	6530	4350	6630	4410	6730	4480
			2	9.00	9510	5970	3970	6060	4030	6140	4090	6230	4140	6310	4200	6400	4260	6490	4310
			3	18.0	8030	5790	3850	5870	3900	5940	3950	6010	4000	6080	4050	6150	4090	6230	4140
			4	27.0	6550	5600	3730	5660	3770	5720	3810	5780	3850	5840	3880	5900	3920	5960	3960
			BFL	36.0	5060	5400	3590	5450	3620	5490	3650	5540	3680	5580	3710	5630	3740	5670	3770
			6	126	3910	5200	3460	5230	3480	5270	3500	5300	3530	5340	3550	5370	3570	5410	3600
			7	237	2750	4880	3250	4910	3270	4930	3280	4960	3300	4980	3310	5010	3330	5030	3350
HEB 900	3110	2070	TFL	0.00	10200	5240	3490	5330	3550	5420	3610	5510	3670	5610	3730	5700	3790	5790	3850
			2	8.75	8770	5080	3380	5160	3430	5230	3480	5310	3540	5390	3590	5470	3640	5550	3690
			3	17.5	7320	4900	3260	4970	3310	5040	3350	5100	3390	5170	3440	5230	3480	5300	3530
			4	26.3	5880	4720	3140	4770	3180	4830	3210	4880	3250	4930	3280	4980	3320	5040	3350
			BFL	35.0	4440	4520	3010	4560	3040	4600	3060	4640	3090	4680	3120	4720	3140	4760	3170
			6	107	3490	4370	2900	4400	2930	4430	2950	4460	2970	4490	2990	4520	3010	4550	3030
			7	199	2550	4130	2750	4160	2770	4180	2780	4200	2800	4230	2810	4250	2830	4270	2840
HEB 800	2530	1680	TFL	0.00	9190	4300	2860	4380	2920	4470	2970	4550	3030	4630	3080	4710	3140	4800	3190
			2	8.25	7830	4150	2760	4220	2810	4290	2850	4360	2900	4430	2950	4500	2990	4570	3040
			3	16.5	6470	3990	2650	4050	2690	4100	2730	4160	2770	4220	2810	4280	2850	4340	2890
			4	24.8	5110	3810	2540	3860	2570	3910	2600	3950	2630	4000	2660	4040	2690	4090	2720
			BFL	33.0	3750	3630	2420	3670	2440	3700	2460	3730	2480	3770	2510	3800	2530	3830	2550
			6	86.1	3020	3520	2340	3540	2360	3570	2380	3600	2390	3630	2410	3650	2430	3680	2450
			7	161	2300	3360	2230	3380	2250	3400	2260	3420	2280	3440	2290	3460	2300	3480	2320
HEB 700	2060	1370	TFL	0.00	8430	3560	2370	3640	2420	3720	2470	3790	2520	3870	2570	3940	2620	4020	2670
			2	8.00	7110	3420	2270	3480	2320	3540	2360	3610	2400	3670	2440	3740	2490	3800	2530
			3	16.0	5790	3260	2170	3310	2200	3360	2240	3420	2270	3470	2310	3520	2340	3570	2380
			4	24.0	4470	3090	2060	3130	2090	3170	2110	3210	2140	3250	2170	3290	2190	3330	2220
			BFL	32.0	3150	2920	1940	2950	1960	2970	1980	3000	2000	3030	2020	3060	2040	3090	2050
			6	69.1	2630	2840	1890	2860	1900	2890	1920	2910	1940	2930	1950	2960	1970	2980	1980
			7	125	2110	2740	1820	2760	1830	2780	1850	2790	1860	2810	1870	2830	1880	2850	1900
HEB 650	1810	1210	TFL	0.00	7870	3150	2100	3220	2150	3290	2190	3370	2240	3440	2290	3510	2330	3580	2380
			2	7.75	6590	3010	2000	3070	2040	3130	2080	3190	2120	3250	2160	3310	2200	3370	2240
			3	15.5	5320	2860	1900	2910	1930	2950	1970	3000	2000	3050	2030	3100	2060	3150	2090
			4	23.3	4040	2700	1800	2740	1820	2770	1840	2810	1870	2840	1890	2880	1920	2920	1940
			BFL	31.0	2760	2530	1680	2550	1700	2580	1720	2600	1730	2630	1750	2650	1770	2680	1780
			6	57.1	2360	2470	1640	2490	1660	2510	1670	2530	1690	2560	1700	2580	1710	2600	1730
			7	101	1970	2400	1600	2420	1610	2440	1620	2450	1630	2470	1640	2490	1660	2510	1670
HEB 600	1590	1060	TFL	0.00	7430	2810	1870	2870	1910	2940	1960	3010	2000	3070	2050	3140	2090	3210	2130
			2	7.50	6190	2670	1780	2720	1810	2780	1850	2840	1890	2890	1920	2950	1960	3000	2000
			3	15.0	4950	2520	1680	2570	1710	2610	1740	2660	1770	2700	1800	2750	1830	2790	1860
			4	22.5	3710	2370	1580	2400	1600	2430	1620	2470	1640	2500	1660	2540	1690	2570	1710
			BFL	30.0	2480	2210	1470	2230	1480	2250	1500	2270	1510	2290	1530	2320	1540	2340	1560
			6	50.7	2170	2160	1440	2180	1450	2200	1460	2220	1480	2240	1490	2260	1500	2280	1520
			7	82.3	1860	2110	1400	2130	1410	2140	1430	2160	1440	2180	1450	2190	1460	2210	1470
HEB 550	1380	921	TFL	0.00	6990	2480	1650	2550	1690	2610	1740	2670	1780	2740	1820	2800	1860	2860	1900
			2	7.25	5790	2350	1560	2400	1600	2460	1630	2510	1670	2560	1700	2610	1740	2660	1770
			3	14.5	4600	2210	1470	2250	1500	2290	1530	2330	1550	2380	1580	2420	1610	2460	1640
			4	21.8	3400	2060	1370	2090	1390	2120	1410	2150	1430	2180	1450	2210	1470	2240	1490
			BFL	29.0	2200	1900	1270	1920	1280	1940	1290	1960	1310	1980	1320	2000	1330	2020	1350
			6	44.5	1970	1870	1250	1890	1260	1910	1270	1930	1280	1940	1290	1960	1310	1980	1320
			7	63.3	1750	1840	1220	1850	1230	1870	1240	1880	1250	1900	1260	1920	1270	1930	1290
HEB 500	1190	793	TFL	0.00	6560	2180	1450	2240	1490	2300	1530	2360	1570	2420	1610	2480	1650	2540	1690
			2	7.00	5410	2060	1370	2110	1400	2150	1430	2200	1470	2250	1500	2300	1530	2350	1560
			3	14.0	4250	1920	1280	1960	1300	2000	1330	2040	1350	2070	1380	2110	1410	2150	1430
			4	21.0	3100	1780	1180	1810	1200	1830	1220	1860	1240	1890	1260	1920	1280	1950	1290
			BFL	28.0	1940	1630	1080	1650	1090	1660	1110	1680	1120	1700	1130	1720	1140	1730	1150
			6	38.5	1790	1610	1070	1620	1080	1640	1090	1660	1100	1670	1110	1690	1120	1700	1130
			7	49.0	1640	1580	1050	1600	1060	1610	1070	1630	1080	1640	1090	1660	1100	1670	1110

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

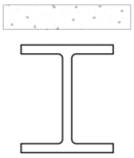
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	kN·m		PNA	$Y1^{a}$	$\Sigma Q_n{}^{d}$	$Y2^{b}$, mm													
	$\phi_b M_p$	M_p/Ω_b				50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 450	986	656	TFL	0.00	6000	1480	987	1540	1020	1590	1060	1650	1090	1700	1130	1750	1170	1810	1200
			2	6.50	4920	1430	953	1480	982	1520	1010	1570	1040	1610	1070	1650	1100	1700	1130
			3	13.0	3850	1370	915	1410	938	1440	961	1480	984	1510	1010	1550	1030	1580	1050
			4	19.5	2780	1310	872	1340	889	1360	905	1390	922	1410	939	1440	955	1460	972
			BFL	26.0	1710	1240	825	1260	836	1270	846	1290	856	1300	866	1320	876	1330	887
			6	33.3	1600	1230	820	1250	830	1260	840	1280	849	1290	859	1310	868	1320	878
			7	40.6	1500	1230	815	1240	824	1250	833	1270	842	1280	851	1290	860	1310	869
HEB 400	800	532	TFL	0.00	5440	1220	814	1270	847	1320	879	1370	912	1420	945	1470	977	1520	1010
			2	6.00	4450	1180	783	1220	810	1260	836	1300	863	1340	889	1380	916	1420	943
			3	12.0	3460	1120	748	1160	769	1190	789	1220	810	1250	831	1280	851	1310	872
			4	18.0	2470	1070	709	1090	724	1110	739	1130	754	1160	769	1180	783	1200	798
			BFL	24.0	1480	1000	667	1020	676	1030	685	1040	694	1060	703	1070	712	1080	720
			6	28.3	1420	999	665	1010	673	1020	682	1040	690	1050	699	1060	707	1080	716
			7	32.7	1360	994	662	1010	670	1020	678	1030	686	1040	694	1060	702	1070	711
HEB 360	664	442	TFL	0.00	4970	1030	684	1070	714	1120	743	1160	773	1210	803	1250	833	1300	862
			2	5.63	4040	984	655	1020	679	1060	703	1090	727	1130	751	1170	776	1200	800
			3	11.3	3110	935	622	963	641	991	659	1020	678	1050	697	1080	715	1100	734
			4	16.9	2180	882	587	901	600	921	613	941	626	960	639	980	652	999	665
			BFL	22.5	1250	823	548	835	555	846	563	857	570	869	578	880	585	891	593
			6	23.0	1250	823	548	834	555	845	563	857	570	868	577	879	585	890	592
			7	23.4	1240	823	547	834	555	845	562	856	570	867	577	878	584	890	592
HEB 340	596	397	TFL	0.00	4700	931	619	973	647	1020	675	1060	704	1100	732	1140	760	1180	788
			2	5.38	3810	888	591	923	614	957	637	991	660	1030	682	1060	705	1090	728
			3	10.8	2930	842	560	868	578	895	595	921	613	947	630	974	648	1000	665
			4	16.1	2040	792	527	810	539	828	551	847	563	865	575	883	588	902	600
			BFL	21.5	1150	737	490	747	497	757	504	768	511	778	518	788	525	799	531
HEB 320	532	354	TFL	0.00	4440	838	558	878	584	918	611	958	637	998	664	1040	691	1080	717
			2	5.13	3590	798	531	831	553	863	574	895	596	928	617	960	639	992	660
			3	10.3	2740	754	502	779	518	804	535	829	551	853	568	878	584	903	601
			4	15.4	1900	707	470	724	482	741	493	758	504	775	516	792	527	809	538
			BFL	20.5	1050	655	436	664	442	674	448	683	455	693	461	702	467	712	474
HEB 300	463	308	TFL	0.00	4100	738	491	775	516	812	540	849	565	886	589	923	614	959	638
			2	4.75	3320	701	466	731	486	761	506	791	526	820	546	850	566	880	586
			3	9.50	2530	661	440	684	455	706	470	729	485	752	500	775	515	798	531
			4	14.3	1750	617	411	633	421	649	432	664	442	680	453	696	463	712	473
			BFL	19.0	965	570	379	579	385	588	391	596	397	605	402	614	408	622	414
HEB 280	380	253	TFL	0.00	3610	618	411	650	433	683	454	715	476	748	498	781	519	813	541
			2	4.50	2920	585	389	612	407	638	424	664	442	690	459	717	477	743	494
			3	9.00	2230	550	366	570	379	590	393	610	406	630	419	650	433	670	446
			4	13.5	1530	512	340	526	350	539	359	553	368	567	377	581	386	595	396
			BFL	18.0	842	471	313	478	318	486	323	493	328	501	333	509	338	516	343
HEB 260	318	211	TFL	0.00	3260	527	351	557	370	586	390	615	409	645	429	674	448	703	468
			2	4.38	2630	498	331	522	347	545	363	569	379	593	394	616	410	640	426
			3	8.75	2000	466	310	484	322	502	334	520	346	538	358	556	370	574	382
			4	13.1	1380	432	287	444	296	457	304	469	312	482	320	494	329	506	337
			BFL	17.5	753	395	263	402	267	409	272	415	276	422	281	429	285	436	290

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

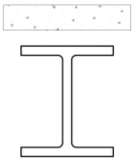
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	kN·m		PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 450	986	656	TFL	0.00	6000	1860	1240	1920	1270	1970	1310	2020	1350	2080	1380	2130	1420	2190	1450
			2	6.50	4920	1740	1160	1790	1190	1830	1220	1880	1250	1920	1280	1960	1310	2010	1340
			3	13.0	3850	1620	1080	1650	1100	1690	1120	1720	1150	1760	1170	1790	1190	1830	1210
			4	19.5	2780	1490	989	1510	1010	1540	1020	1560	1040	1590	1060	1610	1070	1640	1090
			BFL	26.0	1710	1350	897	1360	907	1380	917	1390	927	1410	938	1420	948	1440	958
			6	33.3	1600	1330	888	1350	897	1360	907	1380	916	1390	926	1410	936	1420	945
			7	40.6	1500	1320	878	1330	887	1350	896	1360	905	1370	914	1390	923	1400	932
HEB 400	800	532	TFL	0.00	5440	1570	1040	1620	1070	1660	1110	1710	1140	1760	1170	1810	1210	1860	1240
			2	6.00	4450	1460	969	1500	996	1540	1020	1580	1050	1620	1080	1660	1100	1700	1130
			3	12.0	3460	1340	893	1370	914	1400	934	1440	955	1470	976	1500	996	1530	1020
			4	18.0	2470	1220	813	1240	828	1270	842	1290	857	1310	872	1330	887	1360	902
			BFL	24.0	1480	1100	729	1110	738	1120	747	1140	756	1150	765	1160	774	1180	782
			6	28.3	1420	1090	724	1100	733	1110	741	1130	750	1140	758	1150	767	1160	775
			7	32.7	1360	1080	719	1090	727	1100	735	1120	743	1130	751	1140	759	1150	768
HEB 360	664	442	TFL	0.00	4970	1340	892	1390	922	1430	952	1480	981	1520	1010	1560	1040	1610	1070
			2	5.63	4040	1240	824	1270	848	1310	872	1350	896	1380	921	1420	945	1460	969
			3	11.3	3110	1130	753	1160	771	1190	790	1220	808	1240	827	1270	846	1300	864
			4	16.9	2180	1020	678	1040	691	1060	704	1080	717	1100	730	1120	743	1140	756
			BFL	22.5	1250	902	600	914	608	925	615	936	623	948	630	959	638	970	645
			6	23.0	1250	902	600	913	607	924	615	935	622	947	630	958	637	969	645
			7	23.4	1240	901	599	912	607	923	614	934	622	946	629	957	637	968	644
HEB 340	596	397	TFL	0.00	4700	1230	816	1270	844	1310	872	1350	901	1400	929	1440	957	1480	985
			2	5.38	3810	1130	751	1160	774	1200	797	1230	819	1270	842	1300	865	1330	888
			3	10.8	2930	1030	683	1050	700	1080	718	1110	736	1130	753	1160	771	1180	788
			4	16.1	2040	920	612	938	624	957	637	975	649	993	661	1010	673	1030	685
			BFL	21.5	1150	809	538	820	545	830	552	840	559	851	566	861	573	871	580
HEB 320	532	354	TFL	0.00	4440	1120	744	1160	770	1200	797	1240	823	1280	850	1320	877	1360	903
			2	5.13	3590	1020	682	1060	703	1090	725	1120	746	1150	768	1190	789	1220	811
			3	10.3	2740	927	617	952	633	977	650	1000	666	1030	683	1050	699	1080	716
			4	15.4	1900	826	550	843	561	860	572	878	584	895	595	912	607	929	618
			BFL	20.5	1050	721	480	731	486	740	493	750	499	759	505	769	511	778	518
HEB 300	463	308	TFL	0.00	4100	996	663	1030	687	1070	712	1110	737	1140	761	1180	786	1220	810
			2	4.75	3320	910	605	940	625	970	645	1000	665	1030	685	1060	705	1090	725
			3	9.50	2530	820	546	843	561	866	576	889	591	912	606	934	622	957	637
			4	14.3	1750	727	484	743	494	759	505	775	515	790	526	806	536	822	547
			BFL	19.0	965	631	420	640	426	648	431	657	437	666	443	674	449	683	454
HEB 280	380	253	TFL	0	3610	846	563	878	584	911	606	943	627	976	649	1010	671	1040	692
			2	4.5	2920	769	512	796	529	822	547	848	564	874	582	901	599	927	617
			3	9	2230	690	459	710	473	730	486	750	499	770	513	790	526	811	539
			4	13.5	1530	608	405	622	414	636	423	650	432	664	442	677	451	691	460
			BFL	18	842	524	348	531	353	539	359	546	364	554	369	562	374	569	379
HEB 260	318	211	TFL	0	3260	733	487	762	507	791	526	821	546	850	565	879	585	908	604
			2	4.38	2630	664	442	687	457	711	473	735	489	758	505	782	520	806	536
			3	8.75	2000	593	394	611	406	629	418	647	430	665	442	683	454	701	466
			4	13.1	1380	519	345	531	353	544	362	556	370	568	378	581	386	593	395
			BFL	17.5	753	443	294	449	299	456	304	463	308	470	313	477	317	483	322

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

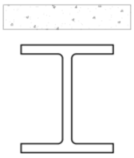
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	kN·m		PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 240	261	173	TFL	0.00	2920	446	297	472	314	498	332	525	349	551	367	577	384	603	401
			2	4.25	2350	420	279	441	293	462	307	483	322	504	336	526	350	547	364
			3	8.50	1790	391	260	407	271	423	282	440	292	456	303	472	314	488	325
			4	12.8	1230	361	240	372	247	383	255	394	262	405	269	416	277	427	284
			BFL	17.0	671	328	218	334	222	340	226	346	230	352	234	358	238	364	242
HEB 220	205	136	TFL	0.00	2500	361	240	383	255	406	270	428	285	451	300	473	315	496	330
			2	4.00	2020	338	225	356	237	374	249	392	261	411	273	429	285	447	297
			3	8.00	1540	313	209	327	218	341	227	355	236	369	245	383	255	396	264
			4	12.0	1050	287	191	297	197	306	204	316	210	325	216	335	223	344	229
			BFL	16.0	568	259	173	265	176	270	179	275	183	280	186	285	190	290	193
HEB 200	159	106	TFL	0.00	2150	290	193	309	206	329	219	348	231	367	244	386	257	406	270
			2	3.75	1730	271	180	286	190	302	201	317	211	333	222	349	232	364	242
			3	7.50	1320	250	166	262	174	274	182	286	190	298	198	309	206	321	214
			4	11.3	910	228	152	236	157	244	163	252	168	261	173	269	179	277	184
			BFL	15.0	497	204	136	209	139	213	142	218	145	222	148	227	151	231	154
HEB180	119	79.3	TFL	0.00	1790	226	150	242	161	258	172	275	183	291	193	307	204	323	215
			2	3.50	1450	210	140	223	148	236	157	249	166	262	174	275	183	288	192
			3	7.00	1100	193	128	203	135	213	141	222	148	232	155	242	161	252	168
			4	10.5	755	174	116	181	121	188	125	195	130	202	134	208	139	215	143
			BFL	14.0	408	155	103	159	106	162	108	166	110	170	113	173	115	177	118
HEB 160	87.6	58.3	TFL	0.00	1490	175	116	188	125	201	134	215	143	228	152	242	161	255	170
			2	3.25	1210	161	107	172	115	183	122	194	129	205	136	216	143	226	151
			3	6.50	920	147	97.9	155	103	164	109	172	114	180	120	189	125	197	131
			4	9.75	634	132	87.9	138	91.7	144	95.5	149	99.3	155	103	161	107	166	111
			BFL	13.0	348	116	77.4	120	79.5	123	81.6	126	83.7	129	85.8	132	87.8	135	89.9
HEB 140	60.7	40.4	TFL	0.00	1180	128	84.9	138	92.0	149	99.0	159	106	170	113	181	120	191	127
			2	3.00	950	117	77.8	125	83.5	134	89.1	143	94.8	151	101	160	106	168	112
			3	6.00	719	106	70.2	112	74.5	119	78.8	125	83.2	131	87.5	138	91.8	144	96.1
			4	9.00	488	93.6	62.3	98.0	65.2	102	68.1	107	71.0	111	74.0	116	76.9	120	79.8
			BFL	12.0	257	81.0	53.9	83.3	55.4	85.7	57.0	88.0	58.5	90.3	60.1	92.6	61.6	94.9	63.2
HEB 120	40.9	27.2	TFL	0.00	935	92.6	61.6	101	67.2	109	72.8	118	78.4	126	84.0	135	89.6	143	95.2
			2	2.75	754	84.2	56.0	91.0	60.5	97.8	65.0	105	69.6	111	74.1	118	78.6	125	83.1
			3	5.50	572	75.4	50.1	80.5	53.6	85.7	57.0	90.8	60.4	96.0	63.8	101	67.3	106	70.7
			4	8.25	391	66.1	44.0	69.6	46.3	73.1	48.6	76.6	51.0	80.1	53.3	83.7	55.7	87.2	58.0
			BFL	11.0	209	56.3	37.5	58.2	38.7	60.1	40.0	62.0	41.2	63.9	42.5	65.7	43.7	67.6	45.0
HEB 100	25.8	17.2	TFL	0.00	716	64.4	42.9	70.9	47.2	77.3	51.5	83.8	55.7	90.2	60.0	96.7	64.3	103	68.6
			2	2.50	579	58.1	38.7	63.3	42.1	68.5	45.6	73.7	49.1	78.9	52.5	84.1	56.0	89.4	59.4
			3	5.00	441	51.5	34.2	55.4	36.9	59.4	39.5	63.4	42.2	67.3	44.8	71.3	47.4	75.3	50.1
			4	7.50	304	44.5	29.6	47.2	31.4	50.0	33.2	52.7	35.1	55.4	36.9	58.2	38.7	60.9	40.5
			BFL	10.0	166	37.2	24.8	38.7	25.8	40.2	26.8	41.7	27.8	43.2	28.7	44.7	29.7	46.2	30.7

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

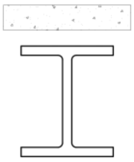
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	kN·m		PNA	$Y1^{a}$	$\Sigma Q_n{}^{d}$	$Y2^{b}$, mm													
	$\phi_b M_p$	M_p/Ω_b				120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 240	261	173	TFL	0.00	2920	630	419	656	436	682	454	708	471	735	489	761	506	787	524
			2	4.25	2350	568	378	589	392	610	406	632	420	653	434	674	448	695	462
			3	8.50	1790	504	335	520	346	536	357	553	368	569	378	585	389	601	400
			4	12.8	1230	438	292	449	299	460	306	471	314	483	321	494	328	505	336
			BFL	17.0	671	370	246	376	250	382	254	388	258	394	262	400	266	406	270
HEB 220	205	136	TFL	0.00	2500	518	345	541	360	563	375	586	390	608	405	631	420	653	435
			2	4.00	2020	465	309	483	322	501	334	520	346	538	358	556	370	574	382
			3	8.00	1540	410	273	424	282	438	291	452	301	465	310	479	319	493	328
			4	12.0	1050	354	235	363	242	373	248	382	254	391	260	401	267	410	273
			BFL	16.0	568	295	196	300	200	305	203	311	207	316	210	321	213	326	217
HEB 200	159	106	TFL	0.00	2150	425	283	444	296	464	309	483	321	502	334	522	347	541	360
			2	3.75	1730	380	253	396	263	411	274	427	284	442	294	458	305	474	315
			3	7.50	1320	333	222	345	230	357	238	369	245	381	253	393	261	405	269
			4	11.3	910	285	190	293	195	302	201	310	206	318	212	326	217	334	222
			BFL	15.0	497	236	157	240	160	245	163	249	166	254	169	258	172	263	175
HEB180	119	79.3	TFL	0.00	1790	339	226	355	236	371	247	388	258	404	269	420	279	436	290
			2	3.50	1450	301	200	314	209	327	218	340	226	353	235	366	244	379	252
			3	7.00	1100	262	174	272	181	282	188	292	194	302	201	312	207	322	214
			4	10.5	755	222	148	229	152	236	157	242	161	249	166	256	170	263	175
			BFL	14.0	408	181	120	184	123	188	125	192	128	195	130	199	132	203	135
HEB 160	87.6	58.3	TFL	0.00	1490	269	179	282	188	295	197	309	205	322	214	336	223	349	232
			2	3.25	1210	237	158	248	165	259	172	270	180	281	187	291	194	302	201
			3	6.50	920	205	136	213	142	222	147	230	153	238	158	246	164	255	170
			4	9.75	634	172	115	178	118	184	122	189	126	195	130	201	133	206	137
			BFL	13.0	348	138	92.0	141	94.1	145	96.2	148	98.3	151	100	154	102	157	105
HEB 140	60.7	40.4	TFL	0.00	1180	202	134	213	141	223	149	234	156	245	163	255	170	266	177
			2	3.00	950	177	118	185	123	194	129	202	135	211	140	220	146	228	152
			3	6.00	719	151	100	157	105	164	109	170	113	177	118	183	122	190	126
			4	9.00	488	124	82.7	129	85.7	133	88.6	138	91.5	142	94.4	146	97.4	151	100
			BFL	12.0	257	97.2	64.7	99.6	66.2	102	67.8	104	69.3	107	70.9	109	72.4	111	73.9
HEB 120	40.9	27.2	TFL	0.00	935	152	101	160	106	168	112	177	118	185	123	194	129	202	134
			2	2.75	754	132	87.6	138	92.1	145	96.6	152	101	159	106	166	110	172	115
			3	5.50	572	111	74.1	117	77.6	122	81.0	127	84.4	132	87.8	137	91.3	142	94.7
			4	8.25	391	90.7	60.3	94.2	62.7	97.7	65.0	101	67.4	105	69.7	108	72.0	112	74.4
			BFL	11.0	209	69.5	46.2	71.4	47.5	73.3	48.8	75.2	50.0	77.0	51.3	78.9	52.5	80.8	53.8
HEB 100	25.8	17.2	TFL	0.00	716	110	72.9	116	77.2	122	81.5	129	85.8	135	90.0	142	94.3	148	98.6
			2	2.50	579	94.6	62.9	99.8	66.4	105	69.8	110	73.3	115	76.8	121	80.2	126	83.7
			3	5.00	441	79.2	52.7	83.2	55.4	87.2	58.0	91.2	60.6	95.1	63.3	99.1	65.9	103	68.6
			4	7.50	304	63.6	42.3	66.4	44.1	69.1	46.0	71.8	47.8	74.6	49.6	77.3	51.4	80.0	53.2
			BFL	10.0	166	47.7	31.7	49.2	32.7	50.7	33.7	52.2	34.7	53.7	35.7	55.2	36.7	56.7	37.7

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

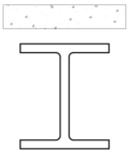
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	kN·m		PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 1000	4750	3160	TFL	0.00	14200	7030	4680	7160	4760	7280	4850	7410	4930	7540	5020	7670	5100	7800	5190
			2	9.00	12300	6930	4610	7050	4690	7160	4760	7270	4830	7380	4910	7490	4980	7600	5060
			3	18.0	10400	6830	4540	6920	4600	7010	4670	7110	4730	7200	4790	7290	4850	7390	4910
			4	27.0	8450	6700	4460	6780	4510	6850	4560	6930	4610	7000	4660	7080	4710	7160	4760
			BFL	36.0	6530	6560	4360	6620	4400	6680	4440	6740	4480	6790	4520	6850	4560	6910	4600
			6	126	5040	6390	4250	6440	4280	6480	4310	6530	4340	6570	4370	6620	4400	6660	4430
			7	237	3550	6080	4050	6110	4070	6140	4090	6180	4110	6210	4130	6240	4150	6270	4170
HEB 900	4020	2670	TFL	0.00	13200	5930	3950	6050	4030	6170	4100	6290	4180	6410	4260	6520	4340	6640	4420
			2	8.75	11300	5840	3890	5940	3950	6040	4020	6150	4090	6250	4160	6350	4220	6450	4290
			3	17.5	9450	5730	3820	5820	3870	5900	3930	5990	3990	6070	4040	6160	4100	6240	4150
			4	26.3	7590	5610	3740	5680	3780	5750	3830	5820	3870	5890	3920	5960	3960	6020	4010
			BFL	35.0	5730	5480	3650	5530	3680	5580	3710	5630	3750	5680	3780	5740	3820	5790	3850
			6	107	4510	5350	3560	5390	3590	5430	3610	5470	3640	5510	3670	5550	3700	5600	3720
			7	199	3300	5130	3410	5160	3430	5190	3450	5220	3470	5250	3490	5280	3510	5310	3530
HEB 800	3270	2170	TFL	0.00	11900	4800	3200	4910	3270	5020	3340	5130	3410	5230	3480	5340	3550	5450	3620
			2	8.25	10100	4720	3140	4810	3200	4900	3260	4990	3320	5080	3380	5170	3440	5270	3500
			3	16.5	8350	4620	3070	4700	3120	4770	3170	4850	3220	4920	3270	5000	3320	5070	3370
			4	24.8	6590	4510	3000	4570	3040	4630	3080	4690	3120	4750	3160	4810	3200	4870	3240
			BFL	33.0	4840	4380	2920	4430	2950	4470	2970	4510	3000	4560	3030	4600	3060	4650	3090
			6	86.1	3900	4300	2860	4330	2880	4370	2900	4400	2930	4440	2950	4470	2970	4510	3000
			7	161	2970	4150	2760	4180	2780	4200	2800	4230	2810	4260	2830	4280	2850	4310	2870
HEB 700	2660	1770	TFL	0.00	10900	3920	2610	4010	2670	4110	2740	4210	2800	4310	2870	4410	2930	4500	3000
			2	8.00	9170	3830	2550	3920	2610	4000	2660	4080	2720	4160	2770	4250	2820	4330	2880
			3	16.0	7470	3740	2490	3810	2530	3870	2580	3940	2620	4010	2670	4070	2710	4140	2760
			4	24.0	5770	3630	2420	3680	2450	3730	2480	3790	2520	3840	2550	3890	2590	3940	2620
			BFL	32.0	4060	3510	2340	3550	2360	3580	2380	3620	2410	3660	2430	3690	2460	3730	2480
			6	69.1	3390	3450	2300	3480	2320	3510	2340	3540	2360	3570	2380	3600	2400	3630	2420
			7	125	2720	3360	2240	3390	2250	3410	2270	3440	2290	3460	2300	3480	2320	3510	2330
HEB 650	2340	1560	TFL	0.00	10200	3430	2280	3520	2340	3610	2400	3700	2460	3800	2530	3890	2590	3980	2650
			2	7.75	8510	3350	2230	3430	2280	3500	2330	3580	2380	3660	2430	3730	2480	3810	2530
			3	15.5	6860	3260	2170	3320	2210	3380	2250	3440	2290	3510	2330	3570	2370	3630	2410
			4	23.3	5210	3160	2100	3200	2130	3250	2160	3300	2190	3340	2220	3390	2260	3440	2290
			BFL	31.0	3560	3040	2020	3070	2040	3110	2070	3140	2090	3170	2110	3200	2130	3230	2150
			6	57.1	3050	3000	1990	3030	2010	3050	2030	3080	2050	3110	2070	3140	2090	3160	2100
			7	101	2540	2940	1960	2960	1970	2980	1990	3010	2000	3030	2020	3050	2030	3080	2050
HEB 600	2050	1370	TFL	0.00	9580	3020	2010	3110	2070	3190	2120	3280	2180	3360	2240	3450	2300	3540	2350
			2	7.50	7990	2940	1960	3010	2010	3090	2050	3160	2100	3230	2150	3300	2200	3370	2240
			3	15.0	6390	2850	1900	2910	1940	2970	1980	3030	2010	3080	2050	3140	2090	3200	2130
			4	22.5	4790	2760	1830	2800	1860	2840	1890	2880	1920	2930	1950	2970	1980	3010	2010
			BFL	30.0	3200	2650	1760	2670	1780	2700	1800	2730	1820	2760	1840	2790	1860	2820	1870
			6	50.7	2800	2610	1740	2640	1760	2660	1770	2690	1790	2710	1810	2740	1820	2760	1840
			7	82.3	2400	2570	1710	2590	1730	2610	1740	2640	1750	2660	1770	2680	1780	2700	1800
HEB 550	1790	1190	TFL	0.00	9020	2640	1760	2720	1810	2800	1860	2880	1920	2960	1970	3040	2030	3130	2080
			2	7.25	7480	2560	1710	2630	1750	2700	1800	2770	1840	2830	1880	2900	1930	2970	1970
			3	14.5	5930	2480	1650	2530	1690	2590	1720	2640	1760	2690	1790	2750	1830	2800	1860
			4	21.8	4390	2380	1590	2420	1610	2460	1640	2500	1670	2540	1690	2580	1720	2620	1740
			BFL	29.0	2840	2280	1520	2310	1530	2330	1550	2360	1570	2380	1590	2410	1600	2430	1620
			6	44.5	2550	2260	1500	2280	1520	2300	1530	2330	1550	2350	1560	2370	1580	2390	1590
			7	63.3	2260	2230	1480	2250	1500	2270	1510	2290	1520	2310	1540	2330	1550	2350	1560
HEB 500	1540	1020	TFL	0.00	8470	2290	1520	2360	1570	2440	1620	2520	1670	2590	1720	2670	1780	2740	1830
			2	7.00	6980	2220	1470	2280	1520	2340	1560	2400	1600	2470	1640	2530	1680	2590	1720
			3	14.0	5490	2130	1420	2180	1450	2230	1490	2280	1520	2330	1550	2380	1580	2430	1620
			4	21.0	4000	2040	1360	2080	1380	2120	1410	2150	1430	2190	1460	2220	1480	2260	1500
			BFL	28.0	2510	1940	1290	1970	1310	1990	1320	2010	1340	2030	1350	2060	1370	2080	1380
			6	38.5	2310	1930	1280	1950	1300	1970	1310	1990	1320	2010	1340	2030	1350	2050	1370
			7	49.0	2120	1910	1270	1930	1290	1950	1300	1970	1310	1990	1320	2010	1340	2030	1350

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

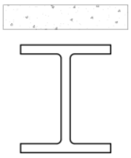
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	kN·m		PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 1000	4750	3160	TFL	0.00	14200	7920	5270	8050	5360	8180	5440	8310	5530	8430	5610	8560	5700	8690	5780
			2	9.00	12300	7710	5130	7820	5200	7930	5280	8040	5350	8150	5420	8260	5500	8370	5570
			3	18.0	10400	7480	4980	7570	5040	7670	5100	7760	5160	7850	5220	7940	5290	8040	5350
			4	27.0	8450	7230	4810	7310	4860	7380	4910	7460	4960	7540	5010	7610	5070	7690	5120
			BFL	36.0	6530	6970	4640	7030	4680	7090	4720	7150	4760	7210	4790	7270	4830	7320	4870
			6	126	5040	6710	4460	6750	4490	6800	4520	6840	4550	6890	4580	6940	4610	6980	4640
			7	237	3550	6300	4190	6340	4220	6370	4240	6400	4260	6430	4280	6460	4300	6500	4320
HEB 900	4020	2670	TFL	0.00	13200	6760	4500	6880	4580	7000	4660	7120	4740	7240	4810	7360	4890	7470	4970
			2	8.75	11300	6550	4360	6660	4430	6760	4500	6860	4560	6960	4630	7060	4700	7160	4770
			3	17.5	9450	6330	4210	6420	4270	6500	4320	6590	4380	6670	4440	6760	4490	6840	4550
			4	26.3	7590	6090	4050	6160	4100	6230	4140	6300	4190	6370	4240	6430	4280	6500	4330
			BFL	35.0	5730	5840	3890	5890	3920	5940	3950	5990	3990	6050	4020	6100	4060	6150	4090
			6	107	4510	5640	3750	5680	3780	5720	3800	5760	3830	5800	3860	5840	3880	5880	3910
			7	199	3300	5340	3550	5370	3570	5400	3590	5430	3610	5460	3630	5490	3650	5520	3670
HEB 800	3270	2170	TFL	0.00	11900	5550	3690	5660	3770	5770	3840	5870	3910	5980	3980	6090	4050	6190	4120
			2	8.25	10100	5360	3560	5450	3620	5540	3680	5630	3750	5720	3810	5810	3870	5900	3930
			3	16.5	8350	5150	3420	5220	3470	5300	3520	5370	3570	5450	3620	5520	3670	5600	3720
			4	24.8	6590	4920	3280	4980	3320	5040	3360	5100	3390	5160	3430	5220	3470	5280	3510
			BFL	33.0	4840	4690	3120	4730	3150	4780	3180	4820	3210	4860	3240	4910	3260	4950	3290
			6	86.1	3900	4540	3020	4580	3040	4610	3070	4650	3090	4680	3110	4720	3140	4750	3160
			7	161	2970	4340	2880	4360	2900	4390	2920	4420	2940	4440	2960	4470	2970	4500	2990
HEB 700	2660	1770	TFL	0.00	10900	4600	3060	4700	3130	4800	3190	4890	3260	4990	3320	5090	3390	5190	3450
			2	8.00	9170	4410	2930	4490	2990	4580	3040	4660	3100	4740	3150	4820	3210	4910	3260
			3	16.0	7470	4210	2800	4280	2840	4340	2890	4410	2930	4480	2980	4540	3020	4610	3070
			4	24.0	5770	3990	2660	4050	2690	4100	2730	4150	2760	4200	2800	4250	2830	4310	2860
			BFL	32.0	4060	3770	2510	3800	2530	3840	2550	3880	2580	3910	2600	3950	2630	3990	2650
			6	69.1	3390	3660	2440	3700	2460	3730	2480	3760	2500	3790	2520	3820	2540	3850	2560
			7	125	2720	3530	2350	3560	2370	3580	2380	3610	2400	3630	2420	3660	2430	3680	2450
HEB 650	2340	1560	TFL	0.00	10200	4070	2710	4160	2770	4250	2830	4340	2890	4440	2950	4530	3010	4620	3070
			2	7.75	8510	3890	2590	3960	2640	4040	2690	4120	2740	4190	2790	4270	2840	4350	2890
			3	15.5	6860	3690	2460	3750	2500	3810	2540	3880	2580	3940	2620	4000	2660	4060	2700
			4	23.3	5210	3480	2320	3530	2350	3580	2380	3620	2410	3670	2440	3720	2470	3770	2510
			BFL	31.0	3560	3270	2170	3300	2190	3330	2220	3360	2240	3390	2260	3430	2280	3460	2300
			6	57.1	3050	3190	2120	3220	2140	3240	2160	3270	2180	3300	2200	3330	2210	3350	2230
			7	101	2540	3100	2060	3120	2080	3140	2090	3170	2110	3190	2120	3210	2140	3240	2150
HEB 600	2050	1370	TFL	0.00	9580	3620	2410	3710	2470	3800	2530	3880	2580	3970	2640	4050	2700	4140	2750
			2	7.50	7990	3450	2290	3520	2340	3590	2390	3660	2440	3730	2480	3800	2530	3880	2580
			3	15.0	6390	3260	2170	3310	2200	3370	2240	3430	2280	3490	2320	3540	2360	3600	2400
			4	22.5	4790	3060	2030	3100	2060	3140	2090	3190	2120	3230	2150	3270	2180	3320	2210
			BFL	30.0	3200	2850	1890	2880	1910	2900	1930	2930	1950	2960	1970	2990	1990	3020	2010
			6	50.7	2800	2790	1860	2810	1870	2840	1890	2860	1910	2890	1920	2910	1940	2940	1960
			7	82.3	2400	2720	1810	2740	1830	2770	1840	2790	1850	2810	1870	2830	1880	2850	1900
HEB 550	1790	1190	TFL	0.00	9020	3210	2130	3290	2190	3370	2240	3450	2300	3530	2350	3610	2400	3690	2460
			2	7.25	7480	3030	2020	3100	2060	3170	2110	3240	2150	3300	2200	3370	2240	3440	2290
			3	14.5	5930	2850	1900	2910	1930	2960	1970	3010	2000	3070	2040	3120	2080	3170	2110
			4	21.8	4390	2660	1770	2700	1800	2740	1820	2780	1850	2820	1880	2860	1900	2900	1930
			BFL	29.0	2840	2460	1640	2480	1650	2510	1670	2540	1690	2560	1700	2590	1720	2610	1740
			6	44.5	2550	2420	1610	2440	1620	2460	1640	2490	1650	2510	1670	2530	1680	2560	1700
			7	63.3	2260	2370	1580	2390	1590	2410	1610	2430	1620	2450	1630	2470	1650	2490	1660
HEB 500	1540	1020	TFL	0.00	8470	2820	1880	2900	1930	2970	1980	3050	2030	3130	2080	3200	2130	3280	2180
			2	7.00	6980	2650	1770	2720	1810	2780	1850	2840	1890	2910	1930	2970	1980	3030	2020
			3	14.0	5490	2480	1650	2530	1680	2580	1720	2630	1750	2680	1780	2730	1810	2780	1850
			4	21.0	4000	2300	1530	2330	1550	2370	1570	2400	1600	2440	1620	2480	1650	2510	1670
			BFL	28.0	2510	2100	1400	2120	1410	2150	1430	2170	1440	2190	1460	2210	1470	2240	1490
			6	38.5	2310	2070	1380	2100	1390	2120	1410	2140	1420	2160	1440	2180	1450	2200	1460
			7	49.0	2120	2050	1360	2060	1370	2080	1390	2100	1400	2120	1410	2140	1420	2160	1440

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

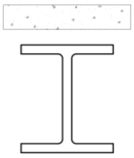
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	kN·m		PNA	$Y1^{a}$	$\Sigma Q_n{}^{d}$	$Y2^{b}$, mm													
	$\phi_b M_p$	M_p/Ω_b				50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 450	1270	846	TFL	0.00	7740	1920	1270	1990	1320	2050	1370	2120	1410	2190	1460	2260	1510	2330	1550
			2	6.50	6350	1850	1230	1910	1270	1960	1310	2020	1340	2080	1380	2140	1420	2190	1460
			3	13.0	4970	1770	1180	1820	1210	1860	1240	1910	1270	1950	1300	2000	1330	2040	1360
			4	19.5	3590	1690	1130	1720	1150	1760	1170	1790	1190	1820	1210	1850	1230	1890	1250
			BFL	26.0	2200	1600	1070	1620	1080	1640	1090	1660	1110	1680	1120	1700	1130	1720	1140
			6	33.3	2070	1590	1060	1610	1070	1630	1080	1650	1100	1670	1110	1680	1120	1700	1130
			7	40.6	1930	1580	1050	1600	1060	1620	1080	1630	1090	1650	1100	1670	1110	1690	1120
HEB 400	1030	687	TFL	0.00	7020	1580	1050	1640	1090	1710	1140	1770	1180	1830	1220	1900	1260	1960	1300
			2	6.00	5740	1520	1010	1570	1050	1620	1080	1670	1110	1730	1150	1780	1180	1830	1220
			3	12.0	4470	1450	965	1490	992	1530	1020	1570	1050	1610	1070	1650	1100	1690	1130
			4	18.0	3190	1380	916	1410	935	1430	954	1460	973	1490	992	1520	1010	1550	1030
			BFL	24.0	1910	1290	861	1310	873	1330	884	1350	896	1360	907	1380	919	1400	930
			6	28.3	1830	1290	858	1310	869	1320	880	1340	891	1360	902	1370	913	1390	924
			7	32.7	1760	1280	854	1300	865	1320	875	1330	886	1350	896	1360	907	1380	917
HEB 360	857	570	TFL	0.00	6410	1330	883	1380	921	1440	960	1500	998	1560	1040	1620	1070	1670	1110
			2	5.63	5210	1270	845	1320	876	1360	908	1410	939	1460	970	1500	1000	1550	1030
			3	11.3	4020	1210	803	1240	827	1280	851	1320	875	1350	899	1390	923	1420	947
			4	16.9	2820	1140	757	1160	774	1190	791	1210	808	1240	825	1260	842	1290	858
			BFL	22.5	1620	1060	707	1080	717	1090	727	1110	736	1120	746	1140	756	1150	765
			6	23.0	1610	1060	707	1080	717	1090	726	1110	736	1120	745	1130	755	1150	765
			7	23.4	1600	1060	707	1080	716	1090	726	1110	735	1120	745	1130	755	1150	764
HEB 340	769	512	TFL	0.00	6070	1200	799	1260	836	1310	872	1370	908	1420	945	1470	981	1530	1020
			2	5.38	4920	1150	763	1190	793	1240	822	1280	852	1320	881	1370	910	1410	940
			3	10.8	3780	1090	723	1120	746	1160	769	1190	791	1220	814	1260	836	1290	859
			4	16.1	2630	1020	680	1050	696	1070	711	1090	727	1120	743	1140	759	1160	774
			BFL	21.5	1490	951	633	964	642	978	650	991	659	1000	668	1020	677	1030	686
HEB 320	687	457	TFL	0.00	5730	1080	720	1130	754	1190	789	1240	823	1290	857	1340	891	1390	926
			2	5.13	4630	1030	686	1070	713	1110	741	1160	769	1200	797	1240	824	1280	852
			3	10.3	3540	974	648	1010	669	1040	690	1070	712	1100	733	1130	754	1170	775
			4	15.4	2450	912	607	934	622	956	636	978	651	1000	666	1020	680	1040	695
			BFL	20.5	1360	845	563	858	571	870	579	882	587	894	595	907	603	919	611
HEB 300	597	397	TFL	0.00	5290	953	634	1000	666	1050	697	1100	729	1140	761	1190	792	1240	824
			2	4.75	4280	905	602	944	628	982	653	1020	679	1060	705	1100	730	1140	756
			3	9.50	3270	853	568	882	587	912	607	941	626	971	646	1000	665	1030	685
			4	14.3	2260	797	530	817	544	837	557	858	571	878	584	898	598	919	611
			BFL	19.0	1250	736	490	747	497	758	505	770	512	781	520	792	527	803	534
HEB 280	490	326	TFL	0.00	4660	798	531	840	559	882	587	924	615	966	642	1010	670	1050	698
			2	4.50	3770	756	503	790	525	823	548	857	570	891	593	925	616	959	638
			3	9.00	2880	710	472	736	490	762	507	788	524	813	541	839	558	865	576
			4	13.5	1980	661	440	678	451	696	463	714	475	732	487	750	499	768	511
			BFL	18.0	1090	608	404	617	411	627	417	637	424	647	430	657	437	666	443
HEB 260	410	273	TFL	0.00	4200	681	453	719	478	757	503	794	529	832	554	870	579	908	604
			2	4.38	3400	643	428	674	448	704	468	735	489	765	509	796	529	826	550
			3	8.75	2590	602	400	625	416	648	431	672	447	695	462	718	478	742	493
			4	13.1	1780	558	371	574	382	590	392	606	403	622	414	638	424	654	435
			BFL	17.5	973	510	339	519	345	528	351	536	357	545	363	554	369	563	374

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

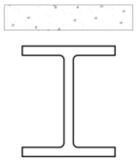
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

$F_y = 355$ MPa

Shape	kN·m		PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 450	1270	846	TFL	0.00	7740	2400	1600	2470	1650	2540	1690	2610	1740	2680	1780	2750	1830	2820	1880
			2	6.50	6350	2250	1500	2310	1530	2360	1570	2420	1610	2480	1650	2540	1690	2590	1720
			3	13.0	4970	2090	1390	2130	1420	2180	1450	2220	1480	2270	1510	2310	1540	2360	1570
			4	19.5	3590	1920	1280	1950	1300	1980	1320	2010	1340	2050	1360	2080	1380	2110	1400
			BFL	26.0	2200	1740	1160	1760	1170	1780	1180	1800	1200	1820	1210	1840	1220	1860	1240
			6	33.3	2070	1720	1150	1740	1160	1760	1170	1780	1180	1800	1200	1820	1210	1830	1220
			7	40.6	1930	1700	1130	1720	1140	1740	1160	1760	1170	1770	1180	1790	1190	1810	1200
HEB 400	1030	687	TFL	0.00	7020	2020	1350	2090	1390	2150	1430	2210	1470	2280	1510	2340	1560	2400	1600
			2	6.00	5740	1880	1250	1930	1290	1980	1320	2040	1350	2090	1390	2140	1420	2190	1460
			3	12.0	4470	1730	1150	1770	1180	1810	1210	1850	1230	1890	1260	1930	1290	1970	1310
			4	18.0	3190	1580	1050	1610	1070	1630	1090	1660	1110	1690	1130	1720	1140	1750	1160
			BFL	24.0	1910	1420	941	1430	953	1450	964	1470	976	1480	987	1500	999	1520	1010
			6	28.3	1830	1400	935	1420	946	1440	957	1450	968	1470	979	1490	990	1500	1000
			7	32.7	1760	1390	928	1410	938	1430	949	1440	959	1460	970	1470	980	1490	991
HEB 360	857	570	TFL	0.00	6410	1730	1150	1790	1190	1850	1230	1900	1270	1960	1310	2020	1340	2080	1380
			2	5.63	5210	1600	1060	1650	1090	1690	1130	1740	1160	1790	1190	1830	1220	1880	1250
			3	11.3	4020	1460	971	1500	996	1530	1020	1570	1040	1600	1070	1640	1090	1680	1120
			4	16.9	2820	1320	875	1340	892	1370	909	1390	926	1420	943	1440	960	1470	976
			BFL	22.5	1620	1160	775	1180	785	1190	794	1210	804	1220	814	1240	824	1250	833
			6	23.0	1610	1160	774	1180	784	1190	794	1210	803	1220	813	1240	823	1250	832
			7	23.4	1600	1160	774	1180	783	1190	793	1210	803	1220	812	1240	822	1250	831
HEB 340	769	512	TFL	0.00	6070	1580	1050	1640	1090	1690	1130	1750	1160	1800	1200	1860	1240	1910	1270
			2	5.38	4920	1460	969	1500	999	1550	1030	1590	1060	1630	1090	1680	1120	1720	1150
			3	10.8	3780	1330	882	1360	904	1390	927	1430	949	1460	972	1500	995	1530	1020
			4	16.1	2630	1190	790	1210	806	1230	822	1260	837	1280	853	1310	869	1330	885
			BFL	21.5	1490	1040	695	1060	704	1070	713	1080	722	1100	731	1110	740	1120	748
HEB 320	687	457	TFL	0.00	5730	1440	960	1490	994	1550	1030	1600	1060	1650	1100	1700	1130	1750	1170
			2	5.13	4630	1320	880	1360	908	1410	935	1450	963	1490	991	1530	1020	1570	1050
			3	10.3	3540	1200	796	1230	818	1260	839	1290	860	1320	881	1360	903	1390	924
			4	15.4	2450	1070	710	1090	724	1110	739	1130	754	1150	768	1180	783	1200	798
			BFL	20.5	1360	931	620	943	628	956	636	968	644	980	652	992	660	1000	668
HEB 300	597	397	TFL	0.00	5290	1290	856	1330	887	1380	919	1430	951	1480	983	1520	1010	1570	1050
			2	4.75	4280	1170	782	1210	807	1250	833	1290	859	1330	884	1370	910	1410	935
			3	9.50	3270	1060	705	1090	724	1120	744	1150	763	1180	783	1210	802	1240	822
			4	14.3	2260	939	625	959	638	980	652	1000	665	1020	679	1040	692	1060	706
			BFL	19.0	1250	815	542	826	549	837	557	848	564	859	572	871	579	882	587
HEB 280	490	326	TFL	0.00	4660	1090	726	1130	754	1180	782	1220	810	1260	838	1300	866	1340	894
			2	4.50	3770	993	661	1030	683	1060	706	1090	728	1130	751	1160	774	1200	796
			3	9.00	2880	891	593	917	610	943	627	969	645	995	662	1020	679	1050	696
			4	13.5	1980	785	523	803	534	821	546	839	558	857	570	875	582	892	594
			BFL	18.0	1090	676	450	686	456	696	463	705	469	715	476	725	482	735	489
HEB 260	410	273	TFL	0.00	4200	946	629	984	654	1020	680	1060	705	1100	730	1130	755	1170	780
			2	4.38	3400	857	570	887	590	918	611	949	631	979	651	1010	672	1040	692
			3	8.75	2590	765	509	788	524	811	540	835	555	858	571	881	586	905	602
			4	13.1	1780	670	446	686	456	702	467	718	478	734	488	750	499	766	510
			BFL	17.5	973	571	380	580	386	589	392	598	398	606	403	615	409	624	415

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

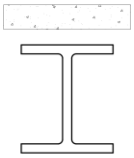
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	kN·m		PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 240	336	224	TFL	0.00	3760	576	383	610	406	643	428	677	451	711	473	745	496	779	518
			2	4.25	3040	542	360	569	379	596	397	624	415	651	433	679	451	706	470
			3	8.50	2310	505	336	526	350	547	364	568	378	588	391	609	405	630	419
			4	12.8	1590	466	310	480	319	494	329	508	338	523	348	537	357	551	367
			BFL	17.0	866	423	282	431	287	439	292	447	297	454	302	462	308	470	313
HEB 220	264	176	TFL	0.00	3230	465	310	494	329	524	348	553	368	582	387	611	406	640	426
			2	4.00	2610	436	290	460	306	483	321	507	337	530	353	553	368	577	384
			3	8.00	1980	405	269	423	281	440	293	458	305	476	317	494	329	512	340
			4	12.0	1360	371	247	383	255	395	263	408	271	420	279	432	287	444	296
			BFL	16.0	733	335	223	342	227	348	232	355	236	361	240	368	245	375	249
HEB 200	205	137	TFL	0.00	2770	374	249	399	266	424	282	449	299	474	315	499	332	524	349
			2	3.75	2240	349	232	369	246	390	259	410	273	430	286	450	299	470	313
			3	7.50	1710	323	215	338	225	353	235	369	245	384	256	399	266	415	276
			4	11.3	1170	294	196	305	203	315	210	326	217	336	224	347	231	358	238
			BFL	15.0	642	264	176	270	179	276	183	281	187	287	191	293	195	299	199
HEB180	154	102	TFL	0.00	2320	292	194	313	208	334	222	354	236	375	250	396	264	417	277
			2	3.50	1870	271	180	288	192	305	203	321	214	338	225	355	236	372	247
			3	7.00	1420	249	166	262	174	274	183	287	191	300	200	313	208	326	217
			4	10.5	974	225	150	234	156	243	161	251	167	260	173	269	179	278	185
			BFL	14.0	527	200	133	205	136	210	139	214	143	219	146	224	149	229	152
HEB 160	113	75.3	TFL	0.00	1930	225	150	243	161	260	173	277	185	295	196	312	208	329	219
			2	3.25	1560	208	139	222	148	236	157	250	166	264	176	278	185	292	194
			3	6.50	1190	190	126	201	133	211	141	222	148	233	155	243	162	254	169
			4	9.75	818	171	114	178	118	185	123	193	128	200	133	207	138	215	143
			BFL	13.0	449	150	100	154	103	158	105	162	108	166	111	170	113	174	116
HEB 140	78.4	52.2	TFL	0.00	1530	165	110	178	119	192	128	206	137	220	146	233	155	247	164
			2	3.00	1230	151	100	162	108	173	115	184	122	195	130	206	137	217	144
			3	6.00	929	136	90.7	145	96.2	153	102	161	107	170	113	178	118	186	124
			4	9.00	630	121	80.4	127	84.2	132	87.9	138	91.7	144	95.5	149	99.3	155	103
			BFL	12.0	332	105	69.6	108	71.6	111	73.6	114	75.6	117	77.5	120	79.5	123	81.5
HEB 120	52.8	35.1	TFL	0.00	1210	120	79.5	130	86.8	141	94.0	152	101	163	108	174	116	185	123
			2	2.75	973	109	72.3	117	78.1	126	84.0	135	89.8	144	95.6	152	101	161	107
			3	5.50	739	97.3	64.7	104	69.1	111	73.6	117	78.0	124	82.4	131	86.8	137	91.3
			4	8.25	504	85.3	56.7	89.8	59.8	94.4	62.8	98.9	65.8	103	68.8	108	71.8	113	74.9
			BFL	11.0	270	72.7	48.4	75.1	50.0	77.6	51.6	80.0	53.2	82.4	54.9	84.9	56.5	87.3	58.1
HEB 100	33.3	22.2	TFL	0.00	924	83.2	55.4	91.5	60.9	99.8	66.4	108	72.0	116	77.5	125	83.0	133	88.6
			2	2.50	747	75.0	49.9	81.7	54.4	88.5	58.9	95.2	63.3	102	67.8	109	72.3	115	76.7
			3	5.00	569	66.4	44.2	71.5	47.6	76.7	51.0	81.8	54.4	86.9	57.8	92.0	61.2	97.2	64.7
			4	7.50	392	57.4	38.2	61.0	40.6	64.5	42.9	68.0	45.3	71.5	47.6	75.1	49.9	78.6	52.3
			BFL	10.0	214	48.1	32.0	50.0	33.3	51.9	34.5	53.8	35.8	55.8	37.1	57.7	38.4	59.6	39.7

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

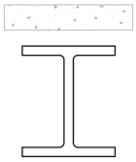
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEB Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	kN·m		PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	$\phi_b M_p$	M_p/Ω_b				120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEB 240	336	224	TFL	0.00	3760	813	541	847	563	881	586	914	608	948	631	982	653	1020	676
			2	4.25	3040	733	488	761	506	788	524	815	542	843	561	870	579	897	597
			3	8.50	2310	651	433	672	447	693	461	713	475	734	488	755	502	776	516
			4	12.8	1590	566	376	580	386	594	395	609	405	623	414	637	424	652	434
			BFL	17.0	866	478	318	486	323	493	328	501	333	509	339	517	344	525	349
HEB 220	264	176	TFL	0.00	3230	669	445	698	464	727	484	756	503	785	523	814	542	844	561
			2	4.00	2610	600	399	624	415	647	431	671	446	694	462	718	478	741	493
			3	8.00	1980	530	352	547	364	565	376	583	388	601	400	619	412	637	424
			4	12.0	1360	456	304	469	312	481	320	493	328	505	336	518	344	530	352
			BFL	16.0	733	381	254	388	258	394	262	401	267	407	271	414	275	421	280
HEB 200	205	137	TFL	0.00	2770	549	365	574	382	599	398	624	415	649	432	674	448	699	465
			2	3.75	2240	490	326	511	340	531	353	551	367	571	380	591	393	611	407
			3	7.50	1710	430	286	446	296	461	307	476	317	492	327	507	337	522	348
			4	11.3	1170	368	245	379	252	389	259	400	266	410	273	421	280	432	287
			BFL	15.0	642	304	203	310	206	316	210	322	214	328	218	333	222	339	226
HEB180	154	102	TFL	0.00	2320	438	291	459	305	479	319	500	333	521	347	542	361	563	375
			2	3.50	1870	389	259	406	270	422	281	439	292	456	303	473	315	490	326
			3	7.00	1420	338	225	351	234	364	242	377	251	390	259	402	268	415	276
			4	10.5	974	287	191	295	196	304	202	313	208	322	214	330	220	339	226
			BFL	14.0	527	233	155	238	158	243	162	248	165	252	168	257	171	262	174
HEB 160	113	75.3	TFL	0.00	1930	347	231	364	242	381	254	399	265	416	277	433	288	451	300
			2	3.25	1560	306	204	320	213	334	222	348	232	362	241	376	250	390	260
			3	6.50	1190	265	176	275	183	286	190	297	197	307	205	318	212	329	219
			4	9.75	818	222	148	230	153	237	158	244	163	252	167	259	172	266	177
			BFL	13.0	449	179	119	183	121	187	124	191	127	195	130	199	132	203	135
HEB 140	78.4	52.2	TFL	0.00	1530	261	174	275	183	288	192	302	201	316	210	329	219	343	228
			2	3.00	1230	228	152	239	159	250	167	261	174	272	181	283	189	294	196
			3	6.00	929	195	130	203	135	211	141	220	146	228	152	237	157	245	163
			4	9.00	630	161	107	166	111	172	114	178	118	183	122	189	126	195	129
			BFL	12.0	332	126	83.5	129	85.5	132	87.5	134	89.5	137	91.5	140	93.5	143	95.5
HEB 120	52.8	35.1	TFL	0.00	1210	196	130	206	137	217	145	228	152	239	159	250	166	261	174
			2	2.75	973	170	113	179	119	188	125	196	131	205	136	214	142	223	148
			3	5.50	739	144	95.7	150	100	157	105	164	109	170	113	177	118	184	122
			4	8.25	504	117	77.9	122	80.9	126	83.9	131	87.0	135	90.0	140	93.0	144	96.0
			BFL	11.0	270	89.7	59.7	92.2	61.3	94.6	62.9	97.0	64.6	99.5	66.2	102	67.8	104	69.4
HEB 100	33.3	22.2	TFL	0.00	924	141	94.1	150	99.6	158	105	166	111	175	116	183	122	191	127
			2	2.50	747	122	81.2	129	85.7	136	90.2	142	94.6	149	99.1	156	104	162	108
			3	5.00	569	102	68.1	107	71.5	113	74.9	118	78.3	123	81.7	128	85.1	133	88.5
			4	7.50	392	82.1	54.6	85.7	57.0	89.2	59.3	92.7	61.7	96.2	64.0	99.8	66.4	103	68.7
			BFL	10.0	214	61.6	41.0	63.5	42.2	65.4	43.5	67.4	44.8	69.3	46.1	71.2	47.4	73.1	48.7

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

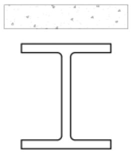
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 1000	3500	2330	TFL	0.00	10400	5200	3460	5300	3530	5390	3590	5490	3650	5580	3710	5670	3780	5770	3840
			2	10.0	9020	5130	3420	5220	3470	5300	3520	5380	3580	5460	3630	5540	3690	5620	3740
			3	20.0	7600	5050	3360	5120	3410	5190	3450	5260	3500	5330	3540	5390	3590	5460	3630
			4	30.0	6180	4960	3300	5010	3330	5070	3370	5120	3410	5180	3450	5230	3480	5290	3520
			BFL	40.0	4760	4850	3220	4890	3250	4930	3280	4980	3310	5020	3340	5060	3370	5100	3400
			6	131	3690	4720	3140	4750	3160	4790	3190	4820	3210	4850	3230	4890	3250	4920	3270
			7	240	2610	4490	2990	4520	3010	4540	3020	4560	3040	4590	3050	4610	3070	4630	3080
HEM 900	3050	2030	TFL	0.00	9950	4520	3010	4610	3070	4700	3130	4790	3190	4880	3250	4970	3310	5060	3370
			2	10.0	8540	4450	2960	4530	3010	4610	3070	4680	3120	4760	3170	4840	3220	4920	3270
			3	20.0	7120	4370	2910	4440	2950	4500	2990	4560	3040	4630	3080	4690	3120	4760	3160
			4	30.0	5700	4280	2840	4330	2880	4380	2910	4430	2950	4480	2980	4530	3020	4580	3050
			BFL	40.0	4280	4170	2770	4210	2800	4240	2820	4280	2850	4320	2870	4360	2900	4400	2930
			6	112	3380	4070	2710	4100	2730	4130	2750	4160	2770	4190	2790	4220	2810	4250	2830
			7	203	2490	3900	2600	3920	2610	3950	2630	3970	2640	3990	2660	4010	2670	4040	2690
HEM 800	2640	1760	TFL	0.00	9500	3910	2600	3990	2660	4080	2710	4160	2770	4250	2830	4340	2880	4420	2940
			2	10.0	8080	3840	2550	3910	2600	3980	2650	4060	2700	4130	2750	4200	2790	4270	2840
			3	20.0	6650	3750	2500	3810	2540	3870	2580	3930	2620	3990	2660	4050	2700	4110	2740
			4	30.0	5230	3660	2430	3700	2470	3750	2500	3800	2530	3850	2560	3890	2590	3940	2620
			BFL	40.0	3800	3550	2360	3580	2380	3620	2410	3650	2430	3690	2450	3720	2480	3750	2500
			6	93.9	3090	3480	2310	3500	2330	3530	2350	3560	2370	3590	2390	3610	2400	3640	2420
			7	166	2380	3360	2240	3380	2250	3400	2260	3420	2280	3450	2290	3470	2310	3490	2320
HEM 700	2230	1480	TFL	0.00	9000	3300	2200	3390	2250	3470	2310	3550	2360	3630	2410	3710	2470	3790	2520
			2	10.0	7570	3230	2150	3300	2200	3370	2240	3440	2290	3510	2330	3570	2380	3640	2420
			3	20.0	6140	3150	2100	3210	2130	3260	2170	3320	2210	3370	2240	3430	2280	3480	2320
			4	30.0	4710	3050	2030	3100	2060	3140	2090	3180	2120	3220	2150	3270	2170	3310	2200
			BFL	40.0	3290	2940	1960	2970	1980	3000	2000	3030	2020	3060	2040	3090	2060	3120	2080
			6	77.6	2770	2890	1930	2920	1940	2940	1960	2970	1980	2990	1990	3020	2010	3040	2030
			7	130	2250	2820	1880	2840	1890	2860	1910	2880	1920	2900	1930	2920	1950	2940	1960
HEM 650	2040	1360	TFL	0.00	8780	3040	2020	3110	2070	3190	2120	3270	2180	3350	2230	3430	2280	3510	2330
			2	10.0	7350	2960	1970	3030	2020	3100	2060	3160	2100	3230	2150	3290	2190	3360	2240
			3	20.0	5910	2880	1920	2930	1950	2990	1990	3040	2020	3090	2060	3150	2090	3200	2130
			4	30.0	4480	2780	1850	2820	1880	2860	1910	2900	1930	2940	1960	2990	1990	3030	2010
			BFL	40.0	3050	2670	1780	2700	1800	2730	1820	2760	1830	2780	1850	2810	1870	2840	1890
			6	68.4	2620	2630	1750	2660	1770	2680	1780	2700	1800	2730	1820	2750	1830	2780	1850
			7	112	2200	2580	1720	2600	1730	2620	1740	2640	1760	2660	1770	2680	1780	2700	1800
HEM 600	1860	1230	TFL	0.00	8550	2770	1840	2850	1890	2920	1940	3000	2000	3080	2050	3150	2100	3230	2150
			2	10.0	7110	2700	1800	2760	1840	2830	1880	2890	1920	2950	1970	3020	2010	3080	2050
			3	20.0	5680	2610	1740	2670	1770	2720	1810	2770	1840	2820	1880	2870	1910	2920	1940
			4	30.0	4250	2520	1680	2560	1700	2590	1730	2630	1750	2670	1780	2710	1800	2750	1830
			BFL	40.0	2810	2410	1600	2430	1620	2460	1640	2480	1650	2510	1670	2530	1690	2560	1700
			6	62.0	2470	2380	1580	2400	1600	2420	1610	2440	1630	2470	1640	2490	1660	2510	1670
			7	93.5	2140	2340	1560	2360	1570	2380	1580	2400	1590	2420	1610	2430	1620	2450	1630
HEM 550	1680	1120	TFL	0.00	8330	2520	1680	2590	1730	2670	1780	2740	1830	2820	1880	2890	1930	2970	1970
			2	10.0	6890	2450	1630	2510	1670	2570	1710	2630	1750	2700	1790	2760	1830	2820	1880
			3	20.0	5450	2360	1570	2410	1600	2460	1640	2510	1670	2560	1700	2610	1740	2660	1770
			4	30.0	4010	2270	1510	2300	1530	2340	1560	2370	1580	2410	1600	2450	1630	2480	1650
			BFL	40.0	2580	2160	1430	2180	1450	2200	1470	2230	1480	2250	1500	2270	1510	2300	1530
			6	56.1	2330	2130	1420	2160	1430	2180	1450	2200	1460	2220	1480	2240	1490	2260	1500
			7	75.0	2080	2110	1400	2130	1420	2150	1430	2170	1440	2180	1450	2200	1470	2220	1480
HEM 500	1500	998	TFL	0.00	8090	2270	1510	2340	1560	2420	1610	2490	1660	2560	1710	2640	1750	2710	1800
			2	10.0	6650	2200	1460	2260	1500	2320	1540	2380	1580	2440	1620	2500	1660	2560	1700
			3	20.0	5210	2120	1410	2160	1440	2210	1470	2260	1500	2300	1530	2350	1560	2400	1600
			4	30.0	3780	2020	1340	2050	1370	2090	1390	2120	1410	2160	1430	2190	1460	2220	1480
			BFL	40.0	2340	1910	1270	1930	1280	1950	1300	1970	1310	1990	1330	2010	1340	2040	1350
			6	50.3	2180	1900	1260	1920	1270	1940	1290	1950	1300	1970	1310	1990	1330	2010	1340
			7	60.6	2020	1880	1250	1900	1260	1920	1280	1940	1290	1950	1300	1970	1310	1990	1320

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

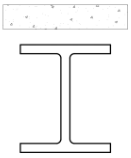
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 1000	3500	2330	TFL	0.00	10400	5860	3900	5960	3960	6050	4030	6140	4090	6240	4150	6330	4210	6430	4280
			2	10.0	9020	5700	3790	5780	3850	5870	3900	5950	3960	6030	4010	6110	4060	6190	4120
			3	20.0	7600	5530	3680	5600	3720	5670	3770	5740	3820	5800	3860	5870	3910	5940	3950
			4	30.0	6180	5350	3560	5400	3590	5460	3630	5510	3670	5570	3700	5620	3740	5680	3780
			BFL	40.0	4760	5150	3420	5190	3450	5230	3480	5280	3510	5320	3540	5360	3570	5400	3600
			6	131	3690	4950	3300	4990	3320	5020	3340	5050	3360	5090	3380	5120	3410	5150	3430
			7	240	2610	4660	3100	4680	3110	4700	3130	4730	3150	4750	3160	4780	3180	4800	3190
HEM 900	3050	2030	TFL	0.00	9950	5150	3430	5240	3490	5330	3550	5420	3610	5510	3670	5600	3730	5690	3790
			2	10.0	8540	4990	3320	5070	3370	5150	3420	5220	3470	5300	3530	5380	3580	5450	3630
			3	20.0	7120	4820	3210	4880	3250	4950	3290	5010	3330	5080	3380	5140	3420	5200	3460
			4	30.0	5700	4630	3080	4690	3120	4740	3150	4790	3190	4840	3220	4890	3250	4940	3290
			BFL	40.0	4280	4440	2950	4470	2980	4510	3000	4550	3030	4590	3050	4630	3080	4670	3110
			6	112	3380	4280	2850	4310	2870	4340	2890	4370	2910	4400	2930	4430	2950	4460	2970
			7	203	2490	4060	2700	4080	2720	4100	2730	4130	2740	4150	2760	4170	2770	4190	2790
HEM 800	2640	1760	TFL	0.00	9500	4510	3000	4590	3060	4680	3110	4760	3170	4850	3230	4930	3280	5020	3340
			2	10.0	8080	4350	2890	4420	2940	4490	2990	4560	3040	4640	3090	4710	3130	4780	3180
			3	20.0	6650	4170	2780	4230	2820	4290	2860	4350	2900	4410	2940	4470	2980	4530	3020
			4	30.0	5230	3990	2650	4030	2680	4080	2720	4130	2750	4180	2780	4220	2810	4270	2840
			BFL	40.0	3800	3790	2520	3820	2540	3860	2570	3890	2590	3930	2610	3960	2630	3990	2660
			6	93.9	3090	3670	2440	3700	2460	3730	2480	3750	2500	3780	2520	3810	2530	3840	2550
			7	166	2380	3510	2330	3530	2350	3550	2360	3570	2380	3590	2390	3620	2410	3640	2420
HEM 700	2230	1480	TFL	0.00	9000	3870	2580	3950	2630	4030	2680	4120	2740	4200	2790	4280	2850	4360	2900
			2	10.0	7570	3710	2470	3780	2510	3850	2560	3920	2610	3980	2650	4050	2700	4120	2740
			3	20.0	6140	3540	2350	3590	2390	3650	2430	3700	2460	3760	2500	3810	2540	3870	2570
			4	30.0	4710	3350	2230	3390	2260	3440	2290	3480	2310	3520	2340	3560	2370	3610	2400
			BFL	40.0	3290	3150	2100	3180	2120	3210	2140	3240	2160	3270	2180	3300	2200	3330	2220
			6	77.6	2770	3070	2040	3090	2060	3120	2080	3140	2090	3170	2110	3190	2120	3220	2140
			7	130	2250	2970	1970	2990	1990	3010	2000	3030	2010	3050	2030	3070	2040	3090	2050
HEM 650	2040	1360	TFL	0.00	8780	3590	2390	3670	2440	3750	2490	3830	2550	3900	2600	3980	2650	4060	2700
			2	10.0	7350	3430	2280	3490	2320	3560	2370	3630	2410	3690	2460	3760	2500	3820	2540
			3	20.0	5910	3250	2160	3310	2200	3360	2240	3410	2270	3470	2310	3520	2340	3570	2380
			4	30.0	4480	3070	2040	3110	2070	3150	2090	3190	2120	3230	2150	3270	2170	3310	2200
			BFL	40.0	3050	2870	1910	2890	1920	2920	1940	2950	1960	2980	1980	3000	2000	3030	2020
			6	68.4	2620	2800	1860	2820	1880	2850	1890	2870	1910	2890	1930	2920	1940	2940	1960
			7	112	2200	2720	1810	2740	1820	2760	1840	2780	1850	2800	1860	2820	1870	2840	1890
HEM 600	1860	1230	TFL	0.00	8550	3310	2200	3380	2250	3460	2300	3540	2350	3620	2410	3690	2460	3770	2510
			2	10.0	7110	3150	2090	3210	2140	3270	2180	3340	2220	3400	2260	3470	2310	3530	2350
			3	20.0	5680	2970	1980	3020	2010	3070	2050	3130	2080	3180	2110	3230	2150	3280	2180
			4	30.0	4250	2790	1850	2820	1880	2860	1900	2900	1930	2940	1950	2980	1980	3010	2010
			BFL	40.0	2810	2590	1720	2610	1740	2640	1750	2660	1770	2690	1790	2710	1800	2740	1820
			6	62.0	2470	2530	1690	2560	1700	2580	1720	2600	1730	2620	1740	2640	1760	2670	1770
			7	93.5	2140	2470	1650	2490	1660	2510	1670	2530	1680	2550	1700	2570	1710	2590	1720
HEM 550	1680	1120	TFL	0.00	8330	3040	2020	3120	2070	3190	2120	3270	2170	3340	2220	3420	2270	3490	2320
			2	10.0	6890	2880	1920	2940	1960	3010	2000	3070	2040	3130	2080	3190	2120	3250	2160
			3	20.0	5450	2710	1800	2760	1830	2800	1870	2850	1900	2900	1930	2950	1960	3000	2000
			4	30.0	4010	2520	1680	2560	1700	2590	1720	2630	1750	2660	1770	2700	1800	2740	1820
			BFL	40.0	2580	2320	1540	2340	1560	2360	1570	2390	1590	2410	1600	2430	1620	2460	1640
			6	56.1	2330	2280	1520	2300	1530	2320	1550	2340	1560	2360	1570	2390	1590	2410	1600
			7	75.0	2080	2240	1490	2260	1500	2280	1520	2300	1530	2310	1540	2330	1550	2350	1570
HEM 500	1500	998	TFL	0.00	8090	2780	1850	2850	1900	2930	1950	3000	2000	3070	2040	3150	2090	3220	2140
			2	10.0	6650	2620	1740	2680	1780	2740	1820	2800	1860	2860	1900	2920	1940	2980	1980
			3	20.0	5210	2450	1630	2490	1660	2540	1690	2590	1720	2630	1750	2680	1780	2730	1810
			4	30.0	3780	2260	1500	2290	1520	2330	1550	2360	1570	2390	1590	2430	1620	2460	1640
			BFL	40.0	2340	2060	1370	2080	1380	2100	1400	2120	1410	2140	1420	2160	1440	2180	1450
			6	50.3	2180	2030	1350	2050	1370	2070	1380	2090	1390	2110	1410	2130	1420	2150	1430
			7	60.6	2020	2010	1340	2030	1350	2040	1360	2060	1370	2080	1380	2100	1400	2120	1410

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

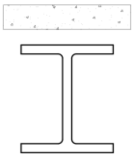
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 450	1340	891	TFL	0.00	7880	2050	1360	2120	1410	2190	1460	2260	1510	2330	1550	2400	1600	2480	1650
			2	10.0	6440	1980	1320	2040	1360	2090	1390	2150	1430	2210	1470	2270	1510	2330	1550
			3	20.0	5000	1890	1260	1940	1290	1980	1320	2030	1350	2070	1380	2120	1410	2160	1440
			4	30.0	3550	1800	1200	1830	1220	1860	1240	1890	1260	1920	1280	1960	1300	1990	1320
			BFL	40.0	2110	1690	1120	1710	1130	1720	1150	1740	1160	1760	1170	1780	1190	1800	1200
			6	44.6	2040	1680	1120	1700	1130	1720	1140	1740	1150	1750	1170	1770	1180	1790	1190
			7	49.1	1970	1670	1110	1690	1130	1710	1140	1730	1150	1750	1160	1760	1170	1780	1180
HEM 400	1180	784	TFL	0.00	7660	1830	1220	1900	1270	1970	1310	2040	1360	2110	1400	2180	1450	2250	1490
			2	10.0	6210	1760	1170	1820	1210	1870	1250	1930	1280	1990	1320	2040	1360	2100	1400
			3	20.0	4770	1680	1120	1720	1140	1760	1170	1810	1200	1850	1230	1890	1260	1930	1290
			4	30.0	3330	1580	1050	1610	1070	1640	1090	1670	1110	1700	1130	1730	1150	1760	1170
			BFL	40.0	1880	1470	978	1490	989	1500	1000	1520	1010	1540	1020	1550	1030	1570	1050
HEM 360	1060	702	TFL	0.00	7490	1670	1110	1740	1160	1800	1200	1870	1240	1940	1290	2010	1330	2070	1380
			2	10.0	6040	1600	1060	1650	1100	1710	1140	1760	1170	1810	1210	1870	1240	1920	1280
			3	20.0	4600	1510	1010	1550	1030	1600	1060	1640	1090	1680	1120	1720	1140	1760	1170
			4	30.0	3150	1410	941	1440	960	1470	979	1500	998	1530	1020	1560	1040	1580	1050
			BFL	40.0	1700	1300	868	1320	878	1330	888	1350	898	1370	908	1380	919	1400	929
HEM 340	998	664	TFL	0.00	7420	1590	1060	1660	1100	1730	1150	1790	1190	1860	1240	1930	1280	1990	1330
			2	10.0	5970	1520	1010	1570	1050	1630	1080	1680	1120	1740	1160	1790	1190	1840	1230
			3	20.0	4520	1440	956	1480	983	1520	1010	1560	1040	1600	1060	1640	1090	1680	1120
			4	30.0	3060	1340	890	1370	909	1390	927	1420	945	1450	964	1480	982	1500	1000
			BFL	40.0	1610	1230	816	1240	826	1260	836	1270	845	1290	855	1300	865	1310	874
HEM 320	938	624	TFL	0.00	7330	1510	1010	1580	1050	1650	1100	1710	1140	1780	1180	1840	1230	1910	1270
			2	10.0	5880	1440	960	1500	995	1550	1030	1600	1070	1650	1100	1710	1140	1760	1170
			3	20.0	4430	1360	903	1400	930	1440	956	1480	983	1520	1010	1560	1040	1600	1060
			4	30.0	2980	1260	838	1290	856	1310	874	1340	891	1370	909	1390	927	1420	945
			BFL	40.0	1520	1150	764	1160	773	1180	782	1190	791	1200	801	1220	810	1230	819
HEM 300	862	574	TFL	0.00	7120	1410	938	1470	981	1540	1020	1600	1070	1670	1110	1730	1150	1790	1190
			2	9.75	5700	1340	892	1390	926	1440	960	1490	994	1550	1030	1600	1060	1650	1100
			3	19.5	4280	1260	837	1300	862	1330	888	1370	914	1410	939	1450	965	1490	991
			4	29.3	2860	1160	773	1190	791	1210	808	1240	825	1270	842	1290	859	1320	876
			BFL	39.0	1440	1050	702	1070	710	1080	719	1090	728	1110	736	1120	745	1130	754
HEM 280	627	417	TFL	0.00	5640	1040	693	1090	727	1140	761	1190	794	1240	828	1300	862	1350	896
			2	8.25	4530	987	657	1030	684	1070	711	1110	738	1150	765	1190	792	1230	819
			3	16.5	3410	924	615	955	635	986	656	1020	676	1050	697	1080	717	1110	738
			4	24.8	2290	853	568	874	582	895	595	915	609	936	623	957	636	977	650
			BFL	33.0	1180	774	515	785	522	795	529	806	536	817	543	827	550	838	557
HEM 260	534	355	TFL	0.00	5160	906	603	952	633	999	664	1050	695	1090	726	1140	757	1180	788
			2	8.13	4140	856	569	893	594	930	619	968	644	1000	669	1040	693	1080	718
			3	16.3	3110	799	531	827	550	855	569	883	587	911	606	939	625	967	643
			4	24.4	2090	734	488	753	501	771	513	790	526	809	538	828	551	847	563
			BFL	32.5	1070	662	440	671	447	681	453	690	459	700	466	710	472	719	479

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

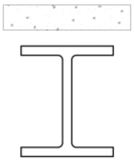
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 450	1340	891	TFL	0.00	7880	2550	1690	2620	1740	2690	1790	2760	1840	2830	1880	2900	1930	2970	1980
			2	10.0	6440	2380	1590	2440	1620	2500	1660	2560	1700	2620	1740	2670	1780	2730	1820
			3	20.0	5000	2210	1470	2250	1500	2300	1530	2340	1560	2390	1590	2430	1620	2480	1650
			4	30.0	3550	2020	1340	2050	1370	2080	1390	2120	1410	2150	1430	2180	1450	2210	1470
			BFL	40.0	2110	1820	1210	1840	1220	1860	1240	1880	1250	1900	1260	1910	1270	1930	1290
			6	44.6	2040	1810	1200	1830	1220	1850	1230	1860	1240	1880	1250	1900	1260	1920	1280
			7	49.1	1970	1800	1200	1820	1210	1830	1220	1850	1230	1870	1240	1890	1260	1910	1270
HEM 400	1180	784	TFL	0.00	7660	2320	1540	2380	1590	2450	1630	2520	1680	2590	1720	2660	1770	2730	1820
			2	10.0	6210	2150	1430	2210	1470	2260	1510	2320	1540	2380	1580	2430	1620	2490	1660
			3	20.0	4770	1980	1320	2020	1340	2060	1370	2110	1400	2150	1430	2190	1460	2240	1490
			4	30.0	3330	1790	1190	1820	1210	1850	1230	1880	1250	1910	1270	1940	1290	1970	1310
			BFL	40.0	1880	1590	1060	1610	1070	1620	1080	1640	1090	1660	1100	1670	1110	1690	1120
HEM 360	1060	702	TFL	0.00	7490	2140	1420	2210	1470	2280	1510	2340	1560	2410	1600	2480	1650	2550	1690
			2	10.0	6040	1980	1320	2030	1350	2090	1390	2140	1420	2200	1460	2250	1500	2300	1530
			3	20.0	4600	1800	1200	1840	1230	1880	1250	1930	1280	1970	1310	2010	1340	2050	1360
			4	30.0	3150	1610	1070	1640	1090	1670	1110	1700	1130	1730	1150	1750	1170	1780	1190
			BFL	40.0	1700	1410	939	1430	949	1440	959	1460	969	1470	980	1490	990	1500	1000
HEM 340	998	664	TFL	0.00	7420	2060	1370	2130	1420	2190	1460	2260	1500	2330	1550	2390	1590	2460	1640
			2	10.0	5970	1900	1260	1950	1300	2000	1330	2060	1370	2110	1410	2170	1440	2220	1480
			3	20.0	4520	1720	1140	1760	1170	1800	1200	1840	1230	1880	1250	1920	1280	1960	1310
			4	30.0	3060	1530	1020	1560	1040	1590	1060	1610	1070	1640	1090	1670	1110	1700	1130
			BFL	40.0	1610	1330	884	1340	894	1360	903	1370	913	1390	923	1400	932	1420	942
HEM 320	938	624	TFL	0.00	7330	1980	1310	2040	1360	2110	1400	2170	1450	2240	1490	2310	1530	2370	1580
			2	10.0	5880	1810	1210	1870	1240	1920	1280	1970	1310	2020	1350	2080	1380	2130	1420
			3	20.0	4430	1640	1090	1680	1120	1720	1140	1760	1170	1800	1190	1840	1220	1880	1250
			4	30.0	2980	1450	963	1470	981	1500	998	1530	1020	1550	1030	1580	1050	1610	1070
			BFL	40.0	1520	1240	828	1260	837	1270	846	1290	855	1300	864	1310	874	1330	883
HEM 300	862	574	TFL	0.00	7120	1860	1240	1920	1280	1990	1320	2050	1360	2120	1410	2180	1450	2240	1490
			2	9.75	5700	1700	1130	1750	1160	1800	1200	1850	1230	1900	1270	1960	1300	2010	1340
			3	19.5	4280	1530	1020	1570	1040	1600	1070	1640	1090	1680	1120	1720	1140	1760	1170
			4	29.3	2860	1340	893	1370	910	1390	928	1420	945	1450	962	1470	979	1500	996
			BFL	39.0	1440	1150	762	1160	771	1170	779	1180	788	1200	797	1210	805	1220	814
HEM 280	627	417	TFL	0.00	5640	1400	930	1450	963	1500	997	1550	1030	1600	1060	1650	1100	1700	1130
			2	8.25	4530	1270	847	1310	874	1350	901	1390	928	1440	955	1480	982	1520	1010
			3	16.5	3410	1140	758	1170	778	1200	799	1230	819	1260	840	1290	860	1320	881
			4	24.8	2290	998	664	1020	678	1040	691	1060	705	1080	719	1100	733	1120	746
			BFL	33.0	1180	848	564	859	571	870	579	880	586	891	593	901	600	912	607
HEM 260	534	355	TFL	0.00	5160	1230	819	1280	850	1320	881	1370	912	1420	943	1460	973	1510	1000
			2	8.13	4140	1120	743	1150	768	1190	792	1230	817	1270	842	1300	867	1340	892
			3	16.3	3110	995	662	1020	681	1050	699	1080	718	1110	736	1130	755	1160	774
			4	24.4	2090	866	576	884	588	903	601	922	613	941	626	960	638	978	651
			BFL	32.5	1070	729	485	738	491	748	498	758	504	767	510	777	517	786	523

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

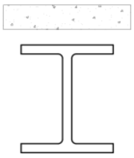
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 240	448	298	TFL	0.00	4690	781	520	823	548	865	576	908	604	950	632	992	660	1030	688
			2	8.00	3760	736	489	769	512	803	534	837	557	871	579	905	602	939	624
			3	16.0	2830	684	455	709	472	734	489	760	506	785	523	811	539	836	556
			4	24.0	1890	625	416	642	427	659	438	676	450	693	461	710	472	727	484
			BFL	32.0	961	559	372	568	378	577	384	585	389	594	395	603	401	611	407
HEM 220	300	200	TFL	0.00	3510	537	357	569	378	600	399	632	420	664	441	695	463	727	484
			2	6.50	2820	504	335	529	352	555	369	580	386	606	403	631	420	656	437
			3	13.0	2130	467	311	486	323	505	336	524	349	544	362	563	374	582	387
			4	19.5	1440	426	283	439	292	452	301	465	309	478	318	491	326	504	335
			BFL	26.0	749	381	253	387	258	394	262	401	267	408	271	414	276	421	280
HEM 200	240	160	TFL	0.00	3090	444	296	472	314	500	333	528	351	555	370	583	388	611	406
			2	6.25	2480	415	276	438	291	460	306	482	321	505	336	527	351	549	365
			3	12.5	1880	383	255	400	266	417	277	434	289	451	300	467	311	484	322
			4	18.8	1270	347	231	359	239	370	246	382	254	393	262	404	269	416	277
			BFL	25.0	665	308	205	314	209	320	213	326	217	332	221	338	225	344	229
HEM 180	187	124	TFL	0.00	2660	359	239	383	255	407	271	431	287	455	303	479	319	503	335
			2	6.00	2140	334	223	354	235	373	248	392	261	411	274	431	287	450	299
			3	12.0	1610	307	204	321	214	336	223	350	233	365	243	379	252	394	262
			4	18.0	1090	276	184	286	190	295	197	305	203	315	210	325	216	335	223
			BFL	24.0	564	242	161	247	165	253	168	258	171	263	175	268	178	273	182
HEM 160	143	94.9	TFL	0.00	2280	287	191	308	205	328	219	349	232	369	246	390	259	411	273
			2	5.75	1830	266	177	283	188	299	199	315	210	332	221	348	232	365	243
			3	11.5	1380	242	161	255	170	267	178	280	186	292	194	305	203	317	211
			4	17.3	935	216	144	225	150	233	155	242	161	250	166	258	172	267	178
			BFL	23.0	486	188	125	192	128	197	131	201	134	206	137	210	140	214	143
HEM 140	104	69.5	TFL	0.00	1890	221	147	239	159	256	170	273	181	290	193	307	204	324	215
			2	5.50	1520	204	135	217	145	231	154	245	163	258	172	272	181	285	190
			3	11.0	1140	184	122	194	129	204	136	215	143	225	150	235	156	245	163
			4	16.5	761	162	108	169	112	176	117	183	122	190	126	196	131	203	135
			BFL	22.0	384	139	92.2	142	94.5	146	96.8	149	99.1	152	101	156	104	159	106
HEM 120	74.2	49.3	TFL	0.00	1560	169	112	183	121	197	131	211	140	225	150	239	159	253	168
			2	5.25	1250	154	102	165	110	176	117	188	125	199	132	210	140	221	147
			3	10.5	939	138	91.6	146	97.2	155	103	163	108	171	114	180	120	188	125
			4	15.8	628	120	79.8	126	83.6	131	87.3	137	91.1	143	94.9	148	98.6	154	102
			BFL	21.0	317	101	67.1	104	69.0	107	70.9	109	72.8	112	74.7	115	76.6	118	78.5
HEM 100	49.9	33.2	TFL	0.00	1250	124	82.4	135	89.9	146	97.4	158	105	169	112	180	120	191	127
			2	5.00	1000	112	74.6	121	80.6	130	86.6	139	92.6	148	98.6	157	105	166	111
			3	10.0	753	99.2	66.0	106	70.5	113	75.0	120	79.5	126	84.0	133	88.5	140	93.1
			4	15.0	504	85.2	56.7	89.7	59.7	94.3	62.7	98.8	65.7	103	68.7	108	71.8	112	74.8
			BFL	20.0	255	70.1	46.6	72.3	48.1	74.6	49.7	76.9	51.2	79.2	52.7	81.5	54.2	83.8	55.8

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

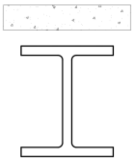
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 240	448	298	TFL	0.00	4690	1080	716	1120	744	1160	772	1200	800	1250	829	1290	857	1330	885
			2	8.00	3760	972	647	1010	669	1040	692	1070	715	1110	737	1140	760	1180	782
			3	16.0	2830	862	573	887	590	913	607	938	624	963	641	989	658	1010	675
			4	24.0	1890	744	495	761	506	778	518	795	529	812	540	829	552	846	563
			BFL	32.0	961	620	412	629	418	637	424	646	430	655	435	663	441	672	447
HEM 220	300	200	TFL	0.00	3510	758	505	790	526	822	547	853	568	885	589	916	610	948	631
			2	6.50	2820	682	454	707	470	733	487	758	504	783	521	809	538	834	555
			3	13.0	2130	601	400	620	413	639	425	659	438	678	451	697	464	716	476
			4	19.5	1440	516	344	529	352	542	361	555	369	568	378	581	387	594	395
			BFL	26.0	749	428	285	435	289	441	294	448	298	455	303	461	307	468	312
HEM 200	240	160	TFL	0.00	3090	639	425	666	443	694	462	722	480	750	499	778	517	805	536
			2	6.25	2480	572	380	594	395	616	410	639	425	661	440	683	455	706	469
			3	12.5	1880	501	333	518	345	535	356	552	367	569	378	586	390	602	401
			4	18.8	1270	427	284	439	292	450	300	462	307	473	315	484	322	496	330
			BFL	25.0	665	350	233	356	237	362	241	368	245	374	249	380	253	386	257
HEM 180	187	124	TFL	0.00	2660	527	351	551	367	575	383	599	399	623	415	647	430	671	446
			2	6.00	2140	469	312	488	325	508	338	527	351	546	363	565	376	585	389
			3	12.0	1610	408	272	423	281	437	291	452	301	466	310	481	320	495	330
			4	18.0	1090	344	229	354	236	364	242	374	249	384	255	393	262	403	268
			BFL	24.0	564	278	185	283	188	288	192	293	195	298	198	303	202	308	205
HEM 160	143	94.9	TFL	0.00	2280	431	287	452	300	472	314	493	328	513	341	534	355	554	369
			2	5.75	1830	381	254	398	265	414	276	431	287	447	298	464	309	480	320
			3	11.5	1380	330	219	342	228	354	236	367	244	379	252	392	261	404	269
			4	17.3	935	275	183	284	189	292	194	300	200	309	206	317	211	326	217
			BFL	23.0	486	219	145	223	148	227	151	232	154	236	157	241	160	245	163
HEM 140	104	69.5	TFL	0.00	1890	341	227	358	238	375	249	392	261	409	272	426	283	443	295
			2	5.50	1520	299	199	313	208	326	217	340	226	354	235	367	244	381	253
			3	11.0	1140	256	170	266	177	276	184	286	190	296	197	307	204	317	211
			4	16.5	761	210	140	217	144	224	149	231	153	237	158	244	163	251	167
			BFL	22.0	384	163	108	166	111	170	113	173	115	177	117	180	120	183	122
HEM 120	74.2	49.3	TFL	0.00	1560	267	178	281	187	295	196	309	206	323	215	337	224	351	234
			2	5.25	1250	233	155	244	162	255	170	266	177	278	185	289	192	300	200
			3	10.5	939	197	131	205	137	214	142	222	148	231	153	239	159	247	165
			4	15.8	628	160	106	165	110	171	114	176	117	182	121	188	125	193	129
			BFL	21.0	317	121	80.4	124	82.3	127	84.2	129	86.1	132	88.0	135	89.9	138	91.8
HEM 100	49.9	33.2	TFL	0.00	1250	203	135	214	142	225	150	236	157	248	165	259	172	270	180
			2	5.00	1000	175	117	184	123	193	129	202	135	211	141	220	147	229	153
			3	10.0	753	147	97.6	153	102	160	107	167	111	174	116	181	120	187	125
			4	15.0	504	117	77.8	121	80.8	126	83.8	131	86.9	135	89.9	140	92.9	144	95.9
			BFL	20.0	255	86.1	57.3	88.4	58.8	90.7	60.3	93.0	61.9	95.3	63.4	97.6	64.9	99.9	66.4

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

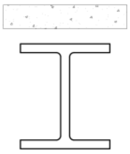
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 1000	4100	2730	TFL	0.00	12200	6090	4050	6200	4130	6310	4200	6420	4270	6530	4340	6640	4420	6750	4490
			2	10.0	10600	6010	4000	6100	4060	6200	4120	6290	4190	6390	4250	6480	4310	6580	4380
			3	20.0	8890	5910	3930	5990	3990	6070	4040	6150	4090	6230	4150	6310	4200	6390	4250
			4	30.0	7230	5800	3860	5860	3900	5930	3940	5990	3990	6060	4030	6120	4070	6190	4120
			BFL	40.0	5570	5670	3770	5720	3810	5770	3840	5820	3870	5870	3910	5920	3940	5970	3970
			6	131	4310	5520	3680	5560	3700	5600	3730	5640	3750	5680	3780	5720	3800	5760	3830
			7	240	3050	5260	3500	5290	3520	5310	3540	5340	3550	5370	3570	5400	3590	5420	3610
HEM 900	3570	2380	TFL	0.00	11600	5290	3520	5400	3590	5500	3660	5610	3730	5710	3800	5820	3870	5920	3940
			2	10.0	9990	5210	3470	5300	3530	5390	3590	5480	3650	5570	3710	5660	3770	5750	3830
			3	20.0	8330	5120	3400	5190	3450	5260	3500	5340	3550	5410	3600	5490	3650	5560	3700
			4	30.0	6670	5000	3330	5060	3370	5120	3410	5180	3450	5240	3490	5300	3530	5360	3570
			BFL	40.0	5010	4880	3240	4920	3270	4970	3300	5010	3330	5060	3360	5100	3390	5150	3420
			6	112	3960	4760	3170	4800	3190	4830	3220	4870	3240	4900	3260	4940	3290	4970	3310
			7	203	2910	4570	3040	4590	3060	4620	3070	4640	3090	4670	3110	4700	3120	4720	3140
HEM 800	3090	2060	TFL	0.00	11100	4570	3040	4670	3110	4770	3180	4870	3240	4970	3310	5070	3380	5170	3440
			2	10.0	9450	4490	2990	4580	3040	4660	3100	4750	3160	4830	3210	4920	3270	5000	3330
			3	20.0	7790	4390	2920	4460	2970	4530	3020	4600	3060	4670	3110	4740	3160	4810	3200
			4	30.0	6120	4280	2850	4340	2880	4390	2920	4450	2960	4500	2990	4560	3030	4610	3070
			BFL	40.0	4450	4150	2760	4190	2790	4230	2820	4270	2840	4310	2870	4350	2900	4390	2920
			6	93.9	3620	4070	2710	4100	2730	4130	2750	4160	2770	4200	2790	4230	2810	4260	2840
			7	166	2780	3930	2620	3960	2630	3980	2650	4010	2670	4030	2680	4060	2700	4080	2720
HEM 700	2610	1740	TFL	0.00	10500	3870	2570	3960	2640	4060	2700	4150	2760	4250	2830	4340	2890	4440	2950
			2	10.0	8860	3780	2520	3860	2570	3940	2620	4020	2680	4100	2730	4180	2780	4260	2840
			3	20.0	7190	3690	2450	3750	2500	3820	2540	3880	2580	3950	2630	4010	2670	4080	2710
			4	30.0	5520	3570	2380	3620	2410	3670	2440	3720	2480	3770	2510	3820	2540	3870	2580
			BFL	40.0	3840	3450	2290	3480	2320	3520	2340	3550	2360	3580	2380	3620	2410	3650	2430
			6	77.6	3240	3390	2250	3420	2270	3450	2290	3480	2310	3500	2330	3530	2350	3560	2370
			7	130	2630	3300	2200	3330	2210	3350	2230	3370	2250	3400	2260	3420	2280	3450	2290
HEM 650	2390	1590	TFL	0.00	10300	3550	2360	3640	2420	3740	2490	3830	2550	3920	2610	4010	2670	4110	2730
			2	10.0	8600	3470	2310	3550	2360	3620	2410	3700	2460	3780	2510	3860	2570	3930	2620
			3	20.0	6920	3370	2240	3430	2280	3500	2330	3560	2370	3620	2410	3680	2450	3740	2490
			4	30.0	5240	3260	2170	3300	2200	3350	2230	3400	2260	3450	2290	3490	2320	3540	2360
			BFL	40.0	3570	3130	2080	3160	2100	3190	2120	3230	2150	3260	2170	3290	2190	3320	2210
			6	68.4	3070	3080	2050	3110	2070	3140	2090	3170	2110	3190	2120	3220	2140	3250	2160
			7	112	2570	3020	2010	3040	2020	3070	2040	3090	2060	3110	2070	3140	2090	3160	2100
HEM 600	2170	1440	TFL	0.00	10000	3240	2160	3330	2220	3420	2280	3510	2340	3600	2400	3690	2460	3780	2520
			2	10.0	8320	3160	2100	3230	2150	3310	2200	3380	2250	3460	2300	3530	2350	3610	2400
			3	20.0	6650	3060	2040	3120	2080	3180	2120	3240	2150	3300	2190	3360	2230	3420	2270
			4	30.0	4970	2950	1960	2990	1990	3040	2020	3080	2050	3130	2080	3170	2110	3210	2140
			BFL	40.0	3290	2820	1870	2850	1890	2880	1910	2910	1930	2940	1950	2970	1970	3000	1990
			6	62.0	2900	2780	1850	2810	1870	2830	1890	2860	1900	2890	1920	2910	1940	2940	1950
			7	93.5	2500	2740	1820	2760	1840	2780	1850	2800	1870	2830	1880	2850	1900	2870	1910
HEM 550	1960	1310	TFL	0.00	9750	2950	1960	3030	2020	3120	2080	3210	2140	3300	2190	3390	2250	3470	2310
			2	10.0	8060	2860	1910	2940	1950	3010	2000	3080	2050	3150	2100	3230	2150	3300	2200
			3	20.0	6380	2770	1840	2820	1880	2880	1920	2940	1950	3000	1990	3050	2030	3110	2070
			4	30.0	4700	2650	1760	2690	1790	2740	1820	2780	1850	2820	1880	2860	1900	2910	1930
			BFL	40.0	3010	2520	1680	2550	1700	2580	1710	2600	1730	2630	1750	2660	1770	2690	1790
			6	56.1	2730	2500	1660	2520	1680	2550	1690	2570	1710	2600	1730	2620	1740	2640	1760
			7	75.0	2440	2470	1640	2490	1660	2510	1670	2530	1690	2560	1700	2580	1710	2600	1730
HEM 500	1760	1170	TFL	0.00	9470	2660	1770	2740	1830	2830	1880	2910	1940	3000	2000	3080	2050	3170	2110
			2	10.0	7790	2580	1710	2650	1760	2720	1810	2790	1850	2860	1900	2930	1950	3000	1990
			3	20.0	6100	2480	1650	2530	1680	2590	1720	2640	1760	2700	1790	2750	1830	2810	1870
			4	30.0	4420	2360	1570	2400	1600	2440	1630	2480	1650	2520	1680	2560	1700	2600	1730
			BFL	40.0	2740	2230	1490	2260	1500	2280	1520	2310	1540	2330	1550	2360	1570	2380	1590
			6	50.3	2550	2220	1480	2240	1490	2260	1510	2290	1520	2310	1540	2330	1550	2360	1570
			7	60.6	2370	2200	1460	2220	1480	2240	1490	2270	1510	2290	1520	2310	1540	2330	1550

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

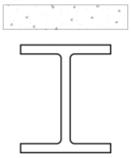
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

$F_y =$ 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 1000	4100	2730	TFL	0.00	12200	6860	4560	6970	4640	7080	4710	7190	4780	7300	4860	7410	4930	7520	5000
			2	10.0	10600	6670	4440	6770	4500	6860	4570	6960	4630	7050	4690	7150	4760	7240	4820
			3	20.0	8890	6470	4310	6550	4360	6630	4410	6710	4470	6790	4520	6870	4570	6950	4630
			4	30.0	7230	6250	4160	6320	4200	6380	4250	6450	4290	6520	4330	6580	4380	6650	4420
			BFL	40.0	5570	6020	4010	6070	4040	6120	4070	6170	4110	6220	4140	6270	4170	6320	4210
			6	131	4310	5800	3860	5840	3880	5870	3910	5910	3930	5950	3960	5990	3990	6030	4010
			7	240	3050	5450	3630	5480	3640	5510	3660	5530	3680	5560	3700	5590	3720	5620	3740
HEM 900	3570	2380	TFL	0.00	11600	6030	4010	6130	4080	6240	4150	6340	4220	6450	4290	6550	4360	6660	4430
			2	10.0	9990	5840	3890	5930	3950	6020	4010	6110	4070	6200	4130	6290	4190	6380	4250
			3	20.0	8330	5640	3750	5710	3800	5790	3850	5860	3900	5940	3950	6010	4000	6090	4050
			4	30.0	6670	5420	3610	5480	3650	5540	3690	5600	3730	5660	3770	5720	3810	5780	3850
			BFL	40.0	5010	5190	3450	5240	3480	5280	3510	5330	3540	5370	3570	5420	3600	5460	3630
			6	112	3960	5010	3330	5050	3360	5080	3380	5120	3400	5150	3430	5190	3450	5220	3480
			7	203	2910	4750	3160	4780	3180	4800	3190	4830	3210	4850	3230	4880	3250	4910	3260
HEM 800	3090	2060	TFL	0.00	11100	5270	3510	5370	3580	5470	3640	5570	3710	5670	3770	5770	3840	5870	3910
			2	10.0	9450	5090	3380	5170	3440	5260	3500	5340	3550	5430	3610	5510	3670	5600	3720
			3	20.0	7790	4880	3250	4950	3300	5020	3340	5090	3390	5160	3440	5230	3480	5300	3530
			4	30.0	6120	4670	3100	4720	3140	4780	3180	4830	3210	4890	3250	4940	3290	5000	3320
			BFL	40.0	4450	4430	2950	4470	2980	4510	3000	4550	3030	4590	3060	4630	3080	4670	3110
			6	93.9	3620	4300	2860	4330	2880	4360	2900	4390	2920	4430	2940	4460	2970	4490	2990
			7	166	2780	4110	2730	4130	2750	4160	2770	4180	2780	4210	2800	4230	2820	4260	2830
HEM 700	2610	1740	TFL	0.00	10500	4530	3010	4630	3080	4720	3140	4820	3200	4910	3270	5010	3330	5100	3390
			2	10.0	8860	4340	2890	4420	2940	4500	3000	4580	3050	4660	3100	4740	3150	4820	3210
			3	20.0	7190	4140	2750	4200	2800	4270	2840	4330	2880	4400	2930	4460	2970	4530	3010
			4	30.0	5520	3920	2610	3970	2640	4020	2680	4070	2710	4120	2740	4170	2770	4220	2810
			BFL	40.0	3840	3690	2450	3720	2480	3760	2500	3790	2520	3830	2550	3860	2570	3900	2590
			6	77.6	3240	3590	2390	3620	2410	3650	2430	3680	2450	3710	2470	3740	2490	3770	2510
			7	130	2630	3470	2310	3490	2320	3520	2340	3540	2360	3560	2370	3590	2390	3610	2400
HEM 650	2390	1590	TFL	0.00	10300	4200	2790	4290	2860	4380	2920	4480	2980	4570	3040	4660	3100	4750	3160
			2	10.0	8600	4010	2670	4090	2720	4170	2770	4240	2820	4320	2870	4400	2930	4470	2980
			3	20.0	6920	3810	2530	3870	2570	3930	2620	3990	2660	4060	2700	4120	2740	4180	2780
			4	30.0	5240	3590	2390	3630	2420	3680	2450	3730	2480	3780	2510	3820	2540	3870	2580
			BFL	40.0	3570	3350	2230	3390	2250	3420	2270	3450	2300	3480	2320	3510	2340	3550	2360
			6	68.4	3070	3280	2180	3300	2200	3330	2220	3360	2230	3390	2250	3410	2270	3440	2290
			7	112	2570	3180	2120	3200	2130	3230	2150	3250	2160	3270	2180	3300	2190	3320	2210
HEM 600	2170	1440	TFL	0.00	10000	3870	2580	3960	2640	4050	2700	4140	2750	4230	2810	4320	2870	4410	2930
			2	10.0	8320	3680	2450	3760	2500	3830	2550	3910	2600	3980	2650	4060	2700	4130	2750
			3	20.0	6650	3480	2310	3540	2350	3600	2390	3660	2430	3720	2470	3780	2510	3840	2550
			4	30.0	4970	3260	2170	3300	2200	3350	2230	3390	2260	3440	2290	3480	2320	3530	2350
			BFL	40.0	3290	3030	2010	3050	2030	3080	2050	3110	2070	3140	2090	3170	2110	3200	2130
			6	62.0	2900	2960	1970	2990	1990	3020	2010	3040	2020	3070	2040	3090	2060	3120	2080
			7	93.5	2500	2890	1930	2920	1940	2940	1960	2960	1970	2980	1990	3010	2000	3030	2020
HEM 550	1960	1310	TFL	0.00	9750	3560	2370	3650	2430	3740	2490	3820	2540	3910	2600	4000	2660	4090	2720
			2	10.0	8060	3370	2240	3440	2290	3520	2340	3590	2390	3660	2440	3730	2480	3810	2530
			3	20.0	6380	3170	2110	3220	2150	3280	2180	3340	2220	3400	2260	3450	2300	3510	2340
			4	30.0	4700	2950	1960	2990	1990	3030	2020	3070	2050	3120	2070	3160	2100	3200	2130
			BFL	40.0	3010	2710	1810	2740	1820	2770	1840	2790	1860	2820	1880	2850	1900	2880	1910
			6	56.1	2730	2670	1780	2690	1790	2720	1810	2740	1820	2770	1840	2790	1860	2820	1870
			7	75.0	2440	2620	1740	2640	1760	2670	1770	2690	1790	2710	1800	2730	1820	2750	1830
HEM 500	1760	1170	TFL	0.00	9470	3260	2170	3340	2220	3430	2280	3510	2340	3600	2390	3680	2450	3770	2510
			2	10.0	7790	3070	2040	3140	2090	3210	2130	3280	2180	3350	2230	3420	2270	3490	2320
			3	20.0	6100	2860	1900	2920	1940	2970	1980	3030	2010	3080	2050	3140	2090	3190	2120
			4	30.0	4420	2640	1760	2680	1780	2720	1810	2760	1840	2800	1860	2840	1890	2880	1920
			BFL	40.0	2740	2410	1600	2430	1620	2460	1630	2480	1650	2510	1670	2530	1680	2550	1700
			6	50.3	2550	2380	1580	2400	1600	2430	1610	2450	1630	2470	1640	2490	1660	2520	1670
			7	60.6	2370	2350	1560	2370	1580	2390	1590	2410	1610	2440	1620	2460	1630	2480	1650

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

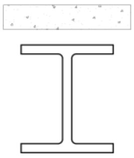
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 450	1570	1040	TFL	0.00	9220	2400	1600	2480	1650	2570	1710	2650	1760	2730	1820	2810	1870	2900	1930
			2	10.0	7540	2320	1540	2380	1590	2450	1630	2520	1680	2590	1720	2650	1770	2720	1810
			3	20.0	5850	2220	1470	2270	1510	2320	1540	2370	1580	2430	1610	2480	1650	2530	1680
			4	30.0	4160	2100	1400	2140	1420	2180	1450	2210	1470	2250	1500	2290	1520	2330	1550
			BFL	40.0	2470	1970	1310	2000	1330	2020	1340	2040	1360	2060	1370	2080	1390	2110	1400
			6	44.6	2390	1970	1310	1990	1320	2010	1340	2030	1350	2050	1370	2070	1380	2100	1390
			7	49.1	2310	1960	1300	1980	1320	2000	1330	2020	1350	2040	1360	2060	1370	2080	1390
HEM 400	1380	917	TFL	0.00	8960	2140	1430	2230	1480	2310	1530	2390	1590	2470	1640	2550	1700	2630	1750
			2	10.0	7270	2060	1370	2130	1420	2190	1460	2260	1500	2320	1550	2390	1590	2450	1630
			3	20.0	5580	1960	1310	2010	1340	2060	1370	2110	1410	2160	1440	2210	1470	2260	1510
			4	30.0	3890	1850	1230	1880	1250	1920	1280	1950	1300	1990	1320	2020	1350	2060	1370
			BFL	40.0	2210	1720	1140	1740	1160	1760	1170	1780	1180	1800	1200	1820	1210	1840	1220
HEM 360	1230	822	TFL	0.00	8770	1950	1300	2030	1350	2110	1400	2190	1460	2270	1510	2350	1560	2430	1610
			2	10.0	7070	1870	1240	1930	1290	2000	1330	2060	1370	2120	1410	2190	1460	2250	1500
			3	20.0	5380	1770	1180	1820	1210	1870	1240	1920	1270	1960	1310	2010	1340	2060	1370
			4	30.0	3680	1660	1100	1690	1120	1720	1150	1760	1170	1790	1190	1820	1210	1850	1230
			BFL	40.0	1990	1530	1020	1540	1030	1560	1040	1580	1050	1600	1060	1620	1070	1630	1090
HEM 340	1170	777	TFL	0.00	8680	1860	1240	1940	1290	2020	1340	2100	1400	2180	1450	2250	1500	2330	1550
			2	10.0	6990	1780	1180	1840	1230	1910	1270	1970	1310	2030	1350	2090	1390	2160	1440
			3	20.0	5290	1680	1120	1730	1150	1780	1180	1820	1210	1870	1240	1920	1280	1970	1310
			4	30.0	3590	1570	1040	1600	1060	1630	1080	1660	1110	1690	1130	1730	1150	1760	1170
			BFL	40.0	1890	1440	955	1450	967	1470	978	1490	989	1500	1000	1520	1010	1540	1020
HEM 320	1100	730	TFL	0.00	8580	1770	1180	1850	1230	1930	1280	2000	1330	2080	1380	2160	1440	2240	1490
			2	10.0	6880	1690	1120	1750	1160	1810	1210	1870	1250	1940	1290	2000	1330	2060	1370
			3	20.0	5180	1590	1060	1640	1090	1680	1120	1730	1150	1780	1180	1820	1210	1870	1240
			4	30.0	3480	1470	981	1510	1000	1540	1020	1570	1040	1600	1060	1630	1080	1660	1110
			BFL	40.0	1780	1340	894	1360	905	1380	916	1390	926	1410	937	1420	948	1440	958
HEM 300	1010	672	TFL	0.00	8340	1650	1100	1730	1150	1800	1200	1880	1250	1950	1300	2030	1350	2100	1400
			2	9.75	6670	1570	1040	1630	1080	1690	1120	1750	1160	1810	1200	1870	1240	1930	1280
			3	19.5	5010	1470	979	1520	1010	1560	1040	1610	1070	1650	1100	1700	1130	1740	1160
			4	29.3	3350	1360	905	1390	925	1420	945	1450	965	1480	985	1510	1010	1540	1030
			BFL	39.0	1690	1230	821	1250	831	1260	842	1280	852	1300	862	1310	872	1330	882
HEM 280	734	488	TFL	0.00	6610	1220	811	1280	850	1340	890	1400	930	1460	969	1520	1010	1580	1050
			2	8.25	5300	1160	769	1200	800	1250	832	1300	864	1350	895	1390	927	1440	959
			3	16.5	3990	1080	720	1120	744	1150	767	1190	791	1230	815	1260	839	1300	863
			4	24.8	2690	999	664	1020	681	1050	697	1070	713	1100	729	1120	745	1140	761
			BFL	33.0	1380	906	603	918	611	931	619	943	627	955	636	968	644	980	652
HEM 260	625	416	TFL	0.00	6040	1060	705	1110	741	1170	777	1220	814	1280	850	1330	886	1390	922
			2	8.13	4840	1000	666	1050	695	1090	724	1130	753	1180	782	1220	811	1260	840
			3	16.3	3640	935	622	967	644	1000	665	1030	687	1070	709	1100	731	1130	753
			4	24.4	2450	859	571	881	586	903	601	925	615	947	630	969	645	991	659
			BFL	32.5	1250	774	515	785	523	797	530	808	538	819	545	830	552	842	560

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

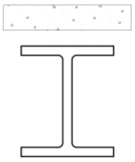
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 450	1570	1040	TFL	0.00	9220	2980	1980	3060	2040	3150	2090	3230	2150	3310	2200	3400	2260	3480	2310
			2	10.0	7540	2790	1860	2860	1900	2930	1950	2990	1990	3060	2040	3130	2080	3200	2130
			3	20.0	5850	2590	1720	2640	1750	2690	1790	2740	1820	2800	1860	2850	1890	2900	1930
			4	30.0	4160	2360	1570	2400	1600	2440	1620	2480	1650	2510	1670	2550	1700	2590	1720
			BFL	40.0	2470	2130	1420	2150	1430	2170	1450	2200	1460	2220	1480	2240	1490	2260	1510
			6	44.6	2390	2120	1410	2140	1420	2160	1440	2180	1450	2200	1470	2220	1480	2250	1490
			7	49.1	2310	2100	1400	2130	1410	2150	1430	2170	1440	2190	1460	2210	1470	2230	1480
HEM 400	1380	917	TFL	0.00	8960	2710	1800	2790	1860	2870	1910	2950	1960	3030	2020	3110	2070	3190	2120
			2	10.0	7270	2520	1680	2580	1720	2650	1760	2720	1810	2780	1850	2850	1890	2910	1940
			3	20.0	5580	2310	1540	2360	1570	2410	1610	2460	1640	2520	1670	2570	1710	2620	1740
			4	30.0	3890	2090	1390	2130	1420	2160	1440	2200	1460	2230	1490	2270	1510	2300	1530
			BFL	40.0	2210	1860	1240	1880	1250	1900	1260	1920	1280	1940	1290	1960	1300	1980	1320
HEM 360	1230	822	TFL	0.00	8770	2510	1670	2580	1720	2660	1770	2740	1820	2820	1880	2900	1930	2980	1980
			2	10.0	7070	2310	1540	2380	1580	2440	1620	2510	1670	2570	1710	2630	1750	2700	1790
			3	20.0	5380	2110	1400	2160	1440	2210	1470	2250	1500	2300	1530	2350	1560	2400	1600
			4	30.0	3680	1890	1260	1920	1280	1950	1300	1990	1320	2020	1340	2050	1370	2090	1390
			BFL	40.0	1990	1650	1100	1670	1110	1690	1120	1710	1130	1720	1150	1740	1160	1760	1170
HEM 340	1170	777	TFL	0.00	8680	2410	1600	2490	1660	2570	1710	2650	1760	2720	1810	2800	1860	2880	1920
			2	10.0	6990	2220	1480	2280	1520	2350	1560	2410	1600	2470	1640	2530	1690	2600	1730
			3	20.0	5290	2010	1340	2060	1370	2110	1400	2160	1430	2200	1470	2250	1500	2300	1530
			4	30.0	3590	1790	1190	1820	1210	1860	1240	1890	1260	1920	1280	1950	1300	1990	1320
			BFL	40.0	1890	1550	1030	1570	1050	1590	1060	1610	1070	1620	1080	1640	1090	1660	1100
HEM 320	1100	730	TFL	0.00	8580	2310	1540	2390	1590	2470	1640	2540	1690	2620	1740	2700	1800	2780	1850
			2	10.0	6880	2120	1410	2180	1450	2250	1490	2310	1540	2370	1580	2430	1620	2490	1660
			3	20.0	5180	1920	1270	1960	1310	2010	1340	2050	1370	2100	1400	2150	1430	2190	1460
			4	30.0	3480	1690	1130	1720	1150	1760	1170	1790	1190	1820	1210	1850	1230	1880	1250
			BFL	40.0	1780	1460	969	1470	980	1490	990	1500	1000	1520	1010	1540	1020	1550	1030
HEM 300	1010	672	TFL	0.00	8340	2180	1450	2250	1500	2330	1550	2400	1600	2480	1650	2550	1700	2630	1750
			2	9.75	6670	1990	1320	2050	1360	2110	1400	2170	1440	2230	1480	2290	1520	2350	1560
			3	19.5	5010	1790	1190	1830	1220	1880	1250	1920	1280	1970	1310	2010	1340	2060	1370
			4	29.3	3350	1570	1050	1600	1070	1630	1090	1660	1110	1690	1130	1720	1150	1750	1170
			BFL	39.0	1690	1340	892	1360	902	1370	912	1390	922	1400	932	1420	942	1430	953
HEM 280	734	488	TFL	0.00	6610	1630	1090	1690	1130	1750	1170	1810	1210	1870	1250	1930	1290	1990	1330
			2	8.25	5300	1490	991	1540	1020	1580	1050	1630	1090	1680	1120	1730	1150	1780	1180
			3	16.5	3990	1330	887	1370	911	1410	935	1440	959	1480	983	1510	1010	1550	1030
			4	24.8	2690	1170	777	1190	793	1220	809	1240	825	1260	841	1290	857	1310	873
			BFL	33.0	1380	993	660	1010	669	1020	677	1030	685	1040	693	1050	702	1070	710
HEM 260	625	416	TFL	0.00	6040	1440	958	1490	994	1550	1030	1600	1070	1660	1100	1710	1140	1770	1180
			2	8.13	4840	1310	869	1350	898	1390	927	1440	956	1480	985	1520	1010	1570	1040
			3	16.3	3640	1160	775	1200	796	1230	818	1260	840	1300	862	1330	884	1360	905
			4	24.4	2450	1010	674	1030	689	1060	703	1080	718	1100	732	1120	747	1140	762
			BFL	32.5	1250	853	567	864	575	875	582	887	590	898	597	909	605	920	612

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

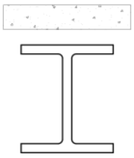
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 240	524	349	TFL	0.00	5490	914	608	963	641	1010	674	1060	707	1110	740	1160	772	1210	805
			2	8.00	4400	861	573	900	599	940	625	980	652	1020	678	1060	704	1100	731
			3	16.0	3310	800	532	830	552	860	572	889	592	919	611	949	631	979	651
			4	24.0	2220	731	487	751	500	771	513	791	526	811	540	831	553	851	566
			BFL	32.0	1120	655	436	665	442	675	449	685	456	695	462	705	469	715	476
HEM 220	351	234	TFL	0.00	4110	629	418	666	443	703	467	740	492	777	517	813	541	850	566
			2	6.50	3300	590	392	620	412	649	432	679	452	709	472	738	491	768	511
			3	13.0	2490	546	364	569	378	591	393	614	408	636	423	659	438	681	453
			4	19.5	1680	498	332	513	342	529	352	544	362	559	372	574	382	589	392
			BFL	26.0	877	445	296	453	302	461	307	469	312	477	317	485	323	493	328
HEM 200	281	187	TFL	0.00	3610	520	346	552	368	585	389	617	411	650	432	682	454	715	476
			2	6.25	2900	486	323	512	341	538	358	564	376	591	393	617	410	643	428
			3	12.5	2190	448	298	468	311	488	325	508	338	527	351	547	364	567	377
			4	18.8	1490	406	270	420	279	433	288	447	297	460	306	473	315	487	324
			BFL	25.0	778	361	240	368	245	375	249	382	254	389	259	396	263	403	268
HEM 180	219	145	TFL	0.00	3120	421	280	449	299	477	317	505	336	533	354	561	373	589	392
			2	6.00	2500	391	260	414	275	436	290	459	305	481	320	504	335	526	350
			3	12.0	1890	359	239	376	250	393	261	410	273	427	284	444	295	461	307
			4	18.0	1270	323	215	334	222	346	230	357	238	369	245	380	253	392	261
			BFL	24.0	661	284	189	290	193	296	197	301	201	307	205	313	208	319	212
HEM 160	167	111	TFL	0.00	2670	336	224	360	240	384	256	408	272	432	288	456	304	480	320
			2	5.75	2140	311	207	331	220	350	233	369	246	388	258	408	271	427	284
			3	11.5	1620	284	189	298	198	313	208	327	218	342	227	356	237	371	247
			4	17.3	1090	253	168	263	175	273	182	283	188	293	195	302	201	312	208
			BFL	23.0	569	220	146	225	150	230	153	235	157	241	160	246	163	251	167
HEM 140	122	81.3	TFL	0.00	2220	259	172	279	186	299	199	319	212	339	226	359	239	379	252
			2	5.50	1770	238	159	254	169	270	180	286	190	302	201	318	212	334	222
			3	11.0	1330	215	143	227	151	239	159	251	167	263	175	275	183	287	191
			4	16.5	890	190	126	198	132	206	137	214	142	222	148	230	153	238	158
			BFL	22.0	449	162	108	166	111	170	113	174	116	178	119	182	121	186	124
HEM 120	86.8	57.7	TFL	0.00	1830	197	131	214	142	230	153	247	164	263	175	279	186	296	197
			2	5.25	1460	180	120	193	129	206	137	219	146	233	155	246	164	259	172
			3	10.5	1100	161	107	171	114	181	120	191	127	201	133	210	140	220	147
			4	15.8	735	140	93.4	147	97.8	154	102	160	107	167	111	173	115	180	120
			BFL	21.0	371	118	78.5	121	80.7	125	83.0	128	85.2	131	87.4	135	89.6	138	91.8
HEM 100	58.4	38.8	TFL	0.00	1460	145	96.4	158	105	171	114	184	123	198	132	211	140	224	149
			2	5.00	1170	131	87.3	142	94.3	152	101	163	108	173	115	184	122	194	129
			3	10.0	881	116	77.2	124	82.5	132	87.8	140	93.1	148	98.3	156	104	164	109
			4	15.0	590	99.7	66.3	105	69.9	110	73.4	116	76.9	121	80.4	126	84.0	132	87.5
			BFL	20.0	298	82.0	54.5	84.7	56.3	87.3	58.1	90.0	59.9	92.7	61.7	95.4	63.5	98.1	65.3

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

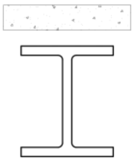
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 240	524	349	TFL	0.00	5490	1260	838	1310	871	1360	904	1410	937	1460	970	1510	1000	1560	1040
			2	8.00	4400	1140	757	1180	783	1220	810	1260	836	1300	862	1340	889	1380	915
			3	16.0	3310	1010	671	1040	691	1070	710	1100	730	1130	750	1160	770	1190	790
			4	24.0	2220	871	579	891	593	911	606	931	619	951	632	971	646	990	659
			BFL	32.0	1120	725	483	736	489	746	496	756	503	766	510	776	516	786	523
HEM 220	351	234	TFL	0.00	4110	887	590	924	615	961	640	998	664	1040	689	1070	713	1110	738
			2	6.50	3300	798	531	828	551	857	570	887	590	917	610	946	630	976	649
			3	13.0	2490	703	468	726	483	748	498	771	513	793	528	816	543	838	558
			4	19.5	1680	604	402	620	412	635	422	650	432	665	442	680	453	695	463
			BFL	26.0	877	501	333	508	338	516	344	524	349	532	354	540	359	548	365
HEM 200	281	187	TFL	0.00	3610	747	497	780	519	812	541	845	562	877	584	910	605	942	627
			2	6.25	2900	669	445	695	462	721	480	747	497	773	515	800	532	826	549
			3	12.5	2190	587	390	606	403	626	417	646	430	666	443	685	456	705	469
			4	18.8	1490	500	333	513	342	527	351	540	359	554	368	567	377	580	386
			BFL	25.0	778	410	273	417	277	424	282	431	287	438	291	445	296	452	301
HEM 180	219	145	TFL	0.00	3120	617	410	645	429	673	448	701	466	729	485	757	504	785	522
			2	6.00	2500	549	365	571	380	594	395	617	410	639	425	662	440	684	455
			3	12.0	1890	478	318	495	329	512	340	529	352	546	363	563	374	580	386
			4	18.0	1270	403	268	415	276	426	283	438	291	449	299	460	306	472	314
			BFL	24.0	661	325	216	331	220	337	224	343	228	349	232	355	236	361	240
HEM 160	167	111	TFL	0.00	2670	504	336	528	352	552	368	576	384	600	400	625	416	649	431
			2	5.75	2140	446	297	466	310	485	323	504	335	524	348	543	361	562	374
			3	11.5	1620	386	257	400	266	415	276	429	286	444	295	458	305	473	315
			4	17.3	1090	322	214	332	221	342	227	352	234	361	241	371	247	381	254
			BFL	23.0	569	256	170	261	174	266	177	271	180	276	184	281	187	287	191
HEM 140	122	81.3	TFL	0.00	2220	399	265	419	279	439	292	459	305	479	318	498	332	518	345
			2	5.50	1770	350	233	366	243	382	254	398	265	414	275	430	286	446	297
			3	11.0	1330	299	199	311	207	323	215	335	223	347	231	359	239	371	247
			4	16.5	890	246	164	254	169	262	174	270	180	278	185	286	190	294	196
			BFL	22.0	449	190	127	195	129	199	132	203	135	207	137	211	140	215	143
HEM 120	86.8	57.7	TFL	0.00	1830	312	208	329	219	345	230	362	241	378	252	394	262	411	273
			2	5.25	1460	272	181	285	190	298	199	312	207	325	216	338	225	351	234
			3	10.5	1100	230	153	240	160	250	166	260	173	270	180	280	186	290	193
			4	15.8	735	187	124	193	129	200	133	207	137	213	142	220	146	226	151
			BFL	21.0	371	141	94.1	145	96.3	148	98.5	151	101	155	103	158	105	161	107
HEM 100	58.4	38.8	TFL	0.00	1460	237	158	250	167	264	175	277	184	290	193	303	202	316	210
			2	5.00	1170	205	136	216	143	226	150	237	157	247	165	258	172	268	179
			3	10.0	881	172	114	180	119	187	125	195	130	203	135	211	141	219	146
			4	15.0	590	137	91.0	142	94.6	147	98.1	153	102	158	105	163	109	169	112
			BFL	20.0	298	101	67.0	103	68.8	106	70.6	109	72.4	111	74.2	114	76.0	117	77.8

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

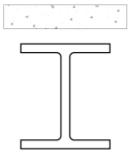
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 1000	5290	3520	TFL	0.00	15800	7860	5230	8000	5330	8150	5420	8290	5510	8430	5610	8570	5700	8710	5800
			2	10.0	13600	7760	5160	7880	5240	8000	5320	8120	5410	8250	5490	8370	5570	8490	5650
			3	20.0	11500	7630	5080	7730	5150	7840	5210	7940	5280	8040	5350	8150	5420	8250	5490
			4	30.0	9340	7490	4980	7570	5040	7650	5090	7740	5150	7820	5200	7910	5260	7990	5320
			BFL	40.0	7190	7320	4870	7390	4910	7450	4960	7520	5000	7580	5040	7650	5090	7710	5130
			6	131	5570	7130	4740	7180	4780	7230	4810	7280	4850	7330	4880	7380	4910	7430	4950
			7	240	3940	6790	4520	6820	4540	6860	4560	6890	4590	6930	4610	6970	4630	7000	4660
HEM 900	4610	3070	TFL	0.00	15000	6830	4550	6970	4640	7110	4730	7240	4820	7380	4910	7510	5000	7650	5090
			2	10.0	12900	6730	4480	6840	4550	6960	4630	7080	4710	7190	4790	7310	4860	7420	4940
			3	20.0	10700	6600	4390	6700	4460	6800	4520	6890	4590	6990	4650	7090	4720	7180	4780
			4	30.0	8610	6460	4300	6540	4350	6610	4400	6690	4450	6770	4500	6850	4550	6920	4610
			BFL	40.0	6460	6290	4190	6350	4230	6410	4270	6470	4300	6530	4340	6590	4380	6640	4420
			6	112	5110	6150	4090	6190	4120	6240	4150	6280	4180	6330	4210	6380	4240	6420	4270
			7	203	3760	5890	3920	5930	3940	5960	3970	6000	3990	6030	4010	6060	4030	6100	4060
HEM 800	3990	2660	TFL	0.00	14400	5900	3930	6030	4010	6160	4100	6290	4190	6420	4270	6550	4360	6680	4440
			2	10.0	12200	5800	3860	5910	3930	6020	4000	6130	4080	6240	4150	6350	4220	6460	4300
			3	20.0	10100	5670	3770	5760	3830	5850	3890	5940	3950	6030	4010	6120	4070	6210	4130
			4	30.0	7900	5530	3680	5600	3720	5670	3770	5740	3820	5810	3870	5880	3910	5950	3960
			BFL	40.0	5750	5360	3570	5410	3600	5460	3640	5520	3670	5570	3700	5620	3740	5670	3770
			6	93.9	4670	5250	3490	5290	3520	5330	3550	5380	3580	5420	3610	5460	3630	5500	3660
			7	166	3590	5080	3380	5110	3400	5140	3420	5170	3440	5200	3460	5240	3480	5270	3510
HEM 700	3370	2240	TFL	0.00	13600	4990	3320	5120	3400	5240	3480	5360	3570	5480	3650	5600	3730	5730	3810
			2	10.0	11400	4890	3250	4990	3320	5090	3390	5190	3460	5300	3520	5400	3590	5500	3660
			3	20.0	9280	4760	3170	4840	3220	4930	3280	5010	3330	5090	3390	5180	3440	5260	3500
			4	30.0	7120	4610	3070	4680	3110	4740	3160	4810	3200	4870	3240	4930	3280	5000	3330
			BFL	40.0	4960	4450	2960	4490	2990	4540	3020	4580	3050	4630	3080	4670	3110	4720	3140
			6	77.6	4180	4370	2910	4410	2930	4450	2960	4490	2980	4520	3010	4560	3030	4600	3060
			7	130	3400	4260	2840	4300	2860	4330	2880	4360	2900	4390	2920	4420	2940	4450	2960
HEM 650	3090	2050	TFL	0.00	13300	4580	3050	4700	3130	4820	3210	4940	3290	5060	3370	5180	3450	5300	3530
			2	10.0	11100	4480	2980	4580	3050	4680	3110	4780	3180	4880	3250	4980	3310	5080	3380
			3	20.0	8940	4350	2890	4430	2950	4510	3000	4590	3060	4670	3110	4750	3160	4830	3220
			4	30.0	6770	4200	2800	4270	2840	4330	2880	4390	2920	4450	2960	4510	3000	4570	3040
			BFL	40.0	4600	4040	2690	4080	2710	4120	2740	4160	2770	4200	2800	4250	2830	4290	2850
			6	68.4	3960	3980	2650	4010	2670	4050	2690	4090	2720	4120	2740	4160	2770	4190	2790
			7	112	3320	3900	2590	3930	2610	3960	2630	3990	2650	4020	2670	4050	2690	4080	2710
HEM 600	2800	1860	TFL	0.00	12900	4180	2780	4300	2860	4420	2940	4530	3020	4650	3090	4760	3170	4880	3250
			2	10.0	10700	4080	2710	4170	2780	4270	2840	4370	2910	4460	2970	4560	3030	4660	3100
			3	20.0	8580	3950	2630	4030	2680	4100	2730	4180	2780	4260	2830	4340	2880	4410	2940
			4	30.0	6410	3800	2530	3860	2570	3920	2610	3980	2650	4030	2680	4090	2720	4150	2760
			BFL	40.0	4250	3640	2420	3680	2450	3710	2470	3750	2500	3790	2520	3830	2550	3870	2570
			6	62.0	3740	3590	2390	3620	2410	3660	2430	3690	2460	3730	2480	3760	2500	3790	2520
			7	93.5	3230	3530	2350	3560	2370	3590	2390	3620	2410	3650	2430	3680	2450	3710	2470
HEM 550	2530	1690	TFL	0.00	12600	3800	2530	3920	2610	4030	2680	4140	2760	4260	2830	4370	2910	4480	2980
			2	10.0	10400	3700	2460	3790	2520	3880	2580	3980	2650	4070	2710	4170	2770	4260	2830
			3	20.0	8240	3570	2380	3640	2420	3720	2470	3790	2520	3870	2570	3940	2620	4010	2670
			4	30.0	6060	3420	2280	3480	2310	3530	2350	3590	2390	3640	2420	3700	2460	3750	2500
			BFL	40.0	3890	3260	2170	3290	2190	3330	2210	3360	2240	3400	2260	3430	2280	3470	2310
			6	56.1	3520	3220	2150	3260	2170	3290	2190	3320	2210	3350	2230	3380	2250	3410	2270
			7	75.0	3150	3190	2120	3210	2140	3240	2160	3270	2180	3300	2190	3330	2210	3360	2230
HEM 500	2270	1510	TFL	0.00	12200	3430	2280	3540	2360	3650	2430	3760	2500	3870	2580	3980	2650	4090	2720
			2	10.0	10100	3320	2210	3420	2270	3510	2330	3600	2390	3690	2450	3780	2510	3870	2570
			3	20.0	7880	3200	2130	3270	2170	3340	2220	3410	2270	3480	2320	3550	2360	3620	2410
			4	30.0	5700	3050	2030	3100	2060	3150	2100	3200	2130	3260	2170	3310	2200	3360	2230
			BFL	40.0	3530	2880	1920	2920	1940	2950	1960	2980	1980	3010	2000	3040	2030	3080	2050
			6	50.3	3290	2860	1910	2890	1930	2920	1950	2950	1960	2980	1980	3010	2000	3040	2020
			7	60.6	3060	2840	1890	2870	1910	2900	1930	2920	1950	2950	1960	2980	1980	3010	2000

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

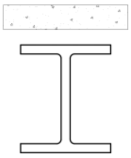
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 1000	5290	3520	TFL	0.00	15800	8860	5890	9000	5990	9140	6080	9280	6180	9420	6270	9570	6360	9710	6460
			2	10.0	13600	8610	5730	8740	5810	8860	5890	8980	5980	9110	6060	9230	6140	9350	6220
			3	20.0	11500	8350	5560	8460	5630	8560	5700	8660	5760	8770	5830	8870	5900	8970	5970
			4	30.0	9340	8070	5370	8160	5430	8240	5480	8330	5540	8410	5600	8490	5650	8580	5710
			BFL	40.0	7190	7780	5170	7840	5220	7900	5260	7970	5300	8030	5350	8100	5390	8160	5430
			6	131	5570	7480	4980	7530	5010	7580	5050	7630	5080	7680	5110	7730	5150	7780	5180
			7	240	3940	7040	4680	7070	4710	7110	4730	7140	4750	7180	4780	7210	4800	7250	4820
HEM 900	4610	3070	TFL	0.00	15000	7780	5180	7920	5270	8050	5360	8190	5450	8320	5540	8460	5630	8590	5720
			2	10.0	12900	7540	5020	7660	5090	7770	5170	7890	5250	8010	5330	8120	5400	8240	5480
			3	20.0	10700	7280	4840	7380	4910	7470	4970	7570	5040	7670	5100	7760	5170	7860	5230
			4	30.0	8610	7000	4660	7080	4710	7160	4760	7230	4810	7310	4860	7390	4920	7470	4970
			BFL	40.0	6460	6700	4460	6760	4500	6820	4540	6880	4570	6930	4610	6990	4650	7050	4690
			6	112	5110	6470	4300	6510	4330	6560	4360	6610	4400	6650	4430	6700	4460	6740	4490
			7	203	3760	6130	4080	6160	4100	6200	4120	6230	4150	6270	4170	6300	4190	6330	4210
HEM 800	3990	2660	TFL	0.00	14400	6810	4530	6940	4620	7070	4700	7190	4790	7320	4870	7450	4960	7580	5040
			2	10.0	12200	6570	4370	6680	4440	6790	4510	6890	4590	7000	4660	7110	4730	7220	4810
			3	20.0	10100	6300	4190	6390	4250	6480	4310	6580	4370	6670	4440	6760	4500	6850	4560
			4	30.0	7900	6020	4010	6090	4050	6170	4100	6240	4150	6310	4200	6380	4240	6450	4290
			BFL	40.0	5750	5720	3810	5770	3840	5830	3880	5880	3910	5930	3950	5980	3980	6030	4010
			6	93.9	4670	5540	3690	5590	3720	5630	3740	5670	3770	5710	3800	5750	3830	5800	3860
			7	166	3590	5300	3530	5330	3550	5370	3570	5400	3590	5430	3610	5460	3630	5500	3660
HEM 700	3370	2240	TFL	0.00	13600	5850	3890	5970	3970	6090	4050	6220	4140	6340	4220	6460	4300	6580	4380
			2	10.0	11400	5610	3730	5710	3800	5810	3870	5920	3940	6020	4000	6120	4070	6220	4140
			3	20.0	9280	5340	3560	5430	3610	5510	3670	5590	3720	5680	3780	5760	3830	5850	3890
			4	30.0	7120	5060	3370	5130	3410	5190	3450	5250	3500	5320	3540	5380	3580	5450	3620
			BFL	40.0	4960	4760	3170	4810	3200	4850	3230	4900	3260	4940	3290	4980	3320	5030	3350
			6	77.6	4180	4640	3080	4670	3110	4710	3130	4750	3160	4790	3190	4820	3210	4860	3240
			7	130	3400	4480	2980	4510	3000	4540	3020	4570	3040	4600	3060	4630	3080	4660	3100
HEM 650	3090	2050	TFL	0.00	13300	5420	3610	5540	3690	5660	3770	5780	3840	5900	3920	6020	4000	6140	4080
			2	10.0	11100	5180	3440	5280	3510	5380	3580	5480	3640	5580	3710	5680	3780	5780	3840
			3	20.0	8940	4910	3270	4990	3320	5070	3380	5160	3430	5240	3480	5320	3540	5400	3590
			4	30.0	6770	4630	3080	4690	3120	4750	3160	4810	3200	4880	3240	4940	3280	5000	3320
			BFL	40.0	4600	4330	2880	4370	2910	4410	2940	4450	2960	4490	2990	4540	3020	4580	3050
			6	68.4	3960	4230	2810	4260	2840	4300	2860	4340	2880	4370	2910	4410	2930	4440	2960
			7	112	3320	4110	2730	4140	2750	4170	2770	4200	2790	4230	2810	4260	2830	4290	2850
HEM 600	2800	1860	TFL	0.00	12900	5000	3320	5110	3400	5230	3480	5350	3560	5460	3630	5580	3710	5690	3790
			2	10.0	10700	4750	3160	4850	3230	4950	3290	5040	3360	5140	3420	5240	3480	5330	3550
			3	20.0	8580	4490	2990	4570	3040	4640	3090	4720	3140	4800	3190	4880	3240	4950	3300
			4	30.0	6410	4210	2800	4270	2840	4320	2880	4380	2910	4440	2950	4500	2990	4550	3030
			BFL	40.0	4250	3910	2600	3940	2620	3980	2650	4020	2670	4060	2700	4100	2730	4130	2750
			6	62.0	3740	3830	2550	3860	2570	3890	2590	3930	2610	3960	2640	3990	2660	4030	2680
			7	93.5	3230	3740	2490	3770	2510	3790	2520	3820	2540	3850	2560	3880	2580	3910	2600
HEM 550	2530	1690	TFL	0.00	12600	4600	3060	4710	3130	4820	3210	4940	3280	5050	3360	5160	3440	5280	3510
			2	10.0	10400	4350	2900	4450	2960	4540	3020	4630	3080	4730	3150	4820	3210	4910	3270
			3	20.0	8240	4090	2720	4160	2770	4240	2820	4310	2870	4390	2920	4460	2970	4530	3020
			4	30.0	6060	3810	2530	3860	2570	3910	2600	3970	2640	4020	2680	4080	2710	4130	2750
			BFL	40.0	3890	3500	2330	3540	2350	3570	2380	3610	2400	3640	2420	3680	2450	3710	2470
			6	56.1	3520	3450	2290	3480	2310	3510	2330	3540	2360	3570	2380	3600	2400	3640	2420
			7	75.0	3150	3380	2250	3410	2270	3440	2290	3470	2310	3500	2330	3530	2350	3550	2360
HEM 500	2270	1510	TFL	0.00	12200	4200	2800	4310	2870	4420	2940	4530	3020	4640	3090	4750	3160	4860	3230
			2	10.0	10100	3960	2630	4050	2690	4140	2750	4230	2810	4320	2870	4410	2930	4500	2990
			3	20.0	7880	3690	2460	3760	2500	3840	2550	3910	2600	3980	2650	4050	2690	4120	2740
			4	30.0	5700	3410	2270	3460	2300	3510	2340	3560	2370	3620	2410	3670	2440	3720	2470
			BFL	40.0	3530	3110	2070	3140	2090	3170	2110	3200	2130	3230	2150	3270	2170	3300	2190
			6	50.3	3290	3070	2040	3100	2060	3130	2080	3160	2100	3190	2120	3220	2140	3250	2160
			7	60.6	3060	3030	2020	3060	2040	3090	2060	3120	2070	3140	2090	3170	2110	3200	2130

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

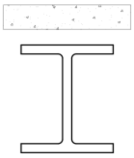
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 450	2020	1350	TFL	0.00	11900	3100	2060	3200	2130	3310	2200	3420	2270	3530	2350	3630	2420	3740	2490
			2	10.0	9730	2990	1990	3080	2050	3160	2110	3250	2160	3340	2220	3430	2280	3510	2340
			3	20.0	7550	2860	1900	2930	1950	3000	1990	3070	2040	3130	2080	3200	2130	3270	2180
			4	30.0	5370	2710	1810	2760	1840	2810	1870	2860	1900	2910	1930	2960	1970	3000	2000
			BFL	40.0	3190	2550	1700	2580	1710	2610	1730	2630	1750	2660	1770	2690	1790	2720	1810
			6	44.6	3080	2540	1690	2570	1710	2590	1730	2620	1740	2650	1760	2680	1780	2710	1800
			7	49.1	2980	2530	1680	2560	1700	2580	1720	2610	1740	2640	1750	2660	1770	2690	1790
HEM 400	1780	1180	TFL	0.00	11600	2770	1840	2870	1910	2980	1980	3080	2050	3190	2120	3290	2190	3390	2260
			2	10.0	9390	2660	1770	2750	1830	2830	1880	2910	1940	3000	2000	3080	2050	3170	2110
			3	20.0	7210	2530	1690	2600	1730	2660	1770	2730	1820	2790	1860	2860	1900	2920	1940
			4	30.0	5030	2390	1590	2430	1620	2480	1650	2520	1680	2570	1710	2610	1740	2660	1770
			BFL	40.0	2850	2220	1480	2250	1490	2270	1510	2300	1530	2320	1540	2350	1560	2370	1580
HEM 360	1590	1060	TFL	0.00	11300	2520	1680	2620	1750	2720	1810	2830	1880	2930	1950	3030	2020	3130	2080
			2	10.0	9130	2410	1610	2490	1660	2580	1710	2660	1770	2740	1820	2820	1880	2910	1930
			3	20.0	6940	2280	1520	2350	1560	2410	1600	2470	1640	2530	1690	2600	1730	2660	1770
			4	30.0	4760	2140	1420	2180	1450	2220	1480	2270	1510	2310	1540	2350	1560	2390	1590
			BFL	40.0	2570	1970	1310	1990	1330	2020	1340	2040	1360	2060	1370	2090	1390	2110	1400
HEM 340	1510	1000	TFL	0.00	11200	2410	1600	2510	1670	2610	1740	2710	1800	2810	1870	2910	1940	3010	2000
			2	10.0	9020	2300	1530	2380	1580	2460	1640	2540	1690	2620	1740	2700	1800	2780	1850
			3	20.0	6820	2170	1440	2230	1480	2290	1530	2350	1570	2420	1610	2480	1650	2540	1690
			4	30.0	4630	2020	1340	2060	1370	2100	1400	2150	1430	2190	1460	2230	1480	2270	1510
			BFL	40.0	2440	1850	1230	1880	1250	1900	1260	1920	1280	1940	1290	1960	1310	1990	1320
HEM 320	1420	943	TFL	0.00	11100	2290	1520	2390	1590	2490	1650	2590	1720	2690	1790	2790	1850	2890	1920
			2	10.0	8880	2180	1450	2260	1500	2340	1560	2420	1610	2500	1660	2580	1720	2660	1770
			3	20.0	6690	2050	1360	2110	1400	2170	1440	2230	1480	2290	1520	2350	1560	2410	1600
			4	30.0	4490	1900	1270	1940	1290	1980	1320	2020	1350	2060	1370	2100	1400	2150	1430
			BFL	40.0	2300	1730	1150	1760	1170	1780	1180	1800	1200	1820	1210	1840	1220	1860	1240
HEM 300	1300	867	TFL	0.00	10800	2130	1420	2230	1480	2320	1550	2420	1610	2520	1680	2610	1740	2710	1800
			2	9.75	8610	2020	1350	2100	1400	2180	1450	2260	1500	2330	1550	2410	1600	2490	1660
			3	19.5	6470	1900	1260	1960	1300	2020	1340	2070	1380	2130	1420	2190	1460	2250	1500
			4	29.3	4320	1760	1170	1790	1190	1830	1220	1870	1250	1910	1270	1950	1300	1990	1320
			BFL	39.0	2180	1590	1060	1610	1070	1630	1090	1650	1100	1670	1110	1690	1130	1710	1140
HEM 280	948	630	TFL	0.00	8530	1570	1050	1650	1100	1730	1150	1800	1200	1880	1250	1960	1300	2030	1350
			2	8.25	6840	1490	992	1550	1030	1610	1070	1680	1110	1740	1160	1800	1200	1860	1240
			3	16.5	5150	1400	929	1440	960	1490	991	1540	1020	1580	1050	1630	1080	1670	1110
			4	24.8	3470	1290	858	1320	878	1350	899	1380	920	1410	941	1450	961	1480	982
			BFL	33.0	1780	1170	778	1190	789	1200	799	1220	810	1230	821	1250	831	1270	842
HEM 260	806	537	TFL	0.00	7800	1370	910	1440	957	1510	1000	1580	1050	1650	1100	1720	1140	1790	1190
			2	8.13	6250	1290	860	1350	898	1410	935	1460	973	1520	1010	1570	1050	1630	1080
			3	16.3	4700	1210	803	1250	831	1290	859	1330	887	1380	915	1420	943	1460	972
			4	24.4	3160	1110	738	1140	756	1170	775	1190	794	1220	813	1250	832	1280	851
			BFL	32.5	1610	999	665	1010	675	1030	684	1040	694	1060	704	1070	713	1090	723

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

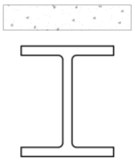
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

$F_y = 355$ MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 450	2020	1350	TFL	0.00	11900	3850	2560	3950	2630	4060	2700	4170	2770	4280	2840	4380	2920	4490	2990
			2	10.0	9730	3600	2400	3690	2450	3780	2510	3860	2570	3950	2630	4040	2690	4130	2750
			3	20.0	7550	3340	2220	3400	2270	3470	2310	3540	2360	3610	2400	3680	2450	3740	2490
			4	30.0	5370	3050	2030	3100	2060	3150	2100	3200	2130	3250	2160	3290	2190	3340	2220
			BFL	40.0	3190	2750	1830	2780	1850	2810	1870	2830	1890	2860	1910	2890	1920	2920	1940
			6	44.6	3080	2730	1820	2760	1840	2790	1860	2820	1870	2840	1890	2870	1910	2900	1930
			7	49.1	2980	2720	1810	2740	1830	2770	1840	2800	1860	2820	1880	2850	1900	2880	1910
HEM 400	1780	1180	TFL	0.00	11600	3500	2330	3600	2400	3710	2470	3810	2530	3910	2600	4020	2670	4120	2740
			2	10.0	9390	3250	2160	3340	2220	3420	2280	3510	2330	3590	2390	3670	2440	3760	2500
			3	20.0	7210	2990	1990	3050	2030	3120	2070	3180	2120	3250	2160	3310	2200	3380	2250
			4	30.0	5030	2700	1800	2750	1830	2790	1860	2840	1890	2880	1920	2930	1950	2970	1980
			BFL	40.0	2850	2400	1600	2420	1610	2450	1630	2480	1650	2500	1660	2530	1680	2550	1700
HEM 360	1590	1060	TFL	0.00	11300	3230	2150	3340	2220	3440	2290	3540	2350	3640	2420	3740	2490	3850	2560
			2	10.0	9130	2990	1990	3070	2040	3150	2100	3230	2150	3320	2210	3400	2260	3480	2320
			3	20.0	6940	2720	1810	2780	1850	2850	1890	2910	1940	2970	1980	3030	2020	3100	2060
			4	30.0	4760	2440	1620	2480	1650	2520	1680	2570	1710	2610	1740	2650	1760	2690	1790
			BFL	40.0	2570	2130	1420	2150	1430	2180	1450	2200	1460	2220	1480	2250	1500	2270	1510
HEM 340	1510	1000	TFL	0.00	11200	3110	2070	3210	2140	3310	2210	3420	2270	3520	2340	3620	2410	3720	2470
			2	10.0	9020	2870	1910	2950	1960	3030	2010	3110	2070	3190	2120	3270	2180	3350	2230
			3	20.0	6820	2600	1730	2660	1770	2720	1810	2780	1850	2840	1890	2910	1930	2970	1970
			4	30.0	4630	2310	1540	2350	1570	2400	1590	2440	1620	2480	1650	2520	1680	2560	1710
			BFL	40.0	2440	2010	1340	2030	1350	2050	1360	2070	1380	2090	1390	2120	1410	2140	1420
HEM 320	1420	943	TFL	0.00	11100	2990	1990	3090	2050	3180	2120	3280	2190	3380	2250	3480	2320	3580	2380
			2	10.0	8880	2740	1820	2820	1880	2900	1930	2980	1980	3060	2030	3140	2090	3220	2140
			3	20.0	6690	2470	1640	2530	1680	2590	1720	2650	1760	2710	1810	2770	1850	2830	1890
			4	30.0	4490	2190	1450	2230	1480	2270	1510	2310	1540	2350	1560	2390	1590	2430	1620
			BFL	40.0	2300	1880	1250	1900	1260	1920	1280	1940	1290	1960	1310	1980	1320	2000	1330
HEM 300	1300	867	TFL	0.00	10800	2810	1870	2910	1930	3000	2000	3100	2060	3200	2130	3290	2190	3390	2260
			2	9.75	8610	2570	1710	2640	1760	2720	1810	2800	1860	2880	1910	2950	1970	3030	2020
			3	19.5	6470	2310	1540	2370	1570	2420	1610	2480	1650	2540	1690	2600	1730	2660	1770
			4	29.3	4320	2030	1350	2070	1380	2110	1400	2150	1430	2180	1450	2220	1480	2260	1500
			BFL	39.0	2180	1730	1150	1750	1160	1770	1180	1790	1190	1810	1200	1830	1220	1850	1230
HEM 280	948	630	TFL	0.00	8530	2110	1400	2190	1460	2260	1510	2340	1560	2420	1610	2490	1660	2570	1710
			2	8.25	6840	1920	1280	1980	1320	2050	1360	2110	1400	2170	1440	2230	1480	2290	1520
			3	16.5	5150	1720	1150	1770	1180	1810	1210	1860	1240	1910	1270	1950	1300	2000	1330
			4	24.8	3470	1510	1000	1540	1020	1570	1040	1600	1070	1630	1090	1660	1110	1690	1130
			BFL	33.0	1780	1280	853	1300	863	1310	874	1330	885	1350	895	1360	906	1380	917
HEM 260	806	537	TFL	0.00	7800	1860	1240	1930	1280	2000	1330	2070	1380	2140	1420	2210	1470	2280	1520
			2	8.13	6250	1690	1120	1740	1160	1800	1200	1860	1230	1910	1270	1970	1310	2020	1350
			3	16.3	4700	1500	1000	1550	1030	1590	1060	1630	1080	1670	1110	1710	1140	1760	1170
			4	24.4	3160	1310	870	1340	889	1360	908	1390	927	1420	946	1450	964	1480	983
			BFL	32.5	1610	1100	733	1120	742	1130	752	1140	761	1160	771	1170	781	1190	790

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

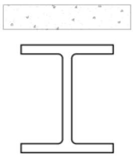
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 240	676	450	TFL	0.00	7090	1180	785	1240	827	1310	870	1370	912	1430	955	1500	997	1560	1040
			2	8.00	5680	1110	739	1160	773	1210	807	1260	841	1320	875	1370	909	1420	943
			3	16.0	4270	1030	687	1070	713	1110	738	1150	764	1190	789	1220	815	1260	840
			4	24.0	2860	944	628	970	645	995	662	1020	679	1050	697	1070	714	1100	731
			BFL	32.0	1450	845	562	858	571	871	580	884	588	897	597	910	606	923	614
HEM 220	453	302	TFL	0.00	5300	811	540	859	572	907	603	955	635	1000	667	1050	699	1100	730
			2	6.50	4260	761	507	800	532	838	558	877	583	915	609	953	634	992	660
			3	13.0	3220	705	469	734	489	763	508	792	527	821	546	850	566	879	585
			4	19.5	2170	643	428	663	441	682	454	702	467	721	480	741	493	761	506
			BFL	26.0	1130	575	383	585	389	595	396	605	403	616	410	626	416	636	423
HEM 200	363	241	TFL	0.00	4660	671	447	713	474	755	502	797	530	839	558	881	586	923	614
			2	6.25	3750	627	417	661	440	695	462	729	485	762	507	796	530	830	552
			3	12.5	2830	579	385	604	402	630	419	655	436	681	453	706	470	732	487
			4	18.8	1920	525	349	542	361	559	372	576	384	594	395	611	407	628	418
			BFL	25.0	1000	466	310	475	316	484	322	493	328	502	334	511	340	520	346
HEM 180	282	188	TFL	0.00	4020	543	361	579	385	615	409	652	434	688	458	724	482	760	506
			2	6.00	3230	505	336	534	355	563	375	592	394	621	413	651	433	680	452
			3	12.0	2440	463	308	485	323	507	337	529	352	551	367	573	381	595	396
			4	18.0	1650	417	277	432	287	446	297	461	307	476	317	491	327	506	336
			BFL	24.0	853	366	244	374	249	381	254	389	259	397	264	405	269	412	274
HEM 160	216	143	TFL	0.00	3450	434	289	465	309	496	330	527	351	558	371	589	392	620	413
			2	5.75	2770	402	267	427	284	452	301	477	317	501	334	526	350	551	367
			3	11.5	2090	366	244	385	256	404	269	423	281	441	294	460	306	479	319
			4	17.3	1410	327	217	340	226	352	234	365	243	378	251	390	260	403	268
			BFL	23.0	734	284	189	291	193	297	198	304	202	311	207	317	211	324	215
HEM 140	158	105	TFL	0.00	2860	335	223	360	240	386	257	412	274	438	291	463	308	489	325
			2	5.50	2290	308	205	328	218	349	232	369	246	390	259	411	273	431	287
			3	11.0	1720	278	185	293	195	309	205	324	216	340	226	355	236	371	247
			4	16.5	1150	245	163	255	170	266	177	276	184	286	190	297	197	307	204
			BFL	22.0	579	209	139	215	143	220	146	225	150	230	153	235	157	241	160
HEM 120	112	74.5	TFL	0.00	2360	255	169	276	184	297	198	318	212	339	226	361	240	382	254
			2	5.25	1890	232	155	249	166	266	177	283	189	300	200	317	211	334	222
			3	10.5	1420	208	138	221	147	233	155	246	164	259	172	272	181	284	189
			4	15.8	949	181	121	190	126	198	132	207	138	215	143	224	149	232	155
			BFL	21.0	479	152	101	157	104	161	107	165	110	170	113	174	116	178	119
HEM 100	75.3	50.1	TFL	0.00	1890	187	124	204	136	221	147	238	158	255	170	272	181	289	192
			2	5.00	1510	169	113	183	122	197	131	210	140	224	149	237	158	251	167
			3	10.0	1140	150	99.7	160	107	170	113	181	120	191	127	201	134	211	141
			4	15.0	761	129	85.6	136	90.2	142	94.7	149	99.3	156	104	163	108	170	113
			BFL	20.0	385	106	70.4	109	72.7	113	75.0	116	77.3	120	79.6	123	81.9	127	84.2

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

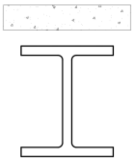
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite HEM Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HEM 240	676	450	TFL	0.00	7090	1630	1080	1690	1120	1750	1170	1820	1210	1880	1250	1950	1290	2010	1340
			2	8.00	5680	1470	977	1520	1010	1570	1050	1620	1080	1670	1110	1720	1150	1780	1180
			3	16.0	4270	1300	866	1340	892	1380	917	1420	943	1460	968	1490	994	1530	1020
			4	24.0	2860	1120	748	1150	765	1180	782	1200	799	1230	816	1250	834	1280	851
			BFL	32.0	1450	937	623	950	632	963	640	976	649	989	658	1000	667	1010	675
HEM 220	453	302	TFL	0.00	5300	1150	762	1190	794	1240	826	1290	857	1340	889	1380	921	1430	953
			2	6.50	4260	1030	685	1070	711	1110	736	1140	762	1180	787	1220	813	1260	838
			3	13.0	3220	908	604	937	623	966	643	995	662	1020	681	1050	701	1080	720
			4	19.5	2170	780	519	800	532	819	545	839	558	859	571	878	584	898	597
			BFL	26.0	1130	646	430	656	437	667	444	677	450	687	457	697	464	707	471
HEM 200	363	241	TFL	0.00	4660	965	642	1010	670	1050	698	1090	726	1130	754	1170	782	1220	809
			2	6.25	3750	864	575	897	597	931	619	965	642	998	664	1030	687	1070	709
			3	12.5	2830	757	504	783	521	808	538	834	555	859	572	885	589	910	606
			4	18.8	1920	646	430	663	441	680	452	697	464	715	475	732	487	749	498
			BFL	25.0	1000	529	352	538	358	547	364	556	370	565	376	574	382	583	388
HEM 180	282	188	TFL	0.00	4020	796	530	833	554	869	578	905	602	941	626	977	650	1010	674
			2	6.00	3230	709	472	738	491	767	510	796	530	825	549	854	568	883	588
			3	12.0	2440	617	410	639	425	661	439	682	454	704	469	726	483	748	498
			4	18.0	1650	520	346	535	356	550	366	565	376	580	386	594	395	609	405
			BFL	24.0	853	420	279	428	284	435	290	443	295	451	300	458	305	466	310
HEM 160	216	143	TFL	0.00	3450	651	433	682	454	713	474	744	495	775	516	806	536	837	557
			2	5.75	2770	576	383	601	400	626	417	651	433	676	450	701	466	726	483
			3	11.5	2090	498	331	517	344	535	356	554	369	573	381	592	394	611	406
			4	17.3	1410	416	277	429	285	441	294	454	302	467	310	479	319	492	327
			BFL	23.0	734	330	220	337	224	344	229	350	233	357	237	363	242	370	246
HEM 140	158	105	TFL	0.00	2860	515	343	541	360	566	377	592	394	618	411	643	428	669	445
			2	5.50	2290	452	301	472	314	493	328	514	342	534	355	555	369	575	383
			3	11.0	1720	386	257	401	267	417	277	432	288	448	298	463	308	479	319
			4	16.5	1150	317	211	328	218	338	225	348	232	359	239	369	246	379	252
			BFL	22.0	579	246	164	251	167	256	171	262	174	267	177	272	181	277	184
HEM 120	112	74.5	TFL	0.00	2360	403	268	424	282	446	296	467	311	488	325	509	339	530	353
			2	5.25	1890	351	234	368	245	385	256	402	268	419	279	436	290	453	302
			3	10.5	1420	297	198	310	206	323	215	336	223	348	232	361	240	374	249
			4	15.8	949	241	160	250	166	258	172	267	177	275	183	284	189	292	194
			BFL	21.0	479	182	121	187	124	191	127	195	130	200	133	204	136	208	139
HEM 100	75.3	50.1	TFL	0.00	1890	306	204	323	215	340	226	357	238	374	249	391	260	408	272
			2	5.00	1510	265	176	278	185	292	194	306	203	319	212	333	221	346	230
			3	10.0	1140	222	147	232	154	242	161	252	168	262	175	273	181	283	188
			4	15.0	761	177	118	183	122	190	127	197	131	204	136	211	140	218	145
			BFL	20.0	385	130	86.5	134	88.8	137	91.2	140	93.5	144	95.8	147	98.1	151	100

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

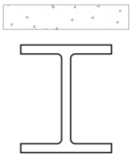
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 600	743	494	TFL	0.00	3670	1150	768	1190	790	1220	812	1250	834	1290	856	1320	878	1350	900
			2	4.75	3170	1130	753	1160	772	1190	791	1220	810	1250	829	1270	848	1300	867
			3	9.50	2680	1110	736	1130	752	1150	768	1180	784	1200	800	1230	816	1250	833
			4	14.3	2190	1080	718	1100	731	1120	744	1140	757	1160	770	1180	784	1200	797
			BFL	19.0	1700	1050	698	1060	709	1080	719	1100	729	1110	739	1130	749	1140	759
			6	67.9	1310	1020	677	1030	685	1040	693	1050	701	1070	709	1080	716	1090	724
			7	138	917	964	641	972	647	980	652	989	658	997	663	1010	669	1010	674
IPE 550	589	392	TFL	0.00	3160	924	615	952	634	981	652	1010	671	1040	690	1070	709	1090	728
			2	4.30	2730	904	601	929	618	953	634	978	651	1000	667	1030	683	1050	700
			3	8.60	2310	882	587	903	601	924	615	945	629	965	642	986	656	1010	670
			4	12.9	1890	859	572	876	583	893	594	910	605	927	617	944	628	961	639
			BFL	17.2	1460	834	555	847	564	861	573	874	581	887	590	900	599	913	608
			6	59.3	1130	809	538	819	545	829	551	839	558	849	565	859	572	869	578
			7	124	790	766	510	773	514	780	519	787	524	794	528	801	533	808	538
IPE 500	464	309	TFL	0.00	2710	733	488	757	504	782	520	806	536	831	553	855	569	879	585
			2	4.00	2340	715	476	736	490	757	504	778	518	799	532	820	546	842	560
			3	8.00	1960	696	463	714	475	732	487	749	499	767	510	785	522	802	534
			4	12.0	1590	676	450	690	459	705	469	719	478	733	488	747	497	762	507
			BFL	16.0	1210	654	435	665	443	676	450	687	457	698	464	709	472	720	479
			6	53.0	944	635	422	643	428	652	434	660	439	669	445	677	451	686	456
			7	108	679	603	402	610	406	616	410	622	414	628	418	634	422	640	426
IPE 450	360	240	TFL	0.00	2320	575	382	596	396	617	410	637	424	658	438	679	452	700	466
			2	3.65	2000	560	372	578	384	595	396	613	408	631	420	649	432	667	444
			3	7.30	1670	543	361	558	371	573	381	588	391	603	401	618	411	633	421
			4	11.0	1340	526	350	538	358	550	366	562	374	574	382	586	390	599	398
			BFL	14.6	1020	508	338	517	344	526	350	535	356	544	362	553	368	563	374
			6	44.0	800	492	328	499	332	507	337	514	342	521	347	528	351	535	356
			7	93.6	581	469	312	474	315	479	319	484	322	490	326	495	329	500	333
IPE 400	276	184	TFL	0.00	1980	447	297	464	309	482	321	500	333	518	345	536	357	554	368
			2	3.38	1700	433	288	449	298	464	309	479	319	494	329	510	339	525	349
			3	6.75	1410	419	279	432	287	445	296	457	304	470	313	483	321	495	330
			4	10.1	1130	404	269	414	276	424	282	435	289	445	296	455	303	465	309
			BFL	13.5	843	388	258	396	263	403	268	411	273	419	279	426	284	434	289
			6	34.4	669	377	251	383	255	389	259	395	263	401	267	407	271	413	275
			7	77.2	496	360	240	365	243	369	246	374	249	378	252	383	255	387	257
IPE 360	216	143	TFL	0.00	1710	354	235	369	246	385	256	400	266	415	276	431	287	446	297
			2	3.18	1460	342	228	355	236	368	245	381	254	394	262	408	271	421	280
			3	6.35	1200	330	219	340	226	351	234	362	241	373	248	384	255	394	262
			4	9.52	948	316	210	325	216	333	222	342	227	350	233	359	239	367	245
			BFL	12.7	694	302	201	309	205	315	209	321	214	327	218	334	222	340	226
			6	30.8	561	294	195	299	199	304	202	309	205	314	209	319	212	324	216
			7	66.4	427	282	188	286	190	290	193	293	195	297	198	301	200	305	203

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

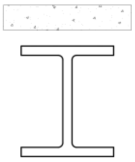
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 600	743	494	TFL	0.00	3670	1390	922	1420	944	1450	966	1480	988	1520	1010	1550	1030	1580	1050
			2	4.75	3170	1330	886	1360	905	1390	924	1420	943	1450	962	1470	981	1500	1000
			3	9.50	2680	1280	849	1300	865	1320	881	1350	897	1370	913	1400	929	1420	945
			4	14.3	2190	1220	810	1240	823	1260	836	1280	849	1300	862	1320	875	1340	889
			BFL	19.0	1700	1160	770	1170	780	1190	790	1200	800	1220	810	1230	821	1250	831
			6	67.9	1310	1100	732	1110	740	1120	748	1140	756	1150	763	1160	771	1170	779
			7	138	917	1020	680	1030	685	1040	691	1050	696	1050	702	1060	707	1070	713
IPE 550	589	392	TFL	0.00	3160	1120	747	1150	766	1180	785	1210	804	1240	823	1260	842	1290	861
			2	4.30	2730	1080	716	1100	732	1130	749	1150	765	1170	781	1200	798	1220	814
			3	8.60	2310	1030	684	1050	698	1070	712	1090	725	1110	739	1130	753	1150	767
			4	12.9	1890	978	651	995	662	1010	673	1030	685	1050	696	1060	707	1080	718
			BFL	17.2	1460	926	616	939	625	953	634	966	643	979	651	992	660	1010	669
			6	59.3	1130	879	585	890	592	900	599	910	605	920	612	930	619	940	626
			7	124	790	816	543	823	547	830	552	837	557	844	562	851	566	858	571
IPE 500	464	309	TFL	0.00	2710	904	601	928	618	953	634	977	650	1000	666	1030	683	1050	699
			2	4.00	2340	863	574	884	588	905	602	926	616	947	630	968	644	989	658
			3	8.00	1960	820	546	838	557	855	569	873	581	891	593	908	604	926	616
			4	12.0	1590	776	516	790	526	804	535	819	545	833	554	847	564	862	573
			BFL	16.0	1210	731	486	741	493	752	501	763	508	774	515	785	522	796	530
			6	53.0	944	694	462	703	468	711	473	720	479	728	485	737	490	745	496
			7	108	679	646	430	652	434	658	438	665	442	671	446	677	450	683	454
IPE 450	360	240	TFL	0.00	2320	721	480	742	494	763	508	784	521	805	535	826	549	846	563
			2	3.65	2000	685	456	703	468	721	480	739	492	757	504	775	516	793	528
			3	7.30	1670	649	431	664	441	679	451	694	461	709	471	724	481	739	491
			4	11.0	1340	611	406	623	414	635	422	647	430	659	438	671	447	683	455
			BFL	14.6	1020	572	380	581	386	590	393	599	399	608	405	618	411	627	417
			6	44.0	800	543	361	550	366	557	371	564	375	571	380	579	385	586	390
			7	93.6	581	505	336	511	340	516	343	521	347	526	350	532	354	537	357
IPE 400	276	184	TFL	0.00	1980	572	380	589	392	607	404	625	416	643	428	661	440	679	452
			2	3.38	1700	540	360	556	370	571	380	586	390	602	400	617	410	632	421
			3	6.75	1410	508	338	521	347	534	355	546	364	559	372	572	380	585	389
			4	10.1	1130	475	316	485	323	496	330	506	336	516	343	526	350	536	357
			BFL	13.5	843	441	294	449	299	457	304	464	309	472	314	479	319	487	324
			6	34.4	669	419	279	425	283	431	287	437	291	443	295	449	299	455	303
			7	77.2	496	391	260	396	263	400	266	405	269	409	272	414	275	418	278
IPE 360	216	143	TFL	0.00	1710	461	307	477	317	492	328	508	338	523	348	538	358	554	368
			2	3.18	1460	434	289	447	297	460	306	473	315	486	323	499	332	512	341
			3	6.35	1200	405	270	416	277	427	284	438	291	448	298	459	306	470	313
			4	9.52	948	376	250	385	256	393	262	402	267	410	273	419	279	427	284
			BFL	12.7	694	346	230	352	234	359	239	365	243	371	247	377	251	384	255
			6	30.8	561	329	219	334	222	339	226	344	229	349	232	354	236	359	239
			7	66.4	427	309	205	313	208	316	211	320	213	324	216	328	218	332	221

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

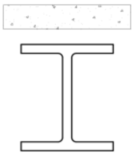
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 330	170	113	TFL	0.00	1470	285	189	298	198	311	207	324	216	338	225	351	233	364	242
			2	2.88	1260	275	183	286	190	297	198	309	205	320	213	331	220	342	228
			3	5.75	1040	264	176	273	182	283	188	292	194	302	201	311	207	320	213
			4	8.63	823	253	168	260	173	268	178	275	183	283	188	290	193	297	198
			BFL	11.5	607	241	161	247	164	252	168	258	171	263	175	269	179	274	182
			6	28.2	487	234	156	238	158	243	161	247	164	251	167	256	170	260	173
			7	60.7	368	224	149	227	151	230	153	234	155	237	158	240	160	244	162
IPE 300	133	88.4	TFL	0.00	1260	228	151	239	159	250	167	262	174	273	182	285	189	296	197
			2	2.68	1080	219	146	229	152	238	159	248	165	258	171	267	178	277	184
			3	5.35	887	210	140	218	145	226	150	234	155	242	161	250	166	258	171
			4	8.02	699	200	133	206	137	213	142	219	146	225	150	232	154	238	158
			BFL	10.7	510	190	126	195	129	199	133	204	136	208	139	213	142	218	145
			6	26.2	413	184	122	188	125	192	127	195	130	199	132	203	135	206	137
			7	55.3	316	176	117	179	119	182	121	185	123	188	125	190	127	193	129
IPE 270	102	68.1	TFL	0.00	1080	180	120	190	126	199	133	209	139	219	145	228	152	238	158
			2	2.55	918	172	115	181	120	189	126	197	131	205	137	214	142	222	148
			3	5.10	756	164	109	171	114	178	118	185	123	192	128	199	132	205	137
			4	7.65	594	156	104	162	108	167	111	172	115	178	118	183	122	188	125
			BFL	10.2	433	148	98.3	152	101	155	103	159	106	163	109	167	111	171	114
			6	23.5	351	143	95.0	146	97.1	149	99.2	152	101	155	103	159	106	162	108
			7	48.0	270	137	90.9	139	92.5	141	94.1	144	95.7	146	97.3	149	99.0	151	101
IPE 240	77.5	51.6	TFL	0.00	919	141	93.6	149	99.1	157	105	165	110	174	116	182	121	190	127
			2	2.45	781	134	89.3	141	94.0	148	98.7	155	103	162	108	169	113	176	117
			3	4.90	643	128	84.9	133	88.8	139	92.6	145	96.5	151	100	157	104	162	108
			4	7.35	505	121	80.3	125	83.3	130	86.3	134	89.3	139	92.4	143	95.4	148	98.4
			BFL	9.80	367	113	75.4	117	77.6	120	79.8	123	82.0	127	84.2	130	86.4	133	88.6
			6	21.3	298	109	72.7	112	74.5	115	76.3	117	78.1	120	79.9	123	81.7	125	83.4
			7	41.1	230	104	69.5	106	70.8	109	72.2	111	73.6	113	75.0	115	76.3	117	77.7
IPE 220	60.4	40.2	TFL	0.00	784	113	75.1	120	79.8	127	84.5	134	89.2	141	93.9	148	98.6	155	103
			2	2.30	665	107	71.5	113	75.5	119	79.5	125	83.4	131	87.4	137	91.4	143	95.4
			3	4.60	546	102	67.7	107	71.0	112	74.2	116	77.5	121	80.8	126	84.0	131	87.3
			4	6.90	427	95.8	63.7	99.6	66.3	103	68.8	107	71.4	111	74.0	115	76.5	119	79.1
			BFL	9.20	309	89.6	59.6	92.3	61.4	95.1	63.3	97.9	65.1	101	67.0	103	68.8	106	70.7
			6	20.0	252	86.3	57.4	88.6	58.9	90.8	60.4	93.1	61.9	95.4	63.4	97.6	65.0	99.9	66.5
			7	39.3	196	82.3	54.7	84.0	55.9	85.8	57.1	87.6	58.3	89.3	59.4	91.1	60.6	92.9	61.8
IPE 200	46.7	31	TFL	0.00	669	90.4	60.1	96.4	64.1	102	68.1	108	72.1	114	76.1	120	80.2	126	84.2
			2	2.13	569	85.8	57.1	90.9	60.5	96.0	63.9	101	67.3	106	70.7	111	74.1	117	77.5
			3	4.25	470	81.0	53.9	85.2	56.7	89.4	59.5	93.7	62.3	97.9	65.1	102	67.9	106	70.7
			4	6.38	370	76.0	50.6	79.3	52.8	82.7	55.0	86.0	57.2	89.3	59.4	92.6	61.6	96.0	63.9
			BFL	8.50	270	70.8	47.1	73.3	48.8	75.7	50.4	78.1	52.0	80.6	53.6	83.0	55.2	85.4	56.8
			6	18.7	219	67.9	45.2	69.9	46.5	71.8	47.8	73.8	49.1	75.8	50.4	77.8	51.7	79.7	53.0
			7	36.4	167	64.4	42.8	65.9	43.8	67.4	44.8	68.9	45.8	70.4	46.8	71.9	47.8	73.4	48.8

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

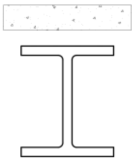
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 330	170	113	TFL	0.00	1470	377	251	391	260	404	269	417	278	430	286	444	295	457	304
			2	2.88	1260	354	235	365	243	376	250	388	258	399	265	410	273	422	280
			3	5.75	1040	330	219	339	226	348	232	358	238	367	244	376	250	386	257
			4	8.63	823	305	203	312	208	320	213	327	218	334	223	342	227	349	232
			BFL	11.5	607	280	186	285	190	290	193	296	197	301	201	307	204	312	208
			6	28.2	487	265	176	269	179	273	182	278	185	282	188	286	191	291	193
			7	60.7	368	247	164	250	166	254	169	257	171	260	173	263	175	267	177
IPE 300	133	88.4	TFL	0.00	1260	307	204	319	212	330	220	341	227	353	235	364	242	376	250
			2	2.68	1080	287	191	296	197	306	204	316	210	325	217	335	223	345	229
			3	5.35	887	266	177	274	182	282	187	290	193	298	198	306	203	314	209
			4	8.02	699	244	162	250	167	257	171	263	175	269	179	276	183	282	188
			BFL	10.7	510	222	148	227	151	231	154	236	157	241	160	245	163	250	166
			6	26.2	413	210	140	214	142	218	145	221	147	225	150	229	152	232	155
			7	55.3	316	196	130	199	132	202	134	205	136	207	138	210	140	213	142
IPE 270	102	68.1	TFL	0.00	1080	248	165	258	171	267	178	277	184	287	191	296	197	306	204
			2	2.55	918	230	153	238	159	247	164	255	170	263	175	271	181	280	186
			3	5.10	756	212	141	219	146	226	150	233	155	239	159	246	164	253	168
			4	7.65	594	194	129	199	132	204	136	210	140	215	143	220	147	226	150
			BFL	10.2	433	175	116	179	119	183	122	187	124	191	127	194	129	198	132
			6	23.5	351	165	110	168	112	171	114	174	116	178	118	181	120	184	122
			7	48.0	270	154	102	156	104	158	105	161	107	163	109	166	110	168	112
IPE 240	77.5	51.6	TFL	0.00	919	199	132	207	138	215	143	223	149	232	154	240	160	248	165
			2	2.45	781	183	122	191	127	198	131	205	136	212	141	219	145	226	150
			3	4.90	643	168	112	174	116	180	120	185	123	191	127	197	131	203	135
			4	7.35	505	152	101	157	104	162	107	166	110	171	114	175	117	180	120
			BFL	9.80	367	136	90.8	140	93.0	143	95.2	146	97.4	150	99.6	153	102	156	104
			6	21.3	298	128	85.2	131	87.0	133	88.8	136	90.6	139	92.4	142	94.2	144	95.9
			7	41.1	230	119	79.1	121	80.5	123	81.8	125	83.2	127	84.6	129	86.0	131	87.3
IPE 220	60.4	40.2	TFL	0.00	784	162	108	169	113	176	117	184	122	191	127	198	131	205	136
			2	2.30	665	149	99.4	155	103	161	107	167	111	173	115	179	119	185	123
			3	4.60	546	136	90.6	141	93.9	146	97.1	151	100	156	104	161	107	166	110
			4	6.90	427	123	81.6	127	84.2	130	86.8	134	89.3	138	91.9	142	94.4	146	97.0
			BFL	9.20	309	109	72.5	112	74.4	115	76.2	117	78.1	120	79.9	123	81.8	126	83.6
			6	20.0	252	102	68.0	104	69.5	107	71.0	109	72.5	111	74.0	114	75.5	116	77.0
			7	39.3	196	94.6	63.0	96.4	64.1	98.1	65.3	99.9	66.5	102	67.7	103	68.8	105	70.0
IPE 200	46.7	31	TFL	0.00	669	133	88.2	139	92.2	145	96.2	151	100	157	104	163	108	169	112
			2	2.13	569	122	80.9	127	84.3	132	87.7	137	91.2	142	94.6	147	98.0	152	101
			3	4.25	470	111	73.6	115	76.4	119	79.2	123	82.0	127	84.8	132	87.6	136	90.4
			4	6.38	370	99.3	66.1	103	68.3	106	70.5	109	72.7	113	74.9	116	77.1	119	79.3
			BFL	8.50	270	87.8	58.4	90.3	60.1	92.7	61.7	95.1	63.3	97.6	64.9	100	66.5	102	68.1
			6	18.7	219	81.7	54.3	83.7	55.7	85.6	57.0	87.6	58.3	89.6	59.6	91.5	60.9	93.5	62.2
			7	36.4	167	74.9	49.8	76.4	50.8	77.9	51.8	79.4	52.8	80.9	53.9	82.4	54.9	83.9	55.9

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

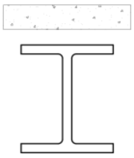
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 180	35.2	23.4	TFL	0.00	563	70.9	47.2	76.0	50.6	81.0	53.9	86.1	57.3	91.2	60.7	96.2	64.0	101	67.4
			2	2.00	477	67.0	44.6	71.3	47.4	75.6	50.3	79.9	53.1	84.2	56.0	88.5	58.9	92.8	61.7
			3	4.00	392	62.9	41.9	66.4	44.2	70.0	46.5	73.5	48.9	77.0	51.2	80.5	53.6	84.1	55.9
			4	6.00	306	58.7	39.0	61.4	40.9	64.2	42.7	66.9	44.5	69.7	46.4	72.5	48.2	75.2	50.0
			BFL	8.00	221	54.3	36.1	56.3	37.4	58.3	38.8	60.2	40.1	62.2	41.4	64.2	42.7	66.2	44.0
			6	17.5	181	52.0	34.6	53.7	35.7	55.3	36.8	56.9	37.9	58.5	38.9	60.2	40.0	61.8	41.1
			7	33.5	141	49.3	32.8	50.6	33.7	51.8	34.5	53.1	35.3	54.4	36.2	55.6	37.0	56.9	37.9
IPE 160	26.2	17.4	TFL	0.00	472	55.2	36.8	59.5	39.6	63.7	42.4	68.0	45.2	72.2	48.1	76.5	50.9	80.7	53.7
			2	1.85	401	52.0	34.6	55.6	37.0	59.2	39.4	62.8	41.8	66.4	44.2	70.0	46.6	73.6	49.0
			3	3.70	330	48.6	32.3	51.5	34.3	54.5	36.3	57.5	38.2	60.4	40.2	63.4	42.2	66.4	44.2
			4	5.55	258	45.1	30.0	47.4	31.5	49.7	33.1	52.0	34.6	54.4	36.2	56.7	37.7	59.0	39.3
			BFL	7.40	187	41.5	27.6	43.1	28.7	44.8	29.8	46.5	30.9	48.2	32.1	49.9	33.2	51.5	34.3
			6	15.7	152	39.5	26.3	40.9	27.2	42.3	28.1	43.7	29.1	45.0	30.0	46.4	30.9	47.8	31.8
			7	29.8	118	37.3	24.8	38.4	25.5	39.4	26.2	40.5	26.9	41.5	27.6	42.6	28.4	43.7	29.1
IPE 140	18.7	12.4	TFL	0.00	386	41.7	27.7	45.2	30.1	48.6	32.4	52.1	34.7	55.6	37.0	59.1	39.3	62.5	41.6
			2	1.73	327	39.0	25.9	41.9	27.9	44.9	29.9	47.8	31.8	50.8	33.8	53.7	35.7	56.6	37.7
			3	3.45	268	36.2	24.1	38.6	25.7	41.0	27.3	43.4	28.9	45.8	30.5	48.2	32.1	50.6	33.7
			4	5.18	209	33.3	22.2	35.2	23.4	37.0	24.7	38.9	25.9	40.8	27.1	42.7	28.4	44.6	29.6
			BFL	6.90	149	30.3	20.2	31.7	21.1	33.0	22.0	34.3	22.9	35.7	23.7	37.0	24.6	38.4	25.5
			6	14.3	123	28.9	19.2	30.0	19.9	31.1	20.7	32.2	21.4	33.3	22.2	34.4	22.9	35.5	23.6
			7	26.3	96.5	27.2	18.1	28.1	18.7	28.9	19.3	29.8	19.8	30.7	20.4	31.5	21.0	32.4	21.6
IPE 120	12.8	8.55	TFL	0.00	310	30.7	20.4	33.5	22.3	36.3	24.2	39.1	26.0	41.9	27.9	44.7	29.7	47.5	31.6
			2	1.58	263	28.6	19.0	30.9	20.6	33.3	22.2	35.7	23.7	38.0	25.3	40.4	26.9	42.8	28.5
			3	3.15	216	26.3	17.5	28.3	18.8	30.2	20.1	32.2	21.4	34.1	22.7	36.0	24.0	38.0	25.3
			4	4.73	168	24.0	16.0	25.5	17.0	27.1	18.0	28.6	19.0	30.1	20.0	31.6	21.0	33.1	22.0
			BFL	6.30	121	21.7	14.4	22.8	15.1	23.8	15.9	24.9	16.6	26.0	17.3	27.1	18.0	28.2	18.8
			6	12.5	99.3	20.5	13.6	21.4	14.2	22.3	14.8	23.2	15.4	24.1	16.0	25.0	16.6	25.9	17.2
			7	22.5	77.6	19.2	12.8	19.9	13.2	20.6	13.7	21.3	14.2	22.0	14.6	22.7	15.1	23.4	15.6
IPE 100	8.34	5.55	TFL	0.00	243	21.8	14.5	24.0	16.0	26.2	17.4	28.4	18.9	30.6	20.3	32.7	21.8	34.9	23.2
			2	1.43	206	20.1	13.4	22.0	14.6	23.8	15.9	25.7	17.1	27.6	18.3	29.4	19.6	31.3	20.8
			3	2.85	169	18.4	12.3	19.9	13.3	21.5	14.3	23.0	15.3	24.5	16.3	26.0	17.3	27.5	18.3
			4	4.28	132	16.6	11.1	17.8	11.9	19.0	12.7	20.2	13.4	21.4	14.2	22.6	15.0	23.8	15.8
			BFL	5.70	95.2	14.8	9.86	15.7	10.4	16.5	11.0	17.4	11.6	18.2	12.1	19.1	12.7	20.0	13.3
			6	10.9	77.9	13.9	9.26	14.6	9.72	15.3	10.2	16.0	10.7	16.7	11.1	17.4	11.6	18.1	12.1
			7	18.5	60.6	12.9	8.59	13.5	8.95	14.0	9.32	14.5	9.68	15.1	10.0	15.6	10.4	16.2	10.8
IPE 80	4.91	3.27	TFL	0.00	180	14.5	9.68	16.2	10.8	17.8	11.8	19.4	12.9	21.0	14.0	22.6	15.1	24.2	16.1
			2	1.30	151	13.3	8.82	14.6	9.73	16.0	10.6	17.4	11.5	18.7	12.5	20.1	13.4	21.4	14.3
			3	2.60	123	11.9	7.95	13.1	8.69	14.2	9.43	15.3	10.2	16.4	10.9	17.5	11.6	18.6	12.4
			4	3.90	95.2	10.6	7.05	11.5	7.62	12.3	8.19	13.2	8.76	14.0	9.33	14.9	9.90	15.7	10.5
			BFL	5.20	67.1	9.22	6.13	9.82	6.54	10.4	6.94	11.0	7.34	11.6	7.74	12.2	8.14	12.8	8.55
			6	9.20	56.0	8.65	5.75	9.15	6.09	9.66	6.42	10.2	6.76	10.7	7.10	11.2	7.43	11.7	7.77
			7	14.9	44.9	8.03	5.34	8.43	5.61	8.84	5.88	9.24	6.15	9.65	6.42	10.0	6.69	10.5	6.96

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

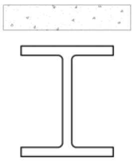
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 180	35.2	23.4	TFL	0.00	563	106	70.8	111	74.1	117	77.5	122	80.9	127	84.3	132	87.6	137	91.0
			2	2.00	477	97.1	64.6	101	67.4	106	70.3	110	73.2	114	76.0	119	78.9	123	81.7
			3	4.00	392	87.6	58.3	91.1	60.6	94.6	63.0	98.2	65.3	102	67.7	105	70.0	109	72.4
			4	6.00	306	78.0	51.9	80.7	53.7	83.5	55.5	86.2	57.4	89.0	59.2	91.7	61.0	94.5	62.9
			BFL	8.00	221	68.2	45.4	70.2	46.7	72.2	48.0	74.1	49.3	76.1	50.7	78.1	52.0	80.1	53.3
			6	17.5	181	63.4	42.2	65.0	43.3	66.7	44.4	68.3	45.4	69.9	46.5	71.5	47.6	73.2	48.7
			7	33.5	141	58.2	38.7	59.4	39.6	60.7	40.4	62.0	41.2	63.2	42.1	64.5	42.9	65.8	43.8
IPE 160	26.2	17.4	TFL	0.00	472	85.0	56.5	89.2	59.4	93.5	62.2	97.7	65.0	102	67.8	106	70.7	110	73.5
			2	1.85	401	77.2	51.4	80.8	53.8	84.4	56.2	88.0	58.6	91.7	61.0	95.3	63.4	98.9	65.8
			3	3.70	330	69.3	46.1	72.3	48.1	75.3	50.1	78.2	52.1	81.2	54.0	84.2	56.0	87.1	58.0
			4	5.55	258	61.3	40.8	63.7	42.4	66.0	43.9	68.3	45.5	70.6	47.0	73.0	48.5	75.3	50.1
			BFL	7.40	187	53.2	35.4	54.9	36.5	56.6	37.7	58.3	38.8	60.0	39.9	61.6	41.0	63.3	42.1
			6	15.7	152	49.2	32.7	50.5	33.6	51.9	34.5	53.3	35.4	54.6	36.4	56.0	37.3	57.4	38.2
			7	29.8	118	44.7	29.8	45.8	30.5	46.9	31.2	47.9	31.9	49.0	32.6	50.0	33.3	51.1	34.0
IPE 140	18.7	12.4	TFL	0.00	386	66.0	43.9	69.5	46.2	73.0	48.6	76.4	50.9	79.9	53.2	83.4	55.5	86.9	57.8
			2	1.73	327	59.6	39.6	62.5	41.6	65.5	43.6	68.4	45.5	71.4	47.5	74.3	49.4	77.2	51.4
			3	3.45	268	53.1	35.3	55.5	36.9	57.9	38.5	60.3	40.1	62.7	41.7	65.1	43.3	67.5	44.9
			4	5.18	209	46.4	30.9	48.3	32.1	50.2	33.4	52.1	34.6	53.9	35.9	55.8	37.1	57.7	38.4
			BFL	6.90	149	39.7	26.4	41.1	27.3	42.4	28.2	43.8	29.1	45.1	30.0	46.4	30.9	47.8	31.8
			6	14.3	123	36.6	24.4	37.7	25.1	38.8	25.8	39.9	26.6	41.0	27.3	42.1	28.0	43.3	28.8
			7	26.3	96.5	33.3	22.1	34.1	22.7	35.0	23.3	35.9	23.9	36.8	24.5	37.6	25.0	38.5	25.6
IPE 120	12.8	8.55	TFL	0.00	310	50.3	33.5	53.1	35.3	55.9	37.2	58.7	39.0	61.5	40.9	64.3	42.8	67.1	44.6
			2	1.58	263	45.1	30.0	47.5	31.6	49.9	33.2	52.2	34.8	54.6	36.3	57.0	37.9	59.3	39.5
			3	3.15	216	39.9	26.6	41.9	27.9	43.8	29.1	45.7	30.4	47.7	31.7	49.6	33.0	51.6	34.3
			4	4.73	168	34.6	23.0	36.2	24.1	37.7	25.1	39.2	26.1	40.7	27.1	42.2	28.1	43.7	29.1
			BFL	6.30	121	29.3	19.5	30.4	20.2	31.5	20.9	32.6	21.7	33.6	22.4	34.7	23.1	35.8	23.8
			6	12.5	99.3	26.8	17.8	27.7	18.4	28.6	19.0	29.4	19.6	30.3	20.2	31.2	20.8	32.1	21.4
			7	22.5	77.6	24.1	16.0	24.8	16.5	25.5	17.0	26.2	17.4	26.9	17.9	27.6	18.4	28.3	18.8
IPE 100	8.34	5.55	TFL	0.00	243	37.1	24.7	39.3	26.1	41.5	27.6	43.7	29.0	45.8	30.5	48.0	31.9	50.2	33.4
			2	1.43	206	33.1	22.0	35.0	23.3	36.8	24.5	38.7	25.7	40.5	27.0	42.4	28.2	44.2	29.4
			3	2.85	169	29.1	19.3	30.6	20.3	32.1	21.4	33.6	22.4	35.1	23.4	36.7	24.4	38.2	25.4
			4	4.28	132	25.0	16.6	26.1	17.4	27.3	18.2	28.5	19.0	29.7	19.8	30.9	20.6	32.1	21.3
			BFL	5.70	95.2	20.8	13.8	21.7	14.4	22.5	15.0	23.4	15.6	24.2	16.1	25.1	16.7	26.0	17.3
			6	10.9	77.9	18.8	12.5	19.5	13.0	20.2	13.5	20.9	13.9	21.6	14.4	22.3	14.9	23.0	15.3
			7	18.5	60.6	16.7	11.1	17.3	11.5	17.8	11.9	18.4	12.2	18.9	12.6	19.5	12.9	20.0	13.3
IPE 80	4.91	3.27	TFL	0.00	180	25.9	17.2	27.5	18.3	29.1	19.4	30.7	20.4	32.3	21.5	33.9	22.6	35.5	23.7
			2	1.30	151	22.8	15.2	24.2	16.1	25.5	17.0	26.9	17.9	28.3	18.8	29.6	19.7	31.0	20.6
			3	2.60	123	19.7	13.1	20.8	13.9	21.9	14.6	23.0	15.3	24.2	16.1	25.3	16.8	26.4	17.5
			4	3.90	95.2	16.6	11.0	17.5	11.6	18.3	12.2	19.2	12.8	20.0	13.3	20.9	13.9	21.7	14.5
			BFL	5.20	67.1	13.4	8.95	14.1	9.35	14.7	9.75	15.3	10.2	15.9	10.6	16.5	11.0	17.1	11.4
			6	9.20	56.0	12.2	8.10	12.7	8.44	13.2	8.77	13.7	9.11	14.2	9.44	14.7	9.78	15.2	10.1
			7	14.9	44.9	10.9	7.22	11.3	7.49	11.7	7.76	12.1	8.03	12.5	8.30	12.9	8.57	13.3	8.84

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

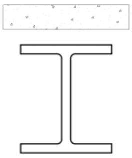
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

$F_y = 275$ MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 600	869	578	TFL	0.00	4290	1350	899	1390	925	1430	950	1470	976	1510	1000	1540	1030	1580	1050
			2	4.75	3720	1320	881	1360	903	1390	926	1420	948	1460	970	1490	992	1520	1010
			3	9.50	3140	1290	861	1320	880	1350	899	1380	918	1410	937	1440	955	1460	974
			4	14.3	2570	1260	840	1290	855	1310	871	1330	886	1360	902	1380	917	1400	932
			BFL	19.0	1990	1230	817	1250	829	1260	841	1280	853	1300	865	1320	877	1340	889
			6	67.9	1530	1190	793	1200	802	1220	811	1230	820	1250	829	1260	838	1270	848
			7	138	1070	1130	751	1140	757	1150	763	1160	770	1170	776	1180	783	1190	789
IPE 550	690	459	TFL	0.00	3700	1080	719	1110	741	1150	764	1180	786	1210	808	1250	830	1280	852
			2	4.30	3200	1060	704	1090	723	1120	742	1140	761	1170	780	1200	800	1230	819
			3	8.60	2700	1030	687	1060	703	1080	719	1110	736	1130	752	1150	768	1180	784
			4	12.9	2210	1010	669	1030	682	1050	695	1060	709	1080	722	1100	735	1120	748
			BFL	17.2	1710	976	650	992	660	1010	670	1020	680	1040	691	1050	701	1070	711
			6	59.3	1320	946	630	958	637	970	645	982	653	994	661	1010	669	1020	677
			7	124	924	896	596	905	602	913	607	921	613	929	618	938	624	946	629
IPE 500	543	361	TFL	0.00	3180	858	571	886	590	915	609	943	628	972	647	1000	666	1030	685
			2	4.00	2740	837	557	862	573	886	590	911	606	936	622	960	639	985	655
			3	8.00	2300	815	542	835	556	856	570	877	583	897	597	918	611	939	625
			4	12.0	1860	791	526	808	537	824	549	841	560	858	571	875	582	891	593
			BFL	16.0	1420	766	509	778	518	791	526	804	535	817	543	829	552	842	560
			6	53.0	1110	743	494	753	501	763	507	773	514	783	521	793	527	802	534
			7	108	794	706	470	713	475	720	479	728	484	735	489	742	494	749	498
IPE 450	421	280	TFL	0.00	2720	673	448	697	464	722	480	746	496	770	513	795	529	819	545
			2	3.65	2340	655	436	676	450	697	464	718	478	739	492	760	506	781	520
			3	7.30	1950	636	423	653	435	671	446	689	458	706	470	724	482	741	493
			4	11.0	1570	615	409	630	419	644	428	658	438	672	447	686	457	700	466
			BFL	14.6	1190	594	395	605	402	615	409	626	417	637	424	648	431	658	438
			6	44.0	936	576	383	584	389	593	394	601	400	610	406	618	411	627	417
			7	93.6	679	549	365	555	369	561	373	567	377	573	381	579	385	585	389
IPE 400	323	215	TFL	0.00	2320	523	348	544	362	564	376	585	389	606	403	627	417	648	431
			2	3.38	1990	507	337	525	349	543	361	561	373	579	385	597	397	614	409
			3	6.75	1650	490	326	505	336	520	346	535	356	550	366	565	376	580	386
			4	10.1	1320	473	315	485	323	497	330	509	338	520	346	532	354	544	362
			BFL	13.5	986	454	302	463	308	472	314	481	320	490	326	499	332	508	338
			6	34.4	783	441	293	448	298	455	303	462	307	469	312	476	317	483	321
			7	77.2	581	422	280	427	284	432	287	437	291	442	294	448	298	453	301
IPE 360	252	168	TFL	0.00	2000	414	275	432	287	450	299	468	311	486	323	504	335	522	347
			2	3.18	1700	400	266	416	276	431	287	446	297	462	307	477	317	492	327
			3	6.35	1410	386	257	398	265	411	273	424	282	436	290	449	299	462	307
			4	9.52	1110	370	246	380	253	390	260	400	266	410	273	420	279	430	286
			BFL	12.7	813	354	235	361	240	368	245	376	250	383	255	390	260	398	265
			6	30.8	656	344	229	350	233	356	237	361	240	367	244	373	248	379	252
			7	66.4	500	330	219	334	222	339	225	343	228	348	231	352	234	357	237

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

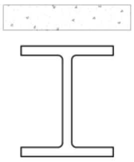
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 600	869	578	TFL	0.00	4290	1620	1080	1660	1100	1700	1130	1740	1160	1780	1180	1810	1210	1850	1230
			2	4.75	3720	1560	1040	1590	1060	1630	1080	1660	1100	1690	1130	1730	1150	1760	1170
			3	9.50	3140	1490	993	1520	1010	1550	1030	1580	1050	1610	1070	1630	1090	1660	1110
			4	14.3	2570	1420	948	1450	963	1470	978	1490	994	1520	1010	1540	1020	1560	1040
			BFL	19.0	1990	1350	901	1370	913	1390	924	1410	936	1430	948	1440	960	1460	972
			6	67.9	1530	1290	857	1300	866	1320	875	1330	884	1340	893	1360	903	1370	912
			7	138	1070	1200	795	1210	802	1210	808	1220	815	1230	821	1240	828	1250	834
IPE 550	690	459	TFL	0.00	3700	1310	874	1350	896	1380	918	1410	941	1450	963	1480	985	1510	1010
			2	4.30	3200	1260	838	1290	857	1320	876	1350	895	1370	915	1400	934	1430	953
			3	8.60	2700	1200	800	1230	816	1250	833	1280	849	1300	865	1320	881	1350	897
			4	12.9	2210	1140	761	1160	775	1180	788	1200	801	1220	814	1240	827	1260	841
			BFL	17.2	1710	1080	721	1100	731	1110	742	1130	752	1150	762	1160	772	1180	783
			6	59.3	1320	1030	685	1040	693	1050	701	1060	708	1080	716	1090	724	1100	732
			7	124	924	954	635	963	641	971	646	979	652	988	657	996	663	1000	668
IPE 500	543	361	TFL	0.00	3180	1060	704	1090	723	1110	742	1140	761	1170	780	1200	799	1230	818
			2	4.00	2740	1010	672	1030	688	1060	704	1080	721	1110	737	1130	753	1160	770
			3	8.00	2300	959	638	980	652	1000	666	1020	680	1040	693	1060	707	1080	721
			4	12.0	1860	908	604	925	615	941	626	958	637	975	649	992	660	1010	671
			BFL	16.0	1420	855	569	868	577	880	586	893	594	906	603	919	611	931	620
			6	53.0	1110	812	541	822	547	832	554	842	560	852	567	862	574	872	580
			7	108	794	756	503	763	508	771	513	778	517	785	522	792	527	799	532
IPE 450	421	280	TFL	0.00	2720	844	561	868	578	893	594	917	610	942	627	966	643	991	659
			2	3.65	2340	802	534	823	548	844	562	865	576	886	590	907	604	928	618
			3	7.30	1950	759	505	776	517	794	528	812	540	829	552	847	563	864	575
			4	11.0	1570	715	475	729	485	743	494	757	504	771	513	785	523	800	532
			BFL	14.6	1190	669	445	680	452	690	459	701	467	712	474	723	481	733	488
			6	44.0	936	635	422	643	428	652	434	660	439	669	445	677	450	685	456
			7	93.6	679	591	393	598	398	604	402	610	406	616	410	622	414	628	418
IPE 400	323	215	TFL	0.00	2320	669	445	690	459	711	473	732	487	753	501	773	515	794	529
			2	3.38	1990	632	421	650	433	668	445	686	456	704	468	722	480	740	492
			3	6.75	1650	595	396	610	406	625	416	639	425	654	435	669	445	684	455
			4	10.1	1320	556	370	568	378	580	386	592	394	604	402	616	410	627	417
			BFL	13.5	986	516	344	525	350	534	355	543	361	552	367	561	373	570	379
			6	34.4	783	490	326	497	331	504	336	511	340	518	345	525	350	532	354
			7	77.2	581	458	305	463	308	469	312	474	315	479	319	484	322	489	326
IPE 360	252	168	TFL	0.00	2000	540	359	558	371	576	383	594	395	612	407	630	419	648	431
			2	3.18	1700	508	338	523	348	538	358	554	368	569	378	584	389	600	399
			3	6.35	1410	474	316	487	324	500	332	512	341	525	349	537	358	550	366
			4	9.52	1110	440	293	450	299	460	306	470	313	480	319	490	326	500	333
			BFL	12.7	813	405	269	412	274	420	279	427	284	434	289	442	294	449	299
			6	30.8	656	385	256	391	260	397	264	403	268	409	272	415	276	420	280
			7	66.4	500	361	240	366	243	370	246	375	249	379	252	384	255	388	258

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

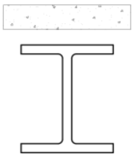
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 330	199	132	TFL	0.00	1720	333	222	349	232	364	242	380	253	395	263	411	273	426	284
			2	2.88	1470	321	214	335	223	348	231	361	240	374	249	388	258	401	267
			3	5.75	1220	309	206	320	213	331	220	342	227	353	235	364	242	375	249
			4	8.63	963	296	197	305	203	313	209	322	214	331	220	339	226	348	232
			BFL	11.5	710	282	188	289	192	295	196	302	201	308	205	314	209	321	213
			6	28.2	570	274	182	279	185	284	189	289	192	294	196	299	199	304	203
			7	60.7	430	262	174	266	177	270	179	273	182	277	185	281	187	285	190
IPE 300	156	103	TFL	0.00	1480	266	177	280	186	293	195	306	204	320	213	333	222	346	230
			2	2.68	1260	256	170	267	178	279	186	290	193	301	201	313	208	324	216
			3	5.35	1040	245	163	255	170	264	176	273	182	283	188	292	194	302	201
			4	8.02	818	234	156	242	161	249	166	256	170	264	175	271	180	278	185
			BFL	10.7	597	222	148	228	152	233	155	239	159	244	162	249	166	255	169
			6	26.2	483	215	143	220	146	224	149	228	152	233	155	237	158	242	161
			7	55.3	370	206	137	209	139	213	142	216	144	219	146	223	148	226	150
IPE 270	120	79.7	TFL	0.00	1260	210	140	222	148	233	155	245	163	256	170	267	178	279	185
			2	2.55	1070	202	134	211	141	221	147	231	153	240	160	250	166	260	173
			3	5.10	885	192	128	200	133	208	139	216	144	224	149	232	155	240	160
			4	7.65	696	183	122	189	126	195	130	202	134	208	138	214	143	220	147
			BFL	10.2	506	173	115	177	118	182	121	187	124	191	127	196	130	200	133
			6	23.5	411	167	111	171	114	175	116	178	119	182	121	186	123	189	126
			7	48.0	316	160	106	163	108	166	110	168	112	171	114	174	116	177	118
IPE 240	90.7	60.4	TFL	0.00	1080	165	110	174	116	184	122	194	129	203	135	213	142	223	148
			2	2.45	914	157	105	165	110	174	115	182	121	190	126	198	132	207	137
			3	4.90	752	149	99.4	156	104	163	108	170	113	176	117	183	122	190	126
			4	7.35	591	141	93.9	146	97.5	152	101	157	105	162	108	168	112	173	115
			BFL	9.80	429	133	88.2	137	90.8	140	93.4	144	96.0	148	98.5	152	101	156	104
			6	21.3	349	128	85.1	131	87.2	134	89.3	137	91.4	140	93.5	144	95.6	147	97.6
			7	41.1	269	122	81.3	125	82.9	127	84.5	129	86.1	132	87.7	134	89.3	137	90.9
IPE 220	70.6	47	TFL	0.00	918	132	87.9	140	93.4	149	98.9	157	104	165	110	173	115	182	121
			2	2.30	779	126	83.7	133	88.3	140	93.0	147	97.6	154	102	161	107	168	112
			3	4.60	639	119	79.2	125	83.0	131	86.9	136	90.7	142	94.5	148	98.3	154	102
			4	6.90	500	112	74.6	117	77.6	121	80.6	126	83.5	130	86.5	135	89.5	139	92.5
			BFL	9.20	361	105	69.7	108	71.9	111	74.0	115	76.2	118	78.4	121	80.5	124	82.7
			6	20.0	295	101	67.2	104	68.9	106	70.7	109	72.5	112	74.2	114	76.0	117	77.8
			7	39.3	229	96.3	64.1	98.3	65.4	100	66.8	102	68.2	105	69.5	107	70.9	109	72.3
IPE 200	54.6	36.3	TFL	0.00	783	106	70.3	113	75.0	120	79.7	127	84.4	134	89.1	141	93.8	148	98.5
			2	2.13	666	100	66.8	106	70.8	112	74.8	118	78.7	124	82.7	130	86.7	136	90.7
			3	4.25	549	94.8	63.1	99.7	66.3	105	69.6	110	72.9	115	76.2	119	79.5	124	82.8
			4	6.38	433	88.9	59.2	92.8	61.8	96.7	64.4	101	67.0	105	69.5	108	72.1	112	74.7
			BFL	8.50	316	82.9	55.2	85.7	57.1	88.6	58.9	91.4	60.8	94.3	62.7	97.1	64.6	100	66.5
			6	18.7	256	79.5	52.9	81.8	54.4	84.1	55.9	86.4	57.5	88.7	59.0	91.0	60.5	93.3	62.1
			7	36.4	196	75.3	50.1	77.1	51.3	78.9	52.5	80.6	53.6	82.4	54.8	84.1	56.0	85.9	57.2

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

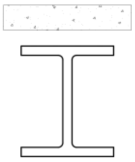
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 330	199	132	TFL	0.00	1720	442	294	457	304	473	314	488	325	504	335	519	345	535	356
			2	2.88	1470	414	275	427	284	440	293	454	302	467	311	480	319	493	328
			3	5.75	1220	386	257	397	264	408	271	419	278	429	286	440	293	451	300
			4	8.63	963	357	237	365	243	374	249	383	255	391	260	400	266	409	272
			BFL	11.5	710	327	218	333	222	340	226	346	230	353	235	359	239	365	243
			6	28.2	570	310	206	315	209	320	213	325	216	330	220	335	223	340	226
			7	60.7	430	289	192	293	195	297	197	301	200	304	203	308	205	312	208
IPE 300	156	103	TFL	0.00	1480	360	239	373	248	386	257	400	266	413	275	426	284	439	292
			2	2.68	1260	335	223	347	231	358	238	369	246	381	253	392	261	403	268
			3	5.35	1040	311	207	320	213	330	219	339	225	348	232	358	238	367	244
			4	8.02	818	286	190	293	195	300	200	308	205	315	210	322	215	330	219
			BFL	10.7	597	260	173	265	177	271	180	276	184	281	187	287	191	292	194
			6	26.2	483	246	164	250	166	255	169	259	172	263	175	268	178	272	181
			7	55.3	370	229	153	233	155	236	157	239	159	243	162	246	164	249	166
IPE 270	120	79.7	TFL	0.00	1260	290	193	301	201	313	208	324	216	335	223	347	231	358	238
			2	2.55	1070	269	179	279	186	289	192	298	198	308	205	318	211	327	218
			3	5.10	885	248	165	256	170	264	176	272	181	280	186	288	192	296	197
			4	7.65	696	227	151	233	155	239	159	245	163	252	167	258	172	264	176
			BFL	10.2	506	205	136	209	139	214	142	218	145	223	148	228	151	232	154
			6	23.5	411	193	128	197	131	200	133	204	136	208	138	212	141	215	143
			7	48.0	316	180	120	183	121	185	123	188	125	191	127	194	129	197	131
IPE 240	90.7	60.4	TFL	0.00	1080	232	155	242	161	252	167	261	174	271	180	281	187	290	193
			2	2.45	914	215	143	223	148	231	154	239	159	248	165	256	170	264	176
			3	4.90	752	197	131	204	135	210	140	217	144	224	149	231	153	237	158
			4	7.35	591	178	119	184	122	189	126	194	129	200	133	205	136	210	140
			BFL	9.80	429	160	106	164	109	167	111	171	114	175	117	179	119	183	122
			6	21.3	349	150	99.7	153	102	156	104	159	106	162	108	166	110	169	112
			7	41.1	269	139	92.6	142	94.2	144	95.8	146	97.4	149	99.0	151	101	154	102
IPE 220	70.6	47	TFL	0.00	918	190	126	198	132	206	137	215	143	223	148	231	154	240	159
			2	2.30	779	175	116	182	121	189	126	196	130	203	135	210	140	217	144
			3	4.60	639	159	106	165	110	171	114	177	117	182	121	188	125	194	129
			4	6.90	500	144	95.5	148	98.5	153	102	157	105	162	108	166	111	171	113
			BFL	9.20	361	128	84.9	131	87.0	134	89.2	137	91.3	141	93.5	144	95.7	147	97.8
			6	20.0	295	120	79.6	122	81.3	125	83.1	128	84.9	130	86.6	133	88.4	136	90.2
			7	39.3	229	111	73.7	113	75.0	115	76.4	117	77.8	119	79.2	121	80.5	123	81.9
IPE 200	54.6	36.3	TFL	0.00	783	155	103	162	108	169	113	176	117	183	122	190	127	197	131
			2	2.13	666	142	94.7	148	98.7	154	103	160	107	166	111	172	115	178	119
			3	4.25	549	129	86.1	134	89.4	139	92.7	144	96.0	149	99.2	154	103	159	106
			4	6.38	433	116	77.3	120	79.9	124	82.5	128	85.1	132	87.7	136	90.3	140	92.9
			BFL	8.50	316	103	68.4	106	70.3	108	72.2	111	74.1	114	76.0	117	77.8	120	79.7
			6	18.7	256	95.6	63.6	97.9	65.1	100	66.7	102	68.2	105	69.7	107	71.3	109	72.8
			7	36.4	196	87.7	58.3	89.4	59.5	91.2	60.7	93.0	61.8	94.7	63.0	96.5	64.2	98.2	65.4

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

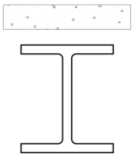
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 180	41.2	27.4	TFL	0.00	659	83.0	55.2	88.9	59.2	94.8	63.1	101	67.0	107	71.0	113	74.9	119	78.9
			2	2.00	559	78.4	52.2	83.4	55.5	88.4	58.8	93.5	62.2	98.5	65.5	104	68.9	109	72.2
			3	4.00	458	73.6	49.0	77.7	51.7	81.9	54.5	86.0	57.2	90.1	60.0	94.2	62.7	98.4	65.5
			4	6.00	358	68.7	45.7	71.9	47.8	75.1	50.0	78.3	52.1	81.6	54.3	84.8	56.4	88.0	58.6
			BFL	8.00	258	63.5	42.3	65.9	43.8	68.2	45.4	70.5	46.9	72.8	48.5	75.1	50.0	77.5	51.5
			6	17.5	211	60.9	40.5	62.8	41.8	64.7	43.0	66.6	44.3	68.5	45.6	70.4	46.8	72.3	48.1
			7	33.5	165	57.7	38.4	59.2	39.4	60.7	40.4	62.2	41.4	63.6	42.3	65.1	43.3	66.6	44.3
IPE 160	30.7	20.4	TFL	0.00	552	64.6	43.0	69.6	46.3	74.6	49.6	79.6	52.9	84.5	56.2	89.5	59.5	94.5	62.9
			2	1.85	469	60.8	40.5	65.0	43.3	69.3	46.1	73.5	48.9	77.7	51.7	81.9	54.5	86.1	57.3
			3	3.70	386	56.9	37.8	60.3	40.1	63.8	42.4	67.3	44.8	70.7	47.1	74.2	49.4	77.7	51.7
			4	5.55	302	52.8	35.1	55.5	36.9	58.2	38.7	60.9	40.5	63.6	42.3	66.3	44.1	69.1	46.0
			BFL	7.40	219	48.5	32.3	50.5	33.6	52.4	34.9	54.4	36.2	56.4	37.5	58.4	38.8	60.3	40.1
			6	15.7	178	46.3	30.8	47.9	31.9	49.5	32.9	51.1	34.0	52.7	35.1	54.3	36.1	55.9	37.2
			7	29.8	138	43.6	29.0	44.9	29.9	46.1	30.7	47.4	31.5	48.6	32.3	49.9	33.2	51.1	34.0
IPE 140	21.9	14.5	TFL	0.00	452	48.8	32.5	52.9	35.2	56.9	37.9	61.0	40.6	65.1	43.3	69.1	46.0	73.2	48.7
			2	1.73	383	45.6	30.4	49.1	32.6	52.5	34.9	56.0	37.2	59.4	39.5	62.8	41.8	66.3	44.1
			3	3.45	313	42.3	28.2	45.2	30.1	48.0	31.9	50.8	33.8	53.6	35.7	56.4	37.6	59.3	39.4
			4	5.18	244	39.0	25.9	41.2	27.4	43.4	28.8	45.6	30.3	47.7	31.8	49.9	33.2	52.1	34.7
			BFL	6.90	175	35.5	23.6	37.0	24.6	38.6	25.7	40.2	26.7	41.8	27.8	43.3	28.8	44.9	29.9
			6	14.3	144	33.8	22.5	35.1	23.3	36.4	24.2	37.7	25.1	39.0	25.9	40.3	26.8	41.6	27.6
			7	26.3	113	31.8	21.2	32.8	21.9	33.9	22.5	34.9	23.2	35.9	23.9	36.9	24.6	37.9	25.2
IPE 120	15	10	TFL	0.00	363	36.0	23.9	39.2	26.1	42.5	28.3	45.8	30.5	49.0	32.6	52.3	34.8	55.6	37.0
			2	1.58	308	33.4	22.2	36.2	24.1	39.0	25.9	41.7	27.8	44.5	29.6	47.3	31.5	50.1	33.3
			3	3.15	252	30.8	20.5	33.1	22.0	35.4	23.5	37.6	25.0	39.9	26.5	42.2	28.1	44.4	29.6
			4	4.73	197	28.1	18.7	29.9	19.9	31.7	21.1	33.4	22.3	35.2	23.4	37.0	24.6	38.8	25.8
			BFL	6.30	142	25.4	16.9	26.6	17.7	27.9	18.6	29.2	19.4	30.5	20.3	31.7	21.1	33.0	22.0
			6	12.5	116	24.0	16.0	25.0	16.7	26.1	17.4	27.1	18.1	28.2	18.8	29.2	19.4	30.3	20.1
			7	22.5	90.8	22.5	14.9	23.3	15.5	24.1	16.0	24.9	16.6	25.7	17.1	26.6	17.7	27.4	18.2
IPE 100	9.75	6.49	TFL	0.00	284	25.5	17.0	28.1	18.7	30.7	20.4	33.2	22.1	35.8	23.8	38.3	25.5	40.9	27.2
			2	1.43	241	23.6	15.7	25.7	17.1	27.9	18.6	30.1	20.0	32.2	21.5	34.4	22.9	36.6	24.3
			3	2.85	198	21.6	14.3	23.3	15.5	25.1	16.7	26.9	17.9	28.7	19.1	30.4	20.3	32.2	21.4
			4	4.28	154	19.5	13.0	20.9	13.9	22.3	14.8	23.6	15.7	25.0	16.7	26.4	17.6	27.8	18.5
			BFL	5.70	111	17.3	11.5	18.3	12.2	19.3	12.9	20.3	13.5	21.4	14.2	22.4	14.9	23.4	15.5
			6	10.9	91.2	16.3	10.8	17.1	11.4	17.9	11.9	18.7	12.5	19.6	13.0	20.4	13.6	21.2	14.1
			7	18.5	71.0	15.1	10.1	15.7	10.5	16.4	10.9	17.0	11.3	17.7	11.8	18.3	12.2	18.9	12.6
IPE 80	5.75	3.82	TFL	0.00	210	17.0	11.3	18.9	12.6	20.8	13.8	22.7	15.1	24.6	16.4	26.5	17.6	28.4	18.9
			2	1.30	177	15.5	10.3	17.1	11.4	18.7	12.4	20.3	13.5	21.9	14.6	23.5	15.6	25.1	16.7
			3	2.60	144	14.0	9.30	15.3	10.2	16.6	11.0	17.9	11.9	19.2	12.8	20.5	13.6	21.8	14.5
			4	3.90	111	12.4	8.25	13.4	8.92	14.4	9.59	15.4	10.3	16.4	10.9	17.4	11.6	18.4	12.3
			BFL	5.20	78.5	10.8	7.18	11.5	7.65	12.2	8.12	12.9	8.59	13.6	9.06	14.3	9.53	15.0	10.0
			6	9.20	65.5	10.1	6.73	10.7	7.13	11.3	7.52	11.9	7.91	12.5	8.30	13.1	8.70	13.7	9.09
			7	14.9	52.5	9.40	6.25	9.87	6.57	10.3	6.88	10.8	7.20	11.3	7.51	11.8	7.82	12.2	8.14

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

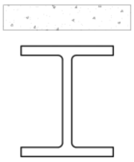
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 180	41.2	27.4	TFL	0.00	659	124	82.8	130	86.8	136	90.7	142	94.7	148	98.6	154	103	160	106
			2	2.00	559	114	75.6	119	78.9	124	82.3	129	85.6	134	88.9	139	92.3	144	95.6
			3	4.00	458	102	68.2	107	70.9	111	73.7	115	76.4	119	79.2	123	81.9	127	84.7
			4	6.00	358	91.2	60.7	94.5	62.8	97.7	65.0	101	67.1	104	69.3	107	71.4	111	73.6
			BFL	8.00	258	79.8	53.1	82.1	54.6	84.4	56.2	86.8	57.7	89.1	59.3	91.4	60.8	93.7	62.4
			6	17.5	211	74.2	49.4	76.1	50.6	78.0	51.9	79.9	53.2	81.8	54.4	83.7	55.7	85.6	57.0
			7	33.5	165	68.1	45.3	69.6	46.3	71.0	47.3	72.5	48.3	74.0	49.2	75.5	50.2	77.0	51.2
IPE 160	30.7	20.4	TFL	0.00	552	99.4	66.2	104	69.5	109	72.8	114	76.1	119	79.4	124	82.7	129	86.0
			2	1.85	469	90.4	60.1	94.6	62.9	98.8	65.7	103	68.5	107	71.4	111	74.2	116	77.0
			3	3.70	386	81.1	54.0	84.6	56.3	88.1	58.6	91.6	60.9	95.0	63.2	98.5	65.5	102	67.8
			4	5.55	302	71.8	47.8	74.5	49.6	77.2	51.4	79.9	53.2	82.7	55.0	85.4	56.8	88.1	58.6
			BFL	7.40	219	62.3	41.4	64.3	42.8	66.2	44.1	68.2	45.4	70.2	46.7	72.1	48.0	74.1	49.3
			6	15.7	178	57.5	38.3	59.1	39.3	60.7	40.4	62.3	41.5	63.9	42.5	65.5	43.6	67.2	44.7
			7	29.8	138	52.3	34.8	53.6	35.7	54.8	36.5	56.1	37.3	57.3	38.1	58.6	39.0	59.8	39.8
IPE 140	21.9	14.5	TFL	0.00	452	77.3	51.4	81.3	54.1	85.4	56.8	89.5	59.5	93.5	62.2	97.6	64.9	102	67.6
			2	1.73	383	69.7	46.4	73.2	48.7	76.6	51.0	80.1	53.3	83.5	55.6	86.9	57.8	90.4	60.1
			3	3.45	313	62.1	41.3	64.9	43.2	67.7	45.1	70.5	46.9	73.4	48.8	76.2	50.7	79.0	52.6
			4	5.18	244	54.3	36.2	56.5	37.6	58.7	39.1	60.9	40.5	63.1	42.0	65.3	43.5	67.5	44.9
			BFL	6.90	175	46.5	30.9	48.1	32.0	49.6	33.0	51.2	34.1	52.8	35.1	54.3	36.2	55.9	37.2
			6	14.3	144	42.8	28.5	44.1	29.4	45.4	30.2	46.7	31.1	48.0	32.0	49.3	32.8	50.6	33.7
			7	26.3	113	38.9	25.9	40.0	26.6	41.0	27.3	42.0	27.9	43.0	28.6	44.0	29.3	45.0	30.0
IPE 120	15	10	TFL	0.00	363	58.9	39.2	62.1	41.3	65.4	43.5	68.7	45.7	71.9	47.9	75.2	50.0	78.5	52.2
			2	1.58	308	52.8	35.1	55.6	37.0	58.4	38.8	61.1	40.7	63.9	42.5	66.7	44.4	69.4	46.2
			3	3.15	252	46.7	31.1	49.0	32.6	51.3	34.1	53.5	35.6	55.8	37.1	58.1	38.6	60.3	40.2
			4	4.73	197	40.5	27.0	42.3	28.1	44.1	29.3	45.9	30.5	47.6	31.7	49.4	32.9	51.2	34.0
			BFL	6.30	142	34.3	22.8	35.5	23.6	36.8	24.5	38.1	25.3	39.4	26.2	40.6	27.0	41.9	27.9
			6	12.5	116	31.3	20.8	32.4	21.5	33.4	22.2	34.5	22.9	35.5	23.6	36.5	24.3	37.6	25.0
			7	22.5	90.8	28.2	18.8	29.0	19.3	29.8	19.8	30.6	20.4	31.5	20.9	32.3	21.5	33.1	22.0
IPE 100	9.75	6.49	TFL	0.00	284	43.4	28.9	46.0	30.6	48.5	32.3	51.1	34.0	53.6	35.7	56.2	37.4	58.7	39.1
			2	1.43	241	38.7	25.8	40.9	27.2	43.1	28.7	45.2	30.1	47.4	31.5	49.6	33.0	51.7	34.4
			3	2.85	198	34.0	22.6	35.8	23.8	37.6	25.0	39.3	26.2	41.1	27.4	42.9	28.5	44.7	29.7
			4	4.28	154	29.2	19.4	30.6	20.4	32.0	21.3	33.4	22.2	34.8	23.1	36.2	24.1	37.5	25.0
			BFL	5.70	111	24.4	16.2	25.4	16.9	26.4	17.5	27.4	18.2	28.4	18.9	29.4	19.5	30.4	20.2
			6	10.9	91.2	22.0	14.7	22.8	15.2	23.7	15.7	24.5	16.3	25.3	16.8	26.1	17.4	26.9	17.9
			7	18.5	71.0	19.6	13.0	20.2	13.5	20.9	13.9	21.5	14.3	22.1	14.7	22.8	15.2	23.4	15.6
IPE 80	5.75	3.82	TFL	0.00	210	30.3	20.1	32.1	21.4	34.0	22.6	35.9	23.9	37.8	25.2	39.7	26.4	41.6	27.7
			2	1.30	177	26.7	17.8	28.3	18.8	29.9	19.9	31.5	20.9	33.1	22.0	34.7	23.1	36.3	24.1
			3	2.60	144	23.1	15.4	24.4	16.2	25.7	17.1	27.0	17.9	28.3	18.8	29.6	19.7	30.9	20.5
			4	3.90	111	19.4	12.9	20.4	13.6	21.4	14.3	22.4	14.9	23.4	15.6	24.4	16.3	25.4	16.9
			BFL	5.20	78.5	15.7	10.5	16.4	10.9	17.2	11.4	17.9	11.9	18.6	12.4	19.3	12.8	20.0	13.3
			6	9.20	65.5	14.2	9.48	14.8	9.87	15.4	10.3	16.0	10.7	16.6	11.0	17.2	11.4	17.8	11.8
			7	14.9	52.5	12.7	8.45	13.2	8.77	13.7	9.08	14.1	9.40	14.6	9.71	15.1	10.0	15.5	10.3

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

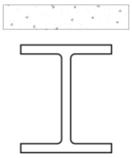
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 600	1120	747	TFL	0.00	5540	1740	1160	1790	1190	1840	1230	1890	1260	1940	1290	1990	1330	2040	1360
			2	4.75	4800	1710	1140	1750	1170	1800	1190	1840	1220	1880	1250	1930	1280	1970	1310
			3	9.50	4050	1670	1110	1710	1140	1740	1160	1780	1180	1820	1210	1850	1230	1890	1260
			4	14.3	3310	1630	1080	1660	1100	1690	1120	1720	1140	1750	1160	1780	1180	1810	1200
			BFL	19.0	2570	1590	1050	1610	1070	1630	1090	1650	1100	1680	1120	1700	1130	1720	1150
			6	67.9	1980	1540	1020	1560	1030	1570	1050	1590	1060	1610	1070	1630	1080	1640	1090
			7	138	1380	1460	969	1470	977	1480	985	1490	994	1510	1000	1520	1010	1530	1020
IPE 550	890	592	TFL	0.00	4770	1400	929	1440	957	1480	986	1520	1010	1570	1040	1610	1070	1650	1100
			2	4.30	4130	1370	909	1400	933	1440	958	1480	983	1510	1010	1550	1030	1590	1060
			3	8.60	3490	1330	887	1360	908	1400	929	1430	950	1460	970	1490	991	1520	1010
			4	12.9	2850	1300	864	1320	881	1350	898	1370	915	1400	932	1430	949	1450	966
			BFL	17.2	2210	1260	839	1280	852	1300	865	1320	878	1340	891	1360	905	1380	918
			6	59.3	1700	1220	813	1240	823	1250	833	1270	843	1280	853	1300	864	1310	874
			7	124	1190	1160	770	1170	777	1180	784	1190	791	1200	798	1210	805	1220	813
IPE 500	701	466	TFL	0.00	4100	1110	737	1140	761	1180	786	1220	810	1250	835	1290	859	1330	884
			2	4.00	3530	1080	719	1110	740	1140	761	1180	782	1210	803	1240	825	1270	846
			3	8.00	2960	1050	700	1080	718	1110	735	1130	753	1160	771	1190	789	1210	806
			4	12.0	2400	1020	679	1040	694	1060	708	1090	722	1110	737	1130	751	1150	766
			BFL	16.0	1830	988	658	1000	669	1020	680	1040	691	1050	701	1070	712	1090	723
			6	53.0	1430	959	638	972	647	985	655	997	664	1010	672	1020	681	1040	689
			7	108	1030	912	607	921	613	930	619	939	625	949	631	958	637	967	643
IPE 450	544	362	TFL	0.00	3510	868	578	900	599	931	620	963	641	995	662	1030	683	1060	704
			2	3.65	3020	845	562	872	580	900	599	927	617	954	635	981	653	1010	671
			3	7.30	2520	821	546	843	561	866	576	889	591	912	606	934	622	957	637
			4	11.0	2030	795	529	813	541	831	553	849	565	868	577	886	589	904	602
			BFL	14.6	1540	767	510	781	519	794	529	808	538	822	547	836	556	850	565
			6	44.0	1210	744	495	754	502	765	509	776	516	787	524	798	531	809	538
			7	93.6	877	708	471	716	476	724	482	732	487	740	492	748	497	756	503
IPE 400	418	278	TFL	0.00	3000	675	449	702	467	729	485	756	503	783	521	810	539	837	557
			2	3.38	2570	655	436	678	451	701	466	724	482	747	497	770	512	793	528
			3	6.75	2140	633	421	652	434	672	447	691	460	710	472	729	485	749	498
			4	10.1	1700	610	406	626	416	641	427	657	437	672	447	687	457	703	467
			BFL	13.5	1270	587	390	598	398	609	405	621	413	632	421	644	428	655	436
			6	34.4	1010	569	379	578	385	587	391	596	397	605	403	615	409	624	415
			7	77.2	750	544	362	551	367	558	371	564	376	571	380	578	384	585	389
IPE 360	326	217	TFL	0.00	2580	534	356	558	371	581	387	604	402	627	417	651	433	674	448
			2	3.18	2200	517	344	536	357	556	370	576	383	596	396	616	410	635	423
			3	6.35	1820	498	331	514	342	530	353	547	364	563	375	579	386	596	396
			4	9.52	1430	478	318	491	326	504	335	516	344	529	352	542	361	555	369
			BFL	12.7	1050	457	304	466	310	476	316	485	323	494	329	504	335	513	342
			6	30.8	847	444	295	451	300	459	305	467	310	474	315	482	321	489	326
			7	66.4	645	426	283	432	287	437	291	443	295	449	299	455	303	461	306

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

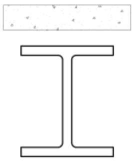
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 600	1120	747	TFL	0.00	5540	2090	1390	2140	1430	2190	1460	2240	1490	2290	1530	2340	1560	2390	1590
			2	4.75	4800	2010	1340	2050	1370	2100	1400	2140	1420	2180	1450	2230	1480	2270	1510
			3	9.50	4050	1930	1280	1960	1310	2000	1330	2040	1350	2070	1380	2110	1400	2150	1430
			4	14.3	3310	1840	1220	1870	1240	1900	1260	1930	1280	1960	1300	1990	1320	2020	1340
			BFL	19.0	2570	1750	1160	1770	1180	1790	1190	1820	1210	1840	1220	1860	1240	1890	1250
			6	67.9	1980	1660	1110	1680	1120	1700	1130	1720	1140	1730	1150	1750	1170	1770	1180
			7	138	1380	1540	1030	1560	1040	1570	1040	1580	1050	1590	1060	1610	1070	1620	1080
IPE 550	890	592	TFL	0.00	4770	1700	1130	1740	1160	1780	1190	1820	1210	1870	1240	1910	1270	1950	1300
			2	4.30	4130	1630	1080	1660	1110	1700	1130	1740	1160	1770	1180	1810	1210	1850	1230
			3	8.60	3490	1550	1030	1580	1050	1620	1070	1650	1100	1680	1120	1710	1140	1740	1160
			4	12.9	2850	1480	983	1500	1000	1530	1020	1550	1030	1580	1050	1610	1070	1630	1090
			BFL	17.2	2210	1400	931	1420	944	1440	957	1460	971	1480	984	1500	997	1520	1010
			6	59.3	1700	1330	884	1340	894	1360	904	1370	914	1390	925	1410	935	1420	945
			7	124	1190	1230	820	1240	827	1250	834	1260	841	1280	848	1290	855	1300	863
IPE 500	701	466	TFL	0.00	4100	1370	908	1400	933	1440	958	1480	982	1510	1010	1550	1030	1590	1060
			2	4.00	3530	1300	867	1330	888	1370	909	1400	930	1430	952	1460	973	1490	994
			3	8.00	2960	1240	824	1270	842	1290	860	1320	877	1350	895	1370	913	1400	931
			4	12.0	2400	1170	780	1190	794	1220	809	1240	823	1260	837	1280	852	1300	866
			BFL	16.0	1830	1100	734	1120	745	1140	756	1150	767	1170	778	1190	789	1200	800
			6	53.0	1430	1050	698	1060	706	1070	715	1090	723	1100	732	1110	740	1130	749
			7	108	1030	976	650	985	656	995	662	1000	668	1010	674	1020	680	1030	686
IPE 450	544	362	TFL	0.00	3510	1090	725	1120	746	1150	767	1180	788	1220	809	1250	830	1280	851
			2	3.65	3020	1040	689	1060	707	1090	725	1120	743	1140	761	1170	779	1200	797
			3	7.30	2520	980	652	1000	667	1030	682	1050	697	1070	712	1090	727	1120	742
			4	11.0	2030	922	614	941	626	959	638	977	650	996	662	1010	675	1030	687
			BFL	14.6	1540	864	575	877	584	891	593	905	602	919	611	933	621	947	630
			6	44.0	1210	820	545	831	553	841	560	852	567	863	574	874	582	885	589
			7	93.6	877	763	508	771	513	779	518	787	524	795	529	803	534	811	539
IPE 400	418	278	TFL	0.00	3000	864	575	891	592	917	610	944	628	971	646	998	664	1030	682
			2	3.38	2570	816	543	839	558	862	574	886	589	909	605	932	620	955	635
			3	6.75	2140	768	511	787	524	806	536	825	549	845	562	864	575	883	588
			4	10.1	1700	718	478	733	488	749	498	764	508	779	518	795	529	810	539
			BFL	13.5	1270	667	444	678	451	690	459	701	466	713	474	724	482	735	489
			6	34.4	1010	633	421	642	427	651	433	660	439	669	445	678	451	687	457
			7	77.2	750	591	393	598	398	605	402	612	407	618	411	625	416	632	420
IPE 360	326	217	TFL	0.00	2580	697	464	720	479	744	495	767	510	790	526	813	541	837	557
			2	3.18	2200	655	436	675	449	695	462	715	475	734	489	754	502	774	515
			3	6.35	1820	612	407	628	418	645	429	661	440	678	451	694	462	710	473
			4	9.52	1430	568	378	581	387	594	395	607	404	620	412	632	421	645	429
			BFL	12.7	1050	523	348	532	354	542	360	551	367	561	373	570	379	579	386
			6	30.8	847	497	331	505	336	512	341	520	346	528	351	535	356	543	361
			7	66.4	645	466	310	472	314	478	318	484	322	490	326	495	330	501	334

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

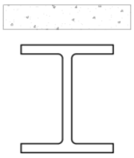
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 330	257	171	TFL	0.00	2220	430	286	450	299	470	313	490	326	510	339	530	353	550	366
			2	2.88	1900	415	276	432	287	449	299	466	310	483	322	500	333	517	344
			3	5.75	1570	399	265	413	275	427	284	441	294	455	303	470	312	484	322
			4	8.63	1240	382	254	393	262	405	269	416	277	427	284	438	291	449	299
			BFL	11.5	916	365	243	373	248	381	254	389	259	398	264	406	270	414	275
			6	28.2	736	353	235	360	239	366	244	373	248	380	253	386	257	393	261
			7	60.7	556	338	225	343	228	348	232	353	235	358	238	363	242	368	245
IPE 300	201	134	TFL	0.00	1910	344	229	361	240	378	252	395	263	413	275	430	286	447	297
			2	2.68	1630	331	220	345	230	360	239	375	249	389	259	404	269	418	278
			3	5.35	1340	317	211	329	219	341	227	353	235	365	243	377	251	389	259
			4	8.02	1060	302	201	312	207	321	214	331	220	340	226	350	233	359	239
			BFL	10.7	771	287	191	294	196	301	200	308	205	315	209	322	214	329	219
			6	26.2	624	278	185	284	189	289	192	295	196	301	200	306	204	312	207
			7	55.3	478	266	177	270	180	275	183	279	186	283	188	288	191	292	194
IPE 270	155	103	TFL	0.00	1630	272	181	286	190	301	200	316	210	330	220	345	230	360	239
			2	2.55	1390	260	173	273	182	285	190	298	198	310	206	323	215	335	223
			3	5.10	1140	248	165	259	172	269	179	279	186	290	193	300	200	310	206
			4	7.65	898	236	157	244	162	252	168	260	173	268	179	276	184	285	189
			BFL	10.2	654	223	148	229	152	235	156	241	160	247	164	253	168	258	172
			6	23.5	531	216	144	221	147	225	150	230	153	235	156	240	159	244	163
			7	48.0	408	206	137	210	140	214	142	217	145	221	147	225	149	228	152
IPE 240	117	77.9	TFL	0.00	1390	212	141	225	150	237	158	250	166	262	175	275	183	287	191
			2	2.45	1180	203	135	213	142	224	149	235	156	245	163	256	170	267	177
			3	4.90	971	193	128	202	134	210	140	219	146	228	152	236	157	245	163
			4	7.35	763	182	121	189	126	196	130	203	135	210	140	217	144	223	149
			BFL	9.80	554	171	114	176	117	181	121	186	124	191	127	196	131	201	134
			6	21.3	450	165	110	169	113	173	115	177	118	181	121	185	123	189	126
			7	41.1	347	158	105	161	107	164	109	167	111	170	113	173	115	176	117
IPE 220	91.2	60.7	TFL	0.00	1180	171	113	181	121	192	128	203	135	213	142	224	149	235	156
			2	2.30	1010	162	108	171	114	180	120	189	126	198	132	208	138	217	144
			3	4.60	825	154	102	161	107	169	112	176	117	183	122	191	127	198	132
			4	6.90	646	145	96.3	150	100	156	104	162	108	168	112	174	116	180	119
			BFL	9.20	466	135	90.0	139	92.8	144	95.6	148	98.4	152	101	156	104	160	107
			6	20.0	381	130	86.7	134	89.0	137	91.3	141	93.6	144	95.8	147	98.1	151	100
			7	39.3	296	124	82.7	127	84.5	130	86.2	132	88.0	135	89.8	138	91.6	140	93.3
IPE 200	70.5	46.9	TFL	0.00	1010	136	90.8	146	96.9	155	103	164	109	173	115	182	121	191	127
			2	2.13	860	130	86.2	137	91.3	145	96.5	153	102	161	107	168	112	176	117
			3	4.25	709	122	81.4	129	85.6	135	89.9	141	94.1	148	98.4	154	103	161	107
			4	6.38	558	115	76.4	120	79.7	125	83.1	130	86.4	135	89.8	140	93.1	145	96.5
			BFL	8.50	408	107	71.2	111	73.6	114	76.1	118	78.5	122	81.0	125	83.4	129	85.8
			6	18.7	330	103	68.3	106	70.2	109	72.2	112	74.2	114	76.2	117	78.1	120	80.1
			7	36.4	253	97.2	64.7	99.5	66.2	102	67.7	104	69.2	106	70.8	109	72.3	111	73.8

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

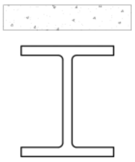
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 330	257	171	TFL	0.00	2220	570	379	590	393	610	406	630	419	650	433	670	446	690	459
			2	2.88	1900	534	356	551	367	569	378	586	390	603	401	620	412	637	424
			3	5.75	1570	498	331	512	341	526	350	540	359	554	369	569	378	583	388
			4	8.63	1240	460	306	472	314	483	321	494	329	505	336	516	344	528	351
			BFL	11.5	916	422	281	431	286	439	292	447	297	455	303	463	308	472	314
			6	28.2	736	400	266	406	270	413	275	419	279	426	283	433	288	439	292
			7	60.7	556	373	248	378	251	383	255	388	258	393	261	398	265	403	268
IPE 300	201	134	TFL	0.00	1910	464	309	481	320	499	332	516	343	533	355	550	366	567	377
			2	2.68	1630	433	288	448	298	462	308	477	317	492	327	506	337	521	347
			3	5.35	1340	401	267	413	275	425	283	437	291	450	299	462	307	474	315
			4	8.02	1060	369	245	378	252	388	258	397	264	407	271	416	277	426	283
			BFL	10.7	771	336	223	343	228	350	233	356	237	363	242	370	246	377	251
			6	26.2	624	317	211	323	215	329	219	334	222	340	226	345	230	351	234
			7	55.3	478	296	197	300	200	305	203	309	206	313	209	318	211	322	214
IPE 270	155	103	TFL	0.00	1630	374	249	389	259	404	269	418	278	433	288	448	298	462	308
			2	2.55	1390	348	231	360	240	373	248	385	256	398	265	410	273	423	281
			3	5.10	1140	320	213	331	220	341	227	351	234	362	241	372	247	382	254
			4	7.65	898	293	195	301	200	309	205	317	211	325	216	333	222	341	227
			BFL	10.2	654	264	176	270	180	276	184	282	188	288	191	294	195	300	199
			6	23.5	531	249	166	254	169	259	172	263	175	268	178	273	182	278	185
			7	48.0	408	232	154	236	157	239	159	243	162	247	164	250	167	254	169
IPE 240	117	77.9	TFL	0.00	1390	300	200	312	208	325	216	337	225	350	233	362	241	375	249
			2	2.45	1180	277	184	288	191	298	199	309	206	320	213	330	220	341	227
			3	4.90	971	254	169	263	175	271	181	280	186	289	192	298	198	306	204
			4	7.35	763	230	153	237	158	244	162	251	167	258	171	265	176	271	181
			BFL	9.80	554	206	137	211	140	216	144	221	147	226	150	231	154	236	157
			6	21.3	450	194	129	198	131	202	134	206	137	210	140	214	142	218	145
			7	41.1	347	180	119	183	122	186	124	189	126	192	128	195	130	198	132
IPE 220	91.2	60.7	TFL	0.00	1180	245	163	256	170	267	177	277	184	288	192	299	199	309	206
			2	2.30	1010	226	150	235	156	244	162	253	168	262	174	271	180	280	186
			3	4.60	825	206	137	213	142	221	147	228	152	235	157	243	162	250	166
			4	6.90	646	185	123	191	127	197	131	203	135	209	139	214	143	220	147
			BFL	9.20	466	165	110	169	112	173	115	177	118	181	121	186	123	190	126
			6	20.0	381	154	103	158	105	161	107	165	110	168	112	172	114	175	116
			7	39.3	296	143	95.1	146	96.9	148	98.6	151	100	154	102	156	104	159	106
IPE 200	70.5	46.9	TFL	0.00	1010	200	133	209	139	218	145	227	151	237	157	246	163	255	170
			2	2.13	860	184	122	191	127	199	133	207	138	215	143	222	148	230	153
			3	4.25	709	167	111	173	115	180	120	186	124	193	128	199	132	205	137
			4	6.38	558	150	99.8	155	103	160	106	165	110	170	113	175	117	180	120
			BFL	8.50	408	133	88.3	136	90.7	140	93.2	144	95.6	147	98.1	151	100	155	103
			6	18.7	330	123	82.1	126	84.1	129	86.1	132	88.0	135	90.0	138	92.0	141	94.0
			7	36.4	253	113	75.3	115	76.8	118	78.3	120	79.8	122	81.3	125	82.9	127	84.4

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

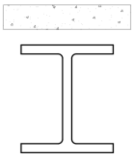
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

$F_y = 355$ MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 180	53.2	35.4	TFL	0.00	850	107	71.3	115	76.4	122	81.5	130	86.5	138	91.6	145	96.7	153	102
			2	2.00	721	101	67.3	108	71.6	114	76.0	121	80.3	127	84.6	134	88.9	140	93.2
			3	4.00	592	95.0	63.2	100	66.8	106	70.3	111	73.9	116	77.4	122	80.9	127	84.5
			4	6.00	463	88.6	59.0	92.8	61.7	97.0	64.5	101	67.3	105	70.1	109	72.8	114	75.6
			BFL	8.00	333	82.0	54.6	85.0	56.6	88.0	58.6	91.0	60.6	94.0	62.5	97.0	64.5	100	66.5
			6	17.5	273	78.6	52.3	81.1	53.9	83.5	55.6	86.0	57.2	88.4	58.8	90.9	60.5	93.3	62.1
			7	33.5	213	74.5	49.6	76.4	50.8	78.3	52.1	80.2	53.4	82.2	54.7	84.1	55.9	86.0	57.2
IPE 160	39.6	26.3	TFL	0.00	713	83.4	55.5	89.9	59.8	96.3	64.1	103	68.3	109	72.6	116	76.9	122	81.1
			2	1.85	605	78.5	52.2	84.0	55.9	89.4	59.5	94.9	63.1	100	66.7	106	70.4	111	74.0
			3	3.70	498	73.4	48.8	77.9	51.8	82.4	54.8	86.8	57.8	91.3	60.8	95.8	63.7	100	66.7
			4	5.55	390	68.1	45.3	71.6	47.6	75.1	50.0	78.6	52.3	82.1	54.7	85.6	57.0	89.2	59.3
			BFL	7.40	282	62.6	41.7	65.2	43.4	67.7	45.0	70.2	46.7	72.8	48.4	75.3	50.1	77.9	51.8
			6	15.7	230	59.7	39.7	61.8	41.1	63.9	42.5	66.0	43.9	68.0	45.3	70.1	46.6	72.2	48.0
			7	29.8	178	56.3	37.5	58.0	38.6	59.6	39.6	61.2	40.7	62.8	41.8	64.4	42.8	66.0	43.9
IPE 140	28.2	18.8	TFL	0.00	583	63.0	41.9	68.2	45.4	73.5	48.9	78.7	52.4	84.0	55.9	89.2	59.4	94.5	62.9
			2	1.73	494	58.9	39.2	63.3	42.1	67.8	45.1	72.2	48.1	76.7	51.0	81.1	54.0	85.6	56.9
			3	3.45	404	54.7	36.4	58.3	38.8	61.9	41.2	65.6	43.6	69.2	46.1	72.9	48.5	76.5	50.9
			4	5.18	315	50.3	33.5	53.1	35.4	56.0	37.2	58.8	39.1	61.6	41.0	64.5	42.9	67.3	44.8
			BFL	6.90	226	45.8	30.5	47.8	31.8	49.9	33.2	51.9	34.5	53.9	35.9	55.9	37.2	58.0	38.6
			6	14.3	186	43.6	29.0	45.3	30.1	47.0	31.2	48.6	32.4	50.3	33.5	52.0	34.6	53.6	35.7
			7	26.3	146	41.1	27.3	42.4	28.2	43.7	29.1	45.0	30.0	46.3	30.8	47.7	31.7	49.0	32.6
IPE 120	19.4	12.9	TFL	0.00	469	46.4	30.9	50.6	33.7	54.9	36.5	59.1	39.3	63.3	42.1	67.5	44.9	71.8	47.7
			2	1.58	397	43.2	28.7	46.7	31.1	50.3	33.5	53.9	35.9	57.5	38.2	61.0	40.6	64.6	43.0
			3	3.15	326	39.8	26.5	42.7	28.4	45.6	30.4	48.6	32.3	51.5	34.3	54.4	36.2	57.4	38.2
			4	4.73	254	36.3	24.2	38.6	25.7	40.9	27.2	43.2	28.7	45.5	30.2	47.7	31.8	50.0	33.3
			BFL	6.30	183	32.7	21.8	34.4	22.9	36.0	24.0	37.7	25.1	39.3	26.2	41.0	27.2	42.6	28.3
			6	12.5	150	31.0	20.6	32.3	21.5	33.7	22.4	35.0	23.3	36.4	24.2	37.7	25.1	39.1	26.0
			7	22.5	117	29.0	19.3	30.1	20.0	31.1	20.7	32.2	21.4	33.2	22.1	34.3	22.8	35.3	23.5
IPE 100	12.6	8.38	TFL	0.00	366	33.0	21.9	36.3	24.1	39.6	26.3	42.9	28.5	46.2	30.7	49.5	32.9	52.8	35.1
			2	1.43	311	30.4	20.2	33.2	22.1	36.0	24.0	38.8	25.8	41.6	27.7	44.4	29.6	47.2	31.4
			3	2.85	255	27.8	18.5	30.1	20.0	32.4	21.6	34.7	23.1	37.0	24.6	39.3	26.1	41.6	27.7
			4	4.28	199	25.1	16.7	26.9	17.9	28.7	19.1	30.5	20.3	32.3	21.5	34.1	22.7	35.9	23.9
			BFL	5.70	144	22.4	14.9	23.7	15.8	25.0	16.6	26.3	17.5	27.6	18.3	28.9	19.2	30.1	20.1
			6	10.9	118	21.0	14.0	22.1	14.7	23.1	15.4	24.2	16.1	25.3	16.8	26.3	17.5	27.4	18.2
			7	18.5	91.6	19.5	13.0	20.3	13.5	21.2	14.1	22.0	14.6	22.8	15.2	23.6	15.7	24.5	16.3
IPE 80	7.42	4.94	TFL	0.00	271	22.0	14.6	24.4	16.2	26.9	17.9	29.3	19.5	31.7	21.1	34.2	22.7	36.6	24.4
			2	1.30	229	20.0	13.3	22.1	14.7	24.2	16.1	26.2	17.4	28.3	18.8	30.3	20.2	32.4	21.5
			3	2.60	186	18.0	12.0	19.7	13.1	21.4	14.2	23.1	15.4	24.8	16.5	26.4	17.6	28.1	18.7
			4	3.90	144	16.0	10.7	17.3	11.5	18.6	12.4	19.9	13.2	21.2	14.1	22.5	15.0	23.8	15.8
			BFL	5.20	101	13.9	9.27	14.8	9.87	15.8	10.5	16.7	11.1	17.6	11.7	18.5	12.3	19.4	12.9
			6	9.20	84.6	13.1	8.69	13.8	9.20	14.6	9.71	15.3	10.2	16.1	10.7	16.9	11.2	17.6	11.7
			7	14.9	67.8	12.1	8.07	12.7	8.48	13.4	8.88	14.0	9.29	14.6	9.69	15.2	10.1	15.8	10.5

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

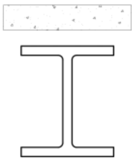
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPE Shapes
Available Strength in Flexure, kN·m

$F_y = 355$ MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 180	53.2	35.4	TFL	0.00	850	161	107	168	112	176	117	184	122	191	127	199	132	207	137
			2	2.00	721	147	97.6	153	102	160	106	166	111	173	115	179	119	186	123
			3	4.00	592	132	88.0	138	91.6	143	95.1	148	98.7	154	102	159	106	164	109
			4	6.00	463	118	78.4	122	81.1	126	83.9	130	86.7	134	89.4	139	92.2	143	95.0
			BFL	8.00	333	103	68.5	106	70.5	109	72.5	112	74.5	115	76.5	118	78.5	121	80.5
			6	17.5	273	95.8	63.7	98.3	65.4	101	67.0	103	68.6	106	70.3	108	71.9	111	73.5
			7	33.5	213	87.9	58.5	89.8	59.7	91.7	61.0	93.6	62.3	95.5	63.6	97.5	64.8	99.4	66.1
IPE 160	39.6	26.3	TFL	0.00	713	128	85.4	135	89.7	141	94.0	148	98.2	154	102	160	107	167	111
			2	1.85	605	117	77.6	122	81.2	128	84.9	133	88.5	138	92.1	144	95.7	149	99.4
			3	3.70	498	105	69.7	109	72.7	114	75.7	118	78.6	123	81.6	127	84.6	132	87.6
			4	5.55	390	92.7	61.7	96.2	64.0	99.7	66.3	103	68.7	107	71.0	110	73.3	114	75.7
			BFL	7.40	282	80.4	53.5	83.0	55.2	85.5	56.9	88.0	58.6	90.6	60.3	93.1	62.0	95.7	63.6
			6	15.7	230	74.3	49.4	76.3	50.8	78.4	52.2	80.5	53.5	82.5	54.9	84.6	56.3	86.7	57.7
			7	29.8	178	67.6	45.0	69.2	46.0	70.8	47.1	72.4	48.2	74.0	49.2	75.6	50.3	77.2	51.4
IPE 140	28.2	18.8	TFL	0.00	583	99.7	66.4	105	69.9	110	73.3	115	76.8	121	80.3	126	83.8	131	87.3
			2	1.73	494	90.0	59.9	94.5	62.8	98.9	65.8	103	68.8	108	71.7	112	74.7	117	77.6
			3	3.45	404	80.1	53.3	83.8	55.7	87.4	58.2	91.1	60.6	94.7	63.0	98.3	65.4	102	67.9
			4	5.18	315	70.1	46.7	73.0	48.6	75.8	50.4	78.7	52.3	81.5	54.2	84.3	56.1	87.2	58.0
			BFL	6.90	226	60.0	39.9	62.0	41.3	64.1	42.6	66.1	44.0	68.1	45.3	70.2	46.7	72.2	48.0
			6	14.3	186	55.3	36.8	57.0	37.9	58.7	39.0	60.3	40.1	62.0	41.3	63.7	42.4	65.3	43.5
			7	26.3	146	50.3	33.4	51.6	34.3	52.9	35.2	54.2	36.1	55.5	36.9	56.8	37.8	58.1	38.7
IPE 120	19.4	12.9	TFL	0.00	469	76.0	50.5	80.2	53.4	84.4	56.2	88.6	59.0	92.9	61.8	97.1	64.6	101	67.4
			2	1.58	397	68.2	45.4	71.8	47.7	75.3	50.1	78.9	52.5	82.5	54.9	86.1	57.3	89.6	59.6
			3	3.15	326	60.3	40.1	63.2	42.1	66.2	44.0	69.1	46.0	72.0	47.9	75.0	49.9	77.9	51.8
			4	4.73	254	52.3	34.8	54.6	36.3	56.9	37.9	59.2	39.4	61.5	40.9	63.8	42.4	66.1	43.9
			BFL	6.30	183	44.2	29.4	45.9	30.5	47.5	31.6	49.2	32.7	50.8	33.8	52.5	34.9	54.1	36.0
			6	12.5	150	40.4	26.9	41.8	27.8	43.1	28.7	44.5	29.6	45.8	30.5	47.2	31.4	48.5	32.3
			7	22.5	117	36.4	24.2	37.4	24.9	38.5	25.6	39.6	26.3	40.6	27.0	41.7	27.7	42.7	28.4
IPE 100	12.6	8.38	TFL	0.00	366	56.1	37.3	59.4	39.5	62.6	41.7	65.9	43.9	69.2	46.1	72.5	48.3	75.8	50.5
			2	1.43	311	50.0	33.3	52.8	35.1	55.6	37.0	58.4	38.9	61.2	40.7	64.0	42.6	66.8	44.4
			3	2.85	255	43.9	29.2	46.2	30.7	48.5	32.3	50.8	33.8	53.1	35.3	55.4	36.8	57.7	38.4
			4	4.28	199	37.7	25.1	39.5	26.3	41.3	27.5	43.1	28.7	44.9	29.9	46.7	31.1	48.5	32.2
			BFL	5.70	144	31.4	20.9	32.7	21.8	34.0	22.6	35.3	23.5	36.6	24.4	37.9	25.2	39.2	26.1
			6	10.9	118	28.4	18.9	29.5	19.6	30.5	20.3	31.6	21.0	32.7	21.7	33.7	22.4	34.8	23.1
			7	18.5	91.6	25.3	16.8	26.1	17.4	26.9	17.9	27.7	18.5	28.6	19.0	29.4	19.6	30.2	20.1
IPE 80	7.42	4.94	TFL	0.00	271	39.1	26.0	41.5	27.6	43.9	29.2	46.4	30.9	48.8	32.5	51.3	34.1	53.7	35.7
			2	1.30	229	34.4	22.9	36.5	24.3	38.6	25.7	40.6	27.0	42.7	28.4	44.7	29.8	46.8	31.1
			3	2.60	186	29.8	19.8	31.5	20.9	33.1	22.0	34.8	23.2	36.5	24.3	38.2	25.4	39.8	26.5
			4	3.90	144	25.1	16.7	26.4	17.5	27.7	18.4	29.0	19.3	30.3	20.1	31.5	21.0	32.8	21.9
			BFL	5.20	101	20.3	13.5	21.2	14.1	22.1	14.7	23.1	15.3	24.0	15.9	24.9	16.6	25.8	17.2
			6	9.20	84.6	18.4	12.2	19.2	12.7	19.9	13.3	20.7	13.8	21.4	14.3	22.2	14.8	23.0	15.3
			7	14.9	67.8	16.4	10.9	17.0	11.3	17.6	11.7	18.2	12.1	18.8	12.5	19.5	12.9	20.1	13.3

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

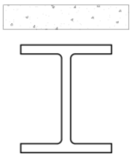
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 600	664	442	TFL	0.00	3220	1010	672	1040	691	1070	710	1100	730	1130	749	1150	768	1180	788
			2	4.38	2770	989	658	1010	674	1040	691	1060	707	1090	724	1110	741	1140	757
			3	8.75	2310	966	642	986	656	1010	670	1030	684	1050	698	1070	712	1090	726
			4	13.1	1860	941	626	957	637	974	648	991	659	1010	670	1020	682	1040	693
			BFL	17.5	1410	914	608	927	617	939	625	952	634	965	642	978	650	990	659
			6	58.1	1110	891	593	901	599	911	606	921	613	931	619	941	626	951	633
			7	124	805	853	567	860	572	867	577	874	582	882	587	889	591	896	596
IPEA 550	523	348	TFL	0.00	2760	803	534	827	550	852	567	877	583	902	600	927	617	951	633
			2	3.93	2370	784	522	806	536	827	550	848	564	870	579	891	593	912	607
			3	7.85	1980	765	509	783	521	801	533	818	545	836	556	854	568	872	580
			4	11.8	1590	744	495	758	505	773	514	787	524	802	533	816	543	830	552
			BFL	15.7	1210	722	480	733	488	744	495	754	502	765	509	776	516	787	524
			6	49.4	948	703	468	712	474	720	479	729	485	737	491	746	496	754	502
			7	111	689	673	448	679	452	685	456	691	460	698	464	704	468	710	472
IPEA 500	412	274	TFL	0.00	2380	638	425	660	439	681	453	702	467	724	482	745	496	767	510
			2	3.63	2040	622	414	641	426	659	438	677	451	696	463	714	475	732	487
			3	7.25	1690	605	403	621	413	636	423	651	433	666	443	682	454	697	464
			4	10.9	1350	587	391	599	399	612	407	624	415	636	423	648	431	660	439
			BFL	14.5	1010	568	378	577	384	586	390	595	396	605	402	614	408	623	414
			6	45.0	803	553	368	561	373	568	378	575	383	582	387	590	392	597	397
			7	98.1	594	530	353	536	357	541	360	547	364	552	367	557	371	563	374
IPEA 450	316	210	TFL	0.00	2010	495	329	513	341	531	353	549	365	567	377	585	389	603	401
			2	3.28	1720	481	320	497	330	512	341	528	351	543	361	559	372	574	382
			3	6.55	1430	467	311	480	319	492	328	505	336	518	345	531	353	544	362
			4	9.83	1130	452	300	462	307	472	314	482	321	492	328	502	334	513	341
			BFL	13.1	841	435	290	443	295	450	300	458	305	466	310	473	315	481	320
			6	35.5	672	424	282	430	286	436	290	442	294	448	298	454	302	460	306
			7	82.8	503	407	271	412	274	417	277	421	280	426	283	430	286	435	289
IPEA 400	242	161	TFL	0.00	1720	384	256	400	266	415	276	431	286	446	297	462	307	477	317
			2	3.00	1460	372	248	386	257	399	265	412	274	425	283	438	292	451	300
			3	6.00	1210	360	240	371	247	382	254	393	261	404	268	414	276	425	283
			4	9.00	956	347	231	355	236	364	242	373	248	381	254	390	259	398	265
			BFL	12.0	703	333	222	339	226	346	230	352	234	358	238	365	243	371	247
			6	30.1	566	324	216	329	219	334	223	340	226	345	229	350	233	355	236
			7	68.0	429	312	208	316	210	320	213	324	216	328	218	332	221	335	223
IPEA 360	192	128	TFL	0.00	1500	310	206	323	215	337	224	350	233	364	242	377	251	391	260
			2	2.88	1270	299	199	310	206	322	214	333	222	345	229	356	237	368	245
			3	5.75	1040	288	191	297	198	306	204	316	210	325	216	335	223	344	229
			4	8.63	814	276	184	283	188	290	193	298	198	305	203	312	208	320	213
			BFL	11.5	584	263	175	269	179	274	182	279	186	284	189	290	193	295	196
			6	27.0	480	257	171	261	174	266	177	270	180	274	182	279	185	283	188
			7	57.7	376	248	165	252	167	255	170	259	172	262	174	265	176	269	179

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

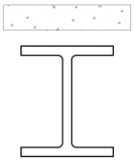
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shape
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 600	664	442	TFL	0.00	3220	1210	807	1240	826	1270	845	1300	865	1330	884	1360	903	1390	922
			2	4.38	2770	1160	774	1190	790	1210	807	1240	823	1260	840	1290	857	1310	873
			3	8.75	2310	1110	739	1130	753	1150	767	1170	781	1190	795	1220	809	1240	823
			4	13.1	1860	1060	704	1070	715	1090	726	1110	737	1130	749	1140	760	1160	771
			BFL	17.5	1410	1000	667	1020	676	1030	684	1040	693	1050	701	1070	710	1080	718
			6	58.1	1110	961	639	971	646	981	653	991	659	1000	666	1010	672	1020	679
			7	124	805	903	601	911	606	918	611	925	616	932	620	940	625	947	630
IPEA 550	523	348	TFL	0.00	2760	976	650	1000	666	1030	683	1050	699	1080	716	1100	732	1130	749
			2	3.93	2370	934	621	955	635	976	650	998	664	1020	678	1040	692	1060	706
			3	7.85	1980	890	592	908	604	925	616	943	628	961	639	979	651	997	663
			4	11.8	1590	845	562	859	571	873	581	888	591	902	600	916	610	931	619
			BFL	15.7	1210	798	531	809	538	820	545	831	553	841	560	852	567	863	574
			6	49.4	948	763	508	771	513	780	519	788	525	797	530	806	536	814	542
			7	111	689	716	477	722	481	729	485	735	489	741	493	747	497	754	501
IPEA 500	412	274	TFL	0.00	2380	788	524	809	538	831	553	852	567	873	581	895	595	916	610
			2	3.63	2040	751	499	769	512	787	524	806	536	824	548	842	560	860	573
			3	7.25	1690	712	474	727	484	743	494	758	504	773	514	788	525	804	535
			4	10.9	1350	673	447	685	456	697	464	709	472	721	480	733	488	746	496
			BFL	14.5	1010	632	420	641	426	650	433	659	439	668	445	677	451	687	457
			6	45.0	803	604	402	611	407	618	411	626	416	633	421	640	426	647	431
			7	98.1	594	568	378	573	381	579	385	584	389	589	392	595	396	600	399
IPEA 450	316	210	TFL	0.00	2010	622	414	640	426	658	438	676	450	694	462	712	474	730	486
			2	3.28	1720	590	392	605	403	620	413	636	423	651	433	667	444	682	454
			3	6.55	1430	557	370	569	379	582	387	595	396	608	404	621	413	634	422
			4	9.83	1130	523	348	533	355	543	361	553	368	564	375	574	382	584	389
			BFL	13.1	841	488	325	496	330	503	335	511	340	519	345	526	350	534	355
			6	35.5	672	466	310	472	314	478	318	485	322	491	326	497	330	503	334
			7	82.8	503	439	292	444	295	448	298	453	301	457	304	462	307	466	310
IPEA 400	242	161	TFL	0.00	1720	492	328	508	338	523	348	539	358	554	369	570	379	585	389
			2	3.00	1460	465	309	478	318	491	327	504	335	517	344	531	353	544	362
			3	6.00	1210	436	290	447	297	458	305	469	312	480	319	491	326	502	334
			4	9.00	956	407	271	416	277	424	282	433	288	442	294	450	299	459	305
			BFL	12.0	703	377	251	384	255	390	259	396	264	403	268	409	272	415	276
			6	30.1	566	360	239	365	243	370	246	375	250	380	253	385	256	391	260
			7	68.0	429	339	226	343	228	347	231	351	234	355	236	359	239	363	241
IPEA 360	192	128	TFL	0.00	1500	404	269	418	278	431	287	445	296	458	305	472	314	485	323
			2	2.88	1270	379	252	391	260	402	267	413	275	425	283	436	290	448	298
			3	5.75	1040	353	235	363	241	372	248	382	254	391	260	400	266	410	273
			4	8.63	814	327	218	334	223	342	227	349	232	356	237	364	242	371	247
			BFL	11.5	584	300	200	305	203	311	207	316	210	321	214	327	217	332	221
			6	27.0	480	287	191	291	194	296	197	300	200	304	203	309	205	313	208
			7	57.7	376	272	181	275	183	279	185	282	188	286	190	289	192	292	194

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

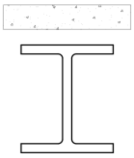
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 330	148	98.8	TFL	0.00	1290	247	164	259	172	270	180	282	188	293	195	305	203	317	211
			2	2.50	1100	239	159	248	165	258	172	268	178	278	185	288	192	298	198
			3	5.00	910	229	153	238	158	246	164	254	169	262	174	270	180	279	185
			4	7.50	722	220	146	226	151	233	155	239	159	246	164	252	168	259	172
			BFL	10.0	534	210	140	215	143	220	146	224	149	229	152	234	156	239	159
			6	25.9	428	203	135	207	138	211	140	215	143	219	146	223	148	227	151
			7	58.2	322	195	130	198	131	201	133	203	135	206	137	209	139	212	141
IPEA 300	115	76.2	TFL	0.00	1090	195	130	205	137	215	143	225	150	235	156	245	163	254	169
			2	2.30	931	188	125	196	131	205	136	213	142	221	147	230	153	238	158
			3	4.60	769	180	120	187	124	194	129	201	134	208	138	215	143	222	147
			4	6.90	607	172	114	177	118	183	122	188	125	194	129	199	133	205	136
			BFL	9.20	445	163	109	167	111	171	114	175	117	179	119	183	122	187	125
			6	23.7	359	158	105	162	108	165	110	168	112	171	114	175	116	178	118
			7	53.2	273	152	101	154	102	156	104	159	106	161	107	164	109	166	111
IPEA 270	87.2	58	TFL	0.00	920	152	101	160	107	169	112	177	118	185	123	193	129	202	134
			2	2.18	782	146	96.9	153	102	160	106	167	111	174	116	181	120	188	125
			3	4.35	644	139	92.5	145	96.3	151	100	156	104	162	108	168	112	174	116
			4	6.52	506	132	87.9	137	90.9	141	93.9	146	97.0	150	100	155	103	159	106
			BFL	8.70	368	125	83.1	128	85.3	132	87.5	135	89.7	138	91.9	142	94.1	145	96.3
			6	21.0	299	121	80.4	124	82.2	126	84.0	129	85.8	132	87.6	134	89.4	137	91.2
			7	44.5	230	116	77.1	118	78.5	120	79.8	122	81.2	124	82.6	126	84.0	128	85.3
IPEA 240	65.9	43.8	TFL	0.00	783	119	79.0	126	83.7	133	88.4	140	93.0	147	97.7	154	102	161	107
			2	2.08	666	113	75.4	119	79.4	125	83.4	131	87.4	137	91.4	143	95.3	149	99.3
			3	4.15	549	108	71.7	113	75.0	118	78.3	123	81.5	127	84.8	132	88.1	137	91.4
			4	6.23	432	102	67.8	106	70.4	110	73.0	114	75.6	117	78.2	121	80.7	125	83.3
			BFL	8.30	315	95.9	63.8	98.7	65.7	102	67.6	104	69.5	107	71.3	110	73.2	113	75.1
			6	19.2	255	92.5	61.5	94.8	63.1	97.1	64.6	99.4	66.1	102	67.6	104	69.2	106	70.7
			7	38.4	196	88.3	58.8	90.1	60.0	91.9	61.1	93.6	62.3	95.4	63.5	97.2	64.6	98.9	65.8
IPEA 220	50.8	33.8	TFL	0.00	664	94.7	63.0	101	67.0	107	71.0	113	75.0	119	78.9	125	82.9	131	86.9
			2	1.93	565	90.2	60.0	95.3	63.4	100	66.8	105	70.1	110	73.5	116	76.9	121	80.3
			3	3.85	465	85.4	56.8	89.6	59.6	93.8	62.4	98.0	65.2	102	68.0	106	70.8	111	73.6
			4	5.78	366	80.5	53.6	83.8	55.8	87.1	58.0	90.4	60.1	93.7	62.3	97.0	64.5	100	66.7
			BFL	7.70	266	75.4	50.2	77.8	51.8	80.2	53.4	82.6	55.0	85.0	56.6	87.4	58.2	89.8	59.8
			6	18.2	216	72.6	48.3	74.6	49.6	76.5	50.9	78.4	52.2	80.4	53.5	82.3	54.8	84.3	56.1
			7	37.8	166	69.1	46.0	70.6	47.0	72.1	48.0	73.6	49.0	75.1	50.0	76.6	51.0	78.1	52.0
IPEA 200	38.4	25.6	TFL	0.00	552	73.7	49.0	78.7	52.3	83.6	55.6	88.6	59.0	93.6	62.3	98.5	65.6	103	68.9
			2	1.75	469	69.9	46.5	74.2	49.3	78.4	52.2	82.6	55.0	86.8	57.8	91.1	60.6	95.3	63.4
			3	3.50	387	66.1	43.9	69.5	46.3	73.0	48.6	76.5	50.9	80.0	53.2	83.5	55.5	87.0	57.9
			4	5.25	305	62.0	41.3	64.8	43.1	67.5	44.9	70.3	46.7	73.0	48.6	75.7	50.4	78.5	52.2
			BFL	7.00	223	57.9	38.5	59.9	39.8	61.9	41.2	63.9	42.5	65.9	43.8	67.9	45.2	69.9	46.5
			6	16.3	180	55.5	36.9	57.1	38.0	58.8	39.1	60.4	40.2	62.0	41.3	63.6	42.3	65.3	43.4
			7	33.3	138	52.7	35.1	54.0	35.9	55.2	36.7	56.4	37.5	57.7	38.4	58.9	39.2	60.2	40.0

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

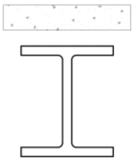
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shape
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 330	148	98.8	TFL	0.00	1290	328	218	340	226	351	234	363	241	375	249	386	257	398	265
			2	2.50	1100	308	205	318	211	327	218	337	224	347	231	357	238	367	244
			3	5.00	910	287	191	295	196	303	202	311	207	320	213	328	218	336	224
			4	7.50	722	265	177	272	181	278	185	285	190	291	194	298	198	304	203
			BFL	10.0	534	244	162	248	165	253	168	258	172	263	175	268	178	272	181
			6	25.9	428	230	153	234	156	238	158	242	161	246	164	250	166	254	169
			7	58.2	322	215	143	218	145	221	147	224	149	227	151	229	153	232	155
IPEA 300	115	76.2	TFL	0.00	1090	264	176	274	182	284	189	294	195	304	202	313	209	323	215
			2	2.30	931	247	164	255	170	263	175	272	181	280	186	288	192	297	198
			3	4.60	769	229	152	235	157	242	161	249	166	256	170	263	175	270	180
			4	6.90	607	210	140	216	143	221	147	227	151	232	154	238	158	243	162
			BFL	9.20	445	191	127	196	130	200	133	204	135	208	138	212	141	216	143
			6	23.7	359	181	120	184	123	187	125	191	127	194	129	197	131	200	133
			7	53.2	273	169	112	171	114	174	116	176	117	179	119	181	120	184	122
IPEA 270	87.2	58	TFL	0.00	920	210	140	218	145	226	151	235	156	243	162	251	167	260	173
			2	2.18	782	195	130	202	134	209	139	216	144	223	148	230	153	237	158
			3	4.35	644	180	119	185	123	191	127	197	131	203	135	209	139	214	143
			4	6.52	506	164	109	169	112	173	115	178	118	182	121	187	124	191	127
			BFL	8.70	368	148	98.6	151	101	155	103	158	105	161	107	165	110	168	112
			6	21.0	299	140	93.0	142	94.8	145	96.6	148	98.4	151	100	153	102	156	104
			7	44.5	230	130	86.7	132	88.1	134	89.5	137	90.9	139	92.2	141	93.6	143	95.0
IPEA 240	65.9	43.8	TFL	0.00	783	168	112	175	116	182	121	189	126	196	131	203	135	210	140
			2	2.08	666	155	103	161	107	167	111	173	115	179	119	185	123	191	127
			3	4.15	549	142	94.7	147	98.0	152	101	157	105	162	108	167	111	172	114
			4	6.23	432	129	85.9	133	88.5	137	91.1	141	93.7	145	96.3	149	98.8	152	101
			BFL	8.30	315	116	77.0	119	78.9	121	80.8	124	82.6	127	84.5	130	86.4	133	88.3
			6	19.2	255	109	72.2	111	73.8	113	75.3	115	76.8	118	78.3	120	79.9	122	81.4
			7	38.4	196	101	67.0	102	68.2	104	69.3	106	70.5	108	71.7	109	72.8	111	74.0
IPEA 220	50.8	33.8	TFL	0.00	664	137	90.9	143	94.8	149	98.8	155	103	160	107	166	111	172	115
			2	1.93	565	126	83.7	131	87.0	136	90.4	141	93.8	146	97.2	151	101	156	104
			3	3.85	465	115	76.3	119	79.1	123	81.9	127	84.7	131	87.5	136	90.3	140	93.0
			4	5.78	366	104	68.9	107	71.1	110	73.3	113	75.5	117	77.7	120	79.8	123	82.0
			BFL	7.70	266	92.2	61.3	94.6	62.9	97.0	64.5	99.4	66.1	102	67.7	104	69.3	107	70.9
			6	18.2	216	86.2	57.4	88.2	58.7	90.1	60.0	92.1	61.2	94.0	62.5	95.9	63.8	97.9	65.1
			7	37.8	166	79.6	53.0	81.1	53.9	82.6	54.9	84.1	55.9	85.6	56.9	87.1	57.9	88.6	58.9
IPEA 200	38.4	25.6	TFL	0.00	552	108	72.2	113	75.5	118	78.8	123	82.1	128	85.4	133	88.7	138	92.0
			2	1.75	469	99.5	66.2	104	69.0	108	71.8	112	74.6	116	77.5	121	80.3	125	83.1
			3	3.50	387	90.4	60.2	93.9	62.5	97.4	64.8	101	67.1	104	69.4	108	71.8	111	74.1
			4	5.25	305	81.2	54.0	84.0	55.9	86.7	57.7	89.5	59.5	92.2	61.3	94.9	63.2	97.7	65.0
			BFL	7.00	223	71.9	47.8	73.9	49.2	75.9	50.5	77.9	51.8	79.9	53.2	81.9	54.5	83.9	55.8
			6	16.3	180	66.9	44.5	68.5	45.6	70.1	46.7	71.7	47.7	73.4	48.8	75.0	49.9	76.6	51.0
			7	33.3	138	61.4	40.9	62.6	41.7	63.9	42.5	65.1	43.3	66.4	44.2	67.6	45.0	68.8	45.8

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

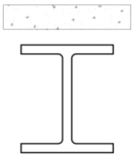
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 180	28.6	19	TFL	0.00	460	57.4	38.2	61.5	40.9	65.6	43.7	69.8	46.4	73.9	49.2	78.1	51.9	82.2	54.7
			2	1.63	391	54.2	36.0	57.7	38.4	61.2	40.7	64.7	43.1	68.2	45.4	71.8	47.7	75.3	50.1
			3	3.25	321	50.9	33.9	53.8	35.8	56.7	37.7	59.6	39.6	62.5	41.6	65.3	43.5	68.2	45.4
			4	4.88	252	47.5	31.6	49.8	33.1	52.0	34.6	54.3	36.1	56.6	37.6	58.8	39.1	61.1	40.7
			BFL	6.50	182	44.0	29.3	45.7	30.4	47.3	31.5	48.9	32.6	50.6	33.7	52.2	34.7	53.9	35.8
			6	15.2	149	42.2	28.1	43.5	29.0	44.9	29.9	46.2	30.7	47.5	31.6	48.9	32.5	50.2	33.4
			7	31.6	115	40.0	26.6	41.0	27.3	42.1	28.0	43.1	28.7	44.1	29.4	45.2	30.0	46.2	30.7
IPEA 160	21.0	13.9	TFL	0.00	380	44.0	29.3	47.4	31.5	50.8	33.8	54.2	36.1	57.7	38.4	61.1	40.6	64.5	42.9
			2	1.48	323	41.4	27.5	44.3	29.5	47.2	31.4	50.1	33.3	53.0	35.3	55.9	37.2	58.8	39.1
			3	2.95	267	38.7	25.8	41.1	27.3	43.5	28.9	45.9	30.5	48.3	32.1	50.7	33.7	53.1	35.3
			4	4.43	210	36.0	23.9	37.8	25.2	39.7	26.4	41.6	27.7	43.5	28.9	45.4	30.2	47.3	31.5
			BFL	5.90	153	33.1	22.0	34.5	23.0	35.9	23.9	37.3	24.8	38.6	25.7	40.0	26.6	41.4	27.5
			6	13.7	124	31.6	21.0	32.7	21.8	33.8	22.5	34.9	23.2	36.0	24.0	37.2	24.7	38.3	25.5
			7	27.9	95.1	29.8	19.8	30.6	20.4	31.5	20.9	32.3	21.5	33.2	22.1	34.0	22.6	34.9	23.2
IPEA 140	15.1	10.1	TFL	0.00	315	33.6	22.4	36.4	24.2	39.3	26.1	42.1	28.0	44.9	29.9	47.8	31.8	50.6	33.7
			2	1.40	267	31.4	20.9	33.8	22.5	36.2	24.1	38.6	25.7	41.0	27.3	43.4	28.9	45.8	30.5
			3	2.80	219	29.2	19.4	31.1	20.7	33.1	22.0	35.1	23.3	37.0	24.6	39.0	26.0	41.0	27.3
			4	4.20	171	26.9	17.9	28.4	18.9	29.9	19.9	31.5	20.9	33.0	22.0	34.5	23.0	36.1	24.0
			BFL	5.60	123	24.5	16.3	25.6	17.0	26.7	17.8	27.8	18.5	28.9	19.2	30.0	20.0	31.1	20.7
			6	12.5	101	23.3	15.5	24.2	16.1	25.1	16.7	26.0	17.3	26.9	17.9	27.8	18.5	28.8	19.1
			7	24.7	78.7	22.0	14.6	22.7	15.1	23.4	15.6	24.1	16.0	24.8	16.5	25.5	17.0	26.2	17.4
IPEA 120	10.5	7.02	TFL	0.00	259	25.4	16.9	27.7	18.4	30.0	20.0	32.4	21.5	34.7	23.1	37.0	24.6	39.4	26.2
			2	1.28	221	23.6	15.7	25.6	17.0	27.6	18.4	29.6	19.7	31.6	21.0	33.6	22.3	35.6	23.7
			3	2.55	183	21.8	14.5	23.5	15.6	25.1	16.7	26.8	17.8	28.4	18.9	30.1	20.0	31.7	21.1
			4	3.82	144	20.0	13.3	21.3	14.2	22.6	15.0	23.9	15.9	25.2	16.8	26.5	17.6	27.8	18.5
			BFL	5.10	106	18.1	12.1	19.1	12.7	20.0	13.3	21.0	14.0	21.9	14.6	22.9	15.2	23.8	15.9
			6	11.5	85.3	17.1	11.3	17.8	11.9	18.6	12.4	19.4	12.9	20.1	13.4	20.9	13.9	21.7	14.4
			7	22.5	64.8	15.8	10.5	16.4	10.9	17.0	11.3	17.6	11.7	18.2	12.1	18.7	12.5	19.3	12.9
IPEA 100	6.98	4.64	TFL	0.00	206	18.4	12.2	20.2	13.5	22.1	14.7	24.0	15.9	25.8	17.2	27.7	18.4	29.5	19.6
			2	1.18	176	17.0	11.3	18.6	12.4	20.2	13.4	21.8	14.5	23.3	15.5	24.9	16.6	26.5	17.6
			3	2.35	146	15.6	10.4	16.9	11.2	18.2	12.1	19.5	13.0	20.8	13.9	22.1	14.7	23.4	15.6
			4	3.53	115	14.1	9.41	15.2	10.1	16.2	10.8	17.2	11.5	18.3	12.2	19.3	12.9	20.4	13.5
			BFL	4.70	84.8	12.7	8.42	13.4	8.93	14.2	9.44	15.0	9.95	15.7	10.5	16.5	11.0	17.2	11.5
			6	10.1	68.2	11.8	7.85	12.4	8.26	13.0	8.67	13.6	9.08	14.3	9.49	14.9	9.89	15.5	10.3
			7	18.5	51.6	10.8	7.22	11.3	7.53	11.8	7.83	12.2	8.14	12.7	8.45	13.2	8.76	13.6	9.07
IPEA 80	4.01	2.67	TFL	0.00	150	12.0	7.99	13.4	8.89	14.7	9.79	16.1	10.7	17.4	11.6	18.8	12.5	20.1	13.4
			2	1.05	127	11.0	7.30	12.1	8.07	13.3	8.83	14.4	9.59	15.6	10.4	16.7	11.1	17.8	11.9
			3	2.10	105	9.92	6.60	10.9	7.23	11.8	7.85	12.7	8.48	13.7	9.11	14.6	9.73	15.6	10.4
			4	3.15	81.8	8.85	5.89	9.58	6.38	10.3	6.87	11.1	7.36	11.8	7.85	12.5	8.34	13.3	8.83
			BFL	4.20	59.1	7.75	5.16	8.28	5.51	8.82	5.87	9.35	6.22	9.88	6.57	10.4	6.93	10.9	7.28
			6	8.39	48.3	7.20	4.79	7.64	5.08	8.07	5.37	8.51	5.66	8.94	5.95	9.38	6.24	9.81	6.53
			7	14.8	37.5	6.61	4.39	6.94	4.62	7.28	4.84	7.62	5.07	7.95	5.29	8.29	5.52	8.63	5.74

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

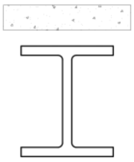
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 180	28.6	19	TFL	0.00	460	86.3	57.4	90.5	60.2	94.6	63.0	98.8	65.7	103	68.5	107	71.2	111	74.0
			2	1.63	391	78.8	52.4	82.3	54.8	85.8	57.1	89.3	59.4	92.8	61.8	96.4	64.1	99.9	66.5
			3	3.25	321	71.1	47.3	74.0	49.2	76.9	51.2	79.8	53.1	82.7	55.0	85.6	56.9	88.5	58.9
			4	4.88	252	63.4	42.2	65.6	43.7	67.9	45.2	70.2	46.7	72.4	48.2	74.7	49.7	77.0	51.2
			BFL	6.50	182	55.5	36.9	57.1	38.0	58.8	39.1	60.4	40.2	62.1	41.3	63.7	42.4	65.3	43.5
			6	15.2	149	51.6	34.3	52.9	35.2	54.2	36.1	55.6	37.0	56.9	37.9	58.2	38.7	59.6	39.6
			7	31.6	115	47.2	31.4	48.3	32.1	49.3	32.8	50.3	33.5	51.4	34.2	52.4	34.9	53.4	35.6
IPEA 160	21.0	13.9	TFL	0.00	380	67.9	45.2	71.4	47.5	74.8	49.7	78.2	52.0	81.6	54.3	85.0	56.6	88.5	58.9
			2	1.48	323	61.8	41.1	64.7	43.0	67.6	45.0	70.5	46.9	73.4	48.8	76.3	50.8	79.2	52.7
			3	2.95	267	55.5	36.9	57.9	38.5	60.3	40.1	62.7	41.7	65.1	43.3	67.5	44.9	69.9	46.5
			4	4.43	210	49.2	32.7	51.1	34.0	52.9	35.2	54.8	36.5	56.7	37.7	58.6	39.0	60.5	40.2
			BFL	5.90	153	42.8	28.5	44.1	29.4	45.5	30.3	46.9	31.2	48.3	32.1	49.6	33.0	51.0	33.9
			6	13.7	124	39.4	26.2	40.5	27.0	41.6	27.7	42.7	28.4	43.9	29.2	45.0	29.9	46.1	30.7
			7	27.9	95.1	35.7	23.8	36.6	24.3	37.5	24.9	38.3	25.5	39.2	26.1	40.0	26.6	40.9	27.2
IPEA 140	15.1	10.1	TFL	0.00	315	53.4	35.6	56.3	37.4	59.1	39.3	61.9	41.2	64.8	43.1	67.6	45.0	70.4	46.9
			2	1.40	267	48.2	32.1	50.6	33.7	53.0	35.3	55.4	36.9	57.8	38.5	60.2	40.1	62.6	41.7
			3	2.80	219	42.9	28.6	44.9	29.9	46.9	31.2	48.8	32.5	50.8	33.8	52.8	35.1	54.7	36.4
			4	4.20	171	37.6	25.0	39.1	26.0	40.7	27.1	42.2	28.1	43.7	29.1	45.3	30.1	46.8	31.1
			BFL	5.60	123	32.2	21.4	33.3	22.2	34.4	22.9	35.5	23.6	36.6	24.4	37.7	25.1	38.8	25.8
			6	12.5	101	29.7	19.7	30.6	20.3	31.5	20.9	32.4	21.5	33.3	22.1	34.2	22.7	35.1	23.3
			7	24.7	78.7	26.9	17.9	27.6	18.4	28.3	18.9	29.0	19.3	29.8	19.8	30.5	20.3	31.2	20.7
IPEA 120	10.5	7.02	TFL	0.00	259	41.7	27.8	44.0	29.3	46.4	30.9	48.7	32.4	51.0	34.0	53.4	35.5	55.7	37.1
			2	1.28	221	37.5	25.0	39.5	26.3	41.5	27.6	43.5	28.9	45.5	30.3	47.5	31.6	49.5	32.9
			3	2.55	183	33.3	22.2	35.0	23.3	36.6	24.4	38.3	25.5	39.9	26.6	41.6	27.6	43.2	28.7
			4	3.82	144	29.1	19.4	30.4	20.2	31.7	21.1	33.0	21.9	34.3	22.8	35.6	23.7	36.9	24.5
			BFL	5.10	106	24.8	16.5	25.7	17.1	26.7	17.8	27.6	18.4	28.6	19.0	29.6	19.7	30.5	20.3
			6	11.5	85.3	22.4	14.9	23.2	15.4	24.0	15.9	24.7	16.5	25.5	17.0	26.3	17.5	27.0	18.0
			7	22.5	64.8	19.9	13.2	20.5	13.6	21.1	14.0	21.7	14.4	22.2	14.8	22.8	15.2	23.4	15.6
IPEA 100	6.98	4.64	TFL	0.00	206	31.4	20.9	33.2	22.1	35.1	23.4	37.0	24.6	38.8	25.8	40.7	27.1	42.5	28.3
			2	1.18	176	28.1	18.7	29.7	19.7	31.3	20.8	32.8	21.8	34.4	22.9	36.0	24.0	37.6	25.0
			3	2.35	146	24.8	16.5	26.1	17.3	27.4	18.2	28.7	19.1	30.0	20.0	31.3	20.8	32.6	21.7
			4	3.53	115	21.4	14.2	22.4	14.9	23.5	15.6	24.5	16.3	25.5	17.0	26.6	17.7	27.6	18.4
			BFL	4.70	84.8	18.0	12.0	18.8	12.5	19.5	13.0	20.3	13.5	21.1	14.0	21.8	14.5	22.6	15.0
			6	10.1	68.2	16.1	10.7	16.7	11.1	17.3	11.5	17.9	11.9	18.6	12.3	19.2	12.8	19.8	13.2
			7	18.5	51.6	14.1	9.38	14.6	9.69	15.0	10.0	15.5	10.3	16.0	10.6	16.4	10.9	16.9	11.2
IPEA 80	4.01	2.67	TFL	0.00	150	21.5	14.3	22.8	15.2	24.2	16.1	25.5	17.0	26.9	17.9	28.2	18.8	29.6	19.7
			2	1.05	127	19.0	12.6	20.1	13.4	21.3	14.2	22.4	14.9	23.6	15.7	24.7	16.4	25.9	17.2
			3	2.10	105	16.5	11.0	17.4	11.6	18.4	12.2	19.3	12.9	20.3	13.5	21.2	14.1	22.2	14.7
			4	3.15	81.8	14.0	9.32	14.7	9.81	15.5	10.3	16.2	10.8	16.9	11.3	17.7	11.8	18.4	12.3
			BFL	4.20	59.1	11.5	7.64	12.0	7.99	12.5	8.34	13.1	8.70	13.6	9.05	14.1	9.41	14.7	9.76
			6	8.39	48.3	10.2	6.82	10.7	7.11	11.1	7.40	11.6	7.69	12.0	7.97	12.4	8.26	12.9	8.55
			7	14.8	37.5	8.97	5.97	9.30	6.19	9.64	6.41	9.98	6.64	10.3	6.86	10.7	7.09	11.0	7.31

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

[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.

Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 600	777	517	TFL	0.00	3770	1180	786	1220	809	1250	831	1280	854	1320	876	1350	899	1390	922
			2	4.38	3240	1160	770	1190	789	1220	808	1240	828	1270	847	1300	867	1330	886
			3	8.75	2710	1130	752	1150	768	1180	784	1200	800	1230	817	1250	833	1280	849
			4	13.1	2180	1100	732	1120	745	1140	759	1160	772	1180	785	1200	798	1220	811
			BFL	17.5	1650	1070	712	1080	722	1100	731	1110	741	1130	751	1140	761	1160	771
			6	58.1	1300	1040	694	1050	702	1070	709	1080	717	1090	725	1100	733	1110	740
			7	124	942	998	664	1010	670	1010	675	1020	681	1030	686	1040	692	1050	698
IPEA 550	613	408	TFL	0.00	3230	939	625	968	644	997	664	1030	683	1060	702	1080	721	1110	741
			2	3.93	2770	918	611	943	627	968	644	993	661	1020	677	1040	694	1070	710
			3	7.85	2320	895	596	916	609	937	623	958	637	979	651	1000	665	1020	679
			4	11.8	1870	871	579	888	591	904	602	921	613	938	624	955	635	972	646
			BFL	15.7	1410	845	562	857	571	870	579	883	587	896	596	908	604	921	613
			6	49.4	1110	823	547	833	554	843	561	853	567	863	574	873	581	883	587
			7	111	806	787	524	795	529	802	534	809	538	816	543	824	548	831	553
IPEA 500	482	320	TFL	0.00	2780	747	497	772	514	797	530	822	547	847	564	872	580	897	597
			2	3.63	2380	728	485	750	499	771	513	793	527	814	542	835	556	857	570
			3	7.25	1980	708	471	726	483	744	495	762	507	780	519	798	531	815	543
			4	10.9	1580	687	457	701	467	716	476	730	486	744	495	759	505	773	514
			BFL	14.5	1190	665	442	675	449	686	456	697	464	707	471	718	478	729	485
			6	45.0	940	648	431	656	436	665	442	673	448	681	453	690	459	698	465
			7	98.1	695	621	413	627	417	633	421	640	426	646	430	652	434	658	438
IPEA 450	370	246	TFL	0.00	2350	579	385	600	399	621	413	643	428	664	442	685	456	706	470
			2	3.28	2010	563	375	581	387	599	399	617	411	636	423	654	435	672	447
			3	6.55	1670	546	363	561	373	576	383	591	393	606	403	621	413	636	423
			4	9.83	1330	528	352	540	359	552	367	564	375	576	383	588	391	600	399
			BFL	13.1	984	509	339	518	345	527	351	536	357	545	363	554	368	563	374
			6	35.5	786	496	330	503	335	510	340	517	344	525	349	532	354	539	358
			7	82.8	588	477	317	482	321	487	324	493	328	498	331	503	335	509	338
IPEA 400	283	188	TFL	0.00	2010	450	299	468	311	486	323	504	335	522	347	540	359	558	371
			2	3.00	1710	436	290	451	300	467	310	482	321	498	331	513	341	528	352
			3	6.00	1420	421	280	434	289	447	297	459	306	472	314	485	323	498	331
			4	9.00	1120	406	270	416	277	426	283	436	290	446	297	456	304	466	310
			BFL	12.0	822	390	259	397	264	405	269	412	274	419	279	427	284	434	289
			6	30.1	662	379	252	385	256	391	260	397	264	403	268	409	272	415	276
			7	68.0	503	365	243	370	246	375	249	379	252	384	255	388	258	393	261
IPEA 360	224	149	TFL	0.00	1760	362	241	378	252	394	262	410	273	426	283	441	294	457	304
			2	2.88	1490	350	233	363	242	377	251	390	259	403	268	417	277	430	286
			3	5.75	1220	337	224	348	231	359	239	370	246	381	253	392	261	403	268
			4	8.63	952	323	215	331	220	340	226	348	232	357	238	366	243	374	249
			BFL	11.5	684	308	205	314	209	321	213	327	217	333	221	339	226	345	230
			6	27.0	562	301	200	306	203	311	207	316	210	321	213	326	217	331	220
			7	57.7	440	291	193	295	196	299	199	303	201	306	204	310	207	314	209

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

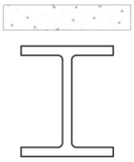
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shape
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 600	777	517	TFL	0.00	3770	1420	944	1450	967	1490	989	1520	1010	1550	1030	1590	1060	1620	1080
			2	4.38	3240	1360	905	1390	925	1420	944	1450	964	1480	983	1510	1000	1540	1020
			3	8.75	2710	1300	865	1320	881	1350	898	1370	914	1400	930	1420	946	1450	963
			4	13.1	2180	1240	824	1260	837	1280	850	1300	863	1320	876	1340	889	1360	902
			BFL	17.5	1650	1170	781	1190	791	1200	801	1220	811	1230	820	1250	830	1260	840
			6	58.1	1300	1120	748	1140	756	1150	764	1160	771	1170	779	1180	787	1190	795
			7	124	942	1060	703	1070	709	1070	715	1080	720	1090	726	1100	732	1110	737
IPEA 550	613	408	TFL	0.00	3230	1140	760	1170	779	1200	799	1230	818	1260	837	1290	857	1320	876
			2	3.93	2770	1090	727	1120	744	1140	760	1170	777	1190	793	1220	810	1240	827
			3	7.85	2320	1040	693	1060	707	1080	721	1100	734	1120	748	1150	762	1170	776
			4	11.8	1870	988	658	1010	669	1020	680	1040	691	1060	702	1070	713	1090	725
			BFL	15.7	1410	934	621	946	630	959	638	972	647	985	655	997	664	1010	672
			6	49.4	1110	893	594	903	601	913	607	923	614	933	621	943	627	953	634
			7	111	806	838	558	845	563	853	567	860	572	867	577	875	582	882	587
IPEA 500	482	320	TFL	0.00	2780	922	613	947	630	972	647	997	663	1020	680	1050	697	1070	713
			2	3.63	2380	878	584	900	599	921	613	943	627	964	641	986	656	1010	670
			3	7.25	1980	833	554	851	566	869	578	887	590	905	602	923	614	940	626
			4	10.9	1580	787	524	801	533	816	543	830	552	844	562	858	571	873	581
			BFL	14.5	1190	739	492	750	499	761	506	771	513	782	520	793	527	803	535
			6	45.0	940	707	470	715	476	724	482	732	487	741	493	749	498	758	504
			7	98.1	695	665	442	671	446	677	450	683	455	690	459	696	463	702	467
IPEA 450	370	246	TFL	0.00	2350	727	484	748	498	770	512	791	526	812	540	833	554	854	568
			2	3.28	2010	690	459	708	471	726	483	744	495	762	507	780	519	798	531
			3	6.55	1670	651	433	666	443	681	453	696	463	711	473	726	483	741	493
			4	9.83	1330	612	407	624	415	636	423	648	431	660	439	672	447	683	455
			BFL	13.1	984	571	380	580	386	589	392	598	398	607	404	616	410	625	416
			6	35.5	786	546	363	553	368	560	373	567	377	574	382	581	387	588	391
			7	82.8	588	514	342	519	345	524	349	530	352	535	356	540	360	546	363
IPEA 400	283	188	TFL	0.00	2010	576	383	594	395	612	407	631	420	649	432	667	444	685	456
			2	3.00	1710	544	362	559	372	575	382	590	393	605	403	621	413	636	423
			3	6.00	1420	510	340	523	348	536	357	549	365	561	374	574	382	587	391
			4	9.00	1120	476	317	486	324	497	330	507	337	517	344	527	350	537	357
			BFL	12.0	822	442	294	449	299	456	304	464	309	471	313	479	318	486	323
			6	30.1	662	421	280	427	284	433	288	439	292	445	296	451	300	457	304
			7	68.0	503	397	264	402	267	406	270	411	273	415	276	420	279	424	282
IPEA 360	224	149	TFL	0.00	1760	473	315	489	325	505	336	520	346	536	357	552	367	568	378
			2	2.88	1490	444	295	457	304	470	313	484	322	497	331	511	340	524	349
			3	5.75	1220	414	275	425	282	436	290	447	297	458	304	469	312	479	319
			4	8.63	952	383	255	391	260	400	266	408	272	417	277	426	283	434	289
			BFL	11.5	684	351	234	357	238	364	242	370	246	376	250	382	254	388	258
			6	27.0	562	336	224	341	227	346	230	351	234	356	237	361	240	366	244
			7	57.7	440	318	212	322	214	326	217	330	220	334	222	338	225	342	228

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

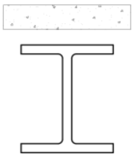
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 330	174	116	TFL	0.00	1510	289	192	303	201	316	210	330	219	343	229	357	238	371	247
			2	2.50	1290	279	186	291	193	302	201	314	209	325	216	337	224	349	232
			3	5.00	1070	268	179	278	185	288	191	297	198	307	204	316	211	326	217
			4	7.50	845	257	171	265	176	273	181	280	186	288	191	295	197	303	202
			BFL	10.0	625	246	163	251	167	257	171	263	175	268	178	274	182	279	186
			6	25.9	501	238	158	243	161	247	164	252	167	256	170	261	173	265	176
			7	58.2	376	228	152	231	154	235	156	238	158	241	161	245	163	248	165
IPEA 300	134	89.2	TFL	0.00	1280	229	152	240	160	252	167	263	175	275	183	286	190	298	198
			2	2.30	1090	220	146	230	153	239	159	249	166	259	172	269	179	279	185
			3	4.60	900	211	140	219	146	227	151	235	156	243	162	251	167	259	173
			4	6.90	710	201	134	208	138	214	142	220	147	227	151	233	155	240	159
			BFL	9.20	521	191	127	196	130	201	134	205	137	210	140	215	143	219	146
			6	23.7	420	185	123	189	126	193	128	197	131	200	133	204	136	208	138
			7	53.2	320	177	118	180	120	183	122	186	124	189	126	192	128	195	129
IPEA 270	102	67.9	TFL	0.00	1080	178	118	187	125	197	131	207	138	217	144	226	151	236	157
			2	2.18	915	170	113	179	119	187	124	195	130	203	135	212	141	220	146
			3	4.35	754	163	108	169	113	176	117	183	122	190	126	197	131	203	135
			4	6.52	592	155	103	160	106	165	110	171	113	176	117	181	121	187	124
			BFL	8.70	431	146	97.3	150	99.9	154	102	158	105	162	108	166	110	169	113
			6	21.0	350	141	94.1	145	96.2	148	98.3	151	100	154	103	157	105	160	107
			7	44.5	269	136	90.2	138	91.8	140	93.4	143	95.0	145	96.6	148	98.3	150	99.9
IPEA 240	77.1	51.3	TFL	0.00	916	139	92.4	147	97.9	155	103	164	109	172	114	180	120	188	125
			2	2.08	779	133	88.2	140	92.9	147	97.6	154	102	161	107	168	112	175	116
			3	4.15	642	126	83.9	132	87.7	138	91.6	143	95.4	149	99.3	155	103	161	107
			4	6.23	505	119	79.4	124	82.4	128	85.4	133	88.4	137	91.5	142	94.5	147	97.5
			BFL	8.30	368	112	74.7	116	76.9	119	79.1	122	81.3	125	83.5	129	85.7	132	87.9
			6	19.2	299	108	72.0	111	73.8	114	75.6	116	77.4	119	79.2	122	80.9	124	82.7
			7	38.4	229	103	68.8	105	70.2	108	71.5	110	72.9	112	74.3	114	75.6	116	77.0
IPEA 220	59.4	39.6	TFL	0.00	777	111	73.8	118	78.4	125	83.1	132	87.7	139	92.4	146	97.0	153	102
			2	1.93	661	106	70.2	111	74.2	117	78.1	123	82.1	129	86.0	135	90.0	141	93.9
			3	3.85	544	100	66.5	105	69.8	110	73.0	115	76.3	120	79.6	124	82.8	129	86.1
			4	5.78	428	94.2	62.7	98.1	65.3	102	67.8	106	70.4	110	72.9	113	75.5	117	78.1
			BFL	7.70	311	88.3	58.7	91.1	60.6	93.9	62.5	96.7	64.3	99.5	66.2	102	68.1	105	69.9
			6	18.2	253	85.0	56.5	87.2	58.0	89.5	59.6	91.8	61.1	94.1	62.6	96.3	64.1	98.6	65.6
			7	37.8	194	80.9	53.8	82.6	55.0	84.4	56.2	86.1	57.3	87.9	58.5	89.6	59.6	91.4	60.8
IPEA 200	45.0	29.9	TFL	0.00	645	86.3	57.4	92.1	61.3	97.9	65.1	104	69.0	109	72.9	115	76.7	121	80.6
			2	1.75	549	81.9	54.5	86.8	57.7	91.7	61.0	96.7	64.3	102	67.6	107	70.9	112	74.2
			3	3.50	453	77.3	51.4	81.4	54.1	85.4	56.9	89.5	59.6	93.6	62.3	97.7	65.0	102	67.7
			4	5.25	357	72.6	48.3	75.8	50.4	79.0	52.6	82.2	54.7	85.4	56.8	88.6	59.0	91.8	61.1
			BFL	7.00	260	67.7	45.1	70.1	46.6	72.4	48.2	74.8	49.7	77.1	51.3	79.4	52.9	81.8	54.4
			6	16.3	211	65.0	43.2	66.9	44.5	68.8	45.8	70.7	47.0	72.6	48.3	74.5	49.5	76.4	50.8
			7	33.3	161	61.7	41.0	63.1	42.0	64.6	43.0	66.0	43.9	67.5	44.9	68.9	45.9	70.4	46.8

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

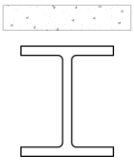
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shape
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 330	174	116	TFL	0.00	1510	384	256	398	265	411	274	425	283	438	292	452	301	465	310
			2	2.50	1290	360	240	372	247	383	255	395	263	406	270	418	278	429	286
			3	5.00	1070	336	223	345	230	355	236	364	242	374	249	384	255	393	262
			4	7.50	845	311	207	318	212	326	217	333	222	341	227	349	232	356	237
			BFL	10.0	625	285	190	291	193	296	197	302	201	308	205	313	208	319	212
			6	25.9	501	270	179	274	182	279	185	283	188	288	191	292	194	297	197
			7	58.2	376	252	167	255	170	258	172	262	174	265	176	269	179	272	181
IPEA 300	134	89.2	TFL	0.00	1280	309	206	321	213	332	221	344	229	355	236	367	244	378	252
			2	2.30	1090	289	192	298	198	308	205	318	212	328	218	338	225	347	231
			3	4.60	900	267	178	276	183	284	189	292	194	300	199	308	205	316	210
			4	6.90	710	246	164	252	168	259	172	265	176	272	181	278	185	284	189
			BFL	9.20	521	224	149	229	152	233	155	238	158	243	162	248	165	252	168
			6	23.7	420	212	141	216	143	219	146	223	148	227	151	231	153	234	156
			7	53.2	320	197	131	200	133	203	135	206	137	209	139	212	141	215	143
IPEA 270	102	67.9	TFL	0.00	1080	246	163	255	170	265	176	275	183	284	189	294	196	304	202
			2	2.18	915	228	152	236	157	245	163	253	168	261	174	269	179	277	185
			3	4.35	754	210	140	217	144	224	149	230	153	237	158	244	162	251	167
			4	6.52	592	192	128	197	131	203	135	208	138	213	142	219	145	224	149
			BFL	8.70	431	173	115	177	118	181	120	185	123	189	126	193	128	197	131
			6	21.0	350	164	109	167	111	170	113	173	115	176	117	179	119	182	121
			7	44.5	269	153	101	155	103	157	105	160	106	162	108	165	110	167	111
IPEA 240	77.1	51.3	TFL	0.00	916	197	131	205	136	213	142	221	147	230	153	238	158	246	164
			2	2.08	779	182	121	189	126	196	130	203	135	210	140	217	144	224	149
			3	4.15	642	167	111	172	115	178	118	184	122	190	126	195	130	201	134
			4	6.23	505	151	101	156	104	160	107	165	110	169	113	174	116	178	119
			BFL	8.30	368	135	90.1	139	92.3	142	94.5	145	96.7	149	98.9	152	101	155	103
			6	19.2	299	127	84.5	130	86.3	132	88.1	135	89.9	138	91.7	140	93.5	143	95.3
			7	38.4	229	118	78.4	120	79.8	122	81.1	124	82.5	126	83.9	128	85.2	130	86.6
IPEA 220	59.4	39.6	TFL	0.00	777	160	106	167	111	174	116	181	120	188	125	195	130	202	134
			2	1.93	661	147	97.9	153	102	159	106	165	110	171	114	177	118	183	122
			3	3.85	544	134	89.3	139	92.6	144	95.8	149	99.1	154	102	159	106	164	109
			4	5.78	428	121	80.6	125	83.2	129	85.7	133	88.3	137	90.9	140	93.4	144	96.0
			BFL	7.70	311	108	71.8	111	73.7	113	75.5	116	77.4	119	79.2	122	81.1	125	83.0
			6	18.2	253	101	67.1	103	68.6	105	70.2	108	71.7	110	73.2	112	74.7	115	76.2
			7	37.8	194	93.1	62.0	94.9	63.1	96.6	64.3	98.4	65.5	100	66.6	102	67.8	104	68.9
IPEA 200	45.0	29.9	TFL	0.00	645	127	84.4	133	88.3	139	92.2	144	96.0	150	99.9	156	104	162	108
			2	1.75	549	116	77.5	121	80.8	126	84.1	131	87.3	136	90.6	141	93.9	146	97.2
			3	3.50	453	106	70.4	110	73.1	114	75.8	118	78.5	122	81.3	126	84.0	130	86.7
			4	5.25	357	95.1	63.2	98.3	65.4	101	67.5	105	69.7	108	71.8	111	73.9	114	76.1
			BFL	7.00	260	84.1	56.0	86.5	57.5	88.8	59.1	91.2	60.7	93.5	62.2	95.8	63.8	98.2	65.3
			6	16.3	211	78.3	52.1	80.2	53.3	82.1	54.6	84.0	55.9	85.9	57.1	87.8	58.4	89.6	59.6
			7	33.3	161	71.9	47.8	73.3	48.8	74.8	49.7	76.2	50.7	77.7	51.7	79.1	52.6	80.6	53.6

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

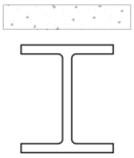
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 180	33.5	22.3	TFL	0.00	538	67.1	44.7	72.0	47.9	76.8	51.1	81.7	54.3	86.5	57.6	91.3	60.8	96.2	64.0
			2	1.63	457	63.4	42.2	67.5	44.9	71.6	47.7	75.7	50.4	79.9	53.1	84.0	55.9	88.1	58.6
			3	3.25	376	59.6	39.6	62.9	41.9	66.3	44.1	69.7	46.4	73.1	48.6	76.5	50.9	79.9	53.1
			4	4.88	294	55.6	37.0	58.3	38.8	60.9	40.5	63.6	42.3	66.2	44.0	68.9	45.8	71.5	47.6
			BFL	6.50	213	51.5	34.3	53.4	35.6	55.4	36.8	57.3	38.1	59.2	39.4	61.1	40.7	63.0	41.9
			6	15.2	174	49.4	32.9	50.9	33.9	52.5	34.9	54.1	36.0	55.6	37.0	57.2	38.1	58.8	39.1
			7	31.6	135	46.8	31.1	48.0	31.9	49.2	32.7	50.4	33.5	51.6	34.4	52.8	35.2	54.1	36.0
IPEA 160	24.5	16.3	TFL	0.00	445	51.5	34.2	55.5	36.9	59.5	39.6	63.5	42.2	67.5	44.9	71.5	47.6	75.5	50.2
			2	1.48	378	48.4	32.2	51.8	34.5	55.2	36.7	58.6	39.0	62.0	41.3	65.5	43.5	68.9	45.8
			3	2.95	312	45.3	30.1	48.1	32.0	50.9	33.9	53.7	35.7	56.5	37.6	59.3	39.5	62.1	41.3
			4	4.43	245	42.1	28.0	44.3	29.5	46.5	30.9	48.7	32.4	50.9	33.9	53.1	35.3	55.3	36.8
			BFL	5.90	179	38.8	25.8	40.4	26.9	42.0	27.9	43.6	29.0	45.2	30.1	46.8	31.2	48.4	32.2
			6	13.7	145	37.0	24.6	38.3	25.5	39.6	26.3	40.9	27.2	42.2	28.1	43.5	28.9	44.8	29.8
			7	27.9	111	34.8	23.2	35.8	23.8	36.8	24.5	37.8	25.2	38.8	25.8	39.8	26.5	40.8	27.2
IPEA 140	17.7	11.8	TFL	0.00	368	39.3	26.2	42.7	28.4	46.0	30.6	49.3	32.8	52.6	35.0	55.9	37.2	59.2	39.4
			2	1.40	312	36.8	24.5	39.6	26.3	42.4	28.2	45.2	30.1	48.0	31.9	50.8	33.8	53.6	35.7
			3	2.80	256	34.1	22.7	36.4	24.2	38.7	25.8	41.0	27.3	43.3	28.8	45.6	30.4	48.0	31.9
			4	4.20	200	31.4	20.9	33.2	22.1	35.0	23.3	36.8	24.5	38.6	25.7	40.4	26.9	42.2	28.1
			BFL	5.60	143	28.7	19.1	29.9	19.9	31.2	20.8	32.5	21.6	33.8	22.5	35.1	23.4	36.4	24.2
			6	12.5	118	27.3	18.2	28.3	18.9	29.4	19.6	30.5	20.3	31.5	21.0	32.6	21.7	33.6	22.4
			7	24.7	92.1	25.7	17.1	26.5	17.7	27.4	18.2	28.2	18.8	29.0	19.3	29.8	19.9	30.7	20.4
IPEA 120	12.3	8.21	TFL	0.00	303	29.7	19.8	32.4	21.6	35.2	23.4	37.9	25.2	40.6	27.0	43.4	28.8	46.1	30.7
			2	1.28	258	27.7	18.4	30.0	19.9	32.3	21.5	34.6	23.0	37.0	24.6	39.3	26.1	41.6	27.7
			3	2.55	214	25.6	17.0	27.5	18.3	29.4	19.6	31.3	20.8	33.2	22.1	35.2	23.4	37.1	24.7
			4	3.82	169	23.4	15.6	24.9	16.6	26.4	17.6	28.0	18.6	29.5	19.6	31.0	20.6	32.5	21.6
			BFL	5.10	124	21.2	14.1	22.3	14.9	23.4	15.6	24.6	16.3	25.7	17.1	26.8	17.8	27.9	18.6
			6	11.5	99.8	20.0	13.3	20.9	13.9	21.7	14.5	22.6	15.1	23.5	15.7	24.4	16.3	25.3	16.9
			7	22.5	75.8	18.5	12.3	19.2	12.8	19.9	13.2	20.6	13.7	21.2	14.1	21.9	14.6	22.6	15.0
IPEA 100	8.16	5.43	TFL	0.00	241	21.5	14.3	23.7	15.8	25.9	17.2	28.0	18.7	30.2	20.1	32.4	21.5	34.6	23.0
			2	1.18	206	19.9	13.2	21.7	14.5	23.6	15.7	25.5	16.9	27.3	18.2	29.2	19.4	31.0	20.6
			3	2.35	170	18.2	12.1	19.8	13.2	21.3	14.2	22.8	15.2	24.4	16.2	25.9	17.2	27.4	18.3
			4	3.53	135	16.5	11.0	17.8	11.8	19.0	12.6	20.2	13.4	21.4	14.2	22.6	15.0	23.8	15.9
			BFL	4.70	99.3	14.8	9.86	15.7	10.5	16.6	11.0	17.5	11.6	18.4	12.2	19.3	12.8	20.2	13.4
			6	10.1	79.8	13.8	9.19	14.5	9.67	15.2	10.1	16.0	10.6	16.7	11.1	17.4	11.6	18.1	12.1
			7	18.5	60.4	12.7	8.44	13.2	8.81	13.8	9.17	14.3	9.53	14.9	9.89	15.4	10.3	16.0	10.6
IPEA 80	4.70	3.13	TFL	0.00	175	14.1	9.35	15.6	10.4	17.2	11.5	18.8	12.5	20.4	13.6	21.9	14.6	23.5	15.7
			2	1.05	149	12.8	8.55	14.2	9.44	15.5	10.3	16.9	11.2	18.2	12.1	19.5	13.0	20.9	13.9
			3	2.10	122	11.6	7.73	12.7	8.46	13.8	9.19	14.9	9.92	16.0	10.7	17.1	11.4	18.2	12.1
			4	3.15	95.8	10.4	6.89	11.2	7.46	12.1	8.04	12.9	8.61	13.8	9.18	14.7	9.76	15.5	10.3
			BFL	4.20	69.2	9.07	6.04	9.69	6.45	10.3	6.86	10.9	7.28	11.6	7.69	12.2	8.11	12.8	8.52
			6	8.39	56.5	8.43	5.61	8.94	5.95	9.45	6.29	9.96	6.62	10.5	6.96	11.0	7.30	11.5	7.64
			7	14.8	43.9	7.73	5.14	8.12	5.41	8.52	5.67	8.91	5.93	9.31	6.19	9.70	6.46	10.1	6.72

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

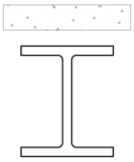
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 180	33.5	22.3	TFL	0.00	538	101	67.2	106	70.4	111	73.7	116	76.9	120	80.1	125	83.3	130	86.6
			2	1.63	457	92.2	61.3	96.3	64.1	100	66.8	105	69.6	109	72.3	113	75.0	117	77.8
			3	3.25	376	83.2	55.4	86.6	57.6	90.0	59.9	93.4	62.1	96.8	64.4	100	66.6	104	68.9
			4	4.88	294	74.2	49.3	76.8	51.1	79.5	52.9	82.1	54.6	84.8	56.4	87.4	58.2	90.1	59.9
			BFL	6.50	213	65.0	43.2	66.9	44.5	68.8	45.8	70.7	47.0	72.6	48.3	74.5	49.6	76.5	50.9
			6	15.2	174	60.3	40.1	61.9	41.2	63.5	42.2	65.0	43.3	66.6	44.3	68.2	45.3	69.7	46.4
			7	31.6	135	55.3	36.8	56.5	37.6	57.7	38.4	58.9	39.2	60.1	40.0	61.3	40.8	62.5	41.6
IPEA 160	24.5	16.3	TFL	0.00	445	79.5	52.9	83.5	55.6	87.5	58.2	91.5	60.9	95.5	63.5	99.5	66.2	104	68.9
			2	1.48	378	72.3	48.1	75.7	50.3	79.1	52.6	82.5	54.9	85.9	57.1	89.3	59.4	92.7	61.7
			3	2.95	312	64.9	43.2	67.8	45.1	70.6	46.9	73.4	48.8	76.2	50.7	79.0	52.5	81.8	54.4
			4	4.43	245	57.5	38.3	59.7	39.8	62.0	41.2	64.2	42.7	66.4	44.2	68.6	45.6	70.8	47.1
			BFL	5.90	179	50.0	33.3	51.7	34.4	53.3	35.4	54.9	36.5	56.5	37.6	58.1	38.7	59.7	39.7
			6	13.7	145	46.1	30.7	47.4	31.5	48.7	32.4	50.0	33.3	51.3	34.1	52.6	35.0	53.9	35.9
			7	27.9	111	41.8	27.8	42.8	28.5	43.8	29.2	44.8	29.8	45.8	30.5	46.8	31.2	47.8	31.8
IPEA 140	17.7	11.8	TFL	0.00	368	62.5	41.6	65.8	43.8	69.2	46.0	72.5	48.2	75.8	50.4	79.1	52.6	82.4	54.8
			2	1.40	312	56.4	37.5	59.2	39.4	62.0	41.3	64.9	43.1	67.7	45.0	70.5	46.9	73.3	48.8
			3	2.80	256	50.3	33.4	52.6	35.0	54.9	36.5	57.2	38.0	59.5	39.6	61.8	41.1	64.1	42.6
			4	4.20	200	44.0	29.3	45.8	30.5	47.6	31.7	49.4	32.9	51.2	34.1	53.0	35.3	54.8	36.4
			BFL	5.60	143	37.7	25.1	39.0	25.9	40.3	26.8	41.6	27.6	42.8	28.5	44.1	29.4	45.4	30.2
			6	12.5	118	34.7	23.1	35.8	23.8	36.8	24.5	37.9	25.2	38.9	25.9	40.0	26.6	41.1	27.3
			7	24.7	92.1	31.5	21.0	32.3	21.5	33.2	22.1	34.0	22.6	34.8	23.2	35.6	23.7	36.5	24.3
IPEA 120	12.3	8.21	TFL	0.00	303	48.8	32.5	51.5	34.3	54.3	36.1	57.0	37.9	59.7	39.7	62.5	41.6	65.2	43.4
			2	1.28	258	43.9	29.2	46.3	30.8	48.6	32.3	50.9	33.9	53.2	35.4	55.6	37.0	57.9	38.5
			3	2.55	214	39.0	26.0	40.9	27.2	42.9	28.5	44.8	29.8	46.7	31.1	48.6	32.4	50.5	33.6
			4	3.82	169	34.0	22.6	35.6	23.7	37.1	24.7	38.6	25.7	40.1	26.7	41.6	27.7	43.1	28.7
			BFL	5.10	124	29.0	19.3	30.1	20.0	31.2	20.8	32.4	21.5	33.5	22.3	34.6	23.0	35.7	23.8
			6	11.5	99.8	26.2	17.5	27.1	18.1	28.0	18.7	28.9	19.3	29.8	19.8	30.7	20.4	31.6	21.0
			7	22.5	75.8	23.3	15.5	24.0	15.9	24.7	16.4	25.3	16.9	26.0	17.3	26.7	17.8	27.4	18.2
IPEA 100	8.16	5.43	TFL	0.00	241	36.7	24.4	38.9	25.9	41.1	27.3	43.2	28.8	45.4	30.2	47.6	31.7	49.8	33.1
			2	1.18	206	32.9	21.9	34.7	23.1	36.6	24.3	38.4	25.6	40.3	26.8	42.1	28.0	44.0	29.3
			3	2.35	170	29.0	19.3	30.5	20.3	32.0	21.3	33.6	22.3	35.1	23.4	36.6	24.4	38.2	25.4
			4	3.53	135	25.0	16.7	26.3	17.5	27.5	18.3	28.7	19.1	29.9	19.9	31.1	20.7	32.3	21.5
			BFL	4.70	99.3	21.1	14.0	22.0	14.6	22.9	15.2	23.7	15.8	24.6	16.4	25.5	17.0	26.4	17.6
			6	10.1	79.8	18.8	12.5	19.6	13.0	20.3	13.5	21.0	14.0	21.7	14.4	22.4	14.9	23.1	15.4
			7	18.5	60.4	16.5	11.0	17.0	11.3	17.6	11.7	18.1	12.1	18.7	12.4	19.2	12.8	19.8	13.1
IPEA 80	4.70	3.13	TFL	0.00	175	25.1	16.7	26.7	17.8	28.3	18.8	29.8	19.9	31.4	20.9	33.0	22.0	34.6	23.0
			2	1.05	149	22.2	14.8	23.6	15.7	24.9	16.6	26.2	17.5	27.6	18.4	28.9	19.2	30.3	20.1
			3	2.10	122	19.3	12.9	20.4	13.6	21.5	14.3	22.6	15.1	23.7	15.8	24.8	16.5	25.9	17.2
			4	3.15	95.8	16.4	10.9	17.2	11.5	18.1	12.0	19.0	12.6	19.8	13.2	20.7	13.8	21.6	14.3
			BFL	4.20	69.2	13.4	8.94	14.1	9.35	14.7	9.76	15.3	10.2	15.9	10.6	16.5	11.0	17.2	11.4
			6	8.39	56.5	12.0	7.98	12.5	8.32	13.0	8.65	13.5	8.99	14.0	9.33	14.5	9.67	15.0	10.0
			7	14.8	43.9	10.5	6.98	10.9	7.24	11.3	7.51	11.7	7.77	12.1	8.03	12.5	8.29	12.9	8.56

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

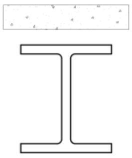
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 600	1000	668	TFL	0.00	4860	1530	1010	1570	1040	1610	1070	1660	1100	1700	1130	1740	1160	1790	1190
			2	4.38	4180	1490	994	1530	1020	1570	1040	1610	1070	1640	1090	1680	1120	1720	1140
			3	8.75	3500	1460	970	1490	991	1520	1010	1550	1030	1580	1050	1620	1080	1650	1100
			4	13.1	2810	1420	945	1450	962	1470	979	1500	996	1520	1010	1550	1030	1570	1050
			BFL	17.5	2130	1380	919	1400	932	1420	944	1440	957	1460	970	1480	983	1500	995
			6	58.1	1670	1350	896	1360	906	1380	916	1390	926	1410	936	1420	946	1440	956
			7	124	1220	1290	857	1300	864	1310	872	1320	879	1330	886	1340	893	1350	901
IPEA 550	791	526	TFL	0.00	4160	1210	807	1250	832	1290	857	1320	881	1360	906	1400	931	1440	956
			2	3.93	3580	1190	788	1220	810	1250	831	1280	853	1310	874	1350	896	1380	917
			3	7.85	2990	1160	769	1180	787	1210	805	1240	823	1260	841	1290	858	1320	876
			4	11.8	2410	1120	748	1150	762	1170	777	1190	791	1210	806	1230	820	1250	834
			BFL	15.7	1820	1090	726	1110	736	1120	747	1140	758	1160	769	1170	780	1190	791
			6	49.4	1430	1060	707	1080	715	1090	724	1100	732	1110	741	1130	750	1140	758
			7	111	1040	1020	676	1030	683	1040	689	1040	695	1050	701	1060	707	1070	714
IPEA 500	622	414	TFL	0.00	3590	964	642	996	663	1030	684	1060	706	1090	727	1130	749	1160	770
			2	3.63	3070	940	626	968	644	996	662	1020	681	1050	699	1080	718	1110	736
			3	7.25	2560	915	608	938	624	961	639	984	654	1010	670	1030	685	1050	700
			4	10.9	2040	887	590	906	602	924	615	942	627	961	639	979	651	998	664
			BFL	14.5	1530	858	571	872	580	886	589	899	598	913	608	927	617	941	626
			6	45.0	1210	836	556	847	563	858	571	869	578	880	585	891	593	902	600
			7	98.1	897	801	533	809	539	818	544	826	549	834	555	842	560	850	565
IPEA 450	477	318	TFL	0.00	3040	748	497	775	516	802	534	830	552	857	570	884	588	912	606
			2	3.28	2600	727	484	750	499	774	515	797	530	820	546	844	561	867	577
			3	6.55	2150	705	469	725	482	744	495	763	508	783	521	802	534	821	547
			4	9.83	1710	682	454	697	464	713	474	728	485	744	495	759	505	774	515
			BFL	13.1	1270	658	438	669	445	680	453	692	460	703	468	715	476	726	483
			6	35.5	1010	641	426	650	432	659	438	668	444	677	451	686	457	695	463
			7	82.8	759	616	410	622	414	629	419	636	423	643	428	650	432	657	437
IPEA 400	366	243	TFL	0.00	2600	580	386	604	402	627	417	650	433	674	448	697	464	721	479
			2	3.00	2210	563	374	583	388	602	401	622	414	642	427	662	441	682	454
			3	6.00	1830	544	362	560	373	577	384	593	395	610	406	626	417	643	427
			4	9.00	1440	524	349	537	357	550	366	563	375	576	383	589	392	602	401
			BFL	12.0	1060	503	335	513	341	522	347	532	354	541	360	551	367	560	373
			6	30.1	855	490	326	498	331	505	336	513	341	521	346	528	352	536	357
			7	68.0	649	472	314	478	318	483	322	489	326	495	329	501	333	507	337
IPEA 360	290	193	TFL	0.00	2270	468	311	488	325	508	338	529	352	549	365	570	379	590	393
			2	2.88	1920	451	300	469	312	486	323	503	335	521	346	538	358	555	370
			3	5.75	1580	435	289	449	299	463	308	477	317	491	327	505	336	520	346
			4	8.63	1230	417	277	428	285	439	292	450	299	461	307	472	314	483	321
			BFL	11.5	883	398	265	406	270	414	275	422	281	430	286	438	291	446	296
			6	27.0	725	388	258	395	263	401	267	408	271	414	276	421	280	427	284
			7	57.7	568	375	250	380	253	385	256	391	260	396	263	401	267	406	270

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

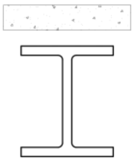
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shape
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 600	1000	668	TFL	0.00	4860	1830	1220	1880	1250	1920	1280	1960	1310	2010	1340	2050	1360	2090	1390
			2	4.38	4180	1760	1170	1790	1190	1830	1220	1870	1240	1910	1270	1940	1290	1980	1320
			3	8.75	3500	1680	1120	1710	1140	1740	1160	1770	1180	1800	1200	1840	1220	1870	1240
			4	13.1	2810	1600	1060	1620	1080	1650	1100	1670	1110	1700	1130	1720	1150	1750	1160
			BFL	17.5	2130	1520	1010	1530	1020	1550	1030	1570	1050	1590	1060	1610	1070	1630	1080
			6	58.1	1670	1450	966	1470	976	1480	986	1500	996	1510	1010	1530	1020	1540	1030
			7	124	1220	1360	908	1380	915	1390	923	1400	930	1410	937	1420	944	1430	952
IPEA 550	791	526	TFL	0.00	4160	1470	981	1510	1010	1550	1030	1590	1060	1620	1080	1660	1110	1700	1130
			2	3.93	3580	1410	938	1440	960	1470	981	1510	1000	1540	1020	1570	1050	1600	1070
			3	7.85	2990	1340	894	1370	912	1400	930	1430	948	1450	966	1480	984	1510	1000
			4	11.8	2410	1280	849	1300	863	1320	878	1340	892	1360	907	1380	921	1410	935
			BFL	15.7	1820	1210	802	1220	813	1240	824	1250	835	1270	846	1290	857	1300	867
			6	49.4	1430	1150	767	1170	775	1180	784	1190	792	1200	801	1220	810	1230	818
			7	111	1040	1080	720	1090	726	1100	732	1110	739	1120	745	1130	751	1140	757
IPEA 500	622	414	TFL	0.00	3590	1190	792	1220	813	1250	835	1290	856	1320	878	1350	899	1380	921
			2	3.63	3070	1130	754	1160	773	1190	791	1220	810	1240	828	1270	846	1300	865
			3	7.25	2560	1080	716	1100	731	1120	746	1140	762	1170	777	1190	792	1210	808
			4	10.9	2040	1020	676	1030	688	1050	700	1070	713	1090	725	1110	737	1130	749
			BFL	14.5	1530	955	635	968	644	982	653	996	663	1010	672	1020	681	1040	690
			6	45.0	1210	912	607	923	614	934	622	945	629	956	636	967	643	978	651
			7	98.1	897	858	571	866	576	874	582	882	587	890	592	898	598	906	603
IPEA 450	477	318	TFL	0.00	3040	939	625	966	643	994	661	1020	679	1050	697	1080	716	1100	734
			2	3.28	2600	891	593	914	608	937	624	961	639	984	655	1010	670	1030	686
			3	6.55	2150	841	559	860	572	880	585	899	598	918	611	938	624	957	637
			4	9.83	1710	790	526	805	536	821	546	836	556	852	567	867	577	882	587
			BFL	13.1	1270	738	491	749	498	760	506	772	514	783	521	795	529	806	536
			6	35.5	1010	705	469	714	475	723	481	732	487	741	493	750	499	759	505
			7	82.8	759	663	441	670	446	677	450	684	455	691	460	698	464	704	469
IPEA 400	366	243	TFL	0.00	2600	744	495	767	510	791	526	814	542	837	557	861	573	884	588
			2	3.00	2210	702	467	722	480	742	494	762	507	782	520	801	533	821	546
			3	6.00	1830	659	438	675	449	692	460	708	471	725	482	741	493	758	504
			4	9.00	1440	615	409	628	418	641	426	654	435	667	444	680	452	693	461
			BFL	12.0	1060	570	379	580	386	589	392	599	398	608	405	618	411	627	417
			6	30.1	855	544	362	551	367	559	372	567	377	575	382	582	387	590	393
			7	68.0	649	513	341	518	345	524	349	530	353	536	357	542	361	548	364
IPEA 360	290	193	TFL	0.00	2270	611	406	631	420	651	433	672	447	692	461	713	474	733	488
			2	2.88	1920	573	381	590	393	607	404	625	416	642	427	659	439	677	450
			3	5.75	1580	534	355	548	365	562	374	576	384	591	393	605	402	619	412
			4	8.63	1230	494	329	505	336	516	343	527	351	538	358	549	366	561	373
			BFL	11.5	883	454	302	461	307	469	312	477	318	485	323	493	328	501	333
			6	27.0	725	434	289	440	293	447	297	453	302	460	306	466	310	473	315
			7	57.7	568	411	273	416	277	421	280	426	284	431	287	436	290	442	294

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

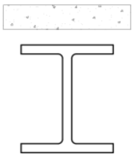
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 330	224	149	TFL	0.00	1940	373	248	391	260	408	272	426	283	443	295	461	307	478	318
			2	2.50	1660	360	240	375	250	390	260	405	270	420	279	435	289	450	299
			3	5.00	1380	347	231	359	239	371	247	384	255	396	264	408	272	421	280
			4	7.50	1090	332	221	342	228	352	234	362	241	371	247	381	254	391	260
			BFL	10.0	807	317	211	324	216	332	221	339	226	346	230	353	235	361	240
			6	25.9	647	307	204	313	208	319	212	325	216	331	220	336	224	342	228
			7	58.2	486	294	196	299	199	303	202	307	204	312	207	316	210	320	213
IPEA 300	173	115	TFL	0.00	1650	295	196	310	206	325	216	340	226	355	236	369	246	384	256
			2	2.30	1410	284	189	296	197	309	206	322	214	334	223	347	231	360	239
			3	4.60	1160	272	181	282	188	293	195	303	202	314	209	324	216	335	223
			4	6.90	917	260	173	268	178	276	184	285	189	293	195	301	200	309	206
			BFL	9.20	672	247	164	253	168	259	172	265	176	271	180	277	184	283	188
			6	23.7	542	239	159	244	162	249	166	254	169	259	172	264	175	268	179
			7	53.2	413	229	152	233	155	236	157	240	160	244	162	248	165	251	167
IPEA 270	132	87.7	TFL	0.00	1390	230	153	242	161	255	169	267	178	280	186	292	194	305	203
			2	2.18	1180	220	146	231	153	241	160	252	168	262	175	273	182	284	189
			3	4.35	973	210	140	219	146	227	151	236	157	245	163	254	169	262	175
			4	6.52	764	200	133	206	137	213	142	220	146	227	151	234	156	241	160
			BFL	8.70	556	189	126	194	129	199	132	204	136	209	139	214	142	219	146
			6	21.0	452	183	122	187	124	191	127	195	130	199	132	203	135	207	138
			7	44.5	347	175	116	178	119	181	121	184	123	188	125	191	127	194	129
IPEA 240	99.6	66.2	TFL	0.00	1180	179	119	190	126	201	133	211	141	222	148	233	155	243	162
			2	2.08	1010	171	114	180	120	189	126	198	132	207	138	216	144	226	150
			3	4.15	829	163	108	170	113	178	118	185	123	193	128	200	133	208	138
			4	6.23	652	154	102	160	106	166	110	172	114	177	118	183	122	189	126
			BFL	8.30	475	145	96.4	149	99.2	153	102	158	105	162	108	166	111	171	113
			6	19.2	385	140	93.0	143	95.3	147	97.6	150	99.9	154	102	157	104	161	107
			7	38.4	296	133	88.8	136	90.6	139	92.3	141	94.1	144	95.9	147	97.6	149	99.4
IPEA 220	76.7	51.1	TFL	0.00	1000	143	95.2	152	101	161	107	170	113	179	119	188	125	197	131
			2	1.93	853	136	90.6	144	95.7	152	101	159	106	167	111	175	116	182	121
			3	3.85	703	129	85.9	135	90.1	142	94.3	148	98.5	154	103	161	107	167	111
			4	5.78	552	122	80.9	127	84.2	132	87.5	137	90.9	142	94.2	146	97.5	151	101
			BFL	7.70	402	114	75.8	118	78.2	121	80.6	125	83.0	128	85.5	132	87.9	136	90.3
			6	18.2	326	110	73.0	113	74.9	116	76.9	118	78.8	121	80.8	124	82.7	127	84.7
			7	37.8	251	104	69.5	107	71.0	109	72.5	111	74.0	113	75.5	116	77.0	118	78.5
IPEA 200	58.1	38.6	TFL	0.00	833	111	74.1	119	79.1	126	84.1	134	89.1	141	94.0	149	99.0	156	104
			2	1.75	709	106	70.3	112	74.5	118	78.8	125	83.0	131	87.3	138	91.5	144	95.8
			3	3.50	585	99.8	66.4	105	69.9	110	73.4	116	76.9	121	80.4	126	83.9	131	87.4
			4	5.25	460	93.7	62.3	97.8	65.1	102	67.9	106	70.6	110	73.4	114	76.1	119	78.9
			BFL	7.00	336	87.4	58.2	90.5	60.2	93.5	62.2	96.5	64.2	99.5	66.2	103	68.2	106	70.2
			6	16.3	272	83.9	55.8	86.3	57.4	88.8	59.1	91.2	60.7	93.7	62.3	96.1	64.0	98.6	65.6
			7	33.3	208	79.6	53.0	81.5	54.2	83.4	55.5	85.3	56.7	87.1	58.0	89.0	59.2	90.9	60.5

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

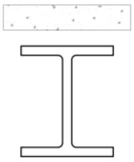
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shape
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 330	224	149	TFL	0.00	1940	496	330	513	342	531	353	548	365	566	376	583	388	601	400
			2	2.50	1660	465	309	480	319	495	329	510	339	525	349	540	359	554	369
			3	5.00	1380	433	288	446	296	458	305	470	313	483	321	495	329	507	338
			4	7.50	1090	401	267	411	273	421	280	430	286	440	293	450	299	460	306
			BFL	10.0	807	368	245	375	250	383	255	390	259	397	264	404	269	412	274
			6	25.9	647	348	232	354	235	360	239	366	243	371	247	377	251	383	255
			7	58.2	486	325	216	329	219	334	222	338	225	342	228	347	231	351	234
IPEA 300	173	115	TFL	0.00	1650	399	266	414	275	429	285	444	295	459	305	473	315	488	325
			2	2.30	1410	372	248	385	256	398	265	410	273	423	282	436	290	448	298
			3	4.60	1160	345	230	356	237	366	244	377	251	387	258	398	264	408	271
			4	6.90	917	318	211	326	217	334	222	342	228	351	233	359	239	367	244
			BFL	9.20	672	289	192	295	196	301	201	307	205	313	209	320	213	326	217
			6	23.7	542	273	182	278	185	283	188	288	192	293	195	298	198	303	201
			7	53.2	413	255	170	259	172	262	175	266	177	270	180	274	182	277	184
IPEA 270	132	87.7	TFL	0.00	1390	317	211	330	219	342	228	355	236	367	244	380	253	392	261
			2	2.18	1180	294	196	305	203	316	210	326	217	337	224	348	231	358	238
			3	4.35	973	271	180	280	186	289	192	298	198	306	204	315	210	324	215
			4	6.52	764	248	165	255	169	261	174	268	179	275	183	282	188	289	192
			BFL	8.70	556	224	149	229	152	234	156	239	159	244	162	249	166	254	169
			6	21.0	452	211	140	215	143	219	146	223	149	227	151	231	154	236	157
			7	44.5	347	197	131	200	133	203	135	206	137	209	139	213	141	216	143
IPEA 240	99.6	66.2	TFL	0.00	1180	254	169	264	176	275	183	286	190	296	197	307	204	318	211
			2	2.08	1010	235	156	244	162	253	168	262	174	271	180	280	186	289	192
			3	4.15	829	215	143	222	148	230	153	237	158	245	163	252	168	260	173
			4	6.23	652	195	130	201	134	207	138	213	141	219	145	224	149	230	153
			BFL	8.30	475	175	116	179	119	183	122	188	125	192	128	196	131	200	133
			6	19.2	385	164	109	167	111	171	114	174	116	178	118	181	121	185	123
			7	38.4	296	152	101	155	103	157	105	160	107	163	108	165	110	168	112
IPEA 220	76.7	51.1	TFL	0.00	1000	206	137	215	143	224	149	233	155	242	161	251	167	260	173
			2	1.93	853	190	126	198	131	205	137	213	142	221	147	228	152	236	157
			3	3.85	703	173	115	180	120	186	124	192	128	199	132	205	136	211	141
			4	5.78	552	156	104	161	107	166	111	171	114	176	117	181	121	186	124
			BFL	7.70	402	139	92.7	143	95.1	147	97.5	150	99.9	154	102	157	105	161	107
			6	18.2	326	130	86.7	133	88.6	136	90.6	139	92.5	142	94.5	145	96.4	148	98.4
			7	37.8	251	120	80.0	122	81.5	125	83.0	127	84.5	129	86.0	132	87.5	134	89.0
IPEA 200	58.1	38.6	TFL	0.00	833	164	109	171	114	179	119	186	124	194	129	201	134	209	139
			2	1.75	709	150	100	157	104	163	109	169	113	176	117	182	121	189	125
			3	3.50	585	137	90.9	142	94.4	147	97.9	152	101	158	105	163	108	168	112
			4	5.25	460	123	81.6	127	84.4	131	87.2	135	89.9	139	92.7	143	95.4	148	98.2
			BFL	7.00	336	109	72.3	112	74.3	115	76.3	118	78.3	121	80.3	124	82.3	127	84.3
			6	16.3	272	101	67.2	103	68.8	106	70.5	108	72.1	111	73.7	113	75.4	116	77.0
			7	33.3	208	92.8	61.7	94.6	63.0	96.5	64.2	98.4	65.5	100	66.7	102	67.9	104	69.2

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

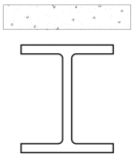
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 180	43.2	28.8	TFL	0.00	695	86.6	57.6	92.9	61.8	99.2	66.0	105	70.1	112	74.3	118	78.5	124	82.6
			2	1.63	590	81.8	54.5	87.2	58.0	92.5	61.5	97.8	65.1	103	68.6	108	72.1	114	75.7
			3	3.25	485	76.9	51.2	81.3	54.1	85.6	57.0	90.0	59.9	94.4	62.8	98.7	65.7	103	68.6
			4	4.88	380	71.8	47.8	75.2	50.0	78.6	52.3	82.0	54.6	85.5	56.9	88.9	59.1	92.3	61.4
			BFL	6.50	275	66.5	44.3	69.0	45.9	71.5	47.6	73.9	49.2	76.4	50.8	78.9	52.5	81.4	54.1
			6	15.2	224	63.7	42.4	65.8	43.8	67.8	45.1	69.8	46.4	71.8	47.8	73.8	49.1	75.9	50.5
			7	31.6	174	60.4	40.2	62.0	41.2	63.5	42.3	65.1	43.3	66.7	44.3	68.2	45.4	69.8	46.4
IPEA 160	31.7	21.1	TFL	0.00	574	66.4	44.2	71.6	47.6	76.8	51.1	81.9	54.5	87.1	58.0	92.3	61.4	97.4	64.8
			2	1.48	489	62.5	41.6	66.9	44.5	71.3	47.4	75.7	50.4	80.1	53.3	84.5	56.2	88.9	59.1
			3	2.95	403	58.5	38.9	62.1	41.3	65.7	43.7	69.3	46.1	73.0	48.5	76.6	51.0	80.2	53.4
			4	4.43	317	54.3	36.1	57.2	38.0	60.0	39.9	62.9	41.8	65.7	43.7	68.6	45.6	71.4	47.5
			BFL	5.90	231	50.1	33.3	52.1	34.7	54.2	36.1	56.3	37.5	58.4	38.8	60.4	40.2	62.5	41.6
			6	13.7	187	47.7	31.7	49.4	32.9	51.1	34.0	52.8	35.1	54.5	36.2	56.1	37.3	57.8	38.5
			7	27.9	144	44.9	29.9	46.2	30.8	47.5	31.6	48.8	32.5	50.1	33.3	51.4	34.2	52.7	35.1
IPEA 140	22.9	15.2	TFL	0.00	475	50.8	33.8	55.1	36.6	59.3	39.5	63.6	42.3	67.9	45.2	72.2	48.0	76.4	50.9
			2	1.40	403	47.5	31.6	51.1	34.0	54.7	36.4	58.3	38.8	62.0	41.2	65.6	43.6	69.2	46.1
			3	2.80	330	44.1	29.3	47.0	31.3	50.0	33.3	53.0	35.3	56.0	37.2	58.9	39.2	61.9	41.2
			4	4.20	258	40.6	27.0	42.9	28.5	45.2	30.1	47.5	31.6	49.8	33.2	52.2	34.7	54.5	36.3
			BFL	5.60	185	37.0	24.6	38.7	25.7	40.3	26.8	42.0	27.9	43.7	29.0	45.3	30.2	47.0	31.3
			6	12.5	152	35.2	23.4	36.6	24.3	38.0	25.3	39.3	26.2	40.7	27.1	42.1	28.0	43.4	28.9
			7	24.7	119	33.2	22.1	34.3	22.8	35.3	23.5	36.4	24.2	37.5	24.9	38.5	25.6	39.6	26.3
IPEA 120	15.9	10.6	TFL	0.00	392	38.3	25.5	41.9	27.9	45.4	30.2	48.9	32.5	52.4	34.9	56.0	37.2	59.5	39.6
			2	1.28	334	35.7	23.8	38.7	25.8	41.7	27.7	44.7	29.7	47.7	31.7	50.7	33.7	53.7	35.7
			3	2.55	276	33.0	22.0	35.5	23.6	38.0	25.3	40.4	26.9	42.9	28.6	45.4	30.2	47.9	31.9
			4	3.82	218	30.2	20.1	32.2	21.4	34.1	22.7	36.1	24.0	38.1	25.3	40.0	26.6	42.0	27.9
			BFL	5.10	160	27.4	18.2	28.8	19.2	30.3	20.1	31.7	21.1	33.1	22.0	34.6	23.0	36.0	24.0
			6	11.5	129	25.8	17.1	26.9	17.9	28.1	18.7	29.2	19.5	30.4	20.2	31.6	21.0	32.7	21.8
			7	22.5	97.9	23.9	15.9	24.8	16.5	25.7	17.1	26.5	17.7	27.4	18.2	28.3	18.8	29.2	19.4
IPEA 100	10.5	7.01	TFL	0.00	312	27.8	18.5	30.6	20.3	33.4	22.2	36.2	24.1	39.0	25.9	41.8	27.8	44.6	29.7
			2	1.18	266	25.7	17.1	28.1	18.7	30.5	20.3	32.9	21.9	35.3	23.5	37.6	25.0	40.0	26.6
			3	2.35	220	23.5	15.7	25.5	17.0	27.5	18.3	29.5	19.6	31.5	20.9	33.4	22.2	35.4	23.6
			4	3.53	174	21.4	14.2	22.9	15.3	24.5	16.3	26.1	17.3	27.6	18.4	29.2	19.4	30.8	20.5
			BFL	4.70	128	19.1	12.7	20.3	13.5	21.4	14.3	22.6	15.0	23.7	15.8	24.9	16.6	26.0	17.3
			6	10.1	103	17.8	11.9	18.8	12.5	19.7	13.1	20.6	13.7	21.5	14.3	22.5	14.9	23.4	15.6
			7	18.5	77.9	16.4	10.9	17.1	11.4	17.8	11.8	18.5	12.3	19.2	12.8	19.9	13.2	20.6	13.7
IPEA 80	6.06	4.03	TFL	0.00	226	18.1	12.1	20.2	13.4	22.2	14.8	24.3	16.1	26.3	17.5	28.3	18.9	30.4	20.2
			2	1.05	192	16.6	11.0	18.3	12.2	20.0	13.3	21.8	14.5	23.5	15.6	25.2	16.8	27.0	17.9
			3	2.10	158	15.0	9.97	16.4	10.9	17.8	11.9	19.3	12.8	20.7	13.8	22.1	14.7	23.5	15.6
			4	3.15	124	13.4	8.89	14.5	9.63	15.6	10.4	16.7	11.1	17.8	11.9	18.9	12.6	20.0	13.3
			BFL	4.20	89.3	11.7	7.79	12.5	8.33	13.3	8.86	14.1	9.40	14.9	9.93	15.7	10.5	16.5	11.0
			6	8.39	73.0	10.9	7.24	11.5	7.68	12.2	8.11	12.9	8.55	13.5	8.99	14.2	9.42	14.8	9.86
			7	14.8	56.6	9.98	6.64	10.5	6.98	11.0	7.32	11.5	7.66	12.0	8.00	12.5	8.33	13.0	8.67

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

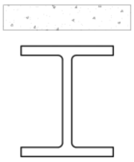
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEA Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^{a}$	$\Sigma Q_n{}^{d}$	$Y2^{b}$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEA 180	43.2	28.8	TFL	0.00	695	130	86.8	137	90.9	143	95.1	149	99.3	155	103	162	108	168	112
			2	1.63	590	119	79.2	124	82.7	130	86.3	135	89.8	140	93.3	146	96.9	151	100
			3	3.25	485	107	71.5	112	74.4	116	77.3	121	80.2	125	83.1	129	86.0	134	88.9
			4	4.88	380	95.7	63.7	99.1	66.0	103	68.2	106	70.5	109	72.8	113	75.1	116	77.3
			BFL	6.50	275	83.8	55.8	86.3	57.4	88.8	59.1	91.3	60.7	93.8	62.4	96.2	64.0	98.7	65.7
			6	15.2	224	77.9	51.8	79.9	53.2	81.9	54.5	83.9	55.8	86.0	57.2	88.0	58.5	90.0	59.9
			7	31.6	174	71.3	47.5	72.9	48.5	74.5	49.5	76.0	50.6	77.6	51.6	79.2	52.7	80.7	53.7
IPEA 160	31.7	21.1	TFL	0.00	574	103	68.3	108	71.7	113	75.2	118	78.6	123	82.0	128	85.5	134	88.9
			2	1.48	489	93.3	62.1	97.7	65.0	102	67.9	106	70.8	111	73.8	115	76.7	120	79.6
			3	2.95	403	83.8	55.8	87.5	58.2	91.1	60.6	94.7	63.0	98.3	65.4	102	67.8	106	70.2
			4	4.43	317	74.3	49.4	77.1	51.3	80.0	53.2	82.8	55.1	85.7	57.0	88.5	58.9	91.4	60.8
			BFL	5.90	231	64.6	43.0	66.7	44.4	68.8	45.7	70.8	47.1	72.9	48.5	75.0	49.9	77.1	51.3
			6	13.7	187	59.5	39.6	61.2	40.7	62.9	41.8	64.6	43.0	66.2	44.1	67.9	45.2	69.6	46.3
			7	27.9	144	54.0	35.9	55.3	36.8	56.6	37.6	57.9	38.5	59.2	39.4	60.5	40.2	61.7	41.1
IPEA 140	22.9	15.2	TFL	0.00	475	80.7	53.7	85.0	56.6	89.3	59.4	93.6	62.3	97.8	65.1	102	67.9	106	70.8
			2	1.40	403	72.8	48.5	76.5	50.9	80.1	53.3	83.7	55.7	87.3	58.1	91.0	60.5	94.6	62.9
			3	2.80	330	64.9	43.2	67.8	45.1	70.8	47.1	73.8	49.1	76.8	51.1	79.7	53.0	82.7	55.0
			4	4.20	258	56.8	37.8	59.1	39.3	61.4	40.9	63.8	42.4	66.1	44.0	68.4	45.5	70.7	47.1
			BFL	5.60	185	48.6	32.4	50.3	33.5	52.0	34.6	53.6	35.7	55.3	36.8	57.0	37.9	58.6	39.0
			6	12.5	152	44.8	29.8	46.2	30.7	47.5	31.6	48.9	32.5	50.3	33.4	51.6	34.4	53.0	35.3
			7	24.7	119	40.7	27.1	41.7	27.8	42.8	28.5	43.9	29.2	45.0	29.9	46.0	30.6	47.1	31.3
IPEA 120	15.9	10.6	TFL	0.00	392	63.0	41.9	66.5	44.3	70.1	46.6	73.6	49.0	77.1	51.3	80.6	53.6	84.2	56.0
			2	1.28	334	56.7	37.7	59.7	39.7	62.7	41.7	65.7	43.7	68.7	45.7	71.7	47.7	74.7	49.7
			3	2.55	276	50.4	33.5	52.8	35.2	55.3	36.8	57.8	38.5	60.3	40.1	62.8	41.8	65.3	43.4
			4	3.82	218	43.9	29.2	45.9	30.5	47.9	31.8	49.8	33.1	51.8	34.5	53.7	35.8	55.7	37.1
			BFL	5.10	160	37.5	24.9	38.9	25.9	40.3	26.8	41.8	27.8	43.2	28.7	44.6	29.7	46.1	30.7
			6	11.5	129	33.9	22.5	35.0	23.3	36.2	24.1	37.4	24.9	38.5	25.6	39.7	26.4	40.8	27.2
			7	22.5	97.9	30.1	20.0	30.9	20.6	31.8	21.2	32.7	21.8	33.6	22.3	34.5	22.9	35.3	23.5
IPEA 100	10.5	7.01	TFL	0.00	312	47.4	31.5	50.2	33.4	53.0	35.3	55.8	37.1	58.6	39.0	61.4	40.9	64.2	42.7
			2	1.18	266	42.4	28.2	44.8	29.8	47.2	31.4	49.6	33.0	52.0	34.6	54.4	36.2	56.8	37.8
			3	2.35	220	37.4	24.9	39.4	26.2	41.4	27.5	43.3	28.8	45.3	30.2	47.3	31.5	49.3	32.8
			4	3.53	174	32.3	21.5	33.9	22.5	35.5	23.6	37.0	24.6	38.6	25.7	40.2	26.7	41.7	27.8
			BFL	4.70	128	27.2	18.1	28.4	18.9	29.5	19.6	30.7	20.4	31.8	21.2	33.0	21.9	34.1	22.7
			6	10.1	103	24.3	16.2	25.2	16.8	26.2	17.4	27.1	18.0	28.0	18.6	29.0	19.3	29.9	19.9
			7	18.5	77.9	21.3	14.2	22.0	14.6	22.7	15.1	23.4	15.6	24.1	16.0	24.8	16.5	25.5	17.0
IPEA 80	6.06	4.03	TFL	0.00	226	32.4	21.6	34.4	22.9	36.5	24.3	38.5	25.6	40.6	27.0	42.6	28.3	44.6	29.7
			2	1.05	192	28.7	19.1	30.4	20.2	32.2	21.4	33.9	22.5	35.6	23.7	37.3	24.8	39.1	26.0
			3	2.10	158	24.9	16.6	26.4	17.5	27.8	18.5	29.2	19.4	30.6	20.4	32.0	21.3	33.5	22.3
			4	3.15	124	21.2	14.1	22.3	14.8	23.4	15.6	24.5	16.3	25.6	17.0	26.7	17.8	27.8	18.5
			BFL	4.20	89.3	17.3	11.5	18.1	12.1	18.9	12.6	19.7	13.1	20.6	13.7	21.4	14.2	22.2	14.7
			6	8.39	73.0	15.5	10.3	16.1	10.7	16.8	11.2	17.4	11.6	18.1	12.0	18.8	12.5	19.4	12.9
			7	14.8	56.6	13.5	9.01	14.1	9.35	14.6	9.69	15.1	10.0	15.6	10.4	16.1	10.7	16.6	11.0

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

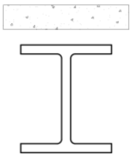
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 600	946	629	TFL	0.00	4620	1480	983	1520	1010	1560	1040	1600	1070	1640	1090	1690	1120	1730	1150
			2	6.00	3990	1450	963	1480	987	1520	1010	1560	1030	1590	1060	1630	1080	1660	1110
			3	12.0	3360	1410	941	1440	961	1470	981	1500	1000	1530	1020	1570	1040	1600	1060
			4	18.0	2730	1380	916	1400	933	1430	949	1450	965	1480	982	1500	998	1520	1010
			BFL	24.0	2100	1340	889	1360	902	1370	914	1390	927	1410	940	1430	952	1450	965
			6	74.2	1630	1300	862	1310	872	1330	882	1340	892	1350	901	1370	911	1380	921
			7	141	1160	1230	818	1240	825	1250	832	1260	839	1270	846	1280	852	1290	859
IPEO 550	690	459	TFL	0.00	3670	1080	720	1120	742	1150	764	1180	786	1210	808	1250	830	1280	852
			2	5.05	3170	1060	705	1090	724	1120	743	1140	762	1170	780	1200	799	1230	818
			3	10.1	2660	1030	687	1060	703	1080	719	1100	735	1130	751	1150	767	1180	783
			4	15.1	2160	1000	668	1020	681	1040	694	1060	707	1080	720	1100	733	1120	746
			BFL	20.2	1660	974	648	989	658	1000	668	1020	678	1030	688	1050	698	1060	708
			6	62.5	1290	945	628	956	636	968	644	979	652	991	659	1000	667	1010	675
			7	124	917	897	597	905	602	913	608	922	613	930	619	938	624	946	630
IPEO 500	553	368	TFL	0.00	3210	876	583	905	602	934	621	963	641	992	660	1020	679	1050	698
			2	4.75	2760	855	569	880	585	904	602	929	618	954	635	979	651	1000	668
			3	9.50	2310	832	553	852	567	873	581	894	595	915	609	936	622	956	636
			4	14.3	1860	806	537	823	548	840	559	857	570	873	581	890	592	907	603
			BFL	19.0	1410	779	519	792	527	805	535	817	544	830	552	843	561	856	569
			6	56.9	1110	756	503	766	510	776	516	786	523	796	530	806	536	816	543
			7	111	803	720	479	727	484	734	488	741	493	749	498	756	503	763	508
IPEO 450	433	288	TFL	0.00	2770	692	460	717	477	742	494	767	510	792	527	817	543	841	560
			2	4.40	2370	673	448	695	462	716	476	737	491	759	505	780	519	801	533
			3	8.80	1970	653	435	671	446	689	458	706	470	724	482	742	494	760	505
			4	13.2	1570	631	420	646	429	660	439	674	448	688	458	702	467	716	477
			BFL	17.6	1180	608	405	619	412	629	419	640	426	650	433	661	440	672	447
			6	47.2	935	590	393	599	398	607	404	616	410	624	415	632	421	641	426
			7	94.3	691	564	375	570	379	576	383	583	388	589	392	595	396	601	400
IPEO 400	318	211	TFL	0.00	2270	514	342	534	355	555	369	575	383	595	396	616	410	636	423
			2	3.88	1930	498	332	516	343	533	355	550	366	568	378	585	389	603	401
			3	7.75	1600	482	320	496	330	510	340	525	349	539	359	554	368	568	378
			4	11.6	1270	464	309	475	316	487	324	498	331	510	339	521	347	532	354
			BFL	15.5	939	445	296	453	302	462	307	470	313	479	318	487	324	496	330
			6	36.9	753	432	287	439	292	446	296	452	301	459	305	466	310	473	315
			7	77.8	566	414	275	419	279	424	282	429	286	434	289	440	292	445	296
IPEO 360	251	167	TFL	0.00	1980	413	275	431	286	448	298	466	310	484	322	502	334	520	346
			2	3.68	1680	399	265	414	275	429	286	444	296	459	306	475	316	490	326
			3	7.35	1380	384	256	397	264	409	272	421	280	434	289	446	297	459	305
			4	11.0	1090	368	245	378	252	388	258	398	265	407	271	417	278	427	284
			BFL	14.7	789	351	234	359	239	366	243	373	248	380	253	387	257	394	262
			6	33.6	641	342	227	347	231	353	235	359	239	365	243	371	247	376	250
			7	67.7	494	328	218	333	221	337	224	342	227	346	230	351	233	355	236
IPEO 330	199	133	TFL	0.00	1710	333	222	349	232	364	242	379	252	395	263	410	273	425	283
			2	3.38	1450	321	214	334	222	347	231	360	240	374	249	387	257	400	266
			3	6.75	1190	309	205	319	212	330	220	341	227	352	234	362	241	373	248
			4	10.1	936	295	196	304	202	312	208	320	213	329	219	337	224	346	230
			BFL	13.5	679	281	187	287	191	293	195	299	199	305	203	311	207	317	211
			6	30.0	553	273	181	278	185	283	188	288	191	293	195	298	198	302	201
			7	60.2	427	262	174	266	177	270	179	273	182	277	184	281	187	285	190

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

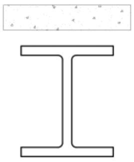
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 600	743	494	TFL	0.00	4620	1770	1180	1810	1200	1850	1230	1890	1260	1940	1290	1980	1320	2020	1340
			2	6.00	3990	1700	1130	1730	1150	1770	1180	1810	1200	1840	1230	1880	1250	1910	1270
			3	12.0	3360	1630	1080	1660	1100	1690	1120	1720	1140	1750	1160	1780	1180	1810	1200
			4	18.0	2730	1550	1030	1570	1050	1600	1060	1620	1080	1650	1100	1670	1110	1700	1130
			BFL	24.0	2100	1470	977	1490	990	1510	1000	1530	1010	1540	1030	1560	1040	1580	1050
			6	74.2	1630	1400	930	1410	940	1430	950	1440	960	1460	969	1470	979	1490	989
			7	141	1160	1300	866	1310	873	1320	880	1330	887	1340	894	1350	901	1360	908
IPEO 550	589	392	TFL	0.00	3670	1310	874	1350	896	1380	918	1410	940	1450	962	1480	984	1510	1010
			2	5.05	3170	1260	837	1290	856	1320	875	1340	894	1370	913	1400	932	1430	951
			3	10.1	2660	1200	799	1220	815	1250	831	1270	847	1300	863	1320	879	1340	895
			4	15.1	2160	1140	759	1160	772	1180	785	1200	798	1220	811	1240	824	1260	836
			BFL	20.2	1660	1080	717	1090	727	1110	737	1120	747	1140	757	1150	767	1170	777
			6	62.5	1290	1030	682	1040	690	1050	698	1060	706	1070	713	1080	721	1100	729
			7	124	917	955	635	963	641	971	646	980	652	988	657	996	663	1000	668
IPEO 500	464	309	TFL	0.00	3210	1080	718	1110	737	1140	756	1170	775	1190	794	1220	814	1250	833
			2	4.75	2760	1030	684	1050	701	1080	718	1100	734	1130	751	1150	767	1180	784
			3	9.50	2310	977	650	998	664	1020	678	1040	692	1060	705	1080	719	1100	733
			4	14.3	1860	924	615	940	626	957	637	974	648	991	659	1010	670	1020	681
			BFL	19.0	1410	868	578	881	586	894	595	906	603	919	611	932	620	944	628
			6	56.9	1110	826	549	836	556	846	563	856	569	866	576	876	583	886	589
			7	111	803	770	513	778	517	785	522	792	527	799	532	806	537	814	541
IPEO 450	360	240	TFL	0.00	2770	866	576	891	593	916	610	941	626	966	643	991	659	1020	676
			2	4.40	2370	823	547	844	562	865	576	887	590	908	604	929	618	951	632
			3	8.80	1970	777	517	795	529	813	541	831	553	848	564	866	576	884	588
			4	13.2	1570	731	486	745	496	759	505	773	514	787	524	801	533	816	543
			BFL	17.6	1180	682	454	693	461	703	468	714	475	725	482	735	489	746	496
			6	47.2	935	649	432	658	438	666	443	674	449	683	454	691	460	700	466
			7	94.3	691	607	404	614	408	620	412	626	417	632	421	639	425	645	429
IPEO 400	276	184	TFL	0.00	2270	656	437	677	450	697	464	718	477	738	491	758	505	779	518
			2	3.88	1930	620	413	637	424	655	436	672	447	690	459	707	470	724	482
			3	7.75	1600	583	388	597	397	611	407	626	416	640	426	655	436	669	445
			4	11.6	1270	544	362	555	369	567	377	578	385	590	392	601	400	612	407
			BFL	15.5	939	504	335	512	341	521	347	529	352	538	358	546	363	555	369
			6	36.9	753	479	319	486	324	493	328	500	333	507	337	513	342	520	346
			7	77.8	566	450	299	455	303	460	306	465	309	470	313	475	316	480	320
IPEO 360	216	143	TFL	0.00	1980	537	358	555	369	573	381	591	393	609	405	626	417	644	429
			2	3.68	1680	505	336	520	346	535	356	550	366	565	376	580	386	596	396
			3	7.35	1380	471	314	484	322	496	330	509	338	521	347	533	355	546	363
			4	11.0	1090	437	291	446	297	456	304	466	310	476	317	486	323	495	330
			BFL	14.7	789	401	267	408	272	415	276	422	281	430	286	437	291	444	295
			6	33.6	641	382	254	388	258	394	262	399	266	405	270	411	273	417	277
			7	67.7	494	359	239	364	242	368	245	373	248	377	251	382	254	386	257
IPEO 330	170	113	TFL	0.00	1710	441	293	456	304	472	314	487	324	502	334	518	344	533	355
			2	3.38	1450	413	275	426	283	439	292	452	301	465	309	478	318	491	327
			3	6.75	1190	384	255	394	262	405	270	416	277	427	284	437	291	448	298
			4	10.1	936	354	236	362	241	371	247	379	252	388	258	396	264	405	269
			BFL	13.5	679	324	215	330	219	336	223	342	227	348	232	354	236	360	240
			6	30.0	553	307	205	312	208	317	211	322	215	327	218	332	221	337	224
			7	60.2	427	289	192	293	195	296	197	300	200	304	202	308	205	312	207

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

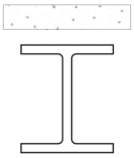
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 300	157	105	TFL	0.00	1480	268	179	282	187	295	196	308	205	322	214	335	223	348	232
			2	3.18	1250	258	172	269	179	280	187	292	194	303	202	314	209	325	216
			3	6.35	1020	247	164	256	170	265	176	274	183	284	189	293	195	302	201
			4	9.52	796	235	156	242	161	249	166	256	171	264	175	271	180	278	185
			BFL	12.7	569	222	148	228	151	233	155	238	158	243	162	248	165	253	168
			6	27.4	469	216	144	220	147	225	149	229	152	233	155	237	158	241	161
			7	53.8	369	208	138	211	141	215	143	218	145	221	147	225	149	228	152
IPEO 160	122	80.9	TFL	0.00	1270	213	142	224	149	236	157	247	164	258	172	270	180	281	187
			2	3.05	1070	204	136	214	142	223	148	233	155	242	161	252	168	262	174
			3	6.10	875	194	129	202	135	210	140	218	145	226	150	234	155	242	161
			4	9.15	680	184	123	190	127	196	131	203	135	209	139	215	143	221	147
			BFL	12.2	485	174	115	178	118	182	121	187	124	191	127	195	130	200	133
			6	25.1	401	168	112	172	114	176	117	179	119	183	122	186	124	190	126
			7	47.3	316	162	108	165	110	168	111	170	113	173	115	176	117	179	119
IPEO 140	86.8	57.7	TFL	0.00	1030	158	105	167	111	177	117	186	124	195	130	204	136	214	142
			2	2.70	872	151	100	159	106	167	111	174	116	182	121	190	127	198	132
			3	5.40	718	143	95.4	150	99.7	156	104	163	108	169	113	176	117	182	121
			4	8.10	563	135	90.1	141	93.5	146	96.9	151	100	156	104	161	107	166	110
			BFL	10.8	408	127	84.6	131	87.1	135	89.5	138	92.0	142	94.4	146	96.8	149	99.3
			6	22.8	332	123	81.6	126	83.6	129	85.6	132	87.6	135	89.6	138	91.6	141	93.6
			7	42.9	257	117	77.9	119	79.4	122	81.0	124	82.5	126	84.1	129	85.6	131	87.1
IPEO 120	67.9	45.2	TFL	0.00	879	127	84.7	135	90.0	143	95.2	151	100	159	106	167	111	175	116
			2	2.55	744	121	80.6	128	85.0	135	89.5	141	94.0	148	98.4	155	103	161	107
			3	5.10	610	115	76.3	120	79.9	126	83.6	131	87.2	137	90.9	142	94.5	148	98.2
			4	7.65	476	108	71.7	112	74.6	116	77.4	121	80.3	125	83.1	129	86.0	134	88.8
			BFL	10.2	342	101	67.0	104	69.0	107	71.1	110	73.1	113	75.2	116	77.2	119	79.3
			6	21.3	281	97.1	64.6	99.6	66.3	102	68.0	105	69.6	107	71.3	110	73.0	112	74.7
			7	40.2	220	92.7	61.7	94.6	63.0	96.6	64.3	98.6	65.6	101	66.9	103	68.2	105	69.5
IPEO 100	52.7	35.1	TFL	0.00	751	102	67.9	109	72.4	116	76.9	122	81.4	129	85.9	136	90.4	143	94.9
			2	2.38	637	96.8	64.4	103	68.2	108	72.1	114	75.9	120	79.7	125	83.5	131	87.3
			3	4.75	523	91.3	60.8	96.0	63.9	101	67.0	105	70.2	110	73.3	115	76.4	120	79.6
			4	7.13	409	85.6	57.0	89.3	59.4	93.0	61.9	96.7	64.3	100	66.8	104	69.2	108	71.7
			BFL	9.50	296	79.6	53.0	82.3	54.7	84.9	56.5	87.6	58.3	90.3	60.1	92.9	61.8	95.6	63.6
			6	19.6	242	76.5	50.9	78.7	52.3	80.8	53.8	83.0	55.2	85.2	56.7	87.4	58.1	89.5	59.6
			7	36.6	188	72.7	48.4	74.4	49.5	76.1	50.6	77.8	51.8	79.5	52.9	81.2	54.0	82.9	55.1
IPEO 80	40.0	26.6	TFL	0.00	637	80.8	53.8	86.5	57.6	92.3	61.4	98.0	65.2	104	69.0	109	72.8	115	76.7
			2	2.25	540	76.3	50.8	81.2	54.0	86.1	57.3	90.9	60.5	95.8	63.7	101	66.9	105	70.2
			3	4.50	442	71.7	47.7	75.6	50.3	79.6	53.0	83.6	55.6	87.6	58.3	91.6	60.9	95.5	63.6
			4	6.75	345	66.8	44.4	69.9	46.5	73.0	48.6	76.1	50.6	79.2	52.7	82.3	54.8	85.4	56.8
			BFL	9.00	248	61.7	41.1	64.0	42.6	66.2	44.0	68.4	45.5	70.6	47.0	72.9	48.5	75.1	50.0
			6	18.9	203	59.2	39.4	61.0	40.6	62.9	41.8	64.7	43.0	66.5	44.3	68.3	45.5	70.2	46.7
			7	34.5	159	56.1	37.3	57.6	38.3	59.0	39.3	60.4	40.2	61.9	41.2	63.3	42.1	64.7	43.1

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

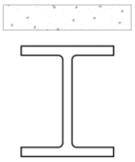
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 235 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 300	133	88.4	TFL	0.00	1480	361	240	375	249	388	258	401	267	415	276	428	285	441	294
			2	3.18	1250	337	224	348	231	359	239	370	246	382	254	393	261	404	269
			3	6.35	1020	311	207	320	213	330	219	339	225	348	232	357	238	366	244
			4	9.52	796	285	190	292	194	299	199	307	204	314	209	321	213	328	218
			BFL	12.7	569	258	172	263	175	269	179	274	182	279	185	284	189	289	192
			6	27.4	469	246	163	250	166	254	169	258	172	263	175	267	177	271	180
			7	53.8	369	231	154	235	156	238	158	241	160	244	163	248	165	251	167
IPEO 160	122	80.9	TFL	0.00	1270	293	195	304	202	315	210	327	217	338	225	350	233	361	240
			2	3.05	1070	271	181	281	187	291	193	300	200	310	206	319	213	329	219
			3	6.10	875	249	166	257	171	265	176	273	182	281	187	289	192	297	197
			4	9.15	680	227	151	233	155	239	159	245	163	252	167	258	171	264	176
			BFL	12.2	485	204	136	209	139	213	142	217	145	222	147	226	150	230	153
			6	25.1	401	194	129	197	131	201	134	204	136	208	138	212	141	215	143
			7	47.3	316	182	121	185	123	187	125	190	127	193	129	196	130	199	132
IPEO 140	86.8	57.7	TFL	0.00	1030	223	148	232	154	241	161	251	167	260	173	269	179	278	185
			2	2.70	872	206	137	214	142	222	147	229	153	237	158	245	163	253	168
			3	5.40	718	189	125	195	130	202	134	208	138	214	143	221	147	227	151
			4	8.10	563	171	114	176	117	181	120	186	124	191	127	196	131	201	134
			BFL	10.8	408	153	102	157	104	160	107	164	109	168	112	171	114	175	116
			6	22.8	332	144	95.5	147	97.5	150	99.5	153	102	156	104	159	105	162	107
			7	42.9	257	133	88.7	136	90.2	138	91.8	140	93.3	143	94.8	145	96.4	147	97.9
IPEO 120	67.9	45.2	TFL	0.00	879	183	122	191	127	198	132	206	137	214	143	222	148	230	153
			2	2.55	744	168	112	175	116	181	121	188	125	195	130	202	134	208	139
			3	5.10	610	153	102	159	105	164	109	170	113	175	116	181	120	186	124
			4	7.65	476	138	91.7	142	94.5	146	97.4	151	100	155	103	159	106	163	109
			BFL	10.2	342	122	81.3	125	83.4	128	85.4	131	87.5	135	89.5	138	91.6	141	93.6
			6	21.3	281	115	76.4	117	78.0	120	79.7	122	81.4	125	83.1	127	84.8	130	86.4
			7	40.2	220	107	70.9	108	72.2	110	73.5	112	74.8	114	76.1	116	77.4	118	78.8
IPEO 100	52.7	35.1	TFL	0.00	751	149	99.4	156	104	163	108	170	113	176	117	183	122	190	126
			2	2.38	637	137	91.1	143	94.9	148	98.8	154	103	160	106	166	110	171	114
			3	4.75	523	124	82.7	129	85.8	134	89.0	138	92.1	143	95.2	148	98.4	153	102
			4	7.13	409	111	74.1	115	76.6	119	79.0	122	81.5	126	83.9	130	86.4	134	88.8
			BFL	9.50	296	98.3	65.4	101	67.1	104	68.9	106	70.7	109	72.5	112	74.2	114	76.0
			6	19.6	242	91.7	61.0	93.9	62.5	96.1	63.9	98.2	65.4	100	66.8	103	68.3	105	69.7
			7	36.6	188	84.6	56.3	86.3	57.4	87.9	58.5	89.6	59.6	91.3	60.8	93.0	61.9	94.7	63.0
IPEO 80	40.0	26.6	TFL	0.00	637	121	80.5	127	84.3	132	88.1	138	91.9	144	95.7	150	99.5	155	103
			2	2.25	540	110	73.4	115	76.6	120	79.9	125	83.1	130	86.3	135	89.6	139	92.8
			3	4.50	442	99.5	66.2	104	68.9	107	71.5	111	74.2	115	76.8	119	79.5	123	82.1
			4	6.75	345	88.5	58.9	91.6	61.0	94.7	63.0	97.8	65.1	101	67.2	104	69.2	107	71.3
			BFL	9.00	248	77.3	51.5	79.6	52.9	81.8	54.4	84.0	55.9	86.2	57.4	88.5	58.9	90.7	60.4
			6	18.9	203	72.0	47.9	73.8	49.1	75.7	50.3	77.5	51.6	79.3	52.8	81.2	54.0	83.0	55.2
			7	34.5	159	66.2	44.0	67.6	45.0	69.0	45.9	70.5	46.9	71.9	47.8	73.3	48.8	74.8	49.7

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

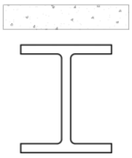
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 600	1110	736	TFL	0.00	5410	1730	1150	1780	1180	1830	1220	1880	1250	1920	1280	1970	1310	2020	1340
			2	6.00	4670	1690	1130	1740	1150	1780	1180	1820	1210	1860	1240	1900	1270	1950	1290
			3	12.0	3930	1650	1100	1690	1120	1730	1150	1760	1170	1800	1200	1830	1220	1870	1240
			4	18.0	3190	1610	1070	1640	1090	1670	1110	1700	1130	1730	1150	1760	1170	1780	1190
			BFL	24.0	2460	1560	1040	1590	1060	1610	1070	1630	1080	1650	1100	1670	1110	1700	1130
			6	74.2	1900	1520	1010	1530	1020	1550	1030	1570	1040	1590	1050	1600	1070	1620	1080
			7	141	1350	1440	957	1450	965	1460	973	1470	981	1490	989	1500	998	1510	1010
IPEO 550	808	537	TFL	0.00	4290	1270	843	1310	869	1340	895	1380	920	1420	946	1460	972	1500	997
			2	5.05	3700	1240	825	1270	847	1310	869	1340	891	1370	913	1410	936	1440	958
			3	10.1	3120	1210	804	1240	823	1260	842	1290	860	1320	879	1350	898	1380	916
			4	15.1	2530	1180	782	1200	797	1220	812	1240	828	1270	843	1290	858	1310	873
			BFL	20.2	1940	1140	758	1160	770	1170	782	1190	793	1210	805	1230	816	1240	828
			6	62.5	1510	1110	735	1120	744	1130	754	1150	763	1160	772	1170	781	1190	790
			7	124	1070	1050	698	1060	705	1070	711	1080	718	1090	724	1100	730	1110	737
IPEO 500	647	430	TFL	0.00	3760	1030	682	1060	705	1090	727	1130	750	1160	772	1190	795	1230	817
			2	4.75	3230	1000	666	1030	685	1060	704	1090	724	1120	743	1150	762	1170	782
			3	9.50	2700	973	647	997	664	1020	680	1050	696	1070	712	1090	728	1120	745
			4	14.3	2180	944	628	963	641	983	654	1000	667	1020	680	1040	693	1060	706
			BFL	19.0	1650	912	607	927	617	942	627	957	636	971	646	986	656	1000	666
			6	56.9	1290	885	589	897	596	908	604	920	612	931	620	943	627	955	635
			7	111	940	842	560	851	566	859	572	868	577	876	583	884	588	893	594
IPEO 450	506	337	TFL	0.00	3240	810	539	839	558	868	578	897	597	926	616	955	636	985	655
			2	4.40	2770	788	524	813	541	838	557	863	574	888	591	913	607	938	624
			3	8.80	2310	764	509	785	522	806	536	827	550	847	564	868	578	889	591
			4	13.2	1840	739	492	755	503	772	514	789	525	805	536	822	547	838	558
			BFL	17.6	1380	711	473	724	482	736	490	749	498	761	506	773	515	786	523
			6	47.2	1090	691	460	701	466	710	473	720	479	730	486	740	492	750	499
			7	94.3	809	660	439	667	444	674	449	682	454	689	458	696	463	704	468
IPEO 400	372	247	TFL	0.00	2650	601	400	625	416	649	432	673	448	697	463	720	479	744	495
			2	3.88	2260	583	388	603	401	624	415	644	429	665	442	685	456	705	469
			3	7.75	1870	564	375	580	386	597	397	614	409	631	420	648	431	665	442
			4	11.6	1490	543	361	556	370	569	379	583	388	596	397	610	406	623	415
			BFL	15.5	1100	521	346	530	353	540	359	550	366	560	373	570	379	580	386
			6	36.9	881	506	336	514	342	521	347	529	352	537	357	545	363	553	368
			7	77.8	663	485	322	490	326	496	330	502	334	508	338	514	342	520	346
IPEO 360	294	195	TFL	0.00	2310	483	321	504	335	525	349	546	363	566	377	587	391	608	405
			2	3.68	1970	467	311	485	322	502	334	520	346	538	358	555	369	573	381
			3	7.35	1620	449	299	464	309	479	318	493	328	508	338	522	348	537	357
			4	11.0	1270	431	287	442	294	454	302	465	310	477	317	488	325	500	332
			BFL	14.7	923	411	274	420	279	428	285	436	290	445	296	453	301	461	307
			6	33.6	751	400	266	407	271	413	275	420	280	427	284	434	288	440	293
			7	67.7	578	384	256	389	259	395	263	400	266	405	269	410	273	415	276
IPEO 330	233	155	TFL	0.00	2000	390	259	408	271	426	283	444	295	462	307	480	319	498	331
			2	3.38	1700	376	250	391	260	407	271	422	281	437	291	452	301	468	311
			3	6.75	1400	361	240	374	249	386	257	399	265	411	274	424	282	436	290
			4	10.1	1090	345	230	355	236	365	243	375	249	385	256	395	263	404	269
			BFL	13.5	794	329	219	336	223	343	228	350	233	357	238	364	242	371	247
			6	30.0	647	319	212	325	216	331	220	337	224	342	228	348	232	354	236
			7	60.2	499	307	204	311	207	316	210	320	213	324	216	329	219	333	222

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

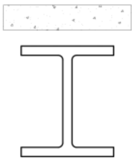
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	$\Sigma Q_n{}^d$	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 600	1110	736	TFL	0.00	5410	1730	1150	1780	1180	1830	1220	1880	1250	1920	1280	1970	1310	2020	1340
			2	6.00	4670	1690	1130	1740	1150	1780	1180	1820	1210	1860	1240	1900	1270	1950	1290
			3	12.0	3930	1650	1100	1690	1120	1730	1150	1760	1170	1800	1200	1830	1220	1870	1240
			4	18.0	3190	1610	1070	1640	1090	1670	1110	1700	1130	1730	1150	1760	1170	1780	1190
			BFL	24.0	2460	1560	1040	1590	1060	1610	1070	1630	1080	1650	1100	1670	1110	1700	1130
			6	74.2	1900	1520	1010	1530	1020	1550	1030	1570	1040	1590	1050	1600	1070	1620	1080
			7	141	1350	1440	957	1450	965	1460	973	1470	981	1490	989	1500	998	1510	1010
IPEO 550	808	537	TFL	0.00	4290	1270	843	1310	869	1340	895	1380	920	1420	946	1460	972	1500	997
			2	5.05	3700	1240	825	1270	847	1310	869	1340	891	1370	913	1410	936	1440	958
			3	10.1	3120	1210	804	1240	823	1260	842	1290	860	1320	879	1350	898	1380	916
			4	15.1	2530	1180	782	1200	797	1220	812	1240	828	1270	843	1290	858	1310	873
			BFL	20.2	1940	1140	758	1160	770	1170	782	1190	793	1210	805	1230	816	1240	828
			6	62.5	1510	1110	735	1120	744	1130	754	1150	763	1160	772	1170	781	1190	790
			7	124	1070	1050	698	1060	705	1070	711	1080	718	1090	724	1100	730	1110	737
IPEO 500	647	430	TFL	0.00	3760	1030	682	1060	705	1090	727	1130	750	1160	772	1190	795	1230	817
			2	4.75	3230	1000	666	1030	685	1060	704	1090	724	1120	743	1150	762	1170	782
			3	9.50	2700	973	647	997	664	1020	680	1050	696	1070	712	1090	728	1120	745
			4	14.3	2180	944	628	963	641	983	654	1000	667	1020	680	1040	693	1060	706
			BFL	19.0	1650	912	607	927	617	942	627	957	636	971	646	986	656	1000	666
			6	56.9	1290	885	589	897	596	908	604	920	612	931	620	943	627	955	635
			7	111	940	842	560	851	566	859	572	868	577	876	583	884	588	893	594
IPEO 450	506	337	TFL	0.00	3240	1010	674	1040	694	1070	713	1100	733	1130	752	1160	771	1190	791
			2	4.40	2770	963	640	988	657	1010	674	1040	690	1060	707	1090	723	1110	740
			3	8.80	2310	910	605	930	619	951	633	972	647	993	661	1010	674	1030	688
			4	13.2	1840	855	569	872	580	888	591	905	602	921	613	938	624	954	635
			BFL	17.6	1380	798	531	811	539	823	548	836	556	848	564	860	572	873	581
			6	47.2	1090	760	505	770	512	779	519	789	525	799	532	809	538	819	545
			7	94.3	809	711	473	718	478	725	483	733	487	740	492	747	497	755	502
IPEO 400	372	247	TFL	0.00	2650	768	511	792	527	816	543	840	559	864	575	887	590	911	606
			2	3.88	2260	726	483	746	496	766	510	787	523	807	537	827	551	848	564
			3	7.75	1870	682	454	699	465	715	476	732	487	749	498	766	510	783	521
			4	11.6	1490	636	423	650	432	663	441	677	450	690	459	703	468	717	477
			BFL	15.5	1100	590	392	600	399	610	406	619	412	629	419	639	425	649	432
			6	36.9	881	561	373	569	379	577	384	585	389	593	394	601	400	609	405
			7	77.8	663	526	350	532	354	538	358	544	362	550	366	556	370	562	374
IPEO 360	294	195	TFL	0.00	2310	629	418	650	432	670	446	691	460	712	474	733	488	754	502
			2	3.68	1970	591	393	608	405	626	417	644	428	661	440	679	452	697	464
			3	7.35	1620	551	367	566	377	581	386	595	396	610	406	624	415	639	425
			4	11.0	1270	511	340	522	348	534	355	545	363	557	370	568	378	580	386
			BFL	14.7	923	469	312	478	318	486	323	494	329	503	334	511	340	519	345
			6	33.6	751	447	297	454	302	461	306	467	311	474	315	481	320	488	324
			7	67.7	578	421	280	426	283	431	287	436	290	441	294	447	297	452	301
IPEO 330	233	155	TFL	0.00	2000	516	343	534	355	552	367	570	379	588	391	606	403	624	415
			2	3.38	1700	483	321	498	331	513	342	529	352	544	362	559	372	575	382
			3	6.75	1400	449	299	462	307	474	315	487	324	499	332	512	341	524	349
			4	10.1	1090	414	276	424	282	434	289	444	295	454	302	464	308	473	315
			BFL	13.5	794	379	252	386	257	393	261	400	266	407	271	414	276	422	280
			6	30.0	647	360	239	366	243	371	247	377	251	383	255	389	259	395	263
			7	60.2	499	338	225	342	228	347	231	351	234	356	237	360	240	365	243

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

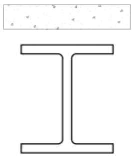
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 300	184	122	TFL	0.00	1730	314	209	330	219	345	230	361	240	376	250	392	261	407	271
			2	3.18	1460	302	201	315	210	328	218	341	227	354	236	368	245	381	253
			3	6.35	1200	289	192	299	199	310	206	321	214	332	221	343	228	353	235
			4	9.52	932	275	183	283	188	292	194	300	200	308	205	317	211	325	216
			BFL	12.7	666	260	173	266	177	272	181	278	185	284	189	290	193	296	197
			6	27.4	549	253	168	258	172	263	175	268	178	273	181	278	185	283	188
			7	53.8	432	243	162	247	164	251	167	255	170	259	172	263	175	267	177
IPEO 160	142	94.6	TFL	0.00	1480	249	166	263	175	276	184	289	192	302	201	316	210	329	219
			2	3.05	1250	239	159	250	166	261	174	272	181	284	189	295	196	306	204
			3	6.10	1020	227	151	237	157	246	164	255	170	264	176	273	182	283	188
			4	9.15	796	216	143	223	148	230	153	237	158	244	162	251	167	259	172
			BFL	12.2	568	203	135	208	139	213	142	218	145	224	149	229	152	234	156
			6	25.1	469	197	131	201	134	205	137	210	139	214	142	218	145	222	148
			7	47.3	370	189	126	193	128	196	130	199	133	203	135	206	137	209	139
IPEO 140	102	67.6	TFL	0.00	1200	185	123	196	130	207	137	217	145	228	152	239	159	250	166
			2	2.70	1020	177	118	186	124	195	130	204	136	213	142	223	148	232	154
			3	5.40	840	168	112	175	117	183	122	190	127	198	132	206	137	213	142
			4	8.10	659	159	105	164	109	170	113	176	117	182	121	188	125	194	129
			BFL	10.8	477	149	99.0	153	102	157	105	162	108	166	110	170	113	175	116
			6	22.8	389	144	95.5	147	97.8	151	100	154	102	158	105	161	107	165	109
			7	42.9	301	137	91.2	140	93.0	142	94.8	145	96.6	148	98.4	151	100	153	102
IPEO 120	79.5	52.9	TFL	0.00	1030	149	99.1	158	105	167	111	177	118	186	124	195	130	205	136
			2	2.55	871	142	94.3	150	99.5	157	105	165	110	173	115	181	120	189	126
			3	5.10	714	134	89.2	141	93.5	147	97.8	153	102	160	106	166	111	173	115
			4	7.65	557	126	83.9	131	87.3	136	90.6	141	93.9	146	97.3	151	101	156	104
			BFL	10.2	400	118	78.4	121	80.8	125	83.2	129	85.6	132	88.0	136	90.4	139	92.8
			6	21.3	328	114	75.6	117	77.6	120	79.5	122	81.5	125	83.5	128	85.4	131	87.4
			7	40.2	257	108	72.1	111	73.7	113	75.2	115	76.8	118	78.3	120	79.8	122	81.4
IPEO 100	61.7	41.1	TFL	0.00	879	119	79.5	127	84.7	135	90.0	143	95.3	151	101	159	106	167	111
			2	2.38	746	113	75.4	120	79.9	127	84.3	133	88.8	140	93.2	147	97.7	154	102
			3	4.75	612	107	71.1	112	74.8	118	78.4	123	82.1	129	85.8	134	89.4	140	93.1
			4	7.13	479	100	66.6	104	69.5	109	72.4	113	75.3	117	78.1	122	81.0	126	83.9
			BFL	9.50	346	93.2	62.0	96.3	64.1	99.4	66.1	103	68.2	106	70.3	109	72.4	112	74.4
			6	19.6	283	89.5	59.6	92.1	61.3	94.6	62.9	97.2	64.6	99.7	66.3	102	68.0	105	69.7
			7	36.6	220	85.1	56.6	87.1	57.9	89.1	59.3	91.0	60.6	93.0	61.9	95.0	63.2	97.0	64.5
IPEO 80	46.8	31.1	TFL	0.00	745	94.6	62.9	101	67.4	108	71.8	115	76.3	121	80.8	128	85.2	135	89.7
			2	2.25	631	89.3	59.4	95.0	63.2	101	67.0	106	70.8	112	74.6	118	78.3	123	82.1
			3	4.50	518	83.9	55.8	88.5	58.9	93.2	62.0	97.8	65.1	102	68.2	107	71.3	112	74.4
			4	6.75	404	78.2	52.0	81.8	54.4	85.4	56.8	89.1	59.3	92.7	61.7	96.3	64.1	100	66.5
			BFL	9.00	290	72.2	48.1	74.8	49.8	77.5	51.5	80.1	53.3	82.7	55.0	85.3	56.7	87.9	58.5
			6	18.9	238	69.3	46.1	71.4	47.5	73.5	48.9	75.7	50.4	77.8	51.8	80.0	53.2	82.1	54.6
			7	34.5	186	65.7	43.7	67.4	44.8	69.0	45.9	70.7	47.1	72.4	48.2	74.1	49.3	75.8	50.4

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

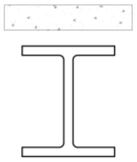
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 275 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 300	184	122	TFL	0.00	1730	423	281	439	292	454	302	470	312	485	323	501	333	516	343
			2	3.18	1460	394	262	407	271	420	280	433	288	447	297	460	306	473	315
			3	6.35	1200	364	242	375	249	386	257	396	264	407	271	418	278	429	285
			4	9.52	932	334	222	342	228	350	233	359	239	367	244	375	250	384	255
			BFL	12.7	666	302	201	308	205	314	209	320	213	326	217	332	221	338	225
			6	27.4	549	287	191	292	195	297	198	302	201	307	204	312	208	317	211
			7	53.8	432	271	180	274	183	278	185	282	188	286	190	290	193	294	196
IPEO 160	26.2	17.4	TFL	0.00	1480	342	228	356	237	369	246	382	254	396	263	409	272	422	281
			2	3.05	1250	318	211	329	219	340	226	351	234	363	241	374	249	385	256
			3	6.10	1020	292	194	301	200	310	207	320	213	329	219	338	225	347	231
			4	9.15	796	266	177	273	182	280	186	287	191	294	196	302	201	309	205
			BFL	12.2	568	239	159	244	162	249	166	254	169	259	173	264	176	270	179
			6	25.1	469	227	151	231	154	235	156	239	159	243	162	248	165	252	168
			7	47.3	370	213	142	216	144	219	146	223	148	226	150	229	153	233	155
IPEO 140	18.7	12.4	TFL	0.00	1200	261	173	272	181	282	188	293	195	304	202	315	209	326	217
			2	2.70	1020	241	160	250	166	259	173	268	179	278	185	287	191	296	197
			3	5.40	840	221	147	228	152	236	157	243	162	251	167	258	172	266	177
			4	8.10	659	200	133	206	137	212	141	218	145	224	149	230	153	236	157
			BFL	10.8	477	179	119	183	122	188	125	192	128	196	130	200	133	205	136
			6	22.8	389	168	112	172	114	175	116	179	119	182	121	186	123	189	126
			7	42.9	301	156	104	159	106	161	107	164	109	167	111	169	113	172	115
IPEO 120	12.8	8.55	TFL	0.00	1030	214	142	223	148	232	155	242	161	251	167	260	173	269	179
			2	2.55	871	197	131	204	136	212	141	220	146	228	152	236	157	244	162
			3	5.10	714	179	119	186	123	192	128	198	132	205	136	211	141	218	145
			4	7.65	557	161	107	166	111	171	114	176	117	181	121	186	124	191	127
			BFL	10.2	400	143	95.2	147	97.6	150	99.9	154	102	157	105	161	107	165	110
			6	21.3	328	134	89.4	137	91.3	140	93.3	143	95.3	146	97.2	149	99.2	152	101
			7	40.2	257	125	82.9	127	84.5	129	86.0	132	87.5	134	89.1	136	90.6	139	92.2
IPEO 100	8.34	5.55	TFL	0.00	879	175	116	183	122	191	127	199	132	206	137	214	143	222	148
			2	2.38	746	160	107	167	111	174	116	180	120	187	125	194	129	201	133
			3	4.75	612	145	96.8	151	100	156	104	162	108	168	111	173	115	179	119
			4	7.13	479	130	86.7	135	89.6	139	92.5	143	95.3	148	98.2	152	101	156	104
			BFL	9.50	346	115	76.5	118	78.6	121	80.6	124	82.7	127	84.8	131	86.9	134	88.9
			6	19.6	283	107	71.4	110	73.1	112	74.8	115	76.5	118	78.2	120	79.9	123	81.6
			7	36.6	220	99.0	65.8	101	67.2	103	68.5	105	69.8	107	71.1	109	72.4	111	73.7
IPEO 80	4.91	3.27	TFL	0.00	745	142	94.2	148	98.6	155	103	162	108	168	112	175	116	182	121
			2	2.25	631	129	85.9	135	89.7	140	93.5	146	97.2	152	101	158	105	163	109
			3	4.50	518	116	77.5	121	80.6	126	83.7	130	86.8	135	89.9	140	93.0	144	96.1
			4	6.75	404	104	68.9	107	71.3	111	73.8	114	76.2	118	78.6	122	81.0	125	83.4
			BFL	9.00	290	90.5	60.2	93.1	61.9	95.7	63.7	98.3	65.4	101	67.2	104	68.9	106	70.6
			6	18.9	238	84.3	56.1	86.4	57.5	88.5	58.9	90.7	60.3	92.8	61.8	95.0	63.2	97.1	64.6
			7	34.5	186	77.4	51.5	79.1	52.6	80.8	53.7	82.5	54.9	84.1	56.0	85.8	57.1	87.5	58.2

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

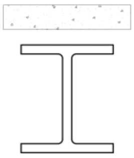
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 600	1430	950	TFL	0.00	6990	2230	1490	2300	1530	2360	1570	2420	1610	2480	1650	2550	1690	2610	1740
			2	6.00	6030	2190	1450	2240	1490	2300	1530	2350	1560	2400	1600	2460	1640	2510	1670
			3	12.0	5080	2140	1420	2180	1450	2230	1480	2270	1510	2320	1540	2360	1570	2410	1600
			4	18.0	4120	2080	1380	2120	1410	2150	1430	2190	1460	2230	1480	2270	1510	2300	1530
			BFL	24.0	3170	2020	1340	2050	1360	2080	1380	2100	1400	2130	1420	2160	1440	2190	1460
			6	74.2	2460	1960	1300	1980	1320	2000	1330	2020	1350	2050	1360	2070	1380	2090	1390
			7	141	1750	1860	1240	1870	1250	1890	1260	1900	1270	1920	1280	1940	1290	1950	1300
IPEO 550	1040	694	TFL	0.00	5540	1640	1090	1690	1120	1740	1150	1790	1190	1840	1220	1890	1250	1940	1290
			2	5.05	4780	1600	1060	1640	1090	1690	1120	1730	1150	1770	1180	1820	1210	1860	1240
			3	10.1	4020	1560	1040	1600	1060	1630	1090	1670	1110	1710	1130	1740	1160	1780	1180
			4	15.1	3260	1520	1010	1550	1030	1580	1050	1610	1070	1640	1090	1660	1110	1690	1130
			BFL	20.2	2500	1470	979	1490	994	1520	1010	1540	1020	1560	1040	1580	1050	1610	1070
			6	62.5	1940	1430	949	1440	961	1460	973	1480	984	1500	996	1510	1010	1530	1020
			7	124	1390	1350	902	1370	910	1380	918	1390	926	1400	935	1420	943	1430	951
IPEO 500	835	555	TFL	0.00	4850	1320	880	1370	910	1410	939	1450	968	1500	997	1540	1030	1590	1050
			2	4.75	4170	1290	859	1330	884	1370	909	1400	934	1440	959	1480	984	1520	1010
			3	9.50	3490	1260	836	1290	857	1320	878	1350	899	1380	919	1410	940	1440	961
			4	14.3	2810	1220	811	1240	827	1270	844	1290	861	1320	878	1340	895	1370	912
			BFL	19.0	2130	1180	783	1200	796	1220	809	1230	822	1250	834	1270	847	1290	860
			6	56.9	1670	1140	760	1160	770	1170	780	1190	790	1200	800	1220	810	1230	820
			7	111	1210	1090	723	1100	731	1110	738	1120	745	1130	752	1140	760	1150	767
IPEO 450	654	435	TFL	0.00	4180	1050	696	1080	721	1120	746	1160	771	1200	796	1230	821	1270	846
			2	4.40	3580	1020	677	1050	698	1080	720	1110	741	1150	763	1180	784	1210	805
			3	8.80	2980	987	656	1010	674	1040	692	1070	710	1090	728	1120	746	1150	764
			4	13.2	2380	954	635	975	649	997	663	1020	677	1040	692	1060	706	1080	720
			BFL	17.6	1780	918	611	934	622	950	632	966	643	983	654	999	664	1010	675
			6	47.2	1410	892	593	904	602	917	610	930	619	943	627	955	636	968	644
			7	94.3	1040	852	567	861	573	871	579	880	586	889	592	899	598	908	604
IPEO 400	480	319	TFL	0.00	3420	776	516	807	537	838	557	868	578	899	598	930	619	961	639
			2	3.88	2920	753	501	779	518	805	536	832	553	858	571	884	588	910	606
			3	7.75	2420	728	484	749	499	771	513	793	528	815	542	836	557	858	571
			4	11.6	1920	701	466	718	478	735	489	752	501	770	512	787	524	804	535
			BFL	15.5	1420	672	447	685	456	698	464	710	473	723	481	736	490	749	498
			6	36.9	1140	653	434	663	441	673	448	683	455	694	461	704	468	714	475
			7	77.8	855	625	416	633	421	641	426	649	432	656	437	664	442	672	447
IPEO 360	379	252	TFL	0.00	2990	624	415	650	433	677	451	704	469	731	486	758	504	785	522
			2	3.68	2540	603	401	626	416	648	431	671	447	694	462	717	477	740	492
			3	7.35	2090	580	386	599	399	618	411	637	424	655	436	674	449	693	461
			4	11.0	1640	556	370	571	380	586	390	601	400	615	409	630	419	645	429
			BFL	14.7	1190	531	353	542	360	552	368	563	375	574	382	585	389	595	396
			6	33.6	969	516	343	525	349	534	355	542	361	551	367	560	372	568	378
			7	67.7	747	496	330	503	334	509	339	516	343	523	348	530	352	536	357
IPEO 330	301	200	TFL	0.00	2580	503	335	527	350	550	366	573	381	596	397	619	412	643	428
			2	3.38	2190	485	323	505	336	525	349	545	362	564	375	584	389	604	402
			3	6.75	1800	466	310	482	321	499	332	515	343	531	353	547	364	563	375
			4	10.1	1410	446	297	458	305	471	314	484	322	497	330	509	339	522	347
			BFL	13.5	1030	424	282	433	288	443	294	452	301	461	307	470	313	480	319
			6	30.0	835	412	274	419	279	427	284	434	289	442	294	449	299	457	304
			7	60.2	645	396	263	401	267	407	271	413	275	419	279	425	283	430	286

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

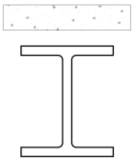
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 600	1430	950	TFL	0.00	6990	2670	1780	2740	1820	2800	1860	2860	1900	2920	1950	2990	1990	3050	2030
			2	6.00	6030	2570	1710	2620	1740	2680	1780	2730	1820	2780	1850	2840	1890	2890	1920
			3	12.0	5080	2460	1630	2500	1660	2550	1690	2590	1730	2640	1760	2680	1790	2730	1820
			4	18.0	4120	2340	1560	2380	1580	2410	1610	2450	1630	2490	1660	2530	1680	2560	1700
			BFL	24.0	3170	2220	1480	2250	1500	2280	1510	2300	1530	2330	1550	2360	1570	2390	1590
			6	74.2	2460	2110	1410	2130	1420	2160	1440	2180	1450	2200	1460	2220	1480	2250	1490
			7	141	1750	1970	1310	1980	1320	2000	1330	2010	1340	2030	1350	2050	1360	2060	1370
IPEO 550	1040	694	TFL	0.00	5540	1980	1320	2030	1350	2080	1390	2130	1420	2180	1450	2230	1490	2280	1520
			2	5.05	4780	1900	1260	1940	1290	1990	1320	2030	1350	2070	1380	2120	1410	2160	1440
			3	10.1	4020	1810	1210	1850	1230	1890	1260	1920	1280	1960	1300	1990	1330	2030	1350
			4	15.1	3260	1720	1150	1750	1170	1780	1190	1810	1210	1840	1220	1870	1240	1900	1260
			BFL	20.2	2500	1630	1080	1650	1100	1670	1110	1700	1130	1720	1140	1740	1160	1760	1170
			6	62.5	1940	1550	1030	1570	1040	1580	1050	1600	1070	1620	1080	1640	1090	1650	1100
			7	124	1390	1440	960	1450	968	1470	976	1480	984	1490	993	1500	1000	1520	1010
IPEO 500	835	555	TFL	0.00	4850	1630	1080	1670	1110	1720	1140	1760	1170	1800	1200	1850	1230	1890	1260
			2	4.75	4170	1550	1030	1590	1060	1630	1080	1670	1110	1700	1130	1740	1160	1780	1180
			3	9.50	3490	1480	982	1510	1000	1540	1020	1570	1040	1600	1070	1630	1090	1660	1110
			4	14.3	2810	1400	928	1420	945	1450	962	1470	979	1500	996	1520	1010	1550	1030
			BFL	19.0	2130	1310	873	1330	885	1350	898	1370	911	1390	924	1410	936	1430	949
			6	56.9	1670	1250	830	1260	840	1280	850	1290	860	1310	870	1320	880	1340	890
			7	111	1210	1160	774	1170	781	1190	789	1200	796	1210	803	1220	811	1230	818
IPEO 450	654	435	TFL	0.00	4180	1310	871	1350	896	1380	921	1420	946	1460	971	1500	996	1530	1020
			2	4.40	3580	1240	827	1270	848	1310	870	1340	891	1370	913	1400	934	1440	955
			3	8.80	2980	1170	781	1200	799	1230	817	1250	835	1280	853	1310	871	1340	888
			4	13.2	2380	1100	734	1130	749	1150	763	1170	777	1190	791	1210	806	1230	820
			BFL	17.6	1780	1030	686	1050	696	1060	707	1080	718	1090	728	1110	739	1130	750
			6	47.2	1410	981	652	993	661	1010	669	1020	678	1030	686	1040	695	1060	703
			7	94.3	1040	918	611	927	617	936	623	946	629	955	636	965	642	974	648
IPEO 400	480	319	TFL	0.00	3420	992	660	1020	680	1050	701	1080	721	1110	742	1150	762	1180	783
			2	3.88	2920	937	623	963	641	989	658	1020	676	1040	693	1070	711	1090	728
			3	7.75	2420	880	585	902	600	924	614	945	629	967	643	989	658	1010	672
			4	11.6	1920	822	547	839	558	856	570	873	581	891	593	908	604	925	616
			BFL	15.5	1420	761	507	774	515	787	524	800	532	812	541	825	549	838	558
			6	36.9	1140	724	482	735	489	745	496	755	502	765	509	775	516	786	523
			7	77.8	855	679	452	687	457	695	462	702	467	710	472	718	478	726	483
IPEO 360	379	252	TFL	0.00	2990	812	540	839	558	866	576	892	594	919	612	946	630	973	647
			2	3.68	2540	763	507	785	523	808	538	831	553	854	568	877	583	900	599
			3	7.35	2090	712	474	731	486	749	499	768	511	787	524	806	536	825	549
			4	11.0	1640	660	439	674	449	689	459	704	468	719	478	733	488	748	498
			BFL	14.7	1190	606	403	617	410	627	417	638	425	649	432	660	439	670	446
			6	33.6	969	577	384	586	390	595	396	603	401	612	407	621	413	630	419
			7	67.7	747	543	361	550	366	556	370	563	375	570	379	577	384	583	388
IPEO 330	301	200	TFL	0.00	2580	666	443	689	458	712	474	736	489	759	505	782	520	805	536
			2	3.38	2190	623	415	643	428	663	441	683	454	702	467	722	480	742	493
			3	6.75	1800	580	386	596	396	612	407	628	418	645	429	661	440	677	450
			4	10.1	1410	535	356	548	364	560	373	573	381	586	390	598	398	611	407
			BFL	13.5	1030	489	325	498	331	507	337	516	344	526	350	535	356	544	362
			6	30.0	835	464	309	472	314	480	319	487	324	495	329	502	334	510	339
			7	60.2	645	436	290	442	294	448	298	454	302	459	306	465	310	471	313

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

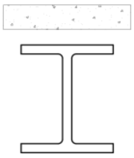
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\phi_b M_p$	M_p/Ω_b	PNA	$Y1^a$	ΣQ_n^d	$Y2^b$, mm													
	kN·m					50		60		70		80		90		100		110	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 300	238	158	TFL	0.00	2230	405	270	426	283	446	297	466	310	486	323	506	337	526	350
			2	3.18	1890	390	259	407	271	424	282	441	293	458	304	475	316	492	327
			3	6.35	1550	373	248	387	257	401	266	414	276	428	285	442	294	456	303
			4	9.52	1200	355	236	366	243	376	250	387	258	398	265	409	272	420	279
			BFL	12.7	860	336	224	344	229	351	234	359	239	367	244	375	249	382	254
			6	27.4	709	326	217	333	221	339	226	346	230	352	234	358	238	365	243
			7	53.8	558	314	209	319	212	324	216	329	219	334	222	339	226	344	229
IPEO 160	184	122	TFL	0.00	1910	322	214	339	225	356	237	373	248	390	260	408	271	425	283
			2	3.05	1620	308	205	323	215	337	224	352	234	366	244	381	253	395	263
			3	6.10	1320	294	195	305	203	317	211	329	219	341	227	353	235	365	243
			4	9.15	1030	278	185	288	191	297	197	306	204	315	210	325	216	334	222
			BFL	12.2	733	262	174	269	179	275	183	282	188	289	192	295	196	302	201
			6	25.1	606	254	169	260	173	265	176	271	180	276	184	282	187	287	191
			7	47.3	478	244	163	249	166	253	168	257	171	262	174	266	177	270	180
IPEO 140	131	87.2	TFL	0.00	1550	239	159	253	168	267	177	281	187	295	196	309	205	323	215
			2	2.70	1320	228	152	240	160	252	167	264	175	275	183	287	191	299	199
			3	5.40	1080	217	144	226	151	236	157	246	164	256	170	265	177	275	183
			4	8.10	850	205	136	212	141	220	146	228	151	235	157	243	162	251	167
			BFL	10.8	616	192	128	198	132	203	135	209	139	214	143	220	146	225	150
			6	22.8	502	185	123	190	126	194	129	199	132	203	135	208	138	212	141
			7	42.9	388	177	118	180	120	184	122	187	125	191	127	194	129	198	132
IPEO 120	103	68.3	TFL	0.00	1330	192	128	204	136	216	144	228	152	240	160	252	168	264	176
			2	2.55	1120	183	122	193	128	203	135	213	142	223	149	234	155	244	162
			3	5.10	922	173	115	181	121	190	126	198	132	206	137	215	143	223	148
			4	7.65	719	163	108	169	113	176	117	182	121	189	126	195	130	202	134
			BFL	10.2	516	152	101	157	104	161	107	166	110	171	114	175	117	180	120
			6	21.3	424	147	97.6	150	100	154	103	158	105	162	108	166	110	170	113
			7	40.2	332	140	93.1	143	95.1	146	97.1	149	99.1	152	101	155	103	158	105
IPEO 100	79.7	53.0	TFL	0.00	1130	154	103	164	109	175	116	185	123	195	130	205	137	215	143
			2	2.38	963	146	97.3	155	103	164	109	172	115	181	120	190	126	198	132
			3	4.75	791	138	91.8	145	96.5	152	101	159	106	166	111	174	115	181	120
			4	7.13	619	129	86.0	135	89.7	140	93.4	146	97.2	152	101	157	105	163	108
			BFL	9.50	447	120	80.0	124	82.7	128	85.4	132	88.1	136	90.7	140	93.4	144	96.1
			6	19.6	365	116	76.9	119	79.1	122	81.3	125	83.4	129	85.6	132	87.8	135	90.0
			7	36.6	284	110	73.1	112	74.8	115	76.5	118	78.2	120	79.9	123	81.6	125	83.3
IPEO 80	60.4	40.2	TFL	0.00	962	122	81.2	131	87.0	139	92.7	148	98.5	157	104	165	110	174	116
			2	2.25	815	115	76.7	123	81.6	130	86.5	137	91.4	145	96.3	152	101	159	106
			3	4.50	668	108	72.0	114	76.0	120	80.0	126	84.0	132	88.0	138	92.0	144	96.0
			4	6.75	521	101	67.1	106	70.3	110	73.4	115	76.5	120	79.6	124	82.7	129	85.9
			BFL	9.00	374	93.2	62.0	96.6	64.3	100	66.5	103	68.8	107	71.0	110	73.2	113	75.5
			6	18.9	307	89.4	59.5	92.2	61.3	94.9	63.2	97.7	65.0	100	66.9	103	68.7	106	70.5
			7	34.5	241	84.8	56.4	87.0	57.9	89.1	59.3	91.3	60.7	93.5	62.2	95.6	63.6	97.8	65.1

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

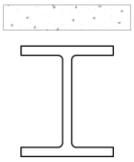
[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

Table F.1 Continued.



Composite IPEO Shapes
Available Strength in Flexure, kN·m

F_y = 355 MPa

Shape	$\Phi_b M_p$	M_p/Ω_b	PNA	$Y1$[a]	ΣQ_n[d]	$Y2$[b], mm													
	kN·m					120		130		140		150		160		170		180	
	LRFD	ASD		mm	kN	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPEO 300	238	158	TFL	0.00	2230	546	363	566	377	586	390	606	403	626	417	646	430	666	443
			2	3.18	1890	509	338	526	350	543	361	559	372	576	384	593	395	610	406
			3	6.35	1550	470	313	484	322	498	331	512	340	526	350	540	359	553	368
			4	9.52	1200	431	286	441	294	452	301	463	308	474	315	485	322	496	330
			BFL	12.7	860	390	260	398	265	406	270	413	275	421	280	429	285	437	290
			6	27.4	709	371	247	377	251	384	255	390	260	397	264	403	268	409	272
			7	53.8	558	349	232	354	236	359	239	364	242	369	246	374	249	379	252
IPEO 160	184	122	TFL	0.00	1910	442	294	459	306	476	317	494	328	511	340	528	351	545	363
			2	3.05	1620	410	273	424	282	439	292	454	302	468	311	483	321	497	331
			3	6.10	1320	377	251	389	259	401	267	413	274	424	282	436	290	448	298
			4	9.15	1030	343	228	352	234	362	241	371	247	380	253	389	259	399	265
			BFL	12.2	733	308	205	315	210	322	214	328	218	335	223	341	227	348	232
			6	25.1	606	292	195	298	198	303	202	309	205	314	209	320	213	325	216
			7	47.3	478	275	183	279	186	283	188	287	191	292	194	296	197	300	200
IPEO 140	131	87.2	TFL	0.00	1550	337	224	351	233	364	243	378	252	392	261	406	270	420	280
			2	2.70	1320	311	207	323	215	335	223	347	231	358	238	370	246	382	254
			3	5.40	1080	285	190	295	196	304	203	314	209	324	216	334	222	343	229
			4	8.10	850	258	172	266	177	274	182	281	187	289	192	296	197	304	202
			BFL	10.8	616	231	154	237	157	242	161	248	165	253	168	259	172	264	176
			6	22.8	502	217	144	221	147	226	150	230	153	235	156	240	159	244	162
			7	42.9	388	201	134	205	136	208	139	212	141	215	143	219	146	222	148
IPEO 120	103	68.3	TFL	0.00	1330	276	184	288	192	300	199	312	207	324	215	336	223	348	231
			2	2.55	1120	254	169	264	176	274	182	284	189	294	196	304	203	315	209
			3	5.10	922	231	154	240	159	248	165	256	170	264	176	273	181	281	187
			4	7.65	719	208	138	215	143	221	147	228	151	234	156	241	160	247	164
			BFL	10.2	516	185	123	189	126	194	129	199	132	203	135	208	138	213	141
			6	21.3	424	173	115	177	118	181	120	185	123	189	126	192	128	196	131
			7	40.2	332	161	107	164	109	167	111	170	113	173	115	176	117	179	119
IPEO 100	79.7	53.0	TFL	0.00	1130	226	150	236	157	246	164	256	171	267	177	277	184	287	191
			2	2.38	963	207	138	216	143	224	149	233	155	242	161	250	166	259	172
			3	4.75	791	188	125	195	130	202	134	209	139	216	144	223	149	230	153
			4	7.13	619	168	112	174	116	179	119	185	123	191	127	196	130	202	134
			BFL	9.50	447	148	98.8	152	101	156	104	160	107	165	109	169	112	173	115
			6	19.6	365	139	92.2	142	94.4	145	96.6	148	98.7	152	101	155	103	158	105
			7	36.6	284	128	85.0	130	86.7	133	88.4	135	90.1	138	91.8	141	93.5	143	95.2
IPEO 80	60.4	40.2	TFL	0.00	962	183	122	191	127	200	133	209	139	217	145	226	150	235	156
			2	2.25	815	167	111	174	116	181	121	189	126	196	130	203	135	211	140
			3	4.50	668	150	100	156	104	162	108	168	112	174	116	180	120	186	124
			4	6.75	521	134	89.0	138	92.1	143	95.2	148	98.3	152	101	157	105	162	108
			BFL	9.00	374	117	77.7	120	80.0	124	82.2	127	84.4	130	86.7	134	88.9	137	91.2
			6	18.9	307	109	72.4	112	74.2	114	76.1	117	77.9	120	79.7	123	81.6	125	83.4
			7	34.5	241	100	66.5	102	67.9	104	69.4	106	70.8	109	72.3	111	73.7	113	75.1

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

[a] Y_1 = distance from top of the steel beam to plastic neutral axis

[b] Y_2 = distance from top of the steel beam to concrete flange force

[c] See Figure F.1 for PNA locations.

[d] Ductility (slip capacity) of the shear connection at the beam/concrete interface may control minimum ΣQ_n requirements per the specification.

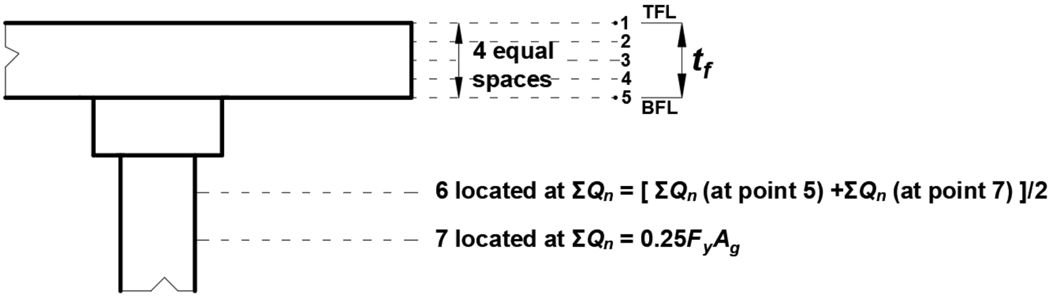


Figure F.1 PNA locations.

Table F.2 Lower-bound elastic moment of inertia for plastic composite sections.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, $\times 10^4$ mm^4
HD Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HD 400×1086	595700	TFL	0.00	32600	38100	49200	1370000	1420000	1470000	1520000	1570000	1620000	1670000
		2	31.3	25900	30300	39100	1280000	1320000	1370000	1410000	1460000	1500000	1550000
		3	62.5	19200	22500	29100	1170000	1210000	1240000	1280000	1320000	1360000	1400000
		4	93.8	12600	14700	19000	1030000	1050000	1080000	1110000	1140000	1170000	1200000
		BFL	125	5900	6900	8910	833000	848000	863000	878000	894000	910000	926000
HD 400×990	518900	TFL	0.00	29700	34700	44800	1190000	1230000	1270000	1310000	1360000	1410000	1450000
		2	28.8	23600	27600	35700	1110000	1150000	1180000	1220000	1260000	1310000	1350000
		3	57.5	17500	20500	26500	1010000	1050000	1080000	1110000	1140000	1180000	1210000
		4	86.3	11500	13500	17400	891000	915000	939000	963000	989000	1010000	1040000
		BFL	115	5440	6370	8220	726000	739000	752000	766000	780000	794000	809000
HD 400×900	450200	TFL	0.00	27000	31600	40800	1020000	1060000	1100000	1140000	1180000	1220000	1260000
		2	26.5	21500	25200	32500	957000	990000	1020000	1060000	1090000	1130000	1170000
		3	53.0	16000	18700	24200	876000	903000	931000	960000	990000	1020000	1050000
		4	79.5	10500	12300	15800	770000	791000	812000	834000	856000	880000	903000
		BFL	106	4980	5830	7520	628000	640000	652000	664000	676000	689000	703000
HD 400×818	392200	TFL	0.00	24500	28700	37000	884000	916000	950000	984000	1020000	1060000	1090000
		2	24.3	19500	22900	29500	828000	857000	887000	917000	949000	982000	1020000
		3	48.5	14500	17000	22000	758000	783000	808000	833000	860000	887000	915000
		4	72.8	9570	11200	14500	668000	686000	705000	725000	745000	765000	787000
		BFL	97.0	4590	5370	6930	547000	557000	568000	579000	590000	602000	614000
HD 400×744	342100	TFL	0.00	22300	26100	33700	766000	795000	824000	855000	887000	919000	953000
		2	22.2	17800	20800	26800	718000	744000	770000	797000	825000	854000	884000
		3	44.5	13300	15500	20000	658000	680000	702000	725000	749000	773000	798000
		4	66.7	8740	10200	13200	581000	597000	614000	631000	649000	668000	686000
		BFL	88.9	4230	4950	6390	477000	487000	496000	506000	516000	526000	537000
HD 400×677	299500	TFL	0.00	20300	23700	30700	666000	692000	718000	746000	774000	803000	833000
		2	20.4	16200	18900	24500	625000	648000	671000	696000	721000	746000	773000
		3	40.8	12100	14200	18300	573000	593000	612000	633000	654000	676000	698000
		4	61.1	7990	9350	12100	507000	521000	536000	552000	568000	584000	601000
		BFL	81.5	3900	4560	5880	418000	426000	434000	443000	452000	462000	471000
HD 400×634	274200	TFL	0.00	19000	22200	28700	607000	631000	655000	680000	706000	733000	761000
		2	19.3	15100	17700	22900	570000	590000	612000	634000	658000	681000	706000
		3	38.6	11300	13200	17100	523000	540000	558000	577000	597000	617000	637000
		4	57.8	7460	8740	11300	462000	475000	489000	503000	518000	533000	549000
		BFL	77.1	3620	4240	5470	381000	388000	396000	404000	413000	421000	430000
HD 400×592	250200	TFL	0.00	17700	20800	26800	551000	573000	596000	619000	643000	667000	693000
		2	18.1	14200	16600	21400	518000	537000	557000	577000	599000	621000	643000
		3	36.2	10600	12400	16000	475000	492000	508000	526000	544000	562000	581000
		4	54.2	7010	8200	10600	421000	433000	446000	459000	473000	487000	501000
		BFL	72.3	3430	4020	5190	348000	355000	362000	370000	378000	386000	394000
HD 400×551	226100	TFL	0.00	16500	19300	24900	496000	516000	536000	558000	580000	602000	626000
		2	16.9	13200	15400	19900	466000	484000	502000	521000	540000	560000	581000
		3	33.8	9840	11500	14900	428000	443000	458000	474000	490000	507000	525000
		4	50.7	6520	7630	9850	379000	390000	402000	414000	427000	439000	453000
		BFL	67.6	3200	3750	4840	314000	320000	327000	334000	341000	348000	356000
HD 400×509	204500	TFL	0.00	15300	17800	23000	446000	464000	483000	502000	522000	543000	564000
		2	15.7	12200	14300	18400	419000	435000	452000	469000	487000	505000	524000
		3	31.4	9120	10700	13800	386000	399000	413000	427000	442000	458000	474000
		4	47.0	6060	7090	9150	342000	352000	363000	374000	385000	397000	409000
		BFL	62.7	2990	3500	4520	284000	290000	296000	302000	309000	316000	323000

[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 F.1 for PNA locations

[d] Ix of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, ×10^4 mm^4
HD Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HD 400×1086	595700	TFL	0.00	32600	38100	49200	1730000	1790000	1840000	1900000	1960000	2030000	2090000
		2	31.3	25900	30300	39100	1600000	1650000	1700000	1750000	1810000	1860000	1920000
		3	62.5	19200	22500	29100	1440000	1480000	1520000	1570000	1610000	1660000	1710000
		4	93.8	12600	14700	19000	1230000	1260000	1290000	1320000	1360000	1390000	1430000
		BFL	125	5900	6900	8910	943000	961000	979000	997000	1020000	1030000	1050000
HD 400×990	518900	TFL	0.00	29700	34700	44800	1500000	1550000	1610000	1660000	1710000	1770000	1830000
		2	28.8	23600	27600	35700	1390000	1440000	1480000	1530000	1580000	1630000	1680000
		3	57.5	17500	20500	26500	1250000	1290000	1330000	1370000	1410000	1450000	1490000
		4	86.3	11500	13500	17400	1070000	1100000	1130000	1160000	1190000	1220000	1250000
		BFL	115	5440	6370	8220	824000	840000	856000	872000	889000	906000	924000
HD 400×900	450200	TFL	0.00	27000	31600	40800	1300000	1350000	1390000	1440000	1490000	1540000	1590000
		2	26.5	21500	25200	32500	1210000	1250000	1290000	1330000	1370000	1420000	1460000
		3	53.0	16000	18700	24200	1090000	1120000	1150000	1190000	1220000	1260000	1300000
		4	79.5	10500	12300	15800	928000	953000	979000	1010000	1030000	1060000	1090000
		BFL	106	4980	5830	7520	716000	730000	744000	759000	774000	790000	805000
HD 400×818	392200	TFL	0.00	24500	28700	37000	1130000	1170000	1210000	1260000	1300000	1340000	1390000
		2	24.3	19500	22900	29500	1050000	1080000	1120000	1160000	1200000	1240000	1280000
		3	48.5	14500	17000	22000	944000	974000	1000000	1040000	1070000	1100000	1130000
		4	72.8	9570	11200	14500	808000	831000	854000	877000	901000	926000	951000
		BFL	97.0	4590	5370	6930	626000	638000	651000	665000	678000	692000	706000
HD 400×744	342100	TFL	0.00	22300	26100	33700	988000	1020000	1060000	1100000	1140000	1170000	1210000
		2	22.2	17800	20800	26800	915000	946000	979000	1010000	1050000	1080000	1120000
		3	44.5	13300	15500	20000	824000	850000	877000	905000	934000	963000	993000
		4	66.7	8740	10200	13200	706000	726000	746000	767000	789000	811000	834000
		BFL	88.9	4230	4950	6390	548000	559000	571000	583000	595000	608000	621000
HD 400×677	299500	TFL	0.00	20300	23700	30700	864000	895000	928000	961000	995000	1030000	1070000
		2	20.4	16200	18900	24500	800000	828000	857000	887000	917000	948000	980000
		3	40.8	12100	14200	18300	721000	744000	769000	794000	819000	845000	872000
		4	61.1	7990	9350	12100	618000	636000	655000	674000	693000	713000	733000
		5	81.5	3900	4560	5880	481000	491000	502000	513000	524000	535000	547000
HD 400×634	274200	TFL	0.00	19000	22200	28700	789000	818000	848000	879000	911000	943000	977000
		2	19.3	15100	17700	22900	731000	757000	784000	811000	839000	868000	898000
		3	38.6	11300	13200	17100	659000	680000	703000	726000	749000	774000	799000
		4	57.8	7460	8740	11300	565000	581000	598000	616000	634000	652000	671000
		BFL	77.1	3620	4240	5470	439000	449000	458000	468000	478000	489000	499000
HD 400×592	250200	TFL	0.00	17700	20800	26800	719000	746000	774000	802000	832000	862000	892000
		2	18.1	14200	16600	21400	667000	691000	715000	741000	766000	793000	820000
		3	36.2	10600	12400	16000	601000	621000	642000	663000	685000	707000	730000
		4	54.2	7010	8200	10600	516000	531000	547000	563000	580000	597000	614000
		BFL	72.3	3430	4020	5190	402000	411000	420000	429000	439000	449000	459000
HD 400×551	226100	TFL	0.00	16500	19300	24900	650000	674000	700000	726000	753000	780000	808000
		2	16.9	13200	15400	19900	602000	624000	647000	670000	694000	718000	743000
		3	33.8	9840	11500	14900	543000	561000	580000	600000	620000	640000	662000
		4	50.7	6520	7630	9850	466000	480000	495000	509000	525000	540000	556000
		BFL	67.6	3200	3750	4840	364000	372000	380000	389000	397000	406000	416000
HD 400×509	204500	TFL	0.00	15300	17800	23000	586000	609000	632000	656000	681000	706000	732000
		2	15.7	12200	14300	18400	544000	564000	584000	606000	627000	650000	673000
		3	31.4	9120	10700	13800	490000	507000	525000	542000	561000	580000	599000
		4	47.0	6060	7090	9150	422000	434000	448000	461000	475000	489000	504000
		BFL	62.7	2990	3500	4520	330000	337000	345000	353000	361000	369000	377000

[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 F.1 for PNA locations

[d] Ix of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, ×10^4 mm^4
HD Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^{4}mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HD 400×463	180200	TFL	0.00	13900	16200	20900	391000	407000	424000	441000	459000	477000	496000
		2	14.4	11100	13000	16700	368000	382000	397000	412000	428000	444000	461000
		3	28.7	8300	9710	12500	338000	350000	363000	376000	389000	403000	417000
		4	43.1	5520	6460	8330	300000	309000	319000	329000	339000	349000	360000
		BFL	57.4	2740	3200	4140	250000	255000	261000	266000	272000	278000	285000
HD 400×421	159600	TFL	0.00	12600	14800	19100	345000	359000	374000	389000	405000	422000	439000
		2	13.2	10100	11800	15200	324000	337000	350000	364000	378000	393000	408000
		3	26.3	7570	8850	11400	298000	309000	320000	332000	344000	356000	369000
		4	39.5	5040	5900	7610	265000	273000	282000	291000	300000	309000	319000
		BFL	52.6	2510	2940	3790	221000	226000	231000	236000	241000	247000	252000
HD 400×382	141300	TFL	0.00	11400	13400	17300	303000	316000	330000	343000	358000	372000	388000
		2	12.0	9160	10700	13800	285000	297000	309000	321000	334000	347000	360000
		3	24.0	6870	8040	10400	263000	272000	282000	293000	303000	315000	326000
		4	36.0	4580	5360	6910	234000	241000	249000	257000	265000	273000	282000
		BFL	48.0	2290	2680	3460	195000	200000	204000	209000	213000	218000	223000
HD 400×347	124900	TFL	0.00	10400	12200	15700	267000	278000	290000	303000	315000	328000	342000
		2	10.9	8310	9730	12600	251000	261000	272000	283000	294000	306000	318000
		3	21.9	6240	7300	9420	231000	240000	249000	258000	268000	278000	288000
		4	32.8	4160	4870	6290	206000	213000	220000	227000	234000	241000	249000
		BFL	43.7	2090	2440	3160	172000	176000	180000	184000	189000	193000	198000
HD 400×314	110200	TFL	0.00	9380	11000	14200	234000	245000	255000	266000	277000	289000	301000
		2	9.90	7520	8790	11400	221000	230000	239000	249000	259000	269000	280000
		3	19.8	5650	6610	8530	204000	211000	219000	227000	236000	245000	254000
		4	29.7	3780	4430	5720	182000	187000	194000	200000	206000	213000	220000
		BFL	39.6	1920	2240	2900	152000	156000	159000	163000	167000	171000	175000
HD 400×287	99710	TFL	0.00	8610	10100	13000	211000	220000	230000	240000	250000	261000	272000
		2	9.15	6890	8070	10400	199000	207000	215000	224000	233000	243000	253000
		3	18.3	5180	6060	7820	183000	190000	197000	205000	213000	221000	229000
		4	27.5	3460	4050	5230	164000	169000	174000	180000	186000	192000	198000
		BFL	36.6	1740	2040	2640	137000	140000	144000	147000	150000	154000	158000
HD 400×262	89410	TFL	0.00	7860	9200	11900	189000	197000	206000	215000	224000	234000	244000
		2	8.33	6310	7380	9530	178000	185000	193000	201000	209000	218000	227000
		3	16.7	4750	5560	7170	164000	170000	177000	184000	191000	198000	205000
		4	25.0	3190	3730	4820	147000	151000	156000	162000	167000	173000	178000
		BFL	33.3	1630	1910	2470	124000	126000	129000	132000	136000	139000	142000
HD 400×237	78780	TFL	0.00	7070	8270	10700	165000	173000	180000	188000	197000	205000	214000
		2	7.55	5670	6630	8560	156000	162000	169000	176000	184000	191000	199000
		3	15.1	4270	4990	6450	144000	150000	155000	161000	168000	174000	181000
		4	22.7	2870	3350	4330	129000	133000	137000	142000	147000	152000	157000
		BFL	30.2	1460	1710	2210	109000	111000	114000	116000	119000	122000	125000
HD 400×216	71140	TFL	0.00	6470	7580	9780	149000	156000	162000	170000	177000	185000	193000
		2	6.93	5190	6080	7840	140000	146000	152000	159000	166000	172000	180000
		3	13.9	3910	4570	5910	130000	135000	140000	145000	151000	157000	163000
		4	20.8	2630	3070	3970	116000	120000	124000	128000	132000	137000	142000
		BFL	27.7	1340	1570	2030	97900	100000	103000	105000	108000	110000	113000
HD 400×187	60180	TFL	0.00	5580	6530	8430	125000	131000	137000	143000	149000	156000	163000
		2	6.00	4480	5240	6770	118000	123000	128000	134000	140000	146000	152000
		3	12.0	3380	3950	5100	109000	114000	118000	123000	127000	132000	138000
		4	18.0	2280	2660	3440	97900	101000	105000	108000	112000	116000	120000
		BFL	24.0	1170	1370	1770	82800	84700	86800	88900	91200	93500	95800

[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 F.1 for PNA locations
[d] Ix of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4

HD Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×$10^4$$mm^4$		mm	kN	kN	kN	120	130	140	150	160	170	180
HD 400×463	180200	TFL	0.00	13900	16200	20900	516000	536000	557000	578000	600000	623000	646000
		2	14.4	11100	13000	16700	479000	496000	515000	534000	553000	573000	594000
		3	28.7	8300	9710	12500	432000	447000	462000	478000	495000	512000	529000
		4	43.1	5520	6460	8330	371000	383000	395000	407000	419000	432000	445000
		BFL	57.4	2740	3200	4140	291000	298000	305000	312000	319000	326000	334000
HD 400×421	159600	TFL	0.00	12600	14800	19100	456000	475000	493000	512000	532000	553000	573000
		2	13.2	10100	11800	15200	423000	440000	456000	473000	491000	509000	527000
		3	26.3	7570	8850	11400	382000	396000	410000	424000	439000	454000	470000
		4	39.5	5040	5900	7610	329000	339000	350000	361000	372000	384000	396000
		BFL	52.6	2510	2940	3790	258000	264000	270000	277000	283000	290000	297000
HD 400×382	141300	TFL	0.00	11400	13400	17300	403000	420000	436000	453000	471000	489000	508000
		2	12.0	9160	10700	13800	374000	389000	403000	419000	434000	451000	467000
		3	24.0	6870	8040	10400	338000	350000	362000	375000	389000	402000	416000
		4	36.0	4580	5360	6910	291000	300000	310000	320000	330000	340000	351000
		BFL	48.0	2290	2680	3460	229000	234000	240000	245000	251000	257000	263000
HD 400×347	124900	TFL	0.00	10400	12200	15700	356000	371000	386000	401000	417000	433000	450000
		2	10.9	8310	9730	12600	331000	343000	357000	370000	385000	399000	414000
		3	21.9	6240	7300	9420	298000	309000	321000	332000	344000	356000	369000
		4	32.8	4160	4870	6290	257000	266000	274000	283000	292000	301000	311000
		BFL	43.7	2090	2440	3160	202000	207000	212000	217000	223000	228000	234000
HD 400×314	110200	TFL	0.00	9380	11000	14200	314000	327000	340000	354000	368000	383000	398000
		2	9.90	7520	8790	11400	291000	303000	315000	327000	340000	353000	366000
		3	19.8	5650	6610	8530	263000	273000	283000	293000	304000	315000	326000
		4	29.7	3780	4430	5720	227000	235000	242000	250000	258000	267000	275000
		BFL	39.6	1920	2240	2900	179000	184000	188000	193000	198000	203000	208000
HD 400×287	99710	TFL	0.00	8610	10100	13000	283000	295000	307000	320000	332000	346000	359000
		2	9.15	6890	8070	10400	263000	273000	284000	295000	307000	318000	331000
		3	18.3	5180	6060	7820	237000	246000	255000	265000	275000	284000	295000
		4	27.5	3460	4050	5230	205000	212000	219000	226000	233000	241000	249000
		BFL	36.6	1740	2040	2640	162000	166000	170000	174000	178000	183000	187000
HD 400×262	89410	TFL	0.00	7860	9200	11900	254000	264000	275000	287000	298000	310000	323000
		2	8.33	6310	7380	9530	236000	245000	255000	265000	275000	286000	297000
		3	16.7	4750	5560	7170	213000	221000	230000	238000	247000	256000	265000
		4	25.0	3190	3730	4820	184000	190000	197000	203000	210000	217000	224000
		BFL	33.3	1630	1910	2470	146000	150000	153000	157000	161000	165000	170000
HD 400×237	78780	TFL	0.00	7070	8270	10700	223000	233000	243000	253000	263000	274000	285000
		2	7.55	5670	6630	8560	207000	216000	225000	234000	243000	252000	262000
		3	15.1	4270	4990	6450	188000	195000	202000	210000	218000	226000	234000
		4	22.7	2870	3350	4330	162000	168000	173000	179000	185000	191000	198000
		BFL	30.2	1460	1710	2210	128000	132000	135000	138000	142000	146000	149000
HD 400×216	71140	TFL	0.00	6470	7580	9780	201000	210000	219000	228000	237000	247000	257000
		2	6.93	5190	6080	7840	187000	195000	203000	211000	219000	228000	237000
		3	13.9	3910	4570	5910	169000	176000	182000	189000	196000	204000	211000
		4	20.8	2630	3070	3970	146000	151000	156000	162000	167000	173000	179000
		BFL	27.7	1340	1570	2030	116000	119000	122000	125000	128000	132000	135000
HD 400×187	60180	TFL	0.00	5580	6530	8430	170000	177000	185000	193000	201000	209000	218000
		2	6.00	4480	5240	6770	158000	164000	171000	178000	185000	193000	200000
		3	12.0	3380	3950	5100	143000	148000	154000	160000	166000	172000	179000
		4	18.0	2280	2660	3440	124000	128000	132000	137000	142000	146000	151000
		BFL	24.0	1170	1370	1770	98300	101000	103000	106000	109000	112000	115000

[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 F.1 for PNA locations

[d] *Ix* of noncomposite steel shape

Table F.2 Continued.

I_{LB} Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times 10^4$ mm^4
HD Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HD 360×196	63630	TFL	0.00	5880	6880	8890	133000	139000	146000	152000	159000	166000	173000
		2	6.55	4730	5540	7150	126000	131000	137000	143000	149000	155000	161000
		3	13.1	3580	4190	5410	116000	121000	126000	131000	136000	141000	147000
		4	19.7	2430	2840	3670	104000	108000	112000	115000	119000	123000	128000
		BFL	26.2	1280	1490	1930	88500	90600	92900	95200	97600	100000	103000
HD 360×179	57440	TFL	0.00	5370	6280	8100	120000	125000	131000	137000	143000	150000	156000
		2	5.98	4320	5050	6520	113000	118000	123000	128000	134000	140000	145000
		3	12.0	3270	3830	4940	105000	109000	113000	118000	122000	127000	132000
		4	17.9	2220	2600	3360	94100	97300	101000	104000	108000	111000	115000
		BFL	23.9	1180	1380	1780	79900	81900	83900	86000	88200	90500	92900
HD 360×162	51540	TFL	0.00	4850	5670	7320	107000	112000	117000	122000	128000	134000	139000
		2	5.45	3900	4560	5890	101000	105000	110000	115000	120000	125000	130000
		3	10.9	2950	3450	4450	93500	97200	101000	105000	109000	114000	118000
		4	16.4	2000	2340	3020	83900	86800	89800	92900	96100	99400	103000
		BFL	21.8	1050	1220	1580	71300	73000	74800	76700	78600	80700	82800
HD 360×147	46290	TFL	0.00	4420	5170	6670	96000	100000	105000	110000	115000	120000	125000
		2	4.95	3550	4160	5370	90600	94600	98700	103000	107000	112000	117000
		3	9.90	2690	3150	4070	84000	87300	90800	94400	98200	102000	106000
		4	14.9	1830	2150	2770	75500	78000	80700	83600	86500	89500	92600
		BFL	19.8	972	1140	1470	64200	65800	67500	69200	71000	72900	74800
HD 360×134	41510	TFL	0.00	4010	4690	6060	85900	89800	94000	98300	103000	107000	112000
		2	4.50	3230	3780	4880	81100	84600	88300	92200	96200	100000	105000
		3	9.00	2450	2860	3700	75100	78100	81300	84600	88000	91500	95200
		4	13.5	1670	1950	2520	67600	69900	72300	74900	77500	80200	83100
		BFL	18.0	887	1040	1340	57600	59000	60500	62100	63700	65400	67200
HD 320×300	86900	TFL	0.00	8980	10500	13600	195000	204000	214000	224000	234000	245000	256000
		2	12.0	7210	8440	10900	183000	191000	200000	209000	218000	228000	238000
		3	24.0	5450	6380	8230	168000	175000	183000	190000	198000	206000	215000
		4	36.0	3680	4310	5560	150000	155000	161000	166000	172000	179000	185000
		BFL	48.0	1920	2240	2900	125000	128000	131000	135000	139000	142000	146000
HD 320× 245	68130	TFL	0.00	7330	8580	11100	150000	158000	165000	173000	181000	190000	199000
		2	10.0	5880	6880	8880	141000	148000	155000	162000	169000	177000	185000
		3	20.0	4430	5180	6690	130000	136000	141000	147000	153000	160000	167000
		4	30.0	2980	3480	4490	116000	120000	124000	129000	134000	138000	144000
		BFL	40.0	1520	1780	2300	96400	98900	102000	104000	107000	110000	113000
HD 320×198	51900	TFL	0.00	5930	6940	8960	114000	120000	125000	132000	138000	145000	152000
		2	8.00	4780	5590	7220	107000	112000	118000	123000	129000	135000	141000
		3	16.0	3630	4250	5480	98900	103000	108000	112000	117000	122000	128000
		4	24.0	2480	2900	3740	88400	91700	95300	98900	103000	107000	111000
		BFL	32.0	1330	1550	2000	74500	76600	78800	81100	83400	85900	88500
HD 320×158	39640	TFL	0.00	4730	5530	7140	86100	90600	95200	100000	105000	110000	116000
		2	6.38	3820	4470	5770	81200	85200	89300	93600	98100	103000	108000
		3	12.8	2910	3410	4400	75100	78500	82000	85700	89500	93500	97600
		4	19.1	2000	2350	3030	67300	70000	72700	75600	78600	81700	84900
		BFL	25.5	1100	1280	1660	57200	58800	60600	62400	64300	66200	68300
HD 320×127	30820	TFL	0.00	3790	4440	5730	66400	69900	73500	77300	81200	85300	89600
		2	5.13	3070	3590	4630	62600	65700	69000	72400	75900	79600	83400
		3	10.3	2350	2740	3540	58000	60700	63400	66300	69400	72500	75800
		4	15.4	1620	1900	2450	52100	54200	56400	58700	61000	63500	66100
		BFL	20.5	900	1050	1360	44500	45800	47200	48600	50200	51700	53400

[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 F.1 for PNA locations

[d] Ix of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, ×10^4 mm^4
HD Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HD 360×196	63630	TFL	0.00	5880	6880	8890	181000	189000	197000	205000	213000	222000	231000
		2	6.55	4730	5540	7150	168000	175000	182000	190000	197000	205000	213000
		3	13.1	3580	4190	5410	152000	158000	164000	171000	177000	184000	190000
		4	19.7	2430	2840	3670	132000	137000	141000	146000	151000	156000	162000
		BFL	26.2	1280	1490	1930	105000	108000	111000	114000	117000	120000	123000
HD 360×179	57440	TFL	0.00	5370	6280	8100	163000	170000	177000	185000	193000	200000	209000
		2	5.98	4320	5050	6520	152000	158000	164000	171000	178000	185000	192000
		3	12.0	3270	3830	4940	137000	143000	148000	154000	160000	166000	172000
		4	17.9	2220	2600	3360	119000	123000	128000	132000	137000	141000	146000
		BFL	23.9	1180	1380	1780	95300	97900	101000	103000	106000	109000	112000
HD 360×162	51540	TFL	0.00	4850	5670	7320	146000	152000	158000	165000	172000	179000	187000
		2	5.45	3900	4560	5890	135000	141000	147000	153000	159000	165000	172000
		3	10.9	2950	3450	4450	123000	127000	132000	138000	143000	148000	154000
		4	16.4	2000	2340	3020	106000	110000	114000	118000	122000	126000	130000
		BFL	21.8	1050	1220	1580	85000	87200	89500	91900	94400	96900	99500
HD 360×147	46290	TFL	0.00	4420	5170	6670	131000	137000	142000	149000	155000	161000	168000
		2	4.95	3550	4160	5370	122000	127000	132000	138000	143000	149000	155000
		3	9.90	2690	3150	4070	110000	115000	119000	124000	129000	134000	139000
		4	14.9	1830	2150	2770	95900	99300	103000	106000	110000	114000	118000
		BFL	19.8	972	1140	1470	76800	78900	81000	83200	85500	87800	90200
HD 360×134	41510	TFL	0.00	4010	4690	6060	117000	122000	128000	133000	139000	145000	151000
		2	4.50	3230	3780	4880	109000	114000	118000	123000	128000	134000	139000
		3	9.00	2450	2860	3700	98900	103000	107000	111000	115000	120000	124000
		4	13.5	1670	1950	2520	86000	89100	92200	95400	98800	102000	106000
		BFL	18.0	887	1040	1340	69000	70800	72800	74800	76800	79000	81100
HD 320×300	86900	TFL	0.00	8980	10500	13600	268000	279000	292000	305000	318000	331000	345000
		2	12.0	7210	8440	10900	248000	258000	269000	281000	292000	304000	317000
		3	24.0	5450	6380	8230	223000	232000	242000	251000	261000	271000	282000
		4	36.0	3680	4310	5560	192000	199000	206000	214000	221000	229000	237000
		BFL	48.0	1920	2240	2900	150000	155000	159000	164000	168000	173000	178000
HD 320× 245	68130	TFL	0.00	7330	8580	11100	208000	218000	227000	237000	248000	259000	270000
		2	10.0	5880	6880	8880	193000	201000	210000	219000	228000	238000	248000
		3	20.0	4430	5180	6690	173000	181000	188000	196000	204000	212000	220000
		4	30.0	2980	3480	4490	149000	154000	160000	166000	172000	178000	185000
		BFL	40.0	1520	1780	2300	116000	120000	123000	126000	130000	134000	137000
HD 320×198	51900	TFL	0.00	5930	6940	8960	159000	167000	174000	182000	191000	199000	208000
		2	8.00	4780	5590	7220	148000	154000	161000	168000	176000	183000	191000
		3	16.0	3630	4250	5480	133000	139000	145000	151000	157000	164000	170000
		4	24.0	2480	2900	3740	115000	119000	124000	129000	134000	139000	144000
		BFL	32.0	1330	1550	2000	91100	93800	96700	99600	103000	106000	109000
HD 320×158	39640	TFL	0.00	4730	5530	7140	121000	127000	133000	139000	146000	153000	159000
		2	6.38	3820	4470	5770	113000	118000	123000	129000	135000	141000	147000
		3	12.8	2910	3410	4400	102000	106000	111000	116000	121000	126000	131000
		4	19.1	2000	2350	3030	88300	91800	95400	99100	103000	107000	111000
		BFL	25.5	1100	1280	1660	70400	72600	74900	77200	79700	82200	84700
HD 320×127	30820	TFL	0.00	3790	4440	5730	94000	98600	103000	108000	113000	119000	124000
		2	5.13	3070	3590	4630	87400	91500	95800	100000	105000	109000	114000
		3	10.3	2350	2740	3540	79200	82700	86300	90100	94000	98000	102000
		4	15.4	1620	1900	2450	68700	71500	74300	77300	80300	83500	86700
		BFL	20.5	900	1050	1360	55100	56800	58700	60600	62500	64500	66600

[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 F.1 for PNA locations

[d] Ix of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times 10^4$ mm^4
HD Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HD 320×97.6	22930	TFL	0.00	2920	3420	4420	49100	51700	54400	57300	60300	63400	66600
		2	3.88	2380	2780	3590	46400	48700	51200	53700	56400	59200	62100
		3	7.75	1830	2140	2770	43100	45100	47200	49400	51700	54100	56600
		4	11.6	1280	1500	1940	38900	40500	42200	43900	45700	47600	49600
		BFL	15.5	738	864	1110	33500	34500	35600	36800	38000	39200	40500
		6	15.9	734	859	1110	33400	34500	35600	36700	37900	39200	40500
		7	16.2	731	855	1100	33400	34400	35500	36700	37900	39100	40400
HD 320×74.2	16450	TFL	0.00	2220	2600	3360	35500	37400	39400	41600	43800	46100	48500
		2	2.75	1830	2150	2770	33600	35400	37200	39200	41200	43300	45500
		3	5.50	1450	1690	2190	31400	33000	34600	36300	38000	39900	41800
		4	8.25	1060	1240	1600	28700	30000	31300	32700	34100	35600	37200
		BFL	11.0	672	786	1010	25300	26200	27100	28100	29100	30200	31300
		6	17.3	614	718	927	24700	25500	26400	27300	28300	29300	30300
		7	23.6	556	650	839	24100	24800	25600	26500	27400	28300	29300
HD 260×172	31310	TFL	0.00	5160	6040	7800	73100	77500	82100	86900	91900	97200	103000
		2	8.13	4140	4840	6250	68500	72400	76500	80800	85300	90000	94800
		3	16.3	3110	3640	4700	62700	66000	69500	73100	76900	80900	85000
		4	24.4	2090	2450	3160	55400	57900	60600	63400	66300	69300	72500
		BFL	32.5	1070	1250	1610	45600	47100	48700	50400	52100	53900	55800
HD 260×142	24330	TFL	0.00	4240	4960	6400	56500	60000	63700	67600	71600	75800	80200
		2	6.63	3410	3990	5150	53100	56200	59500	62900	66500	70300	74200
		3	13.3	2590	3030	3910	48700	51400	54200	57100	60200	63400	66700
		4	19.9	1760	2060	2660	43200	45300	47500	49700	52100	54600	57200
		BFL	26.5	936	1100	1410	36000	37300	38600	40000	41400	43000	44600
HD 260×114	18910	TFL	0.00	3420	4010	5170	43600	46300	49200	52300	55500	58800	62300
		2	5.38	2760	3230	4170	40900	43400	46000	48700	51600	54500	57600
		3	10.8	2100	2460	3170	37700	39800	42000	44300	46700	49200	51900
		4	16.1	1440	1680	2170	33500	35100	36800	38600	40500	42500	44600
		BFL	21.5	776	909	1170	28000	29000	30100	31200	32400	33700	34900
HD 260×93.0	14920	TFL	0.00	2780	3260	4200	34100	36300	38600	41000	43600	46200	49000
		2	4.38	2250	2630	3400	32100	34000	36100	38300	40500	42900	45400
		3	8.75	1710	2000	2590	29500	31200	33000	34800	36800	38800	40900
		4	13.1	1180	1380	1780	26300	27600	29000	30500	32000	33600	35200
		BFL	17.5	644	753	973	22100	23000	23800	24700	25700	26700	27700
HD 260×68.2	10450	TFL	0.00	2040	2390	3080	23700	25300	27000	28700	30500	32400	34400
		2	3.13	1660	1940	2510	22400	23800	25300	26800	28400	30200	31900
		3	6.25	1280	1490	1930	20700	21900	23200	24500	25900	27400	28900
		4	9.38	895	1050	1350	18600	19500	20500	21600	22700	23800	25100
		BFL	12.5	513	600	775	15800	16400	17100	17800	18500	19300	20100
		6	12.7	511	598	773	15800	16400	17100	17800	18500	19300	20100
		7	12.8	510	597	771	15800	16400	17100	17700	18500	19200	20000
HD 260×54.1	7981	TFL	0.00	1620	1900	2450	18200	19400	20700	22100	23500	25000	26500
		2	2.38	1330	1560	2010	17200	18300	19400	20700	22000	23300	24700
		3	4.75	1040	1220	1570	16000	16900	17900	19000	20100	21300	22500
		4	7.13	750	878	1130	14400	15200	16000	16900	17800	18700	19700
		BFL	9.50	460	538	695	12500	13000	13600	14200	14800	15500	16200
		6	13.0	433	506	653	12300	12800	13300	13900	14500	15100	15800
		7	16.4	405	474	612	12100	12600	13100	13600	14200	14800	15400

[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 F.1 for PNA locations

[d] Ix of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times 10^4$ mm^4
HD Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HD 320×97.6	22930	TFL	0.00	2920	3420	4420	70000	73500	77100	80800	84600	88600	92700
		2	3.88	2380	2780	3590	65100	68200	71500	74800	78300	81900	85500
		3	7.75	1830	2140	2770	59200	61800	64600	67500	70500	73500	76700
		4	11.6	1280	1500	1940	51600	53800	56000	58300	60600	63000	65500
		BFL	15.5	738	864	1110	41900	43300	44700	46300	47800	49400	51100
		6	15.9	734	859	1110	41800	43200	44700	46200	47700	49300	51000
		7	16.2	731	855	1100	41700	43100	44600	46100	47600	49200	50900
HD 320×74.2	16450	TFL	0.00	2220	2600	3360	51100	53700	56400	59200	62000	65000	68100
		2	2.75	1830	2150	2770	47700	50100	52500	55100	57700	60400	63200
		3	5.50	1450	1690	2190	43700	45800	47900	50100	52400	54800	57200
		4	8.25	1060	1240	1600	38800	40500	42200	44000	45900	47800	49800
		BFL	11.0	672	786	1010	32500	33700	35000	36300	37600	39000	40400
		6	17.3	614	718	927	31400	32600	33700	34900	36200	37500	38800
		7	23.6	556	650	839	30300	31300	32400	33500	34700	35900	37100
HD 260×172	31310	TFL	0.00	5160	6040	7800	108000	114000	120000	127000	133000	140000	147000
		2	8.13	4140	4840	6250	99900	105000	111000	116000	122000	128000	135000
		3	16.3	3110	3640	4700	89300	93800	98400	103000	108000	113000	119000
		4	24.4	2090	2450	3160	75800	79200	82700	86400	90200	94100	98200
		BFL	32.5	1070	1250	1610	57700	59800	61900	64100	66300	68600	71000
HD 260×142	24330	TFL	0.00	4240	4960	6400	84800	89600	94500	99600	105000	110000	116000
		2	6.63	3410	3990	5150	78300	82500	86900	91500	96200	101000	106000
		3	13.3	2590	3030	3910	70200	73800	77500	81400	85400	89600	93900
		4	19.9	1760	2060	2660	59800	62600	65500	68600	71700	74900	78200
		BFL	26.5	936	1100	1410	46200	47900	49700	51600	53500	55500	57500
HD 260×114	18910	TFL	0.00	3420	4010	5170	65900	69700	73600	77700	81900	86200	90700
		2	5.38	2760	3230	4170	60900	64300	67800	71400	75100	79000	83100
		3	10.8	2100	2460	3170	54600	57500	60500	63600	66800	70100	73500
		4	16.1	1440	1680	2170	46700	48900	51300	53700	56200	58700	61400
		BFL	21.5	776	909	1170	36300	37700	39100	40600	42200	43800	45500
HD 260×93.0	14920	TFL	0.00	2780	3260	4200	51900	54900	58100	61300	64700	68200	71800
		2	4.38	2250	2630	3400	48000	50700	53500	56400	59400	62500	65800
		3	8.75	1710	2000	2590	43100	45400	47800	50300	52900	55500	58300
		4	13.1	1180	1380	1780	36900	38700	40600	42500	44500	46600	48800
		BFL	17.5	644	753	973	28800	30000	31100	32400	33600	34900	36300
HD 260×68.2	10450	TFL	0.00	2040	2390	3080	36500	38700	40900	43300	45700	48200	50800
		2	3.13	1660	1940	2510	33800	35800	37800	39900	42100	44300	46700
		3	6.25	1280	1490	1930	30500	32200	33900	35700	37600	39500	41500
		4	9.38	895	1050	1350	26300	27700	29000	30500	31900	33500	35100
		BFL	12.5	513	600	775	20900	21800	22700	23600	24600	25600	26700
		6	12.7	511	598	773	20900	21800	22700	23600	24600	25600	26600
		7	12.8	510	597	771	20900	21700	22600	23600	24600	25600	26600
HD 260×54.1	7981	TFL	0.00	1620	1900	2450	28200	29900	31700	33500	35400	37400	39400
		2	2.38	1330	1560	2010	26200	27700	29300	31000	32700	34500	36300
		3	4.75	1040	1220	1570	23800	25100	26500	27900	29400	31000	32600
		4	7.13	750	878	1130	20800	21800	23000	24100	25300	26600	27900
		BFL	9.50	460	538	695	16900	17700	18400	19300	20100	21000	21900
		6	13.0	433	506	653	16500	17200	18000	18700	19500	20400	21200
		7	16.4	405	474	612	16100	16700	17400	18200	19000	19700	20600

[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 F.1 for PNA locations

[d] Ix of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, $\times 10^4$ mm^4
HEA Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HE 1000 A	553800	TFL	0.00	8150	9540	12300	1070000	1090000	1110000	1130000	1150000	1170000	1190000
		2	7.75	7060	8260	10700	1030000	1050000	1070000	1090000	1100000	1120000	1140000
		3	15.5	5960	6980	9010	989000	1010000	1020000	1040000	1060000	1070000	1090000
		4	23.3	4870	5700	7360	939000	953000	968000	983000	998000	1010000	1030000
		BFL	31.0	3780	4420	5710	880000	892000	905000	917000	930000	943000	956000
		6	120	2910	3400	4390	825000	835000	845000	855000	866000	877000	888000
		7	232	2040	2380	3080	760000	767000	775000	783000	791000	799000	808000
HE 900 A	422100	TFL	0.00	7530	8810	11400	815000	831000	847000	864000	881000	898000	916000
		2	7.50	6470	7580	9780	785000	800000	815000	830000	846000	862000	878000
		3	15.0	5420	6340	8180	751000	764000	778000	792000	806000	820000	835000
		4	22.5	4360	5100	6590	710000	722000	734000	746000	758000	771000	784000
		BFL	30.0	3300	3860	4990	661000	671000	681000	691000	702000	712000	723000
		6	100	2590	3030	3920	623000	631000	640000	648000	657000	666000	675000
		7	195	1880	2200	2840	579000	586000	592000	599000	606000	612000	620000
HE 800 A	303400	TFL	0.00	6720	7860	10100	586000	599000	612000	626000	640000	654000	668000
		2	7.00	5730	6700	8650	564000	576000	588000	600000	613000	626000	639000
		3	14.0	4740	5550	7160	538000	548000	559000	570000	582000	593000	605000
		4	21.0	3760	4390	5670	506000	516000	525000	535000	544000	555000	565000
		BFL	28.0	2770	3240	4180	469000	476000	484000	492000	500000	508000	516000
		6	79.6	2220	2600	3360	444000	451000	457000	464000	471000	478000	485000
		7	157	1680	1960	2540	417000	422000	427000	432000	438000	443000	449000
HE 700 A	215300	TFL	0.00	6120	7160	9250	419000	429000	440000	451000	462000	473000	485000
		2	6.75	5170	6050	7810	401000	411000	421000	431000	441000	451000	462000
		3	13.5	4220	4940	6370	381000	390000	398000	407000	416000	426000	435000
		4	20.3	3270	3820	4930	357000	364000	371000	379000	387000	395000	403000
		BFL	27.0	2310	2710	3500	327000	333000	338000	344000	351000	357000	363000
		6	62.9	1920	2250	2900	312000	317000	323000	328000	333000	339000	344000
		7	120	1530	1790	2310	297000	301000	305000	309000	314000	318000	323000
HE 650 A	175200	TFL	0	5680	6640	8580	341000	350000	359000	368000	378000	388000	399000
		2	6.5	4760	5570	7190	326000	334000	343000	352000	360000	370000	379000
		3	13	3840	4500	5810	309000	316000	324000	331000	339000	347000	356000
		4	19.5	2930	3430	4420	288000	294000	300000	307000	313000	320000	327000
		BFL	26	2010	2350	3040	262000	266000	271000	276000	281000	287000	292000
		6	51.2	1720	2010	2590	252000	256000	260000	265000	269000	274000	279000
		7	96.3	1420	1660	2140	241000	245000	249000	253000	256000	260000	265000
HE 600 A	141200	TFL	0.00	5320	6230	8040	276000	284000	292000	300000	309000	318000	327000
		2	6.25	4440	5200	6710	264000	271000	278000	286000	294000	302000	310000
		3	12.5	3560	4170	5380	249000	256000	262000	269000	276000	283000	290000
		4	18.8	2680	3140	4050	231000	237000	242000	248000	254000	260000	266000
		BFL	25.0	1800	2100	2720	209000	213000	217000	222000	226000	230000	235000
		6	45.1	1560	1830	2360	202000	206000	210000	214000	217000	221000	226000
		7	77.2	1330	1560	2010	195000	198000	202000	205000	208000	212000	216000
HE 550 A	111900	TFL	0.00	4980	5820	7520	220000	227000	234000	242000	249000	257000	265000
		2	6.00	4130	4830	6240	210000	217000	223000	230000	236000	243000	251000
		3	12.0	3290	3840	4960	198000	204000	209000	215000	221000	227000	234000
		4	18.0	2440	2850	3680	183000	188000	192000	197000	202000	207000	212000
		BFL	24.0	1590	1860	2410	164000	168000	171000	175000	178000	182000	186000
		6	39.4	1420	1660	2140	160000	163000	166000	169000	173000	176000	180000
		7	58.2	1240	1460	1880	155000	158000	161000	164000	167000	170000	173000
HE 500 A	86970	TFL	0.00	4640	5430	7010	173000	179000	185000	191000	198000	205000	211000
		2	5.75	3830	4480	5790	165000	170000	176000	181000	187000	193000	200000
		3	11.5	3020	3530	4560	155000	159000	164000	169000	174000	180000	185000
		4	17.3	2210	2580	3340	142000	146000	150000	154000	158000	163000	167000
		BFL	23.0	1400	1640	2110	127000	130000	132000	135000	138000	141000	145000
		6	33.8	1280	1500	1930	124000	127000	129000	132000	135000	138000	141000
		7	44.5	1160	1360	1750	121000	124000	126000	129000	131000	134000	137000

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4
HEA Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HE 1000 A	553800	TFL	0.00	8150	9540	12300	1210000	1230000	1250000	1280000	1300000	1320000	1340000
		2	7.75	7060	8260	10700	1160000	1180000	1200000	1220000	1240000	1270000	1290000
		3	15.5	5960	6980	9010	1110000	1130000	1140000	1160000	1180000	1200000	1220000
		4	23.3	4870	5700	7360	1040000	1060000	1080000	1090000	1110000	1130000	1140000
		BFL	31.0	3780	4420	5710	969000	983000	997000	1010000	1030000	1040000	1050000
		6	120	2910	3400	4390	899000	910000	922000	933000	945000	957000	969000
		7	232	2040	2380	3080	816000	825000	833000	842000	851000	861000	870000
HE 900 A	422100	TFL	0.00	7530	8810	11400	934000	952000	971000	989000	1010000	1030000	1050000
		2	7.50	6470	7580	9780	895000	912000	929000	947000	964000	982000	1000000
		3	15.0	5420	6340	8180	850000	865000	881000	897000	913000	929000	946000
		4	22.5	4360	5100	6590	797000	811000	824000	838000	852000	866000	881000
		BFL	30.0	3300	3860	4990	734000	745000	756000	768000	780000	792000	804000
		6	100	2590	3030	3920	684000	693000	703000	713000	722000	732000	743000
		7	195	1880	2200	2840	627000	634000	641000	649000	657000	665000	672000
HE 800 A	303400	TFL	0.00	6720	7860	10100	682000	697000	712000	728000	744000	760000	776000
		2	7.00	5730	6700	8650	652000	666000	680000	694000	709000	723000	738000
		3	14.0	4740	5550	7160	617000	629000	642000	655000	668000	681000	694000
		4	21.0	3760	4390	5670	575000	586000	597000	608000	619000	631000	642000
		BFL	28.0	2770	3240	4180	525000	533000	542000	551000	560000	570000	579000
		6	79.6	2220	2600	3360	492000	499000	507000	515000	522000	530000	538000
		7	157	1680	1960	2540	455000	461000	467000	473000	479000	486000	492000
HE 700 A	215300	TFL	0.00	6120	7160	9250	497000	509000	522000	534000	547000	561000	574000
		2	6.75	5170	6050	7810	473000	484000	496000	508000	519000	532000	544000
		3	13.5	4220	4940	6370	445000	455000	465000	476000	486000	497000	508000
		4	20.3	3270	3820	4930	411000	420000	429000	437000	446000	456000	465000
		BFL	27.0	2310	2710	3500	370000	377000	383000	390000	398000	405000	412000
		6	62.9	1920	2250	2900	350000	356000	362000	368000	374000	380000	387000
		7	120	1530	1790	2310	328000	333000	338000	343000	348000	353000	359000
HE 650 A	175200	TFL	0	5680	6640	8580	409000	420000	431000	442000	454000	465000	477000
		2	6.5	4760	5570	7190	389000	398000	408000	419000	429000	440000	451000
		3	13	3840	4500	5810	364000	373000	382000	391000	400000	409000	419000
		4	19.5	2930	3430	4420	334000	342000	349000	357000	365000	373000	381000
		BFL	26	2010	2350	3040	298000	303000	309000	315000	321000	327000	333000
		6	51.2	1720	2010	2590	284000	289000	294000	299000	304000	310000	315000
		7	96.3	1420	1660	2140	269000	273000	277000	282000	287000	291000	296000
HE 600 A	141200	TFL	0.00	5320	6230	8040	336000	346000	355000	365000	376000	386000	397000
		2	6.25	4440	5200	6710	319000	327000	336000	345000	354000	364000	374000
		3	12.5	3560	4170	5380	298000	305000	313000	321000	329000	337000	346000
		4	18.8	2680	3140	4050	272000	278000	285000	291000	298000	305000	312000
		BFL	25.0	1800	2100	2720	240000	244000	249000	254000	260000	265000	270000
		6	45.1	1560	1830	2360	230000	234000	239000	243000	248000	252000	257000
		7	77.2	1330	1560	2010	219000	223000	227000	231000	235000	239000	243000
HE 550 A	111900	TFL	0.00	4980	5820	7520	273000	281000	290000	299000	308000	317000	326000
		2	6.00	4130	4830	6240	258000	266000	273000	281000	290000	298000	306000
		3	12.0	3290	3840	4960	240000	247000	253000	260000	268000	275000	282000
		4	18.0	2440	2850	3680	218000	223000	229000	235000	241000	247000	253000
		BFL	24.0	1590	1860	2410	190000	194000	198000	202000	207000	211000	216000
		6	39.4	1420	1660	2140	183000	187000	191000	195000	199000	203000	207000
		7	58.2	1240	1460	1880	176000	180000	183000	187000	190000	194000	198000
HE 500 A	86970	TFL	0.00	4640	5430	7010	219000	226000	233000	241000	249000	257000	265000
		2	5.75	3830	4480	5790	206000	213000	219000	226000	233000	241000	248000
		3	11.5	3020	3530	4560	191000	196000	202000	208000	215000	221000	228000
		4	17.3	2210	2580	3340	172000	177000	181000	186000	191000	197000	202000
		BFL	23.0	1400	1640	2110	148000	151000	155000	158000	162000	166000	170000
		6	33.8	1280	1500	1930	144000	147000	150000	154000	157000	160000	164000
		7	44.5	1160	1360	1750	140000	143000	146000	149000	152000	155000	158000

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, $\times10^4$ mm^4
HEA Shapes

Shapes	I_x [d]	PNA [c]	$Y1$ [a]	ΣQ_n			$Y2$ [b], mm						
				S235	S275	S355							
	$\times10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HE 450 A	637720	TFL	0.00	4180	4900	6320	129000	133000	139000	144000	149000	155000	161000
		2	5.25	3440	4030	5200	122000	127000	131000	136000	141000	146000	151000
		3	10.5	2700	3160	4080	115000	118000	122000	127000	131000	135000	140000
		4	15.8	1960	2300	2960	105000	108000	112000	115000	118000	122000	126000
		BFL	21.0	1220	1430	1850	93100	95300	97600	99900	102000	105000	108000
		6	29.1	1130	1330	1710	91400	93500	95600	97900	100000	103000	105000
		7	37.3	1050	1220	1580	89700	91600	93700	95800	97900	100000	102000
HE 400 A	45070	TFL	0.00	3740	4370	5640	92800	96800	101000	105000	110000	114000	119000
		2	4.75	3070	3590	4630	88100	91700	95400	99300	103000	107000	112000
		3	9.5	2400	2810	3620	82400	85500	88700	92100	95500	99100	103000
		4	14.3	1730	2020	2610	75200	77800	80400	83100	85900	88800	91800
		BFL	19.0	1060	1240	1600	66100	67900	69700	71600	73600	75600	77700
		6	24.8	996	1170	1500	65200	66800	68600	70400	72200	74200	76200
		7	30.6	934	1090	1410	64200	65700	67400	69100	70900	72700	74700
HE 360 A	33090	TFL	0.00	3360	3930	5070	69200	72500	75900	79500	83200	87100	91100
		2	4.38	2740	3210	4140	65600	68500	71600	74800	78200	81600	85200
		3	8.75	2120	2480	3210	61100	63600	66300	69100	71900	74900	78000
		4	13.1	1510	1760	2270	55500	57500	59600	61800	64100	66500	69000
		BFL	17.5	888	1040	1340	48200	49600	51000	52500	54100	55700	57400
		6	19.9	864	1010	1300	47900	49200	50600	52100	53600	55200	56800
		7	22.3	839	982	1270	47500	48900	50200	51700	53100	54700	56300
HE 340 A	27690	TFL	0.00	3140	3670	4740	58500	61500	64600	67800	71100	74600	78200
		2	4.13	2560	2990	3860	55400	58000	60800	63700	66700	69800	73000
		3	8.25	1970	2310	2980	51500	53800	56200	58600	61200	63900	66700
		4	12.4	1390	1630	2100	46700	48500	50400	52300	54400	56500	58700
		BFL	16.5	811	949	1220	40400	41600	42800	44100	45500	46900	48400
		6	17.8	798	933	1200	40200	41400	42600	43900	45300	46700	48200
		7	19.2	784	918	1180	40000	41200	42400	43700	45100	46400	47900
HE 320 A	22930	TFL	0.00	2920	3420	4420	49100	51700	54400	57300	60300	63400	66600
		2	3.88	2380	2780	3590	46400	48700	51200	53700	56400	59200	62100
		3	7.75	1830	2140	2770	43100	45100	47200	49400	51700	54100	56600
		4	11.6	1280	1500	1940	38900	40500	42200	43900	45700	47600	49600
		BFL	15.5	738	864	1110	33500	34500	35600	36800	38000	39200	40500
		6	15.9	734	859	1110	33400	34500	35600	36700	37900	39200	40500
		7	16.2	731	855	1100	33400	34400	35500	36700	37900	39100	40400
HE 300 A	18260	TFL	0.00	2640	3090	3990	39600	41900	44300	46700	49300	52000	54800
		2	3.50	2150	2520	3250	37400	39500	41600	43800	46100	48500	51100
		3	7.00	1660	1940	2500	34700	36500	38300	40200	42200	44300	46400
		4	10.5	1160	1360	1760	31300	32700	34100	35700	37200	38900	40600
		BFL	14.0	670	784	1010	26900	27800	28800	29800	30800	31900	33000
		6	14.5	665	779	1010	26900	27800	28700	29700	30800	31800	33000
		7	14.9	661	773	998	26800	27700	28700	29700	30700	31800	32900
HE 280 A	13670	TFL	0.00	2290	2670	3450	30300	32200	34100	36100	38300	40500	42900
		2	3.25	1860	2170	2810	28600	30300	32000	33800	35700	37800	39800
		3	6.50	1430	1670	2160	26500	27900	29400	31000	32600	34300	36100
		4	9.75	1000	1170	1510	23800	24900	26100	27400	28700	30000	31500
		BFL	13.0	575	673	868	20400	21100	21900	22700	23600	24500	25400
		6	13.2	573	671	866	20300	21100	21900	22700	23500	24400	25400
		7	13.4	571	669	863	20300	21100	21800	22700	23500	24400	25300
HE 260 A	10450	TFL	0.00	2040	2390	3080	23700	25300	27000	28700	30500	32400	34400
		2	3.13	1660	1940	2510	22400	23800	25300	26800	28400	30200	31900
		3	6.25	1280	1490	1930	20700	21900	23200	24500	25900	27400	28900
		4	9.38	895	1050	1350	18600	19500	20500	21600	22700	23800	25100
		BFL	12.5	513	600	775	15800	16400	17100	17800	18500	19300	20100
		6	12.7	511	598	773	15800	16400	17100	17800	18500	19300	20100
		7	12.8	510	597	771	15800	16400	17100	17700	18500	19200	20000

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, ×10^4 mm^4
HEA Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HE 450 A	637720	TFL	0.00	4180	4900	6320	167000	173000	179000	186000	192000	199000	206000
		2	5.25	3440	4030	5200	157000	162000	168000	174000	180000	186000	192000
		3	10.5	2700	3160	4080	144000	149000	154000	159000	165000	170000	176000
		4	15.8	1960	2300	2960	129000	133000	137000	142000	146000	150000	155000
		BFL	21.0	1220	1430	1850	110000	113000	116000	119000	122000	125000	128000
		6	29.1	1130	1330	1710	108000	110000	113000	116000	119000	121000	124000
		7	37.3	1050	1220	1580	105000	107000	110000	112000	115000	118000	121000
HE 400 A	45070	TFL	0.00	3740	4370	5640	124000	129000	134000	140000	145000	151000	157000
		2	4.75	3070	3590	4630	116000	121000	126000	130000	135000	141000	146000
		3	9.5	2400	2810	3620	107000	111000	115000	119000	123000	128000	132000
		4	14.3	1730	2020	2610	94900	98200	101000	105000	108000	112000	116000
		BFL	19.0	1060	1240	1600	79900	82100	84400	86800	89300	91800	94400
		6	24.8	996	1170	1500	78300	80400	82600	84900	87200	89600	92100
		7	30.6	934	1090	1410	76600	78700	80800	82900	85100	87400	89800
HE 360 A	33090	TFL	0.00	3360	3930	5070	95200	99500	104000	109000	113000	118000	123000
		2	4.38	2740	3210	4140	88900	92800	96800	101000	105000	109000	114000
		3	8.75	2120	2480	3210	81200	84600	88000	91500	95200	98900	103000
		4	13.1	1510	1760	2270	71600	74200	77000	79800	82700	85700	88800
		BFL	17.5	888	1040	1340	59100	60900	62700	64700	66600	68700	70800
		6	19.9	864	1010	1300	58500	60300	62100	64000	65900	67900	69900
		7	22.3	839	982	1270	57900	59700	61400	63300	65100	67100	69100
HE 340 A	27690	TFL	0.00	3140	3670	4740	81900	85800	89800	93900	98200	103000	107000
		2	4.13	2560	2990	3860	76400	79800	83400	87200	91000	94900	99000
		3	8.25	1970	2310	2980	69600	72600	75700	78800	82100	85600	89100
		4	12.4	1390	1630	2100	61000	63400	65900	68400	71000	73700	76500
		BFL	16.5	811	949	1220	50000	51500	53200	54900	56600	58500	60300
		6	17.8	798	933	1200	49700	51200	52900	54500	56300	58100	59900
		7	19.2	784	918	1180	49400	50900	52500	54200	55900	57700	59500
HE 320 A	22930	TFL	0.00	2920	3420	4420	70000	73500	77100	80800	84600	88600	92700
		2	3.88	2380	2780	3590	65100	68200	71500	74800	78300	81900	85500
		3	7.75	1830	2140	2770	59200	61800	64600	67500	70500	73500	76700
		4	11.6	1280	1500	1940	51600	53800	56000	58300	60600	63000	65500
		BFL	15.5	738	864	1110	41900	43300	44700	46300	47800	49400	51100
		6	15.9	734	859	1110	41800	43200	44700	46200	47700	49300	51000
		7	16.2	731	855	1100	41700	43100	44600	46100	47600	49200	50900
HE 300 A	18260	TFL	0.00	2640	3090	3990	57800	60800	63900	67200	70600	74100	77700
		2	3.50	2150	2520	3250	53700	56400	59200	62200	65200	68300	71600
		3	7.00	1660	1940	2500	48700	51000	53500	56000	58600	61300	64000
		4	10.5	1160	1360	1760	42400	44300	46200	48200	50200	52400	54600
		BFL	14.0	670	784	1010	34200	35500	36700	38000	39400	40800	42300
		6	14.5	665	779	1010	34100	35400	36600	37900	39300	40700	42200
		7	14.9	661	773	998	34100	35300	36500	37800	39200	40600	42000
HE 280 A	13670	TFL	0.00	2290	2670	3450	45300	47800	50400	53200	56000	58900	61900
		2	3.25	1860	2170	2810	42000	44300	46700	49100	51600	54200	56900
		3	6.50	1430	1670	2160	38000	40000	42000	44100	46200	48500	50800
		4	9.75	1000	1170	1510	33000	34500	36100	37800	39500	41300	43100
		BFL	13.0	575	673	868	26400	27400	28500	29500	30700	31900	33100
		6	13.2	573	671	866	26300	27400	28400	29500	30600	31800	33000
		7	13.4	571	669	863	26300	27300	28400	29500	30600	31800	33000
HE 260 A	10450	TFL	0.00	2040	2390	3080	36500	38700	40900	43300	45700	48200	50800
		2	3.13	1660	1940	2510	33800	35800	37800	39900	42100	44300	46700
		3	6.25	1280	1490	1930	30500	32200	33900	35700	37600	39500	41500
		4	9.38	895	1050	1350	26300	27700	29000	30500	31900	33500	35100
		BFL	12.5	513	600	775	20900	21800	22700	23600	24600	25600	26700
		6	12.7	511	598	773	20900	21800	22700	23600	24600	25600	26600
		7	12.8	510	597	771	20900	21700	22600	23600	24600	25600	26600

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, $\times 10^4$ mm^4
HEA Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HE 240 A	7763	TFL	0.00	1810	2110	2730	18200	19500	20900	22400	23900	25500	27200
		2	3.00	1470	1720	2220	17100	18300	19600	20900	22200	23700	25200
		3	6.00	1130	1320	1710	15800	16800	17900	19000	20200	21400	22700
		4	9.00	791	925	1190	14100	14900	15800	16700	17600	18600	19600
		BFL	12.0	452	529	683	12000	12500	13000	13600	14200	14900	15600
		6	12.0	452	529	682	11900	12500	13000	13600	14200	14900	15500
		7	12.1	451	528	682	11900	12500	13000	13600	14200	14900	15500
HE 220 A	5410	TFL	0.00	1510	1770	2280	13100	14200	15300	16400	17600	18900	20300
		2	2.75	1230	1440	1850	12300	13300	14200	15300	16400	17500	18700
		3	5.50	943	1100	1420	11300	12100	13000	13900	14800	15800	16800
		4	8.25	659	771	995	10100	10700	11400	12100	12800	13600	14400
		BFL	11.0	375	438	566	8480	8890	9320	9780	10300	10800	11300
HE 200 A	3692	TFL	0.00	1270	1480	1910	9350	10200	11000	11900	12900	13900	15000
		2	2.50	1030	1210	1560	8770	9500	10300	11100	12000	12900	13800
		3	5.00	795	930	1200	8060	8680	9350	10100	10800	11600	12400
		4	7.50	560	655	846	7160	7660	8190	8750	9350	9970	10600
		BFL	10.0	325	380	491	6010	6340	6690	7060	7460	7880	8320
		6	10.7	321	375	484	5980	6310	6660	7030	7420	7830	8270
		7	11.3	316	370	478	5960	6280	6620	6990	7380	7790	8220
HE 180 A	2510	TFL	0.00	1060	1240	1610	6660	7300	7980	8710	9480	10300	11200
		2	2.38	862	1010	1300	6230	6800	7410	8060	8750	9480	10300
		3	4.75	662	774	999	5700	6180	6710	7260	7860	8480	9140
		4	7.13	461	539	696	5020	5410	5820	6260	6720	7220	7740
		BFL	9.50	260	304	392	4140	4390	4660	4940	5250	5570	5900
HE 160 A	1673	TFL	0.00	911	1070	1380	4750	5260	5810	6390	7010	7680	8380
		2	2.25	742	868	1120	4440	4890	5380	5910	6470	7060	7690
		3	4.50	573	670	865	4050	4440	4860	5310	5800	6310	6850
		4	6.75	403	472	610	3560	3870	4210	4570	4950	5360	5790
		BFL	9.00	234	274	354	2930	3140	3360	3600	3860	4130	4420
		6	9.56	231	270	349	2920	3120	3340	3580	3830	4100	4390
		7	10.1	228	267	344	2900	3110	3330	3560	3810	4070	4360
HE 140 A	1033	TFL	0.00	738	864	1120	3170	3550	3960	4400	4880	5390	5930
		2	2.13	599	700	904	2940	3280	3650	4050	4480	4930	5420
		3	4.25	459	537	693	2670	2960	3280	3620	3980	4370	4780
		4	6.38	319	373	482	2320	2550	2800	3070	3350	3660	3990
		BFL	8.50	179	210	271	1870	2010	2180	2350	2540	2730	2940
HE 120 A	606.2	TFL	0.00	595	697	900	2060	2340	2650	2980	3340	3730	4140
		2	2.00	483	565	729	1910	2160	2440	2740	3060	3400	3770
		3	4.00	370	433	559	1720	1940	2170	2430	2700	3000	3310
		4	6.00	257	301	388	1480	1650	1840	2040	2260	2490	2740
		BFL	8.00	144	169	218	1170	1280	1400	1530	1670	1820	1980
HE 100 A	349.2	TFL	0.00	499	584	754	1370	1590	1830	2090	2370	2680	3000
		2	2.00	405	474	612	1260	1460	1670	1910	2160	2430	2720
		3	4.00	311	364	470	1130	1300	1480	1690	1900	2140	2390
		4	6.00	217	254	328	968	1100	1250	1400	1580	1760	1960
		BFL	8.00	123	144	186	753	839	934	1040	1150	1270	1400

[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 F.1 for PNA locations
[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, ×10^4 mm^4
HEA Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×$10^4$$mm^4$		mm	kN	kN	kN	120	130	140	150	160	170	180
HE 240 A	7763	TFL	0.00	1810	2110	2730	29000	30800	32700	34700	36800	39000	41200
		2	3.00	1470	1720	2220	26800	28400	30200	32000	33800	35700	37700
		3	6.00	1130	1320	1710	24100	25500	27000	28500	30100	31800	33500
		4	9.00	791	925	1190	20700	21800	23000	24200	25500	26800	28100
		BFL	12.0	452	529	683	16300	17000	17800	18600	19400	20300	21200
		6	12.0	452	529	682	16300	17000	17800	18600	19400	20300	21100
		7	12.1	451	528	682	16200	17000	17800	18600	19400	20200	21100
HE 220 A	5410	TFL	0.00	1510	1770	2280	21700	23200	24700	26300	28000	29700	31500
		2	2.75	1230	1440	1850	20000	21300	22700	24200	25700	27200	28800
		3	5.50	943	1100	1420	17900	19100	20200	21500	22800	24100	25500
		4	8.25	659	771	995	15300	16200	17100	18100	19100	20200	21300
		BFL	11.0	375	438	566	11900	12500	13100	13700	14400	15100	15800
HE 200 A	3692	TFL	0.00	1270	1480	1910	16100	17300	18600	19800	21200	22600	24000
		2	2.50	1030	1210	1560	14900	15900	17000	18200	19400	20700	22000
		3	5.00	795	930	1200	13300	14200	15200	16200	17200	18300	19400
		4	7.50	560	655	846	11300	12100	12800	13600	14400	15300	16200
		BFL	10.0	325	380	491	8780	9260	9770	10300	10800	11400	12000
		6	10.7	321	375	484	8720	9200	9700	10200	10800	11300	11900
		7	11.3	316	370	478	8670	9140	9640	10200	10700	11300	11800
HE 180 A	2510	TFL	0.00	1060	1240	1610	12100	13000	14000	15100	16100	17300	18500
		2	2.38	862	1010	1300	11100	11900	12800	13700	14700	15700	16800
		3	4.75	662	774	999	9840	10600	11300	12100	13000	13800	14700
		4	7.13	461	539	696	8290	8860	9460	10100	10800	11400	12200
		BFL	9.50	260	304	392	6260	6630	7030	7440	7860	8310	8770
HE 160 A	1673	TFL	0.00	911	1070	1380	9120	9900	10700	11600	12500	13400	14400
		2	2.25	742	868	1120	8360	9060	9790	10600	11400	12200	13100
		3	4.50	573	670	865	7420	8020	8650	9320	10000	10700	11500
		4	6.75	403	472	610	6240	6720	7230	7750	8300	8870	9470
		5	9.00	234	274	354	4720	5040	5370	5720	6090	6470	6870
		6	9.56	231	270	349	4690	5000	5330	5680	6040	6420	6810
		BFL	10.1	228	267	344	4650	4960	5290	5630	5990	6370	6750
HE 140 A	1033	TFL	0.00	738	864	1120	6500	7100	7730	8400	9090	9820	10600
		2	2.13	599	700	904	5930	6460	7030	7630	8250	8900	9580
		3	4.25	459	537	693	5220	5680	6170	6680	7210	7770	8350
		4	6.38	319	373	482	4330	4690	5070	5480	5890	6330	6790
		BFL	8.50	179	210	271	3170	3400	3650	3910	4180	4460	4760
HE 120 A	606.2	TFL	0.00	595	697	900	4580	5040	5520	6040	6570	7130	7720
		2	2.00	483	565	729	4160	4570	5010	5470	5950	6450	6980
		3	4.00	370	433	559	3650	4000	4370	4770	5180	5610	6060
		4	6.00	257	301	388	3000	3280	3570	3880	4200	4540	4900
		BFL	8.00	144	169	218	2150	2330	2520	2720	2930	3150	3380
HE 100 A	349.2	TFL	0.00	499	584	754	3350	3710	4100	4510	4940	5400	5870
		2	2.00	405	474	612	3040	3360	3710	4080	4470	4870	5300
		3	4.00	311	364	470	2650	2930	3230	3550	3880	4230	4590
		4	6.00	217	254	328	2170	2390	2620	2870	3130	3410	3700
		BFL	8.00	123	144	186	1540	1680	1830	2000	2170	2350	2530

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times 10^4$ mm^4
HEB Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HE 1000 B	644700	TFL	0.00	9400	11000	14200	1250000	1270000	1290000	1320000	1340000	1360000	1390000
		2	9.00	8130	9510	12300	1210000	1230000	1250000	1270000	1290000	1310000	1340000
		3	18.0	6860	8030	10400	1160000	1170000	1190000	1210000	1230000	1250000	1270000
		4	27.0	5590	6550	8450	1100000	1110000	1130000	1150000	1160000	1180000	1200000
		BFL	36.0	4320	5060	6530	1030000	1040000	1050000	1070000	1080000	1100000	1110000
		6	126	3340	3910	5040	962000	973000	985000	997000	1010000	1020000	1030000
		7	237	2350	2750	3550	887000	896000	905000	914000	923000	933000	942000
HE 900 B	494100	TFL	0.00	8730	10200	13200	958000	977000	996000	1020000	1040000	1060000	1080000
		2	8.75	7490	8770	11300	923000	940000	958000	976000	994000	1010000	1030000
		3	17.5	6260	7320	9450	882000	897000	913000	930000	946000	963000	980000
		4	26.3	5020	5880	7590	833000	847000	861000	875000	890000	905000	920000
		BFL	35.0	3790	4440	5730	775000	787000	798000	810000	822000	834000	847000
		6	107	2990	3490	4510	731000	740000	750000	760000	770000	780000	791000
		7	199	2180	2550	3300	680000	687000	695000	703000	711000	719000	727000
HE 800 B	359100	TFL	0.00	7850	9190	11900	697000	713000	728000	744000	760000	777000	794000
		2	8.25	6690	7830	10100	670000	684000	699000	713000	728000	743000	759000
		3	16.5	5530	6470	8350	639000	651000	664000	677000	691000	704000	718000
		4	24.8	4360	5110	6590	601000	612000	623000	634000	646000	658000	670000
		BFL	33.0	3200	3750	4840	555000	564000	573000	582000	591000	601000	611000
		6	86.1	2580	3020	3900	527000	534000	542000	550000	558000	566000	574000
		7	161	1960	2300	2970	494000	501000	507000	513000	520000	526000	533000
HE 700 B	256900	TFL	0.00	7200	8430	10900	502000	514000	527000	540000	553000	567000	581000
		2	8.00	6070	7110	9170	481000	493000	504000	516000	528000	541000	554000
		3	16.0	4940	5790	7470	456000	467000	477000	488000	498000	510000	521000
		4	24.0	3820	4470	5770	427000	435000	444000	453000	462000	472000	481000
		BFL	32.0	2690	3150	4060	390000	397000	404000	411000	418000	426000	433000
		6	69.1	2240	2630	3390	373000	379000	385000	392000	398000	404000	411000
		7	125	1800	2110	2720	355000	360000	365000	370000	376000	381000	387000
HE 650 B	210600	TFL	0.00	6730	7870	10200	412000	423000	434000	445000	457000	469000	481000
		2	7.75	5640	6590	8510	394000	404000	414000	425000	435000	446000	458000
		3	15.5	4540	5320	6860	373000	382000	391000	400000	409000	419000	429000
		4	23.3	3450	4040	5210	347000	354000	362000	370000	378000	386000	394000
		BFL	31.0	2360	2760	3560	315000	321000	326000	332000	339000	345000	351000
		6	57.1	2020	2360	3050	304000	309000	314000	319000	324000	330000	336000
		7	101	1680	1970	2540	291000	295000	300000	305000	309000	314000	319000
HE 600 B	171000	TFL	0.00	6350	7430	9580	336000	346000	356000	366000	376000	387000	398000
		2	7.50	5290	6190	7990	321000	330000	339000	348000	358000	367000	377000
		3	15.0	4230	4950	6390	303000	311000	319000	327000	335000	344000	353000
		4	22.5	3170	3710	4790	281000	288000	294000	301000	308000	315000	322000
		BFL	30.0	2120	2480	3200	254000	258000	263000	268000	274000	279000	284000
		6	50.7	1850	2170	2800	246000	250000	254000	259000	264000	269000	273000
		7	82.3	1590	1860	2400	237000	241000	245000	249000	253000	257000	262000
HE 550 B	136700	TFL	0.00	5970	6990	9020	271000	279000	288000	297000	306000	315000	325000
		2	7.25	4950	5790	7480	258000	266000	274000	282000	290000	299000	307000
		3	14.5	3930	4600	5930	243000	250000	257000	264000	271000	278000	286000
		4	21.8	2900	3400	4390	225000	230000	236000	241000	247000	254000	260000
		BFL	29.0	1880	2200	2840	201000	205000	209000	213000	218000	222000	227000
		6	44.5	1690	1970	2550	196000	200000	203000	207000	211000	215000	220000
		7	63.3	1490	1750	2260	190000	194000	197000	201000	204000	208000	212000
HE 500 B	107200	TFL	0.00	5610	6560	8470	215000	222000	229000	237000	245000	253000	262000
		2	7.00	4620	5410	6980	204000	211000	218000	225000	232000	239000	247000
		3	14.0	3630	4250	5490	192000	197000	203000	209000	216000	222000	229000
		4	21.0	2650	3100	4000	176000	181000	186000	191000	196000	201000	206000
		BFL	28.0	1660	1940	2510	156000	160000	163000	167000	170000	174000	178000
		6	38.5	1530	1790	2310	153000	156000	160000	163000	166000	170000	174000
		7	49.0	1400	1640	2120	150000	153000	156000	159000	162000	166000	169000

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times 10^4$ mm^4
HEB Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HE 1000 B	644700	TFL	0.00	9400	11000	14200	1410000	1440000	1460000	1490000	1520000	1540000	1570000
		2	9.00	8130	9510	12300	1360000	1380000	1400000	1430000	1450000	1480000	1500000
		3	18.0	6860	8030	10400	1290000	1310000	1340000	1360000	1380000	1400000	1430000
		4	27.0	5590	6550	8450	1220000	1240000	1260000	1280000	1290000	1310000	1330000
		BFL	36.0	4320	5060	6530	1130000	1140000	1160000	1180000	1190000	1210000	1230000
		6	126	3340	3910	5040	1050000	1060000	1070000	1090000	1100000	1120000	1130000
		7	237	2350	2750	3550	952000	962000	972000	983000	993000	1000000	1010000
HE 900 B	494100	TFL	0.00	8730	10200	13200	1100000	1120000	1140000	1160000	1180000	1210000	1230000
		2	8.75	7490	8770	11300	1050000	1070000	1090000	1110000	1130000	1150000	1170000
		3	17.5	6260	7320	9450	998000	1020000	1030000	1050000	1070000	1090000	1110000
		4	26.3	5020	5880	7590	935000	951000	966000	983000	999000	1020000	1030000
		BFL	35.0	3790	4440	5730	859000	872000	886000	899000	913000	926000	940000
		6	107	2990	3490	4510	802000	813000	824000	835000	846000	858000	870000
		7	199	2180	2550	3300	735000	744000	753000	761000	770000	780000	789000
HE 800 B	359100	TFL	0.00	7850	9190	11900	811000	828000	846000	865000	883000	902000	921000
		2	8.25	6690	7830	10100	775000	791000	807000	824000	841000	859000	876000
		3	16.5	5530	6470	8350	732000	747000	762000	777000	792000	808000	823000
		4	24.8	4360	5110	6590	682000	694000	707000	720000	733000	747000	761000
		BFL	33.0	3200	3750	4840	621000	631000	641000	652000	663000	673000	685000
		6	86.1	2580	3020	3900	583000	591000	600000	609000	618000	628000	637000
		7	161	1960	2300	2970	540000	547000	554000	561000	569000	576000	584000
HE 700 B	256900	TFL	0.00	7200	8430	10900	595000	610000	625000	640000	655000	671000	687000
		2	8.00	6070	7110	9170	567000	580000	593000	607000	622000	636000	651000
		3	16.0	4940	5790	7470	532000	544000	556000	569000	581000	594000	607000
		4	24.0	3820	4470	5770	491000	501000	512000	522000	533000	544000	555000
		BFL	32.0	2690	3150	4060	441000	449000	457000	465000	474000	482000	491000
		6	69.1	2240	2630	3390	418000	425000	432000	439000	446000	454000	461000
		7	125	1800	2110	2720	392000	398000	404000	410000	416000	423000	429000
HE 650 B	210600	TFL	0.00	6730	7870	10200	494000	507000	520000	534000	547000	561000	576000
		2	7.75	5640	6590	8510	469000	481000	493000	505000	518000	530000	543000
		3	15.5	4540	5320	6860	439000	449000	460000	471000	482000	493000	505000
		4	23.3	3450	4040	5210	403000	412000	420000	430000	439000	448000	458000
		BFL	31.0	2360	2760	3560	358000	364000	371000	378000	385000	393000	400000
		6	57.1	2020	2360	3050	341000	347000	354000	360000	366000	373000	379000
		7	101	1680	1970	2540	324000	329000	334000	340000	345000	351000	357000
HE 600 B	171000	TFL	0.00	6350	7430	9580	409000	421000	432000	444000	457000	469000	482000
		2	7.50	5290	6190	7990	387000	398000	409000	420000	431000	442000	454000
		3	15.0	4230	4950	6390	362000	371000	380000	390000	400000	410000	420000
		4	22.5	3170	3710	4790	330000	337000	345000	353000	361000	370000	378000
		BFL	30.0	2120	2480	3200	290000	296000	302000	308000	314000	320000	327000
		6	50.7	1850	2170	2800	279000	284000	289000	294000	300000	306000	311000
		7	82.3	1590	1860	2400	266000	271000	276000	280000	285000	290000	295000
HE 550 B	136700	TFL	0.00	5970	6990	9020	335000	345000	356000	366000	377000	388000	400000
		2	7.25	4950	5790	7480	316000	326000	335000	345000	355000	365000	375000
		3	14.5	3930	4600	5930	294000	302000	310000	319000	327000	336000	345000
		4	21.8	2900	3400	4390	266000	273000	280000	287000	294000	301000	309000
		BFL	29.0	1880	2200	2840	232000	237000	242000	247000	252000	257000	263000
		6	44.5	1690	1970	2550	224000	229000	233000	238000	243000	248000	253000
		7	63.3	1490	1750	2260	216000	220000	224000	228000	233000	237000	242000
HE 500 B	107200	TFL	0.00	5610	6560	8470	271000	279000	289000	298000	308000	318000	328000
		2	7.00	4620	5410	6980	255000	263000	271000	280000	288000	297000	306000
		3	14.0	3630	4250	5490	236000	243000	250000	257000	265000	273000	281000
		4	21.0	2650	3100	4000	212000	218000	224000	230000	236000	242000	249000
		BFL	28.0	1660	1940	2510	182000	186000	190000	194000	199000	203000	208000
		6	38.5	1530	1790	2310	177000	181000	185000	189000	193000	197000	202000
		7	49.0	1400	1640	2120	173000	176000	180000	184000	187000	191000	195000

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times 10^4$ mm^4

HEB Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^{4}mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HE 450 B	79890	TFL	0.00	5120	6000	7740	162000	168000	175000	181000	188000	195000	202000
		2	6.50	4210	4920	6350	154000	160000	165000	171000	177000	184000	190000
		3	13.0	3290	3850	4970	144000	149000	154000	159000	164000	170000	176000
		4	19.5	2370	2780	3590	132000	136000	140000	144000	148000	153000	157000
		BFL	26.0	1460	1710	2200	116000	119000	122000	125000	128000	131000	134000
		6	33.3	1370	1600	2070	115000	117000	120000	123000	126000	128000	131000
		7	40.6	1280	1500	1930	113000	115000	118000	120000	123000	126000	129000
HE 400 B	57680	TFL	0.00	4650	5440	7020	119000	125000	130000	135000	141000	147000	153000
		2	6.00	3800	4450	5740	113000	118000	123000	127000	133000	138000	143000
		3	12.0	2960	3460	4470	106000	110000	114000	118000	122000	127000	132000
		4	18.0	2110	2470	3190	96300	99400	103000	106000	110000	113000	117000
		BFL	24.0	1260	1480	1910	84100	86300	88500	90800	93300	95700	98300
		6	28.3	1210	1420	1830	83300	85400	87500	89800	92100	94500	97000
		7	32.7	1160	1360	1760	82400	84400	86500	88700	90900	93300	95700
HE 360 B	43190	TFL	0.00	4240	4970	6410	91000	95200	99600	104000	109000	114000	119000
		2	5.63	3450	4040	5210	86000	89800	93800	97900	102000	107000	111000
		3	11.3	2660	3110	4020	80000	83200	86700	90200	93900	97700	102000
		4	16.9	1860	2180	2820	72400	74900	77600	80500	83400	86400	89600
		BFL	22.5	1070	1250	1620	62400	64200	65900	67800	69700	71700	73800
		6	23.0	1070	1250	1610	62400	64100	65900	67700	69600	71600	73700
		7	23.4	1060	1240	1600	62300	64000	65800	67600	69500	71500	73600
HE 340 B	36660	TFL	0.00	4020	4700	6070	78000	81900	85900	90100	94400	99000	104000
		2	5.38	3260	3810	4920	73700	77200	80800	84500	88400	92500	96700
		3	10.8	2500	2930	3780	68400	71300	74400	77600	81000	84500	88100
		4	16.1	1740	2040	2630	61700	64000	66400	69000	71600	74400	77200
		BFL	21.5	985	1150	1490	52900	54500	56000	57700	59400	61200	63000
HE 320 B	30820	TFL	0.00	3790	4440	5730	66400	69900	73500	77300	81200	85300	89600
		2	5.13	3070	3590	4630	62600	65700	69000	72400	75900	79600	83400
		3	10.3	2350	2740	3540	58000	60700	63400	66300	69400	72500	75800
		4	15.4	1620	1900	2450	52100	54200	56400	58700	61000	63500	66100
		BFL	20.5	900	1050	1360	44500	45800	47200	48600	50200	51700	53400
HE 300 B	25170	TFL	0.00	3500	4100	5290	55000	58000	61300	64600	68100	71800	75600
		2	4.75	2830	3320	4280	51800	54600	57400	60400	63600	66800	70200
		3	9.50	2160	2530	3270	47900	50300	52700	55300	58000	60800	63700
		4	14.3	1490	1750	2260	43000	44800	46700	48800	50800	53000	55300
		BFL	19.0	825	965	1250	36500	37700	38900	40200	41500	42900	44400
HE 280 B	19270	TFL	0.00	3090	3610	4660	43000	45600	48200	51100	54000	57100	60300
		2	4.50	2500	2920	3770	40500	42800	45200	47700	50300	53100	56000
		3	9	1900	2230	2880	37400	39300	41400	43500	45800	48100	50600
		4	13.5	1310	1530	1980	33400	34900	36500	38200	40000	41800	43700
		BFL	18	719	842	1090	28200	29200	30200	31300	32400	33600	34800
HE 260 B	14920	TFL	0.00	2780	3260	4200	34100	36300	38600	41000	43600	46200	49000
		2	4.38	2250	2630	3400	32100	34000	36100	38300	40500	42900	45400
		3	8.75	1710	2000	2590	29500	31200	33000	34800	36800	38800	40900
		4	13.1	1180	1380	1780	26300	27600	29000	30500	32000	33600	35200
		BFL	17.5	644	753	973	22100	23000	23800	24700	25700	26700	27700

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times 10^4$ mm^4

HEB Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HE 450 B	79890	TFL	0.00	5120	6000	7740	210000	217000	225000	233000	241000	250000	259000
		2	6.50	4210	4920	6350	197000	204000	211000	218000	226000	233000	241000
		3	13.0	3290	3850	4970	181000	187000	193000	200000	206000	213000	220000
		4	19.5	2370	2780	3590	162000	167000	172000	177000	182000	188000	193000
		BFL	26.0	1460	1710	2200	137000	141000	144000	148000	151000	155000	159000
		6	33.3	1370	1600	2070	135000	138000	141000	145000	148000	152000	155000
		7	40.6	1280	1500	1930	132000	135000	138000	141000	145000	148000	151000
HE 400 B	57680	TFL	0.00	4650	5440	7020	159000	165000	172000	179000	186000	193000	200000
		2	6.00	3800	4450	5740	149000	155000	161000	167000	173000	180000	186000
		3	12.0	2960	3460	4470	136000	141000	147000	152000	157000	163000	169000
		4	18.0	2110	2470	3190	121000	125000	129000	133000	138000	142000	147000
		BFL	24.0	1260	1480	1910	101000	104000	107000	109000	112000	116000	119000
		6	28.3	1210	1420	1830	99600	102000	105000	108000	111000	114000	117000
		7	32.7	1160	1360	1760	98200	101000	103000	106000	109000	112000	115000
HE 360 B	43190	TFL	0.00	4240	4970	6410	124000	130000	136000	142000	148000	154000	160000
		2	5.63	3450	4040	5210	116000	121000	126000	131000	137000	142000	148000
		3	11.3	2660	3110	4020	106000	110000	114000	119000	124000	128000	133000
		4	16.9	1860	2180	2820	92800	96200	99600	103000	107000	111000	115000
		BFL	22.5	1070	1250	1620	76000	78200	80500	82800	85300	87800	90400
		6	23.0	1070	1250	1610	75800	78000	80300	82700	85100	87600	90200
		7	23.4	1060	1240	1600	75700	77900	80200	82500	84900	87400	90000
HE 340 B	36660	TFL	0.00	4020	4700	6070	109000	114000	119000	124000	130000	135000	141000
		2	5.38	3260	3810	4920	101000	106000	110000	115000	120000	125000	130000
		3	10.8	2500	2930	3780	91800	95700	99700	104000	108000	112000	117000
		4	16.1	1740	2040	2630	80200	83200	86400	89600	93000	96400	100000
		BFL	21.5	985	1150	1490	65000	66900	69000	71100	73300	75600	77900
HE 320 B	30820	TFL	0.00	3790	4440	5730	94000	98600	103000	108000	113000	119000	124000
		2	5.13	3070	3590	4630	87400	91500	95800	100000	105000	109000	114000
		3	10.3	2350	2740	3540	79200	82700	86300	90100	94000	98000	102000
		4	15.4	1620	1900	2450	68700	71500	74300	77300	80300	83500	86700
		BFL	20.5	900	1050	1360	55100	56800	58700	60600	62500	64500	66600
HE 300 B	25170	TFL	0.00	3500	4100	5290	79500	83600	87900	92300	96800	102000	106000
		2	4.75	2830	3320	4280	73800	77400	81200	85200	89200	93400	97800
		3	9.50	2160	2530	3270	66700	69800	73100	76400	79900	83500	87200
		4	14.3	1490	1750	2260	57700	60100	62700	65300	68000	70800	73700
		BFL	19.0	825	965	1250	45900	47400	49100	50700	52500	54300	56100
HE 280 B	19270	TFL	0.00	3090	3610	4660	63700	67200	70800	74500	78400	82400	86500
		2	4.50	2500	2920	3770	59000	62100	65300	68700	72100	75700	79400
		3	9	1900	2230	2880	53100	55800	58600	61400	64400	67400	70600
		4	13.5	1310	1530	1980	45700	47800	50000	52200	54500	56900	59400
		BFL	18	719	842	1090	36000	37400	38700	40100	41600	43100	44700
HE 260 B	14920	TFL	0.00	2780	3260	4200	51900	54900	58100	61300	64700	68200	71800
		2	4.38	2250	2630	3400	48000	50700	53500	56400	59400	62500	65800
		3	8.75	1710	2000	2590	43100	45400	47800	50300	52900	55500	58300
		4	13.1	1180	1380	1780	36900	38700	40600	42500	44500	46600	48800
		BFL	17.5	644	753	973	28800	30000	31100	32400	33600	34900	36300

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, $\times 10^4$ mm^4
HEB Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HE 240 B	11260	TFL	0.00	2490	2920	3760	26600	28400	30400	32500	34600	36900	39300
		2	4.25	2010	2350	3040	24900	26600	28400	30200	32100	34200	36300
		3	8.50	1530	1790	2310	22900	24300	25800	27400	29100	30800	32600
		4	12.8	1050	1230	1590	20400	21500	22600	23900	25100	26500	27900
		BFL	17.0	573	671	866	17000	17700	18400	19200	20000	20900	21800
HE 220 B	8091	TFL	0.00	2140	2500	3230	19700	21200	22800	24500	26300	28200	30100
		2	4.00	1730	2020	2610	18500	19800	21300	22800	24400	26000	27800
		3	8.00	1310	1540	1980	17000	18100	19300	20600	21900	23400	24800
		4	12.0	899	1050	1360	15000	15900	16800	17800	18900	20000	21100
		BFL	16.0	485	568	733	12400	13000	13500	14200	14800	15500	16200
HE 200 B	5696	TFL	0.00	1830	2150	2770	14500	15700	17000	18300	19800	21300	22900
		2	3.75	1480	1730	2240	13500	14600	15800	17000	18300	19700	21100
		3	7.50	1130	1320	1710	12400	13300	14300	15300	16400	17600	18800
		4	11.3	777	910	1170	10900	11600	12400	13200	14100	15000	15900
		BFL	15.0	425	497	642	9000	9450	9940	10500	11000	11600	12200
HE 180 B	3831	TFL	0.00	1530	1790	2320	10200	11200	12200	13300	14400	15600	16900
		2	3.50	1240	1450	1870	9540	10400	11300	12300	13300	14300	15500
		3	7.00	941	1100	1420	8700	9410	10200	11000	11900	12800	13800
		4	10.5	645	755	974	7620	8180	8780	9410	10100	10800	11600
		BFL	14.0	349	408	527	6200	6550	6930	7330	7750	8200	8670
HE 160 B	2492	TFL	0.00	1270	1490	1930	7080	7810	8600	9440	10300	11300	12300
		2	3.25	1030	1210	1560	6590	7240	7950	8700	9500	10300	11200
		3	6.50	786	920	1190	5990	6550	7150	7790	8470	9200	9960
		4	9.75	542	634	818	5230	5660	6130	6630	7170	7730	8330
		BFL	13.0	297	348	449	4230	4500	4800	5120	5460	5820	6200
HE 140 B	1509	TFL	0.00	1010	1180	1530	4600	5140	5720	6340	7010	7720	8470
		2	3.00	812	950	1230	4270	4750	5260	5820	6410	7040	7710
		3	6.00	615	719	929	3850	4260	4700	5170	5670	6210	6780
		4	9.00	417	488	630	3320	3630	3970	4340	4730	5140	5580
		BFL	12.0	220	257	332	2620	2810	3020	3240	3480	3730	4000
HE 120 B	864.4	TFL	0.00	799	935	1210	2920	3310	3740	4200	4690	5220	5780
		2	2.75	644	754	973	2700	3050	3430	3840	4280	4750	5250
		3	5.50	489	572	739	2430	2720	3050	3390	3770	4170	4600
		4	8.25	334	391	504	2080	2310	2560	2830	3120	3430	3760
		BFL	11.0	179	209	270	1620	1760	1920	2080	2260	2460	2660
HE 100 B	449.5	TFL	0.00	612	716	924	1750	2020	2320	2650	3000	3380	3780
		2	2.50	494	579	747	1610	1860	2130	2420	2730	3070	3430
		3	5.00	377	441	569	1440	1650	1880	2130	2390	2680	2990
		4	7.50	259	304	392	1220	1390	1570	1760	1970	2190	2430
		BFL	10.0	142	166	214	940	1040	1160	1280	1410	1550	1700

[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 F.1 for PNA locations
[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, $\times10^4$ mm^4
HEB Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^{4}mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HE 240 B	11260	TFL	0.00	2490	2920	3760	41800	44400	47100	49900	52800	55800	59000
		2	4.25	2010	2350	3040	38500	40900	43300	45800	48400	51100	53900
		3	8.50	1530	1790	2310	34500	36500	38500	40700	42900	45200	47600
		4	12.8	1050	1230	1590	29400	30900	32500	34200	35900	37700	39600
		BFL	17.0	573	671	866	22700	23700	24700	25700	26800	27900	29100
HE 220 B	8091	TFL	0.00	2140	2500	3230	32200	34300	36500	38900	41300	43800	46400
		2	4.00	1730	2020	2610	29600	31500	33500	35600	37700	40000	42300
		3	8.00	1310	1540	1980	26400	28000	29700	31500	33300	35200	37200
		4	12.0	899	1050	1360	22300	23600	24900	26300	27700	29200	30700
		BFL	16.0	485	568	733	17000	17800	18600	19500	20400	21300	22200
HE 200 B	5696	TFL	0.00	1830	2150	2770	24600	26300	28200	30100	32100	34200	36300
		2	3.75	1480	1730	2240	22600	24200	25800	27500	29300	31100	33100
		3	7.50	1130	1320	1710	20100	21400	22800	24300	25800	27400	29000
		4	11.3	777	910	1170	16900	18000	19100	20200	21400	22600	23900
		BFL	15.0	425	497	642	12800	13500	14200	14900	15600	16400	17200
HE 180 B	3831	TFL	0.00	1530	1790	2320	18200	19600	21100	22600	24200	25900	27600
		2	3.50	1240	1450	1870	16700	17900	19200	20600	22000	23500	25100
		3	7.00	941	1100	1420	14800	15800	17000	18100	19300	20600	21900
		4	10.5	645	755	974	12400	13200	14100	15000	15900	16900	17900
		BFL	14.0	349	408	527	9170	9690	10200	10800	11400	12000	12600
HE 160 B	2492	TFL	0.00	1270	1490	1930	13300	14500	15600	16800	18100	19400	20800
		2	3.25	1030	1210	1560	12200	13200	14200	15300	16500	17600	18900
		3	6.50	786	920	1190	10800	11600	12500	13400	14400	15400	16500
		4	9.75	542	634	818	8960	9630	10300	11000	11800	12600	13400
		BFL	13.0	297	348	449	6600	7020	7460	7920	8400	8900	9430
HE 140 B	1509	TFL	0.00	1010	1180	1530	9260	10100	11000	11900	12900	13900	14900
		2	3.00	812	950	1230	8420	9170	9960	10800	11600	12500	13500
		3	6.00	615	719	929	7380	8010	8680	9380	10100	10900	11700
		4	9.00	417	488	630	6050	6540	7050	7590	8160	8750	9360
		BFL	12.0	220	257	332	4280	4580	4900	5230	5570	5940	6310
HE 120 B	864.4	TFL	0.00	799	935	1210	6370	7000	7670	8360	9090	9860	10700
		2	2.75	644	754	973	5780	6340	6940	7560	8210	8890	9610
		3	5.50	489	572	739	5050	5530	6030	6560	7110	7690	8300
		4	8.25	334	391	504	4110	4480	4870	5280	5720	6170	6640
		BFL	11.0	179	209	270	2880	3110	3350	3610	3870	4150	4450
HE 100 B	449.5	TFL	0.00	612	716	924	4210	4670	5150	5660	6190	6750	7340
		2	2.50	494	579	747	3810	4220	4650	5100	5580	6080	6610
		3	5.00	377	441	569	3320	3670	4030	4420	4830	5250	5700
		4	7.50	259	304	392	2690	2960	3250	3550	3870	4200	4550
		BFL	10.0	142	166	214	1870	2040	2220	2410	2610	2820	3040

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4
HEM Shapes

Shapes	$I_x{}^d$	PNA^c	$Y1^a$	ΣQ_n			$Y2^b$, mm						
				S235	S275	S355							
	×10^{4}mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HE 1000 M	722300	TFL	0.00	10400	12200	15800	1400000	1430000	1450000	1480000	1510000	1530000	1560000
		2	10.0	9020	10600	13600	1350000	1380000	1400000	1420000	1450000	1470000	1500000
		3	20.0	7600	8890	11500	1300000	1320000	1340000	1360000	1380000	1410000	1430000
		4	30.0	6180	7230	9340	1230000	1250000	1270000	1290000	1310000	1320000	1350000
		BFL	40.0	4760	5570	7190	1150000	1160000	1180000	1200000	1210000	1230000	1250000
		6	131	3690	4310	5570	1080000	1090000	1100000	1120000	1130000	1150000	1160000
		7	240	2610	3050	3940	995000	1000000	1020000	1030000	1040000	1050000	1060000
HE 900 M	570400	TFL	0.00	9950	11600	15000	1110000	1130000	1150000	1180000	1200000	1220000	1250000
		2	10.0	8540	9990	12900	1070000	1090000	1110000	1130000	1150000	1170000	1190000
		3	20.0	7120	8330	10700	1020000	1040000	1060000	1080000	1090000	1110000	1130000
		4	30.0	5700	6670	8610	964000	979000	995000	1010000	1030000	1050000	1060000
		BFL	40.0	4280	5010	6460	895000	908000	921000	935000	949000	963000	977000
		6	112.0	3380	3960	5110	844000	855000	867000	878000	890000	901000	913000
		7	203	2490	2910	3760	786000	795000	804000	813000	822000	831000	841000
HE 800 M	442600	TFL	0.00	9500	11100	14400	865000	883000	903000	922000	942000	962000	983000
		2	10.0	8080	9450	12200	831000	848000	865000	883000	901000	920000	939000
		3	20.0	6650	7790	10100	790000	806000	821000	838000	854000	871000	888000
		4	30.0	5230	6120	7900	742000	756000	769000	783000	797000	812000	826000
		BFL	40.0	3800	4450	5750	684000	695000	706000	717000	728000	740000	752000
		6	93.9	3090	3620	4670	650000	659000	668000	678000	688000	698000	708000
		7	166	2380	2780	3590	611000	619000	627000	634000	642000	650000	659000
HE 700 M	329300	TFL	0.00	9000	10500	13600	648000	664000	680000	697000	714000	731000	749000
		2	10.0	7570	8860	11400	621000	635000	650000	665000	681000	696000	713000
		3	20.0	6140	7190	9280	588000	601000	614000	627000	641000	655000	670000
		4	30.0	4710	5520	7120	548000	559000	570000	582000	594000	605000	618000
		BFL	40.0	3290	3840	4960	500000	508000	517000	526000	535000	544000	554000
		6	77.6	2770	3240	4180	479000	487000	494000	502000	510000	518000	527000
		7	130	2250	2630	3400	457000	463000	470000	476000	483000	490000	497000
HE 650 M	281700	TFL	0.00	8780	10300	13300	557000	572000	587000	602000	618000	634000	650000
		2	10.0	7350	8600	11100	533000	546000	560000	573000	588000	602000	617000
		3	20.0	5910	6920	8940	503000	515000	527000	539000	552000	565000	578000
		4	30.0	4480	5240	6770	468000	478000	488000	498000	509000	520000	531000
		BFL	40.0	3050	3570	4600	424000	431000	439000	447000	455000	463000	472000
		6	68.4	2620	3070	3960	408000	415000	422000	429000	436000	444000	451000
		7	112	2200	2570	3320	392000	398000	404000	410000	416000	422000	429000
HE 600 M	237400	TFL	0.00	8550	10000	12900	473000	486000	500000	514000	528000	543000	558000
		2	10.0	7110	8320	10700	452000	464000	476000	489000	502000	515000	529000
		3	20.0	5680	6650	8580	426000	436000	447000	458000	470000	481000	494000
		4	30.0	4250	4970	6410	394000	403000	412000	421000	431000	440000	450000
		BFL	40.0	2810	3290	4250	354000	361000	367000	374000	381000	389000	396000
		6	62.0	2470	2900	3740	343000	349000	355000	362000	368000	375000	381000
		7	93.5	2140	2500	3230	332000	337000	342000	348000	354000	360000	366000
HE 550 M	198000	TFL	0.00	8330	9750	12600	398000	410000	423000	435000	449000	462000	476000
		2	10.0	6890	8060	10400	379000	390000	401000	413000	425000	437000	450000
		3	20.0	5450	6380	8240	356000	366000	376000	386000	396000	407000	418000
		4	30.0	4010	4700	6060	328000	336000	344000	352000	361000	370000	379000
		BFL	40.0	2580	3010	3890	293000	298000	304000	310000	316000	323000	329000
		6	56.1	2330	2730	3520	285000	291000	296000	302000	307000	313000	319000
		7	75.0	2080	2440	3150	278000	283000	288000	293000	298000	304000	309000
HE 500 M	161900	TFL	0.00	8090	9470	12200	329000	340000	352000	363000	375000	387000	400000
		2	10.0	6650	7790	10100	313000	323000	333000	344000	354000	365000	377000
		3	20.0	5210	6100	7880	293000	302000	311000	320000	329000	339000	349000
		4	30.0	3780	4420	5700	269000	275000	283000	290000	298000	305000	314000
		BFL	40.0	2340	2740	3530	237000	242000	247000	252000	258000	263000	269000
		6	50.3	2180	2550	3290	233000	238000	242000	247000	252000	258000	263000
		7	60.6	2020	2370	3060	229000	233000	238000	242000	247000	252000	257000

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, ×10^4 mm^4
HEM Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HE 1000 M	722300	TFL	0.00	10400	12200	15800	1590000	1620000	1640000	1670000	1700000	1730000	1760000
		2	10.0	9020	10600	13600	1520000	1550000	1580000	1600000	1630000	1660000	1690000
		3	20.0	7600	8890	11500	1450000	1470000	1500000	1520000	1550000	1570000	1600000
		4	30.0	6180	7230	9340	1370000	1390000	1410000	1430000	1450000	1470000	1500000
		BFL	40.0	4760	5570	7190	1260000	1280000	1300000	1320000	1340000	1350000	1370000
		6	131	3690	4310	5570	1170000	1190000	1200000	1220000	1230000	1250000	1260000
		7	240	2610	3050	3940	1070000	1080000	1090000	1100000	1110000	1130000	1140000
HE 900 M	570400	TFL	0.00	9950	11600	15000	1270000	1300000	1320000	1350000	1370000	1400000	1420000
		2	10.0	8540	9990	12900	1220000	1240000	1260000	1290000	1310000	1330000	1360000
		3	20.0	7120	8330	10700	1150000	1170000	1200000	1220000	1240000	1260000	1280000
		4	30.0	5700	6670	8610	1080000	1100000	1120000	1130000	1150000	1170000	1190000
		BFL	40.0	4280	5010	6460	991000	1010000	1020000	1040000	1050000	1070000	1080000
		6	112.0	3380	3960	5110	926000	938000	951000	964000	977000	990000	1000000
		7	203	2490	2910	3760	851000	860000	870000	880000	891000	901000	912000
HE 800 M	442600	TFL	0.00	9500	11100	14400	1000000	1030000	1050000	1070000	1090000	1120000	1140000
		2	10.0	8080	9450	12200	959000	978000	998000	1020000	1040000	1060000	1080000
		3	20.0	6650	7790	10100	905000	923000	941000	959000	978000	997000	1020000
		4	30.0	5230	6120	7900	841000	856000	872000	888000	904000	920000	937000
		BFL	40.0	3800	4450	5750	764000	776000	789000	801000	814000	827000	841000
		6	93.9	3090	3620	4670	718000	729000	739000	750000	762000	773000	784000
		7	166	2380	2780	3590	667000	676000	685000	693000	703000	712000	721000
HE 700 M	329300	TFL	0.00	9000	10500	13600	767000	785000	804000	823000	843000	863000	884000
		2	10.0	7570	8860	11400	729000	746000	763000	781000	799000	817000	836000
		3	20.0	6140	7190	9280	684000	699000	715000	730000	746000	762000	779000
		4	30.0	4710	5520	7120	630000	643000	656000	669000	683000	696000	710000
		BFL	40.0	3290	3840	4960	563000	573000	583000	594000	604000	615000	626000
		6	77.6	2770	3240	4180	535000	544000	553000	562000	571000	580000	590000
		7	130	2250	2630	3400	504000	512000	519000	527000	535000	543000	551000
HE 650 M	281700	TFL	0.00	8780	10300	13300	667000	684000	702000	719000	738000	756000	775000
		2	10.0	7350	8600	11100	633000	648000	664000	681000	697000	714000	731000
		3	20.0	5910	6920	8940	592000	606000	620000	634000	649000	664000	679000
		4	30.0	4480	5240	6770	542000	554000	565000	577000	590000	602000	615000
		BFL	40.0	3050	3570	4600	480000	489000	498000	507000	517000	526000	536000
		6	68.4	2620	3070	3960	459000	467000	475000	483000	491000	500000	509000
		7	112	2200	2570	3320	436000	443000	450000	457000	464000	472000	479000
HE 600 M	237400	TFL	0.00	8550	10000	12900	574000	589000	606000	622000	639000	656000	674000
		2	10.0	7110	8320	10700	543000	557000	572000	587000	602000	618000	634000
		3	20.0	5680	6650	8580	506000	519000	531000	545000	558000	572000	586000
		4	30.0	4250	4970	6410	461000	471000	482000	493000	504000	516000	527000
		BFL	40.0	2810	3290	4250	404000	412000	420000	428000	436000	445000	454000
		6	62.0	2470	2900	3740	388000	396000	403000	410000	418000	426000	433000
		7	93.5	2140	2500	3230	372000	378000	385000	391000	398000	405000	412000
HE 550 M	198000	TFL	0.00	8330	9750	12600	490000	505000	520000	535000	550000	566000	583000
		2	10.0	6890	8060	10400	462000	476000	489000	503000	517000	532000	546000
		3	20.0	5450	6380	8240	429000	441000	452000	465000	477000	490000	502000
		4	30.0	4010	4700	6060	388000	397000	407000	417000	427000	438000	448000
		BFL	40.0	2580	3010	3890	336000	343000	350000	357000	365000	372000	380000
		6	56.1	2330	2730	3520	326000	332000	339000	345000	352000	359000	366000
		7	75.0	2080	2440	3150	315000	321000	327000	333000	339000	345000	352000
HE 500 M	161900	TFL	0.00	8090	9470	12200	413000	426000	440000	454000	468000	483000	498000
		2	10.0	6650	7790	10100	389000	401000	413000	426000	439000	452000	465000
		3	20.0	5210	6100	7880	359000	369000	380000	391000	402000	414000	426000
		4	30.0	3780	4420	5700	322000	330000	339000	348000	357000	366000	376000
		BFL	40.0	2340	2740	3530	275000	281000	287000	293000	299000	306000	313000
		6	50.3	2180	2550	3290	269000	274000	280000	286000	292000	298000	305000
		7	60.6	2020	2370	3060	262000	268000	273000	279000	285000	290000	296000

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4

HEM Shapes

Shapes	I_x [d]	PNA [c]	$Y1$ [a]	ΣQ_n			$Y2$ [b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
HE 450 M	131500	TFL	0.00	7880	9220	11900	272000	281000	292000	302000	313000	324000	336000
		2	10.0	6440	7540	9730	257000	266000	275000	285000	295000	305000	315000
		3	20.0	5000	5850	7550	240000	248000	256000	264000	272000	281000	290000
		4	30.0	3550	4160	5370	219000	225000	231000	238000	244000	251000	258000
		BFL	40.0	2110	2470	3190	191000	195000	199000	204000	208000	213000	218000
		6	44.6	2040	2390	3080	189000	193000	197000	202000	206000	211000	216000
		7	49.1	1970	2310	2980	188000	191000	196000	200000	204000	209000	213000
HE 400 M	104100	TFL	0.00	7660	8960	11600	219000	228000	237000	247000	257000	267000	277000
		2	10.0	6210	7270	9390	207000	215000	223000	232000	241000	250000	259000
		3	20.0	4770	5580	7210	193000	199000	206000	214000	221000	229000	237000
		4	30.0	3330	3890	5030	174000	179000	185000	191000	197000	203000	209000
		BFL	40.0	1880	2210	2850	150000	153000	157000	160000	164000	168000	172000
HE 360 M	84870	TFL	0.00	7490	8770	11300	183000	191000	199000	208000	217000	226000	236000
		2	10.0	6040	7070	9130	172000	179000	187000	194000	203000	211000	219000
		3	20.0	4600	5380	6940	159000	165000	172000	178000	185000	192000	199000
		4	30.0	3150	3680	4760	143000	147000	152000	158000	163000	168000	174000
		BFL	40.0	1700	1990	2570	121000	124000	127000	130000	134000	137000	141000
HE 340 M	76370	TFL	0.00	7420	8680	11200	166000	174000	182000	190000	199000	208000	217000
		2	10.0	5970	6990	9020	156000	163000	170000	178000	186000	194000	202000
		3	20.0	4520	5290	6820	144000	150000	156000	163000	169000	176000	183000
		4	30.0	3060	3590	4630	129000	133000	138000	143000	148000	153000	159000
		BFL	40.0	1610	1890	2440	108000	111000	114000	117000	120000	123000	127000
HE 320 M	68130	TFL	0.00	7330	8580	11100	150000	158000	165000	173000	181000	190000	199000
		2	10.0	5880	6880	8880	141000	148000	155000	162000	169000	177000	185000
		3	20.0	4430	5180	6690	130000	136000	141000	147000	153000	160000	167000
		4	30.0	2980	3480	4490	116000	120000	124000	129000	134000	138000	144000
		BFL	40.0	1520	1780	2300	96400	98900	102000	104000	107000	110000	113000
HE 300 M	59200	TFL	0.00	7120	8340	10800	133000	139000	146000	154000	162000	170000	178000
		2	9.75	5700	6670	8610	124000	130000	137000	143000	150000	157000	165000
		3	19.5	4280	5010	6470	114000	119000	125000	130000	136000	142000	148000
		4	29.3	2860	3350	4320	101000	105000	109000	113000	118000	123000	127000
		BFL	39.0	1440	1690	2180	83900	86200	88600	91100	93700	96400	99200
HE 280 M	39550	TFL	0.00	5640	6610	8530	90000	95100	100000	106000	112000	118000	124000
		2	8.25	4530	5300	6840	84500	89000	93700	98600	104000	109000	115000
		3	16.5	3410	3990	5150	77600	81400	85400	89500	93900	98400	103000
		4	24.8	2290	2690	3470	68700	71600	74700	77900	81200	84700	88300
		BFL	33.0	1180	1380	1780	57000	58700	60500	62500	64400	66500	68700
HE 260 M	31310	TFL	0.00	5160	6040	7800	73100	77500	82100	86900	91900	97200	103000
		2	8.13	4140	4840	6250	68500	72400	76500	80800	85300	90000	94800
		3	16.3	3110	3640	4700	62700	66000	69500	73100	76900	80900	85000
		4	24.4	2090	2450	3160	55400	57900	60600	63400	66300	69300	72500
		BFL	32.5	1070	1250	1610	45600	47100	48700	50400	52100	53900	55800

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times 10^4$ mm^4
HEM Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HE 450 M	131500	TFL	0.00	7880	9220	11900	348000	360000	372000	385000	398000	412000	426000
		2	10.0	6440	7540	9730	326000	337000	348000	360000	372000	384000	396000
		3	20.0	5000	5850	7550	299000	309000	318000	328000	339000	349000	360000
		4	30.0	3550	4160	5370	266000	273000	281000	289000	297000	306000	314000
		BFL	40.0	2110	2470	3190	223000	228000	233000	239000	244000	250000	256000
		6	44.6	2040	2390	3080	220000	225000	231000	236000	241000	247000	253000
		7	49.1	1970	2310	2980	218000	223000	228000	233000	238000	244000	249000
HE 400 M	104100	TFL	0.00	7660	8960	11600	288000	299000	311000	322000	334000	347000	360000
		2	10.0	6210	7270	9390	269000	279000	289000	300000	310000	322000	333000
		3	20.0	4770	5580	7210	245000	254000	263000	272000	281000	290000	300000
		4	30.0	3330	3890	5030	216000	222000	229000	236000	244000	251000	259000
		BFL	40.0	1880	2210	2850	177000	181000	186000	190000	195000	200000	205000
HE 360 M	84870	TFL	0.00	7490	8770	11300	246000	256000	266000	277000	289000	300000	312000
		2	10.0	6040	7070	9130	228000	238000	247000	257000	267000	277000	288000
		3	20.0	4600	5380	6940	207000	215000	223000	231000	240000	249000	258000
		4	30.0	3150	3680	4760	180000	186000	192000	199000	205000	212000	219000
		BFL	40.0	1700	1990	2570	144000	148000	152000	156000	160000	165000	169000
HE 340 M	76370	TFL	0.00	7420	8680	11200	227000	237000	247000	257000	268000	279000	291000
		2	10.0	5970	6990	9020	210000	219000	228000	238000	247000	257000	268000
		3	20.0	4520	5290	6820	190000	198000	205000	213000	221000	230000	239000
		4	30.0	3060	3590	4630	164000	170000	176000	182000	188000	195000	202000
		BFL	40.0	1610	1890	2440	130000	134000	137000	141000	145000	149000	153000
HE 320 M	68130	TFL	0.00	7330	8580	11100	208000	218000	227000	237000	248000	259000	270000
		2	10.0	5880	6880	8880	193000	201000	210000	219000	228000	238000	248000
		3	20.0	4430	5180	6690	173000	181000	188000	196000	204000	212000	220000
		4	30.0	2980	3480	4490	149000	154000	160000	166000	172000	178000	185000
		BFL	40.0	1520	1780	2300	116000	120000	123000	126000	130000	134000	137000
HE 300 M	59200	TFL	0.00	7120	8340	10800	187000	196000	205000	214000	224000	234000	245000
		2	9.75	5700	6670	8610	173000	180000	189000	197000	206000	215000	224000
		3	19.5	4280	5010	6470	155000	162000	169000	176000	183000	191000	199000
		4	29.3	2860	3350	4320	132000	137000	143000	148000	154000	160000	166000
		BFL	39.0	1440	1690	2180	102000	105000	108000	111000	115000	118000	122000
HE 280 M	39550	TFL	0.00	5640	6610	8530	130000	137000	144000	151000	159000	166000	174000
		2	8.25	4530	5300	6840	120000	126000	133000	139000	146000	152000	160000
		3	16.5	3410	3990	5150	108000	113000	118000	124000	129000	135000	141000
		4	24.8	2290	2690	3470	92000	95900	100000	104000	108000	113000	117000
		BFL	33.0	1180	1380	1780	70900	73200	75600	78100	80700	83300	86100
HE 260 M	31310	TFL	0.00	5160	6040	7800	108000	114000	120000	127000	133000	140000	147000
		2	8.13	4140	4840	6250	99900	105000	111000	116000	122000	128000	135000
		3	16.3	3110	3640	4700	89300	93800	98400	103000	108000	113000	119000
		4	24.4	2090	2450	3160	75800	79200	82700	86400	90200	94100	98200
		BFL	32.5	1070	1250	1610	57700	59800	61900	64100	66300	68600	71000

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10⁴ mm⁴
HEM Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4 mm^4$		mm	kN	kN	kN	50	60	70	80	90	100	110
HE 240 M	24290	TFL	0.00	4690	5490	7090	58400	62200	66200	70400	74800	79400	84200
		2	8.00	3760	4400	5680	54700	58100	61600	65300	69200	73300	77600
		3	16.0	2830	3310	4270	50000	52800	55800	59000	62300	65700	69300
		4	24.0	1890	2220	2860	43900	46100	48400	50800	53300	56000	58700
		BFL	32.0	961	1120	1450	35900	37200	38500	40000	41500	43000	44700
HE 220 M	14600	TFL	0.00	3510	4110	5300	36200	38800	41600	44500	47500	50800	54100
		2	6.5	2820	3300	4260	33800	36200	38600	41200	44000	46800	49800
		3	13.0	2130	2490	3220	30900	32900	35000	37200	39500	41900	44400
		4	19.5	1440	1680	2170	27200	28700	30300	32000	33800	35600	37600
		BFL	26.0	749	877	1130	22200	23100	24100	25100	26200	27300	28500
HE 200 M	10640	TFL	0.00	3090	3610	4660	27400	29600	31900	34300	36900	39600	42400
		2	6.25	2480	2900	3750	25600	27600	29600	31800	34000	36400	39000
		3	12.5	1880	2190	2830	23300	25000	26700	28600	30500	32500	34700
		4	18.8	1270	1490	1920	20400	21700	23000	24500	26000	27500	29200
		BFL	25.0	665	778	1000	16600	17400	18200	19000	20000	20900	21900
HE 180 M	7483	TFL	0.00	2660	3120	4020	20200	22000	23900	25800	27900	30100	32500
		2	6.00	2140	2500	3230	18800	20400	22100	23800	25700	27700	29700
		3	12.0	1610	1890	2440	17100	18400	19800	21300	22900	24600	26300
		4	18.0	1090	1270	1650	14900	15900	17000	18100	19400	20600	22000
		BFL	24.0	564	661	853	11900	12600	13200	13900	14600	15400	16200
HE 160 M	5098	TFL	0.00	2280	2670	3450	14600	16000	17500	19100	20800	22600	24500
		2	5.75	1830	2140	2770	13600	14800	16200	17600	19100	20700	22400
		3	11.5	1380	1620	2090	12300	13300	14500	15700	17000	18300	19800
		4	17.3	935	1090	1410	10600	11400	12300	13300	14200	15300	16400
		BFL	23.0	486	569	734	8440	8940	9460	10000	10600	11300	11900
HE 140 M	3291	TFL	0.00	1890	2220	2860	10100	11200	12400	13600	14900	16300	17800
		2	5.50	1520	1770	2290	9340	10300	11400	12500	13600	14900	16200
		3	11.0	1140	1330	1720	8400	9220	10100	11000	12000	13100	14200
		4	16.5	761	890	1150	7190	7820	8490	9200	9970	10800	11600
		BFL	22.0	384	449	579	5580	5950	6340	6770	7210	7690	8190
HE 120 M	2018	TFL	0.00	1560	1830	2360	6800	7630	8530	9490	10500	11600	12800
		2	5.25	1250	1460	1890	6270	7010	7810	8660	9580	10600	11600
		3	10.5	939	1100	1420	5610	6230	6910	7630	8400	9230	10100
		4	15.8	628	735	949	4760	5240	5750	6310	6900	7520	8190
		BFL	21.0	317	371	479	3630	3910	4220	4540	4890	5260	5650
HE 100 M	1143	TFL	0.00	1250	1460	1890	4360	4980	5640	6360	7130	7960	8840
		2	5.00	1000	1170	1510	4010	4550	5140	5780	6470	7200	7990
		3	10.0	753	881	1140	3560	4020	4520	5060	5640	6260	6920
		4	15.0	504	590	761	2990	3340	3730	4140	4580	5060	5560
		BFL	20.0	255	298	385	2230	2440	2670	2910	3170	3450	3750

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4
HEM Shapes

Shapes	I_x [d]	PNA [c]	$Y1$ [a]	ΣQ_n			$Y2$ [b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
HE 240 M	24290	TFL	0.00	4690	5490	7090	89200	94400	99800	105000	111000	117000	123000
		2	8.00	3760	4400	5680	82000	86600	91400	96400	102000	107000	112000
		3	16.0	2830	3310	4270	73100	77000	81000	85200	89600	94100	98700
		4	24.0	1890	2220	2860	61600	64600	67700	70900	74200	77700	81200
		BFL	32.0	961	1120	1450	46400	48100	50000	51900	53800	55900	58000
HE 220 M	14600	TFL	0.00	3510	4110	5300	57600	61300	65100	69100	73200	77400	81800
		2	6.5	2820	3300	4260	52900	56200	59600	63100	66800	70600	74500
		3	13.0	2130	2490	3220	47100	49900	52700	55700	58800	62000	65400
		4	19.5	1440	1680	2170	39600	41800	44000	46300	48700	51100	53700
		BFL	26.0	749	877	1130	29700	31000	32400	33800	35200	36700	38200
HE 200 M	10640	TFL	0.00	3090	3610	4660	45400	48500	51700	55000	58500	62100	65900
		2	6.25	2480	2900	3750	41600	44300	47200	50200	53300	56500	59800
		3	12.5	1880	2190	2830	36900	39200	41700	44200	46800	49600	52400
		4	18.8	1270	1490	1920	30900	32700	34600	36500	38600	40700	42800
		BFL	25.0	665	778	1000	23000	24100	25200	26400	27600	28900	30200
HE 180 M	7483	TFL	0.00	2660	3120	4020	34900	37500	40100	42900	45800	48800	51900
		2	6.00	2140	2500	3230	31900	34200	36500	39000	41600	44300	47000
		3	12.0	1610	1890	2440	28200	30100	32100	34200	36400	38600	41000
		4	18.0	1090	1270	1650	23400	24900	26400	28000	29700	31500	33300
		BFL	24.0	564	661	853	17100	18000	18900	19900	20900	21900	23000
HE 160 M	5098	TFL	0.00	2280	2670	3450	26500	28600	30800	33000	35400	37900	40500
		2	5.75	1830	2140	2770	24200	26000	28000	30000	32100	34300	36600
		3	11.5	1380	1620	2090	21300	22800	24500	26200	28000	29900	31800
		4	17.3	935	1090	1410	17500	18800	20000	21300	22700	24200	25700
		BFL	23.0	486	569	734	12600	13400	14100	14900	15800	16600	17500
HE 140 M	3291	TFL	0.00	1890	2220	2860	19400	21100	22800	24600	26500	28500	30500
		2	5.50	1520	1770	2290	17600	19100	20600	22200	23900	25700	27500
		3	11.0	1140	1330	1720	15400	16600	17900	19300	20700	22200	23700
		4	16.5	761	890	1150	12500	13500	14500	15500	16600	17700	18900
		BFL	22.0	384	449	579	8720	9280	9860	10500	11100	11800	12500
HE 120 M	2018	TFL	0.00	1560	1830	2360	14000	15300	16700	18100	19600	21100	22800
		2	5.25	1250	1460	1890	12700	13800	15000	16300	17600	19000	20500
		3	10.5	939	1100	1420	11000	12000	13000	14100	15200	16400	17600
		4	15.8	628	735	949	8900	9640	10400	11200	12100	13000	13900
		BFL	21.0	317	371	479	6070	6500	6960	7440	7950	8480	9030
HE 100 M	1143	TFL	0.00	1250	1460	1890	9770	10800	11800	12900	14000	15200	16500
		2	5.00	1000	1170	1510	8810	9690	10600	11600	12600	13700	14800
		3	10.0	753	881	1140	7620	8360	9140	9960	10800	11700	12700
		4	15.0	504	590	761	6100	6660	7260	7880	8540	9230	9950
		BFL	20.0	255	298	385	4060	4390	4750	5110	5500	5910	6330

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4

IPE Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×$10^4$$mm^4$		mm	kN	kN	kN	50	60	70	80	90	100	110
IPE 600	92080	TFL	0.00	3670	4290	5540	95600	101000	107000	113000	119000	125000	131000
		2	4.75	3170	3720	4800	88700	93800	99100	105000	110000	116000	122000
		3	9.50	2680	3140	4050	80800	85500	90300	95200	100000	106000	111000
		4	14.3	2190	2570	3310	71500	75700	79900	84300	88800	93400	98200
		BFL	19.0	1700	1990	2570	60600	64100	67700	71400	75200	79100	83100
		6	67.9	1310	1530	1980	50300	53200	56200	59300	62400	65700	69000
		7	138	917	1070	1380	38200	40400	42700	45100	47500	49900	52500
IPE 550	67120	TFL	0.00	3160	3700	4770	71000	75400	80000	84700	89500	94500	99600
		2	4.30	2730	3200	4130	65900	70000	74200	78600	83100	87700	92400
		3	8.60	2310	2700	3490	60000	63700	67600	71500	75600	79800	84200
		4	12.9	1890	2210	2850	53100	56400	59800	63300	66900	70700	74500
		BFL	17.2	1460	1710	2210	44900	47700	50600	53600	56600	59800	63000
		6	59.3	1130	1320	1700	37300	39600	42000	44500	47000	49700	52300
		7	124	790	924	1190	28400	30200	32000	33900	35800	37800	39800
IPE 500	48200	TFL	0.00	2710	3180	4100	52000	55500	59100	62900	66800	70700	74800
		2	4.00	2340	2740	3530	48100	51400	54700	58200	61800	65500	69300
		3	8.00	1960	2300	2960	43600	46600	49600	52800	56000	59400	62800
		4	12.0	1590	1860	2400	38300	40900	43600	46400	49300	52200	55200
		BFL	16.0	1210	1420	1830	32100	34200	36500	38800	41200	43600	46200
		6	53.0	944	1110	1430	26800	28700	30500	32500	34500	36500	38600
		7	108	679	794	1030	20800	22200	23700	25200	26700	28300	29900
IPE 450	33740	TFL	0.00	2320	2720	3510	37400	40100	43000	46000	49000	52200	55500
		2	3.65	2000	2340	3020	34500	37100	39800	42500	45300	48300	51300
		3	7.30	1670	1950	2520	31300	33600	36000	38500	41000	43700	46400
		4	11.0	1340	1570	2030	27400	29400	31500	33700	36000	38300	40700
		BFL	14.6	1020	1190	1540	22800	24500	26200	28000	29900	31800	33800
		6	44.0	800	936	1210	19100	20600	22000	23500	25100	26700	28400
		7	93.6	581	679	877	14900	16100	17200	18400	19600	20900	22200
IPE 400	23130	TFL	0.00	1980	2320	3000	26400	28500	30800	33100	35500	38000	40600
		2	3.38	1700	1990	2570	24400	26300	28400	30500	32800	35100	37400
		3	6.75	1410	1650	2140	22000	23800	25600	27500	29600	31600	33800
		4	10.1	1130	1320	1700	19100	20700	22300	24000	25700	27600	29400
		BFL	13.5	843	986	1270	15700	17000	18400	19700	21200	22700	24200
		6	34.4	669	783	1010	13300	14400	15500	16700	17900	19200	20500
		7	77.2	496	581	750	10600	11400	12300	13200	14200	15200	16200
IPE 360	16270	TFL	0.00	1710	2000	2580	19200	20900	22700	24600	26500	28500	30600
		2	3.18	1460	1700	2200	17700	19300	20900	22600	24400	26200	28100
		3	6.35	1200	1410	1820	15900	17300	18800	20300	21900	23500	25300
		4	9.52	948	1110	1430	13700	14900	16200	17500	18900	20300	21800
		BFL	12.7	694	813	1050	11100	12100	13100	14200	15300	16500	17700
		6	30.8	561	656	847	9510	10400	11200	12100	13100	14100	15100
		7	66.4	427	500	645	7700	8380	9090	9830	10600	11400	12200

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, $\times 10^4$ mm^4
IPE Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
	$\times 10^4$mm^4		mm	S235 kN	S275 kN	S355 kN	120	130	140	150	160	170	180
IPE 600	92080	TFL	0.00	3670	4290	5540	138000	144000	151000	158000	165000	172000	180000
		2	4.75	3170	3720	4800	128000	134000	140000	147000	153000	160000	167000
		3	9.50	2680	3140	4050	116000	122000	128000	134000	140000	146000	152000
		4	14.3	2190	2570	3310	103000	108000	113000	118000	124000	129000	135000
		BFL	19.0	1700	1990	2570	87200	91400	95700	100000	105000	109000	114000
		6	67.9	1310	1530	1980	72400	75900	79500	83100	86900	90700	94600
		7	138	917	1070	1380	55000	57700	60400	63200	66000	68900	71900
IPE 550	67120	TFL	0.00	3160	3700	4770	105000	110000	116000	121000	127000	133000	139000
		2	4.30	2730	3200	4130	97300	102000	107000	113000	118000	123000	129000
		3	8.60	2310	2700	3490	88600	93100	97800	103000	107000	112000	118000
		4	12.9	1890	2210	2850	78400	82400	86500	90700	95100	99500	104000
		BFL	17.2	1460	1710	2210	66300	69700	73200	76800	80400	84200	88000
		6	59.3	1130	1320	1700	55100	57900	60800	63800	66800	69900	73100
		7	124	790	924	1190	41900	44100	46300	48600	50900	53200	55700
IPE 500	48200	TFL	0.00	2710	3180	4100	79100	83400	87800	92400	97100	102000	107000
		2	4.00	2340	2740	3530	73200	77200	81300	85500	89900	94300	98800
		3	8.00	1960	2300	2960	66400	70000	73700	77500	81500	85500	89600
		4	12.0	1590	1860	2400	58300	61500	64800	68200	71600	75200	78800
		BFL	16.0	1210	1420	1830	48800	51400	54200	57000	59900	62800	65900
		6	53.0	944	1110	1430	40800	43100	45400	47700	50100	52600	55100
		7	108	679	794	1030	31600	33400	35100	37000	38800	40800	42700
IPE 450	33740	TFL	0.00	2320	2720	3510	58800	62300	65800	69500	73200	77100	81000
		2	3.65	2000	2340	3020	54400	57600	60900	64200	67700	71300	74900
		3	7.30	1670	1950	2520	49200	52100	55100	58100	61300	64500	67800
		4	11.0	1340	1570	2030	43100	45700	48300	51000	53700	56500	59400
		BFL	14.6	1020	1190	1540	35900	38000	40100	42400	44700	47000	49400
		6	44.0	800	936	1210	30100	31900	33700	35600	37500	39500	41500
		7	93.6	581	679	877	23500	24900	26300	27800	29300	30800	32400
IPE 400	23130	TFL	0.00	1980	2320	3000	43200	46000	48800	51700	54700	57800	61000
		2	3.38	1700	1990	2570	39900	42400	45000	47700	50500	53300	56300
		3	6.75	1410	1650	2140	36000	38300	40600	43000	45500	48100	50700
		4	10.1	1130	1320	1700	31300	33300	35400	37500	39700	41900	44200
		BFL	13.5	843	986	1270	25800	27400	29100	30800	32600	34500	36400
		6	34.4	669	783	1010	21800	23200	24600	26100	27600	29200	30800
		7	77.2	496	581	750	17300	18400	19500	20700	21900	23100	24400
IPE 360	16270	TFL	0.00	1710	2000	2580	32700	34900	37200	39600	42000	44500	47100
		2	3.18	1460	1700	2200	30100	32100	34300	36400	38700	41000	43400
		3	6.35	1200	1410	1820	27000	28900	30700	32700	34700	36800	38900
		4	9.52	948	1110	1430	23400	24900	26600	28300	30000	31800	33600
		BFL	12.7	694	813	1050	18900	20200	21500	22900	24300	25700	27200
		6	30.8	561	656	847	16200	17300	18400	19600	20800	22000	23300
		7	66.4	427	500	645	13100	14000	14900	15800	16800	17800	18900

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4
IPE Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
IPE 330	11770	TFL	0.00	1470	1720	2220	14500	15800	17300	18800	20400	22000	23700
		2	2.88	1260	1470	1900	13300	14600	15900	17300	18700	20200	21800
		3	5.75	1040	1220	1570	12000	13100	14300	15600	16900	18200	19600
		4	8.63	823	963	1240	10400	11400	12400	13500	14600	15800	17000
		BFL	11.5	607	710	916	8450	9250	10100	11000	11900	12800	13800
		6	28.2	487	570	736	7200	7890	8600	9350	10100	10900	11800
		7	60.7	368	430	556	5790	6340	6920	7520	8140	8790	9470
IPE 300	8356	TFL	0.00	1260	1480	1910	10800	11900	13000	14200	15500	16800	18200
		2	2.68	1080	1260	1630	9900	10900	12000	13100	14200	15500	16700
		3	5.35	887	1040	1340	8880	9790	10700	11700	12800	13900	15000
		4	8.02	699	818	1060	7660	8450	9270	10100	11000	12000	12900
		BFL	10.7	510	597	771	6190	6820	7490	8180	8910	9670	10500
		6	26.2	413	483	624	5300	5840	6410	7010	7630	8280	8960
		7	55.3	316	370	478	4310	4750	5210	5690	6200	6730	7280
IPE 270	5790	TFL	0.00	1080	1260	1630	7860	8740	9660	10600	11600	12700	13800
		2	2.55	918	1070	1390	7230	8030	8870	9760	10700	11700	12700
		3	5.10	756	885	1140	6480	7200	7950	8750	9580	10500	11400
		4	7.65	594	696	898	5580	6200	6860	7540	8260	9010	9790
		BFL	10.2	433	506	654	4500	5000	5520	6080	6650	7260	7890
		6	23.5	351	411	531	3860	4290	4740	5210	5710	6230	6770
		7	48.0	270	316	408	3150	3500	3860	4250	4650	5080	5520
IPE 240	3892	TFL	0.00	919	1080	1390	5650	6340	7060	7820	8630	9470	10300
		2	2.45	781	914	1180	5190	5820	6490	7190	7930	8700	9510
		3	4.90	643	752	971	4650	5220	5810	6440	7100	7790	8520
		4	7.35	505	591	763	4010	4490	5010	5550	6120	6710	7340
		BFL	9.80	367	429	554	3220	3610	4030	4460	4920	5400	5900
		6	21.3	298	349	450	2770	3100	3460	3830	4230	4640	5070
		7	41.1	230	269	347	2260	2540	2820	3130	3450	3790	4140
IPE 220	2772	TFL	0.00	784	918	1180	4270	4820	5410	6020	6670	7360	8080
		2	2.30	665	779	1010	3920	4430	4960	5530	6130	6750	7410
		3	4.60	546	639	825	3510	3960	4440	4950	5480	6040	6630
		4	6.90	427	500	646	3010	3400	3810	4250	4710	5190	5700
		BFL	9.20	309	361	466	2410	2720	3050	3400	3770	4160	4560
		6	20.0	252	295	381	2080	2350	2630	2930	3250	3580	3930
		7	39.3	196	229	296	1710	1930	2160	2410	2670	2940	3230
IPE 200	1943	TFL	0.00	669	783	1010	3200	3650	4120	4610	5140	5700	6280
		2	2.13	569	666	860	2950	3350	3780	4240	4730	5240	5770
		3	4.25	470	549	709	2640	3010	3390	3800	4240	4700	5180
		4	6.38	370	433	558	2280	2590	2930	3280	3660	4050	4470
		BFL	8.50	270	316	408	1840	2090	2360	2650	2950	3270	3610
		6	18.7	219	256	330	1580	1790	2030	2270	2530	2800	3090
		7	36.4	167	196	253	1280	1460	1650	1850	2060	2280	2510

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, ×10⁴ mm⁴
IPE Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10⁴mm⁴		mm	kN	kN	kN	120	130	140	150	160	170	180
IPE 330	11770	TFL	0.00	1470	1720	2220	25400	27200	29100	31100	33100	35100	37300
		2	2.88	1260	1470	1900	23400	25100	26800	28600	30400	32300	34300
		3	5.75	1040	1220	1570	21000	22600	24100	25700	27400	29100	30800
		4	8.63	823	963	1240	18200	19500	20900	22300	23700	25200	26700
		BFL	11.5	607	710	916	14800	15900	17000	18100	19300	20500	21800
		6	28.2	487	570	736	12700	13600	14500	15500	16500	17500	18500
		7	60.7	368	430	556	10200	10900	11600	12400	13200	14100	14900
IPE 300	8356	TFL	0.00	1260	1480	1910	19600	21100	22600	24200	25900	27600	29300
		2	2.68	1080	1260	1630	18000	19400	20800	22300	23800	25300	26900
		3	5.35	887	1040	1340	16200	17400	18700	20000	21300	22700	24200
		4	8.02	699	818	1060	14000	15000	16100	17200	18400	19600	20900
		BFL	10.7	510	597	771	11300	12100	13000	13900	14900	15800	16800
		6	26.2	413	483	624	9660	10400	11100	11900	12700	13600	14400
		7	55.3	316	370	478	7850	8440	9050	9690	10300	11000	11700
IPE 270	5790	TFL	0.00	1080	1260	1630	14900	16100	17400	18700	20000	21400	22800
		2	2.55	918	1070	1390	13700	14800	16000	17200	18400	19600	21000
		3	5.10	756	885	1140	12300	13300	14300	15400	16500	17600	18800
		4	7.65	594	696	898	10600	11500	12300	13300	14200	15200	16200
		BFL	10.2	433	506	654	8550	9230	9940	10700	11400	12200	13000
		6	23.5	351	411	531	7330	7920	8530	9160	9820	10500	11200
		7	48.0	270	316	408	5980	6450	6950	7470	8000	8550	9120
IPE 240	3892	TFL	0.00	919	1080	1390	11300	12200	13200	14300	15300	16500	17600
		2	2.45	781	914	1180	10400	11200	12100	13100	14100	15100	16200
		3	4.90	643	752	971	9270	10100	10900	11700	12600	13500	14500
		4	7.35	505	591	763	7990	8670	9370	10100	10900	11700	12500
		BFL	9.80	367	429	554	6420	6970	7540	8130	8740	9380	10000
		6	21.3	298	349	450	5520	5990	6480	6990	7510	8060	8620
		7	41.1	230	269	347	4510	4890	5290	5700	6130	6580	7040
IPE 220	2772	TFL	0.00	784	918	1180	8830	9610	10400	11300	12200	13100	14000
		2	2.30	665	779	1010	8100	8820	9570	10400	11200	12000	12900
		3	4.60	546	639	825	7250	7890	8560	9260	9990	10700	11500
		4	6.90	427	500	646	6230	6780	7360	7960	8580	9230	9900
		BFL	9.20	309	361	466	4980	5430	5890	6370	6870	7390	7920
		6	20.0	252	295	381	4300	4680	5080	5490	5920	6370	6830
		7	39.3	196	229	296	3530	3840	4170	4510	4870	5230	5610
IPE 200	1943	TFL	0.00	669	783	1010	6890	7530	8200	8900	9630	10400	11200
		2	2.13	569	666	860	6340	6930	7540	8180	8850	9540	10300
		3	4.25	470	549	709	5680	6210	6760	7340	7940	8560	9210
		4	6.38	370	433	558	4900	5360	5840	6330	6850	7390	7940
		BFL	8.50	270	316	408	3960	4330	4710	5110	5530	5960	6410
		6	18.7	219	256	330	3390	3710	4040	4380	4740	5110	5500
		7	36.4	167	196	253	2760	3010	3280	3560	3850	4150	4470

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times10^4$ mm^4
IPE Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
IPE 180	1317	TFL	0.00	563	659	850	2350	2690	3070	3460	3880	4320	4790
		2	2.00	477	559	721	2150	2470	2810	3180	3560	3970	4400
		3	4.00	392	458	592	1930	2210	2520	2840	3180	3550	3930
		4	6.00	306	358	463	1650	1900	2160	2440	2730	3050	3380
		BFL	8.00	221	258	333	1320	1520	1730	1950	2190	2440	2700
		6	17.5	181	211	273	1140	1310	1490	1680	1890	2100	2330
		7	33.5	141	165	213	939	1080	1230	1380	1550	1730	1920
IPE 160	869.3	TFL	0.00	472	552	713	1700	1970	2260	2570	2900	3250	3630
		2	1.85	401	469	605	1560	1810	2080	2360	2670	2990	3330
		3	3.70	330	386	498	1400	1620	1860	2110	2390	2680	2980
		4	5.55	258	302	390	1200	1390	1600	1820	2050	2300	2560
		BFL	7.40	187	219	282	963	1120	1280	1460	1650	1850	2060
		6	15.7	152	178	230	829	961	1100	1260	1420	1590	1770
		7	29.8	118	138	178	679	788	904	1030	1160	1300	1450
IPE 140	541.2	TFL	0.00	386	452	583	1180	1390	1610	1850	2100	2370	2660
		2	1.73	327	383	494	1080	1270	1480	1700	1930	2180	2440
		3	3.45	268	313	404	969	1140	1320	1510	1720	1940	2180
		4	5.18	209	244	315	830	974	1130	1300	1480	1670	1870
		BFL	6.90	149	175	226	660	775	898	1030	1170	1320	1480
		6	14.3	123	144	186	571	671	778	893	1020	1150	1290
		7	26.3	96.5	113	146	473	555	644	739	841	950	1060
IPE 120	317.8	TFL	0.00	310	363	469	799	951	1120	1290	1490	1690	1910
		2	1.58	263	308	397	733	873	1020	1190	1360	1550	1750
		3	3.15	216	252	326	655	780	915	1060	1220	1390	1570
		4	4.73	168	197	254	562	669	785	910	1040	1190	1340
		BFL	6.30	121	142	183	448	533	626	726	833	948	1070
		6	12.5	99.3	116	150	387	461	541	627	720	819	925
		7	22.5	77.6	90.8	117	320	380	447	518	594	676	764
IPE 100	171.0	TFL	0.00	243	284	366	516	624	743	872	1010	1160	1320
		2	1.43	206	241	311	474	573	682	800	928	1070	1210
		3	2.85	169	198	255	424	513	610	716	830	953	1080
		4	4.28	132	154	199	364	440	524	615	713	818	931
		BFL	5.70	95.2	111	144	291	352	419	492	570	654	745
		6	10.9	77.9	91.2	118	251	304	361	424	492	565	642
		7	18.5	60.6	71	91.6	206	250	297	349	405	464	528
IPE 80	80.14	TFL	0.00	180	210	271	309	382	462	550	646	749	860
		2	1.30	151	177	229	283	350	423	503	591	685	787
		3	2.60	123	144	186	252	311	376	448	526	610	700
		4	3.90	95.2	111	144	214	265	320	381	447	519	596
		BFL	5.20	67.1	78.5	101	168	208	252	299	351	407	468
		6	9.20	56.0	65.5	84.6	147	182	220	262	307	356	409
		7	14.9	44.9	52.5	67.8	124	153	185	220	258	299	344

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB},
for Plastic Composite Sections, $\times 10^4$ mm^4
IPE Shapes

Shapes	I_x [d]	PNA [c]	$Y1$ [a]	ΣQ_n			$Y2$ [b], mm						
				S235	S275	S355							
	×10^{4}mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
IPE 180	1317	TFL	0.00	563	659	850	5280	5800	6330	6900	7480	8100	8730
		2	2.00	477	559	721	4850	5320	5810	6330	6870	7430	8010
		3	4.00	392	458	592	4330	4760	5200	5660	6140	6640	7170
		4	6.00	306	358	463	3720	4080	4460	4860	5270	5700	6150
		BFL	8.00	221	258	333	2970	3260	3570	3890	4220	4560	4920
		6	17.5	181	211	273	2570	2820	3080	3350	3640	3930	4240
		7	33.5	141	165	213	2110	2320	2530	2760	2990	3240	3490
IPE 160	869.3	TFL	0.00	472	552	713	4020	4430	4860	5310	5790	6280	6790
		2	1.85	401	469	605	3690	4070	4460	4880	5310	5770	6240
		3	3.70	330	386	498	3300	3640	4000	4370	4760	5160	5580
		4	5.55	258	302	390	2840	3130	3440	3760	4090	4440	4800
		BFL	7.40	187	219	282	2280	2510	2760	3010	3280	3560	3850
		6	15.7	152	178	230	1960	2160	2370	2590	2820	3070	3320
		7	29.8	118	138	178	1610	1770	1940	2130	2310	2510	2720
IPE 140	541.2	TFL	0.00	386	452	583	2970	3290	3620	3980	4350	4730	5130
		2	1.73	327	383	494	2720	3010	3320	3650	3990	4340	4710
		3	3.45	268	313	404	2430	2690	2970	3260	3560	3880	4200
		4	5.18	209	244	315	2080	2300	2540	2790	3050	3320	3600
		BFL	6.90	149	175	226	1650	1830	2020	2220	2420	2640	2860
		6	14.3	123	144	186	1430	1590	1750	1920	2100	2290	2480
		7	26.3	96.5	113	146	1190	1310	1450	1590	1740	1890	2050
IPE 120	317.8	TFL	0.00	310	363	469	2140	2380	2640	2910	3200	3490	3800
		2	1.58	263	308	397	1960	2190	2420	2670	2930	3210	3490
		3	3.15	216	252	326	1750	1960	2170	2390	2620	2860	3120
		4	4.73	168	197	254	1500	1680	1860	2050	2250	2460	2680
		BFL	6.30	121	142	183	1200	1340	1480	1630	1790	1960	2130
		6	12.5	99.3	116	150	1040	1160	1280	1410	1550	1690	1840
		7	22.5	77.6	90.8	117	856	954	1060	1170	1280	1400	1520
IPE 100	171.0	TFL	0.00	243	284	366	1490	1670	1860	2060	2280	2500	2730
		2	1.43	206	241	311	1370	1530	1710	1890	2090	2290	2510
		3	2.85	169	198	255	1220	1370	1530	1690	1870	2050	2240
		4	4.28	132	154	199	1050	1180	1310	1460	1600	1760	1920
		BFL	5.70	95.2	111	144	841	942	1050	1160	1280	1410	1540
		6	10.9	77.9	91.2	118	725	813	906	1000	1110	1210	1330
		7	18.5	60.6	71	91.6	597	669	745	826	910	999	1090
IPE 80	80.14	TFL	0.00	180	210	271	978	1100	1240	1380	1530	1680	1850
		2	1.30	151	177	229	895	1010	1130	1260	1400	1540	1690
		3	2.60	123	144	186	796	899	1010	1120	1240	1370	1510
		4	3.90	95.2	111	144	678	765	858	956	1060	1170	1280
		BFL	5.20	67.1	78.5	101	532	601	674	750	832	917	1010
		6	9.20	56.0	65.5	84.6	465	525	589	656	727	801	879
		7	14.9	44.9	52.5	67.8	391	442	495	552	611	674	740

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4

IPEA Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^{4}mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
IPE A 600	82920	TFL	0.00	3220	3770	4860	83200	88000	93000	98100	103000	109000	114000
		2	4.38	2770	3240	4180	76900	81400	86000	90700	95600	101000	106000
		3	8.75	2310	2710	3500	69600	73700	77800	82100	86500	91000	95600
		4	13.1	1860	2180	2810	61000	64500	68200	71900	75800	79700	83800
		BFL	17.5	1410	1650	2130	50700	53600	56700	59800	63000	66300	69600
		6	58.1	1110	1300	1670	42600	45100	47600	50200	52900	55700	58500
		7	124	805	942	1220	33300	35200	37200	39300	41400	43500	45700
IPE A 550	59980	TFL	0.00	2760	3230	4160	61400	65200	69200	73300	77500	81800	86300
		2	3.93	2370	2770	3580	56700	60300	64000	67800	71600	75600	79700
		3	7.85	1980	2320	2990	51300	54600	57900	61300	64800	68400	72200
		4	11.8	1590	1870	2410	45000	47800	50700	53700	56800	60000	63200
		BFL	15.7	1210	1410	1820	37400	39700	42200	44600	47200	49800	52500
		6	49.4	948	1110	1430	31400	33400	35400	37500	39700	41900	44200
		7	111	689	806	1040	24600	26100	27700	29300	31000	32700	34500
IPE A 500	42930	TFL	0.00	2380	2780	3590	45000	48100	51300	54600	57900	61400	65000
		2	3.63	2040	2380	3070	41600	44400	47300	50300	53500	56700	60000
		3	7.25	1690	1980	2560	37500	40100	42700	45400	48200	51100	54100
		4	10.9	1350	1580	2040	32700	34900	37200	39600	42000	44600	47200
		BFL	14.5	1010	1190	1530	26900	28800	30700	32600	34600	36700	38800
		6	45.0	803	940	1210	22800	24300	25900	27600	29300	31000	32800
		7	98.1	594	695	897	18000	19200	20500	21800	23200	24600	26000
IPE A 450	29760	TFL	0.00	2010	2350	3040	32000	34400	36900	39400	42000	44800	47600
		2	3.28	1720	2010	2600	29500	31700	34000	36300	38700	41300	43800
		3	6.55	1430	1670	2150	26600	28500	30600	32700	34900	37100	39500
		4	9.83	1130	1330	1710	23100	24800	26600	28400	30300	32300	34300
		BFL	13.1	841	984	1270	18900	20300	21700	23200	24800	26400	28100
		6	35.5	672	786	1010	16000	17200	18500	19700	21100	22400	23800
		7	82.8	503	588	759	12800	13800	14700	15800	16800	17900	19000
IPE A 400	20290	TFL	0.00	1720	2010	2600	22600	24400	26400	28400	30400	32600	34800
		2	3.00	1460	1710	2210	20800	22500	24200	26100	28000	30000	32000
		3	6.00	1210	1420	1830	18700	20200	21800	23400	25100	26900	28800
		4	9.00	956	1120	1440	16100	17500	18800	20300	21800	23300	24900
		BFL	12.0	703	822	1060	13100	14200	15300	16500	17700	18900	20200
		6	30.1	566	662	855	11200	12100	13100	14100	15100	16100	17200
		7	68.0	429	503	649	9030	9770	10500	11300	12200	13000	13900
IPE A 360	14520	TFL	0.00	1500	1760	2270	16700	18200	19800	21400	23100	24900	26700
		2	2.88	1270	1490	1920	15400	16700	18200	19600	21200	22800	24500
		3	5.75	1040	1220	1580	13700	14900	16200	17600	18900	20400	21900
		4	8.63	814	952	1230	11800	12800	13900	15100	16200	17500	18700
		BFL	11.5	584	684	883	9370	10200	11100	12000	12900	13900	14900
		6	27.0	480	562	725	8110	8830	9580	10400	11200	12000	12900
		7	57.7	376	440	568	6700	7300	7920	8570	9240	9940	10700
IPE A 330	10230	TFL	0.00	1290	1510	1940	12500	13700	14900	16200	17600	19000	20500
		2	2.50	1100	1290	1660	11500	12600	13700	14900	16200	17500	18900
		3	5.00	910	1070	1380	10300	11300	12400	13500	14600	15800	17000
		4	7.50	722	845	1090	8970	9830	10700	11700	12700	13700	14700
		BFL	10.0	534	625	807	7320	8030	8760	9530	10300	11200	12000
		6	25.9	428	501	647	6230	6830	7450	8100	8780	9490	10200
		7	58.2	322	376	486	4990	5470	5970	6490	7040	7600	8190
IPE A 300	7173	TFL	0.00	1090	1280	1650	9170	10100	11100	12100	13200	14400	15500
		2	2.30	931	1090	1410	8430	9300	10200	11200	12200	13200	14300
		3	4.60	769	900	1160	7570	8350	9170	10000	10900	11900	12800
		4	6.90	607	710	917	6550	7220	7930	8670	9450	10300	11100
		BFL	9.20	445	521	672	5300	5850	6420	7030	7650	8310	8990
		6	23.7	359	420	542	4530	5000	5490	6010	6540	7100	7690
		7	53.2	273	320	413	3670	4050	4440	4860	5290	5750	6220
IPE A 270	4917	TFL	0.00	920	1080	1390	6590	7330	8110	8920	9780	10700	11600
		2	2.18	782	915	1180	6060	6740	7450	8200	8990	9810	10700
		3	4.35	644	754	973	5430	6040	6680	7350	8050	8790	9560
		4	6.52	506	592	764	4680	5200	5750	6330	6940	7570	8240
		BFL	8.70	368	431	556	3770	4190	4630	5100	5590	6100	6630
		6	21.0	299	350	452	3230	3600	3980	4380	4800	5240	5690
		7	44.5	230	269	347	2640	2930	3240	3570	3910	4270	4640

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4
IPEA Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
IPE A 600	82920	TFL	0.00	3220	3770	4860	120000	126000	132000	138000	144000	150000	157000
		2	4.38	2770	3240	4180	111000	116000	122000	127000	133000	139000	145000
		3	8.75	2310	2710	3500	100000	105000	110000	115000	120000	126000	131000
		4	13.1	1860	2180	2810	87900	92200	96500	101000	106000	110000	115000
		BFL	17.5	1410	1650	2130	73100	76600	80200	83900	87700	91600	95500
		6	58.1	1110	1300	1670	61400	64400	67400	70500	73700	77000	80300
		7	124	805	942	1220	48000	50300	52700	55100	57600	60100	62700
IPE A 550	59980	TFL	0.00	2760	3230	4160	90800	95500	100000	105000	110000	115000	121000
		2	3.93	2370	2770	3580	84000	88300	92700	97200	102000	107000	112000
		3	7.85	1980	2320	2990	76000	79900	83900	88000	92200	96500	101000
		4	11.8	1590	1870	2410	66600	70000	73500	77100	80800	84600	88400
		BFL	15.7	1210	1410	1820	55300	58200	61100	64100	67100	70300	73500
		6	49.4	948	1110	1430	46500	48900	51300	53800	56400	59000	61700
		7	111	689	806	1040	36300	38200	40100	42100	44100	46100	48300
IPE A 500	42930	TFL	0.00	2380	2780	3590	68600	72400	76300	80300	84400	88500	92800
		2	3.63	2040	2380	3070	63300	66800	70400	74100	77800	81700	85700
		3	7.25	1690	1980	2560	57200	60300	63500	66800	70200	73700	77300
		4	10.9	1350	1580	2040	49800	52600	55400	58300	61200	64300	67400
		BFL	14.5	1010	1190	1530	41000	43300	45600	48000	50400	52900	55500
		6	45.0	803	940	1210	34700	36600	38600	40600	42600	44800	46900
		7	98.1	594	695	897	27500	29000	30500	32100	33700	35400	37100
IPE A 450	29760	TFL	0.00	2010	2350	3040	50500	53500	56500	59700	62900	66200	69600
		2	3.28	1720	2010	2600	46500	49300	52100	55000	58000	61000	64200
		3	6.55	1430	1670	2150	41900	44400	46900	49500	52200	55000	57800
		4	9.83	1130	1330	1710	36400	38500	40700	43000	45400	47800	50200
		BFL	13.1	841	984	1270	29800	31500	33300	35200	37100	39100	41100
		6	35.5	672	786	1010	25300	26800	28300	29900	31500	33200	34900
		7	82.8	503	588	759	20200	21400	22600	23900	25200	26500	27900
IPE A 400	20290	TFL	0.00	1720	2010	2600	37100	39400	41900	44400	47000	49600	52400
		2	3.00	1460	1710	2210	34100	36300	38500	40900	43200	45700	48200
		3	6.00	1210	1420	1830	30700	32600	34600	36700	38800	41000	43300
		4	9.00	956	1120	1440	26500	28200	30000	31800	33600	35500	37500
		BFL	12.0	703	822	1060	21500	22900	24300	25800	27300	28800	30400
		6	30.1	566	662	855	18400	19600	20800	22000	23300	24600	26000
		7	68.0	429	503	649	14800	15800	16800	17800	18800	19900	20900
IPE A 360	14520	TFL	0.00	1500	1760	2270	28600	30500	32500	34600	36700	38900	41200
		2	2.88	1270	1490	1920	26200	28000	29800	31700	33700	35700	37800
		3	5.75	1040	1220	1580	23400	25000	26600	28300	30100	31900	33700
		4	8.63	814	952	1230	20100	21400	22800	24300	25800	27300	28900
		BFL	11.5	584	684	883	16000	17100	18200	19400	20600	21800	23000
		6	27.0	480	562	725	13800	14800	15700	16700	17800	18800	19900
		7	57.7	376	440	568	11400	12200	13000	13800	14700	15600	16500
IPE A 330	10230	TFL	0.00	1290	1510	1940	22000	23600	25200	26900	28600	30400	32300
		2	2.50	1100	1290	1660	20300	21700	23200	24800	26400	28000	29700
		3	5.00	910	1070	1380	18200	19500	20900	22300	23700	25200	26800
		4	7.50	722	845	1090	15800	17000	18100	19300	20600	21900	23200
		BFL	10.0	534	625	807	12900	13800	14800	15800	16800	17900	19000
		6	25.9	428	501	647	11000	11800	12600	13400	14300	15200	16100
		7	58.2	322	376	486	8800	9430	10100	10800	11500	12200	12900
IPE A 300	7173	TFL	0.00	1090	1280	1650	16800	18000	19400	20700	22100	23600	25100
		2	2.30	931	1090	1410	15400	16600	17800	19100	20400	21700	23100
		3	4.60	769	900	1160	13900	14900	16000	17100	18300	19500	20700
		4	6.90	607	710	917	12000	12900	13800	14800	15800	16800	17900
		BFL	9.20	445	521	672	9700	10400	11200	12000	12800	13700	14500
		6	23.7	359	420	542	8290	8920	9580	10300	10900	11700	12400
		7	53.2	273	320	413	6710	7220	7750	8290	8860	9440	10000
IPE A 270	4917	TFL	0.00	920	1080	1390	12600	13600	14600	15700	16900	18000	19200
		2	2.18	782	915	1180	11600	12500	13500	14500	15500	16600	17700
		3	4.35	644	754	973	10400	11200	12100	13000	13900	14800	15800
		4	6.52	506	592	764	8930	9650	10400	11200	12000	12800	13700
		BFL	8.70	368	431	556	7190	7770	8370	8990	9640	10300	11000
		6	21.0	299	350	452	6170	6670	7180	7720	8270	8850	9440
		7	44.5	230	269	347	5030	5440	5860	6290	6750	7210	7700

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4
IPEA Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×$10^4$$mm^4$		mm	kN	kN	kN	50	60	70	80	90	100	110
IPE A 240	3290	TFL	0.00	783	916	1180	4730	5310	5920	6560	7240	7950	8700
		2	2.08	666	779	1010	4350	4880	5440	6030	6660	7310	7990
		3	4.15	549	642	829	3900	4370	4880	5410	5970	6550	7170
		4	6.23	432	505	652	3360	3770	4210	4670	5150	5650	6180
		BFL	8.30	315	368	475	2710	3040	3390	3760	4150	4560	4990
		6	19.2	255	299	385	2330	2610	2910	3230	3560	3910	4280
		7	38.4	196	229	296	1890	2120	2370	2630	2900	3180	3480
IPE A 220	2317	TFL	0.00	664	777	1000	3550	4010	4500	5020	5570	6140	6750
		2	1.93	565	661	853	3260	3690	4140	4610	5120	5650	6200
		3	3.85	465	544	703	2920	3300	3710	4140	4590	5060	5560
		4	5.78	366	428	552	2520	2850	3200	3570	3950	4360	4790
		BFL	7.70	266	311	402	2030	2300	2580	2870	3180	3510	3860
		6	18.2	216	253	326	1740	1970	2210	2460	2730	3020	3310
		7	37.8	166	194	251	1420	1600	1800	2010	2230	2460	2700
IPE A 200	1591	TFL	0.00	552	645	833	2590	2950	3330	3740	4170	4620	5100
		2	1.75	469	549	709	2380	2710	3060	3440	3830	4250	4690
		3	3.50	387	453	585	2130	2430	2750	3080	3440	3810	4210
		4	5.25	305	357	460	1840	2100	2370	2660	2970	3290	3630
		BFL	7.00	223	260	336	1490	1700	1920	2150	2400	2660	2930
		6	16.3	180	211	272	1270	1450	1640	1840	2050	2280	2510
		7	33.3	138	161	208	1040	1180	1330	1500	1670	1850	2040
IPE A 180	1063	TFL	0.00	460	538	695	1880	2160	2460	2780	3120	3480	3860
		2	1.63	391	457	590	1720	1980	2260	2550	2860	3190	3540
		3	3.25	321	376	485	1540	1770	2020	2290	2560	2860	3170
		4	4.88	252	294	380	1330	1530	1740	1970	2210	2460	2730
		BFL	6.50	182	213	275	1070	1220	1390	1580	1770	1970	2190
		6	15.2	149	174	224	917	1050	1200	1360	1520	1700	1880
		7	31.6	115	135	174	751	864	984	1110	1250	1390	1540
IPE A 160	689.3	TFL	0.00	380	445	574	1340	1550	1780	2030	2300	2580	2870
		2	1.48	323	378	489	1230	1430	1640	1870	2110	2370	2640
		3	2.95	267	312	403	1100	1280	1470	1680	1890	2120	2370
		4	4.43	210	245	317	950	1100	1270	1440	1630	1830	2040
		BFL	5.90	153	179	231	766	890	1020	1170	1320	1480	1650
		6	13.7	124	145	187	657	763	877	999	1130	1270	1410
		7	27.9	95.1	111	144	534	621	714	813	919	1030	1150
IPE A 140	434.9	TFL	0.00	315	368	475	943	1110	1290	1480	1690	1910	2140
		2	1.40	267	312	403	865	1020	1180	1360	1550	1750	1960
		3	2.80	219	256	330	773	909	1060	1210	1380	1560	1750
		4	4.20	171	200	258	663	780	906	1040	1190	1340	1500
		BFL	5.60	123	143	185	529	622	722	830	945	1070	1200
		6	12.5	101	118	152	457	537	624	717	817	923	1040
		7	24.7	78.7	92.1	119	377	444	515	592	675	762	855
IPE A 120	257.4	TFL	0.00	259	303	392	653	778	915	1060	1220	1390	1570
		2	1.28	221	258	334	601	716	842	978	1120	1280	1450
		3	2.55	183	214	276	539	643	756	878	1010	1150	1300
		4	3.82	144	169	218	467	556	654	759	873	994	1120
		BFL	5.10	106	124	160	378	451	530	616	708	806	911
		6	11.5	85.3	99.8	129	323	385	453	526	605	689	778
		7	22.5	64.8	75.8	97.9	261	311	366	425	488	556	629
IPE A 100	141.2	TFL	0.00	206	241	312	430	522	622	731	848	975	1110
		2	1.18	176	206	266	396	480	572	673	781	897	1020
		3	2.35	146	170	220	356	432	514	604	702	806	918
		4	3.53	115	135	174	308	374	446	524	608	698	795
		BFL	4.70	84.8	99.3	128	251	304	362	426	494	568	647
		6	10.1	68.2	79.8	103	214	259	309	363	421	484	551
		7	18.5	51.6	60.4	77.9	172	209	249	292	339	390	444
IPE A 80	64.38	TFL	0.00	150	175	226	253	313	379	452	531	616	708
		2	1.05	127	149	192	232	287	348	415	487	566	650
		3	2.10	105	122	158	208	257	311	371	436	506	582
		4	3.15	81.8	95.8	124	178	221	268	319	375	435	500
		BFL	4.20	59.1	69.2	89.3	143	177	214	256	300	349	401
		6	8.39	48.3	56.5	73	123	152	185	220	259	300	345
		7	14.8	37.5	43.9	56.6	101	125	152	181	212	247	283

[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 F.1 for PNA locations
[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times10^4$ mm^4
IPEA Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times10^4$mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
IPE A 240	3290	TFL	0.00	783	916	1180	9470	10300	11100	12000	12900	13900	14800
		2	2.08	666	779	1010	8710	9450	10200	11000	11900	12700	13600
		3	4.15	549	642	829	7810	8480	9170	9900	10600	11400	12200
		4	6.23	432	505	652	6740	7310	7910	8540	9180	9860	10600
		BFL	8.30	315	368	475	5430	5900	6380	6890	7410	7950	8510
		6	19.2	255	299	385	4660	5060	5470	5900	6350	6820	7300
		7	38.4	196	229	296	3790	4110	4450	4800	5170	5550	5940
IPE A 220	2317	TFL	0.00	664	777	1000	7380	8040	8730	9440	10200	11000	11800
		2	1.93	565	661	853	6780	7390	8020	8680	9360	10100	10800
		3	3.85	465	544	703	6080	6620	7190	7780	8390	9030	9690
		4	5.78	366	428	552	5240	5710	6200	6700	7230	7780	8350
		BFL	7.70	266	311	402	4220	4600	4990	5400	5830	6270	6730
		6	18.2	216	253	326	3620	3950	4280	4640	5000	5380	5770
		7	37.8	166	194	251	2950	3220	3490	3780	4070	4380	4700
IPE A 200	1591	TFL	0.00	552	645	833	5600	6130	6680	7250	7840	8460	9100
		2	1.75	469	549	709	5150	5630	6140	6660	7210	7780	8370
		3	3.50	387	453	585	4620	5050	5510	5980	6470	6980	7510
		4	5.25	305	357	460	3990	4360	4750	5160	5580	6020	6480
		BFL	7.00	223	260	336	3220	3520	3840	4170	4510	4860	5230
		6	16.3	180	211	272	2760	3020	3290	3570	3860	4170	4480
		7	33.3	138	161	208	2240	2450	2670	2900	3140	3380	3640
IPE A 180	1063	TFL	0.00	460	538	695	4260	4670	5110	5570	6050	6540	7060
		2	1.63	391	457	590	3910	4290	4690	5110	5550	6010	6480
		3	3.25	321	376	485	3500	3840	4200	4580	4970	5380	5800
		4	4.88	252	294	380	3010	3300	3610	3940	4270	4630	4990
		BFL	6.50	182	213	275	2410	2650	2900	3160	3430	3710	4000
		6	15.2	149	174	224	2080	2280	2500	2720	2950	3190	3450
		7	31.6	115	135	174	1700	1870	2040	2230	2420	2620	2820
IPE A 160	689.3	TFL	0.00	380	445	574	3190	3520	3860	4220	4600	5000	5410
		2	1.48	323	378	489	2930	3230	3550	3880	4230	4590	4970
		3	2.95	267	312	403	2630	2900	3180	3480	3790	4120	4460
		4	4.43	210	245	317	2270	2500	2750	3000	3270	3550	3840
		BFL	5.90	153	179	231	1830	2020	2210	2420	2640	2860	3100
		6	13.7	124	145	187	1570	1730	1900	2080	2260	2460	2660
		7	27.9	95.1	111	144	1280	1410	1550	1690	1840	2000	2160
IPE A 140	434.9	TFL	0.00	315	368	475	2380	2640	2920	3200	3500	3810	4140
		2	1.40	267	312	403	2190	2420	2680	2940	3210	3500	3800
		3	2.80	219	256	330	1950	2170	2390	2630	2870	3130	3400
		4	4.20	171	200	258	1680	1860	2050	2250	2460	2680	2910
		BFL	5.60	123	143	185	1340	1480	1630	1790	1960	2140	2320
		6	12.5	101	118	152	1160	1280	1410	1550	1700	1850	2010
		7	24.7	78.7	92.1	119	954	1060	1170	1280	1400	1530	1660
IPE A 120	257.4	TFL	0.00	259	303	392	1760	1970	2180	2400	2640	2890	3140
		2	1.28	221	258	334	1620	1810	2010	2210	2430	2660	2890
		3	2.55	183	214	276	1460	1620	1800	1990	2180	2390	2600
		4	3.82	144	169	218	1260	1410	1560	1720	1890	2060	2250
		BFL	5.10	106	124	160	1020	1140	1260	1390	1530	1670	1820
		6	11.5	85.3	99.8	129	873	974	1080	1190	1310	1430	1560
		7	22.5	64.8	75.8	97.9	705	786	872	962	1060	1150	1260
IPE A 100	141.2	TFL	0.00	206	241	312	1250	1410	1570	1740	1920	2110	2300
		2	1.18	176	206	266	1150	1290	1440	1600	1770	1940	2120
		3	2.35	146	170	220	1040	1160	1300	1440	1590	1740	1900
		4	3.53	115	135	174	899	1010	1120	1250	1370	1510	1650
		BFL	4.70	84.8	99.3	128	731	820	914	1010	1120	1230	1340
		6	10.1	68.2	79.8	103	623	699	779	864	953	1050	1140
		7	18.5	51.6	60.4	77.9	502	563	627	695	767	842	921
IPE A 80	64.38	TFL	0.00	150	175	226	806	911	1020	1140	1260	1390	1530
		2	1.05	127	149	192	740	836	938	1050	1160	1280	1400
		3	2.10	105	122	158	663	749	840	936	1040	1140	1260
		4	3.15	81.8	95.8	124	569	643	722	805	892	984	1080
		BFL	4.20	59.1	69.2	89.3	456	515	578	645	715	788	865
		6	8.39	48.3	56.5	73	393	444	498	555	616	679	746
		7	14.8	37.5	43.9	56.6	323	364	409	456	505	557	612

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times 10^4$ mm^4
IPEO Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
IPE O 600	118300	TFL	0.00	4620	5410	6990	124000	131000	138000	146000	154000	161000	169000
		2	6.00	3990	4670	6030	115000	121000	128000	135000	142000	150000	157000
		3	12.0	3360	3930	5080	104000	110000	116000	123000	129000	136000	143000
		4	18.0	2730	3190	4120	92100	97300	103000	108000	114000	120000	126000
		BFL	24.0	2100	2460	3170	77400	81800	86400	91000	95800	101000	106000
		6	74.2	1630	1900	2460	64600	68200	72000	75900	79900	84000	88200
		7	141	1160	1350	1750	49600	52400	55400	58400	61400	64600	67800
IPE O 550	79160	TFL	0.00	3670	4290	5540	84000	89200	94500	100000	106000	112000	118000
		2	5.05	3170	3700	4780	77800	82600	87600	92700	97900	103000	109000
		3	10.1	2660	3120	4020	70600	75000	79500	84100	88900	93800	98800
		4	15.1	2160	2530	3260	62200	66100	70000	74100	78300	82600	87100
		BFL	20.2	1660	1940	2500	52200	55500	58800	62200	65700	69400	73100
		6	62.5	1290	1510	1940	43600	46300	49100	51900	54900	57900	61000
		7	124	917	1070	1390	33600	35700	37800	40000	42300	44600	47000
IPE O 500	57780	TFL	0.00	3210	3760	4850	62800	67000	71300	75800	80400	85200	90100
		2	4.75	2760	3230	4170	58000	61900	65900	70100	74300	78700	83300
		3	9.50	2310	2700	3490	52500	56000	59700	63400	67300	71300	75400
		4	14.3	1860	2180	2810	46000	49100	52300	55600	59000	62500	66000
		BFL	19.0	1410	1650	2130	38300	40800	43500	46200	49000	51900	54900
		6	56.9	1110	1290	1670	32100	34300	36500	38800	41200	43600	46100
		7	111	803	940	1210	25100	26800	28500	30300	32200	34100	36000
IPE O 450	40920	TFL	0.00	2770	3240	4180	45500	48800	52300	55800	59500	63300	67200
		2	4.40	2370	2770	3580	42000	45000	48200	51500	54900	58400	62000
		3	8.80	1970	2310	2980	37900	40600	43500	46500	49500	52700	56000
		4	13.2	1570	1840	2380	33000	35400	37900	40500	43200	45900	48800
		BFL	17.6	1180	1380	1780	27200	29200	31200	33300	35500	37800	40200
		6	47.2	935	1090	1410	23000	24700	26400	28200	30100	32000	34000
		7	94.3	691	809	1040	18200	19500	20900	22300	23800	25300	26900
IPE O 400	26750	TFL	0.00	2270	2650	3420	30600	33100	35700	38300	41100	44000	46900
		2	3.88	1930	2260	2920	28200	30500	32800	35300	37900	40500	43200
		3	7.75	1600	1870	2420	25400	27400	29500	31800	34100	36400	38900
		4	11.6	1270	1490	1920	22000	23800	25600	27600	29500	31600	33700
		BFL	15.5	939	1100	1420	17900	19400	20900	22500	24100	25800	27500
		6	36.9	753	881	1140	15300	16500	17800	19100	20500	21900	23400
		7	77.8	566	663	855	12200	13200	14300	15300	16400	17600	18800
IPE O 360	19050	TFL	0.00	1980	2310	2990	22600	24600	26700	28900	31100	33500	35900
		2	3.68	1680	1970	2540	20800	22600	24500	26500	28600	30700	33000
		3	7.35	1380	1620	2090	18600	20300	22000	23800	25600	27500	29500
		4	11.0	1090	1270	1640	16100	17500	18900	20500	22100	23700	25400
		BFL	14.7	789	923	1190	12900	14100	15200	16500	17800	19100	20500
		6	33.6	641	751	969	11100	12100	13100	14100	15300	16400	17600
		7	67.7	494	578	747	9060	9860	10700	11600	12500	13400	14300
IPE O 330	13910	TFL	0.00	1710	2000	2580	17100	18700	20400	22200	24000	25900	27900
		2	3.38	1450	1700	2190	15700	17200	18700	20400	22000	23800	25600
		3	6.75	1190	1400	1800	14100	15400	16800	18200	19700	21300	22900
		4	10.1	936	1090	1410	12100	13300	14400	15700	17000	18300	19700
		BFL	13.5	679	794	1030	9730	10600	11600	12600	13600	14700	15900
		6	30.0	553	647	835	8370	9160	9980	10800	11700	12700	13600
		7	60.2	427	499	645	6840	7490	8160	8860	9590	10400	11100

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, $\times 10^4$ mm^4
IPEO Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	$\times 10^4$mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
IPE O 600	118300	TFL	0.00	4620	5410	6990	178000	186000	195000	204000	213000	222000	231000
		2	6.00	3990	4670	6030	165000	173000	181000	189000	197000	206000	215000
		3	12.0	3360	3930	5080	150000	157000	164000	171000	179000	187000	195000
		4	18.0	2730	3190	4120	132000	138000	145000	151000	158000	165000	172000
		BFL	24.0	2100	2460	3170	111000	116000	122000	127000	133000	139000	144000
		6	74.2	1630	1900	2460	92500	96900	101000	106000	111000	116000	120000
		7	141	1160	1350	1750	71100	74500	78000	81500	85100	88800	92600
IPE O 550	79160	TFL	0.00	3670	4290	5540	124000	130000	136000	143000	150000	157000	164000
		2	5.05	3170	3700	4780	115000	120000	126000	132000	139000	145000	152000
		3	10.1	2660	3120	4020	104000	109000	115000	120000	126000	132000	138000
		4	15.1	2160	2530	3260	91600	96300	101000	106000	111000	116000	121000
		BFL	20.2	1660	1940	2500	76900	80800	84800	88900	93100	97400	102000
		6	62.5	1290	1510	1940	64200	67500	70800	74200	77800	81300	85000
		7	124	917	1070	1390	49500	52000	54600	57200	59900	62700	65500
IPE O 500	57780	TFL	0.00	3210	3760	4850	95100	100000	106000	111000	117000	122000	128000
		2	4.75	2760	3230	4170	87900	92700	97600	103000	108000	113000	118000
		3	9.50	2310	2700	3490	79600	83900	88300	92900	97600	102000	107000
		4	14.3	1860	2180	2810	69700	73500	77400	81400	85500	89700	94000
		BFL	19.0	1410	1650	2130	58000	61100	64400	67700	71100	74600	78100
		6	56.9	1110	1290	1670	48700	51400	54100	56900	59700	62600	65600
		7	111	803	940	1210	38000	40100	42200	44400	46600	48900	51300
IPE O 450	40920	TFL	0.00	2770	3240	4180	71300	75400	79700	84100	88600	93200	98000
		2	4.40	2370	2770	3580	65800	69600	73500	77600	81700	86000	90400
		3	8.80	1970	2310	2980	59300	62800	66300	70000	73700	77600	81500
		4	13.2	1570	1840	2380	51700	54700	57800	61000	64300	67600	71100
		BFL	17.6	1180	1380	1780	42600	45100	47600	50200	52900	55700	58500
		6	47.2	935	1090	1410	36000	38100	40300	42500	44800	47100	49500
		7	94.3	691	809	1040	28500	30200	31900	33600	35400	37300	39200
IPE O 400	26750	TFL	0.00	2270	2650	3420	50000	53100	56400	59700	63200	66700	70300
		2	3.88	1930	2260	2920	46000	48900	51900	55000	58200	61400	64800
		3	7.75	1600	1870	2420	41400	44000	46700	49500	52300	55300	58300
		4	11.6	1270	1490	1920	35900	38200	40500	42900	45400	47900	50600
		BFL	15.5	939	1100	1420	29300	31100	33000	35000	37000	39100	41200
		6	36.9	753	881	1140	24900	26500	28100	29800	31500	33300	35100
		7	77.8	566	663	855	20000	21300	22600	23900	25300	26700	28100
IPE O 360	19050	TFL	0.00	1980	2310	2990	38400	40900	43600	46400	49200	52100	55100
		2	3.68	1680	1970	2540	35300	37600	40100	42600	45200	47900	50600
		3	7.35	1380	1620	2090	31600	33700	35900	38200	40500	42900	45400
		4	11.0	1090	1270	1640	27200	29000	30900	32900	34900	37000	39100
		BFL	14.7	789	923	1190	21900	23400	24900	26400	28100	29700	31400
		6	33.6	641	751	969	18800	20100	21400	22700	24100	25500	27000
		7	67.7	494	578	747	15300	16400	17400	18500	19700	20800	22100
IPE O 330	13910	TFL	0.00	1710	2000	2580	29900	32000	34200	36500	38800	41200	43700
		2	3.38	1450	1700	2190	27500	29400	31400	33500	35700	37900	40200
		3	6.75	1190	1400	1800	24600	26400	28200	30000	31900	33900	36000
		4	10.1	936	1090	1410	21200	22700	24200	25800	27500	29200	31000
		BFL	13.5	679	794	1030	17000	18200	19500	20800	22100	23500	24900
		6	30.0	553	647	835	14600	15700	16700	17900	19000	20200	21400
		7	60.2	427	499	645	12000	12800	13700	14600	15500	16500	17500

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4
IPEO Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	50	60	70	80	90	100	110
IPE O 300	9994	TFL	0.00	1480	1730	2230	12800	14100	15500	16900	18400	20000	21600
		2	3.18	1250	1460	1890	11800	12900	14200	15500	16900	18300	19800
		3	6.35	1020	1200	1550	10500	11600	12700	13800	15100	16300	17700
		4	9.52	796	932	1200	8980	9890	10800	11800	12900	14000	15100
		BFL	12.7	569	666	860	7130	7860	8620	9410	10200	11100	12000
		6	27.4	469	549	709	6180	6810	7470	8160	8870	9620	10400
		7	53.8	369	432	558	5130	5650	6190	6760	7360	7980	8630
IPE O 270	6947	TFL	0.00	1270	1480	1910	9410	10400	11500	12700	13900	15100	16400
		2	3.05	1070	1250	1620	8630	9580	10600	11600	12700	13900	15100
		3	6.10	875	1020	1320	7700	8550	9430	10400	11300	12400	13400
		4	9.15	680	796	1030	6580	7310	8070	8870	9700	10600	11500
		BFL	12.2	485	568	733	5220	5790	6400	7030	7690	8390	9110
		6	25.1	401	469	606	4530	5030	5550	6100	6680	7280	7900
		7	47.3	316	370	478	3770	4180	4610	5070	5550	6050	6570
IPE O 240	4369	TFL	0.00	1030	1200	1550	6390	7160	7970	8830	9730	10700	11700
		2	2.70	872	1020	1320	5870	6580	7320	8110	8940	9800	10700
		3	5.40	718	840	1080	5260	5890	6560	7260	8000	8780	9590
		4	8.10	563	659	850	4520	5070	5640	6250	6890	7560	8260
		BFL	10.8	408	477	616	3630	4070	4530	5020	5530	6070	6630
		6	22.8	332	389	502	3120	3500	3900	4320	4760	5220	5700
		7	42.9	257	301	388	2560	2860	3190	3530	3890	4270	4670
IPE O 220	3134	TFL	0.00	879	1030	1330	4850	5470	6120	6820	7550	8320	9130
		2	2.55	744	871	1120	4450	5010	5620	6260	6930	7640	8380
		3	5.10	610	714	922	3970	4480	5020	5590	6190	6820	7480
		4	7.65	476	557	719	3410	3840	4300	4790	5310	5850	6420
		BFL	10.2	342	400	516	2710	3060	3430	3820	4230	4660	5110
		6	21.3	281	328	424	2350	2650	2970	3300	3660	4030	4420
		7	40.2	220	257	332	1940	2190	2450	2730	3020	3330	3650
IPE O 200	2211	TFL	0.00	751	879	1130	3640	4140	4670	5240	5830	6460	7110
		2	2.38	637	746	963	3340	3800	4290	4810	5350	5930	6530
		3	4.75	523	612	791	2990	3400	3840	4300	4790	5300	5840
		4	7.13	409	479	619	2570	2920	3300	3690	4110	4560	5020
		BFL	9.50	296	346	447	2060	2340	2640	2960	3290	3650	4020
		6	19.6	242	283	365	1770	2020	2280	2550	2840	3140	3460
		7	36.6	188	220	284	1460	1660	1870	2090	2330	2580	2850
IPE O 180	1505	TFL	0.00	637	745	962	2690	3090	3510	3960	4440	4940	5470
		2	2.25	540	631	815	2470	2830	3220	3630	4070	4530	5020
		3	4.50	442	518	668	2210	2530	2880	3250	3640	4050	4490
		4	6.75	345	404	521	1890	2170	2470	2780	3120	3470	3850
		BFL	9.00	248	290	374	1510	1730	1970	2220	2490	2770	3070
		6	18.9	203	238	307	1300	1500	1700	1920	2150	2390	2650
		7	34.5	159	186	241	1080	1240	1410	1590	1780	1980	2190

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

Table F.2 Continued.

I_{LB}

Lower-Bound Elastic Moment of Inertia, I_{LB}, for Plastic Composite Sections, ×10^4 mm^4

IPEO Shapes

Shapes	I_x[d]	PNA[c]	$Y1$[a]	ΣQ_n			$Y2$[b], mm						
				S235	S275	S355							
	×10^4mm^4		mm	kN	kN	kN	120	130	140	150	160	170	180
IPE O 300	9994	TFL	0.00	1480	1730	2230	23200	25000	26800	28700	30600	32600	34600
		2	3.18	1250	1460	1890	21300	22900	24600	26300	28000	29900	31700
		3	6.35	1020	1200	1550	19000	20400	21900	23500	25000	26700	28300
		4	9.52	796	932	1200	16300	17500	18800	20100	21400	22800	24300
		BFL	12.7	569	666	860	12900	13900	14900	15900	17000	18100	19300
		6	27.4	469	549	709	11200	12000	12900	13800	14700	15700	16700
		7	53.8	369	432	558	9300	9990	10700	11500	12200	13000	13900
IPE O 270	6947	TFL	0.00	1270	1480	1910	17800	19200	20700	22200	23700	25400	27100
		2	3.05	1070	1250	1620	16300	17600	18900	20300	21800	23300	24800
		3	6.10	875	1020	1320	14500	15700	16900	18100	19400	20800	22100
		4	9.15	680	796	1030	12400	13400	14400	15500	16600	17700	18900
		BFL	12.2	485	568	733	9860	10600	11500	12300	13200	14100	15000
		6	25.1	401	469	606	8560	9240	9940	10700	11400	12200	13000
		7	47.3	316	370	478	7110	7680	8260	8870	9500	10100	10800
IPE O 240	4369	TFL	0.00	1030	1200	1550	12700	13800	14900	16100	17300	18500	19800
		2	2.70	872	1020	1320	11700	12600	13700	14700	15900	17000	18200
		3	5.40	718	840	1080	10400	11300	12200	13200	14200	15200	16300
		4	8.10	563	659	850	8990	9750	10500	11400	12200	13100	14000
		BFL	10.8	408	477	616	7220	7830	8460	9120	9810	10500	11300
		6	22.8	332	389	502	6210	6730	7280	7850	8440	9050	9680
		7	42.9	257	301	388	5080	5510	5960	6420	6900	7400	7920
IPE O 220	3134	TFL	0.00	879	1030	1330	9980	10900	11800	12700	13700	14800	15800
		2	2.55	744	871	1120	9150	9960	10800	11700	12600	13500	14500
		3	5.10	610	714	922	8180	8900	9650	10400	11300	12100	13000
		4	7.65	476	557	719	7010	7630	8280	8950	9650	10400	11100
		BFL	10.2	342	400	516	5590	6080	6600	7130	7690	8270	8870
		6	21.3	281	328	424	4830	5260	5700	6170	6650	7150	7670
		7	40.2	220	257	332	3990	4340	4710	5090	5490	5910	6330
IPE O 200	2211	TFL	0.00	751	879	1130	7810	8530	9280	10100	10900	11700	12600
		2	2.38	637	746	963	7160	7830	8520	9240	9990	10800	11600
		3	4.75	523	612	791	6410	7000	7620	8270	8940	9640	10400
		4	7.13	409	479	619	5510	6020	6550	7100	7680	8280	8900
		BFL	9.50	296	346	447	4410	4820	5240	5690	6150	6630	7130
		6	19.6	242	283	365	3800	4150	4520	4900	5300	5710	6140
		7	36.6	188	220	284	3120	3410	3710	4030	4350	4690	5050
IPE O 180	1505	TFL	0.00	637	745	962	6030	6620	7230	7870	8540	9230	9950
		2	2.25	540	631	815	5530	6070	6630	7220	7830	8470	9130
		3	4.50	442	518	668	4940	5420	5930	6450	7000	7570	8160
		4	6.75	345	404	521	4240	4650	5080	5530	6000	6490	6990
		BFL	9.00	248	290	374	3380	3710	4050	4410	4780	5170	5570
		6	18.9	203	238	307	2920	3200	3500	3810	4130	4470	4820
		7	34.5	159	186	241	2410	2650	2890	3150	3410	3690	3980

[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 F.1 for PNA locations

[d] I_x of noncomposite steel shape

APPENDIX G

DESIGN TABLES FOR BOLTS

Table G.1 Available shear strength of bolts.

Available Shear Strength of Bolts, kN																		
Nominal Bolt Diameter, d, mm					16		20		22		24		27		30		36	
Nominal Bolt Area, mm^2					201		314		380		452		573		707		1018	
Grade	Thread Cond.	ϕF_{nv}	F_{nv}/Ω	Load	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		MPa																
		LRFD	ASD		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
4.6	Not applicable	135	90	S	27.1	18.1	42.4	28.3	51.3	34.2	61.1	40.7	77.3	51.5	95.4	63.6	137	91.6
				D	54.3	36.2	84.8	56.5	103	68.4	122	81.4	155	103	191	127	275	183
4.8	Not applicable	135	90	S	27.1	18.1	42.4	28.3	51.3	34.2	61.1	40.7	77.3	51.5	95.4	63.6	137	91.6
				D	54.3	36.2	84.8	56.5	103	68.4	122	81.4	155	103	191	127	275	183
5.6	Not applicable	169	113	S	33.9	22.6	53.0	35.3	64.1	42.8	76.3	50.9	96.6	64.4	119	79.5	172	115
				D	67.9	45.2	106	70.7	128	85.5	153	102	193	129	239	159	344	229
5.8	Not applicable	169	113	S	33.9	22.6	53.0	35.3	64.1	42.8	76.3	50.9	96.6	64.4	119	79.5	172	115
				D	67.9	45.2	106	70.7	128	85.5	153	102	193	129	239	159	344	229
6.8	Not applicable	203	135	S	40.7	27.1	63.6	42.4	77.0	51.3	91.6	61.1	116	77.3	143	95.4	206	137
				D	81.4	54.3	127	84.8	154	103	183	122	232	155	286	191	412	275
8.8	N	270	180	S	54.3	36.2	84.8	56.5	103	68.4	122	81.4	155	103	191	127	275	183
				D	109	72.4	170	113	205	137	244	163	309	206	382	254	550	366
	X	338	225	S	67.9	45.2	106	70.7	128	85.5	153	102	193	129	239	159	344	229
				D	136	90.5	212	141	257	171	305	204	386	258	477	318	687	458
10.9	N	338	225	S	67.9	45.2	106	70.7	128	85.5	153	102	193	129	239	159	344	229
				D	136	90.5	212	141	257	171	305	204	386	258	477	318	687	458
	X	422	282	S	84.9	56.6	133	88.4	161	107	191	127	242	161	298	199	430	287
				D	170	113	265	177	321	214	382	255	484	322	597	398	860	573
LRFD	ASD	Thread condition "N" indicates that threads are included in the shear plane. Thread condition "X" indicates that threads are excluded from the shear plane. S = single shear D = double shear Strength values shall be reduced by 15% for connections with a length greater than 950 mm.																
$\phi = 0.75$	$\Omega = 2.00$																	

Table G.2 Available tensile strength of bolts.

Available Tensile Strength of Bolts, kN

Nominal Bolt Diameter, d, mm			16		20		22		24		27		30		36	
Nominal Bolt Area, mm^2			201		314		380		452		573		707		1018	
Grade	ϕF_{nt}	F_{nt}/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
	MPa															
	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
4.6	225	150	45.2	30.2	70.7	47.1	85.5	57.0	102	67.9	129	85.9	159	106	229	153
4.8	225	150	45.2	30.2	70.7	47.1	85.5	57.0	102	67.9	129	85.9	159	106	229	153
5.6	281	188	56.5	37.7	88.4	58.9	107	71.3	127	84.8	161	107	199	133	286	191
5.8	281	188	56.5	37.7	88.4	58.9	107	71.3	127	84.8	161	107	199	133	286	191
6.8	338	225	67.9	45.2	106	70.7	128	85.5	153	102	193	129	239	159	344	229
8.8	450	300	90.5	60.3	141	94.2	171	114	204	136	258	172	318	212	458	305
10.9	563	375	113	75.4	177	118	214	143	254	170	322	215	398	265	573	382
LRFD	ASD															
$\phi = 0.75$	$\Omega = 2.00$															

Table G.3 Slip-critical connections.

Slip-Critical Connections
Available Slip Resistance, kN
(Class A Faying Surface, μ=0.50)

Grade 8.8 Bolt

Hole Type	Loading	Nominal Bolt Diameter, *d*, mm													
		16		20		22		24		27		30		36	
		Minimum Bolt Pretension, kN													
		88.0		137		170		198		257		314		458	
		ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
STD/SSLT	S	49.7	33.1	77.4	51.6	96.1	64.0	112	74.6	145	96.8	177	118	259	173
	D	99.4	66.3	155	103	192	128	224	149	290	194	355	237	518	345
OVS/SSLP	S	42.3	28.3	65.8	44.0	81.6	54.6	95.1	63.6	123	82.5	151	101	220	147
	D	84.5	56.5	132	88.0	163	109	190	127	247	165	302	202	440	294
LSL	S	34.8	23.2	54.2	36.2	67.2	44.9	78.3	52.3	102	67.9	124	82.9	181	121
	D	69.6	46.5	108	72.3	134	89.8	157	105	203	136	248	166	362	242

STD = standard hole
OVS = oversized hole
SSLT = short-slotted hole oriented with length transverse to the line of force
SSLP = short-slotted hole oriented with length parallel to the line of force
LSL = long-slotted hole oriented with length transverse or parallel to the line of force
S = single shear
D = double shear

Hole Type	LRFD	ASD
STD and SSLT	$\phi = 1.00$	$\Omega = 1.50$
OVS and SSLP	$\phi = 0.85$	$\Omega = 1.76$
LSL	$\phi = 0.70$	$\Omega = 2.14$

Table G.3 Continued.

Slip-Critical Connections
Available Slip Resistance, kN
(Class B Faying Surface, μ=0.40)

Grade 8.8 Bolt															
Hole Type	**Loading**	**Nominal Bolt Diameter, d, mm**													
		16		**20**		**22**		**24**		**27**		**30**		**36**	
		Minimum Bolt Pretension, kN													
		88.0		**137**		**170**		**198**		**257**		**314**		**458**	
		ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
STD/SSLT	**S**	39.8	26.5	61.9	41.3	76.8	55.1	89.5	59.7	116	77.4	142	94.6	207	138
	D	79.6	53.0	124	82.6	154	110	179	119	232	155	284	189	414	276
OVS/SSLP	**S**	33.8	22.6	52.6	35.2	65.3	46.9	76.1	50.9	98.7	66.0	121	80.6	176	118
	D	67.6	45.2	105	70.4	131	93.9	152	102	197	132	241	161	352	235
LSL	**S**	27.8	18.6	43.3	28.9	53.8	38.6	62.6	41.8	81.3	54.3	99.3	66.3	145	96.7
	D	55.7	37.2	86.7	57.9	108	77.2	125	83.6	163	109	199	133	290	193

STD = standard hole
OVS = oversized hole
SSLT = short-slotted hole oriented with length transverse to the line of force
SSLP = short-slotted hole oriented with length parallel to the line of force
LSL = long-slotted hole oriented with length transverse or parallel to the line of force
S = single shear
D = double shear

Hole Type	**LRFD**	**ASD**
STD and SSLT	$\phi = 1.00$	$\Omega = 1.50$
OVS and SSLP	$\phi = 0.85$	$\Omega = 1.76$
LSL	$\phi = 0.70$	$\Omega = 2.14$

Table G.3 Continued.

Slip-Critical Connections
Available Slip Resistance, kN
(Class C Faying Surface, μ=0.30)

Grade 8.8 Bolt															
Hole Type	Loading	Nominal Bolt Diameter, *d*, mm													
		16		20		22		24		27		30		36	
		Minimum Bolt Pretension, kN													
		88.0		137		170		198		257		314		458	
		ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
STD/SSLT	S	29.8	19.9	46.4	31.0	57.6	38.4	67.1	44.7	87.1	58.1	106	71.0	155	104
	D	59.7	39.8	92.9	61.9	115	76.8	134	89.5	174	116	213	142	311	207
OVS/SSLP	S	25.4	17.0	39.5	26.4	49.0	32.7	57.1	38.1	74.1	49.5	90.5	60.5	132	88.2
	D	50.7	33.9	79.0	52.8	98.0	65.5	114	76.3	148	99.0	181	121	264	176
LSL	S	20.9	13.9	32.5	21.7	40.3	26.9	47.0	31.4	61.0	40.7	74.5	49.7	109	72.6
	D	41.8	27.9	65.0	43.4	80.7	53.9	94.0	62.7	122	81.4	149	99.5	217	145

STD = standard hole
OVS = oversized hole
SSLT = short-slotted hole oriented with length transverse to the line of force
SSLP = short-slotted hole oriented with length parallel to the line of force
LSL = long-slotted hole oriented with length transverse or parallel to the line of force
S = single shear
D = double shear

Hole Type	LRFD	ASD
STD and SSLT	$\phi = 1.00$	$\Omega = 1.50$
OVS and SSLP	$\phi = 0.85$	$\Omega = 1.76$
LSL	$\phi = 0.70$	$\Omega = 2.14$

Table G.3 Continued.

Slip-Critical Connections
Available Slip Resistance, kN
(Class D Faying Surface, μ = 0.20)

Grade 8.8 Bolt															
Hole Type	**Loading**	**Nominal Bolt Diameter, *d*, mm**													
		16		**20**		**22**		**24**		**27**		**30**		**36**	
		Minimum Bolt Pretension, kN													
		88.0		**137**		**170**		**198**		**257**		**314**		**458**	
		ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
STD/SSLT	**S**	19.9	13.3	31.0	20.6	38.4	25.6	44.7	29.8	58.1	38.7	71.0	47.3	104	69.0
	D	39.8	26.5	61.9	41.3	76.8	51.2	89.5	59.7	116	77.4	142	94.6	207	138
OVS/SSLP	**S**	16.9	11.3	26.3	17.6	32.7	21.8	38.0	25.4	49.4	33.0	60.3	40.3	88.0	58.8
	D	33.8	22.6	52.6	35.2	65.3	43.7	76.1	50.9	98.7	66.0	121	80.6	176	118
LSL	**S**	13.9	9.29	21.7	14.5	26.9	18.0	31.3	20.9	40.7	27.1	49.7	33.2	72.5	48.4
	D	27.8	18.6	43.3	28.9	53.8	35.9	62.6	41.8	81.3	54.3	99.3	66.3	145	96.7

STD = standard hole
OVS = oversized hole
SSLT = short-slotted hole oriented with length transverse to the line of force
SSLP = short-slotted hole oriented with length parallel to the line of force
LSL = long-slotted hole oriented with length transverse or parallel to the line of force
S = single shear
D = double shear

Hole Type	**LRFD**	**ASD**
STD and SSLT	$\phi = 1.00$	$\Omega = 1.50$
OVS and SSLP	$\phi = 0.85$	$\Omega = 1.76$
LSL	$\phi = 0.70$	$\Omega = 2.14$

Table G.3 Continued.

Slip-Critical Connections
Available Slip Resistance, kN
(Class Faying A Surface, μ=0.50)

Hole Type	Loading	Grade 10.9 Bolt													
		Nominal Bolt Diameter, *d*, mm													
		16		20		22		24		27		30		36	
		Minimum Bolt Pretension, kN													
		110		172		212		247		321		393		572	
		ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
STD/SSLT	**S**	62.2	41.4	97.2	64.8	120	79.9	140	93.0	181	121	222	148	323	215
	D	124	82.9	194	130	240	160	279	186	363	242	444	296	646	431
OVS/SSLP	**S**	52.8	35.3	82.6	55.2	102	68.1	119	79.3	154	103	189	126	275	184
	D	106	70.6	165	110	204	136	237	159	308	206	377	252	549	367
LSL	**S**	43.5	29.0	68.0	45.4	83.8	56.0	97.7	65.2	127	84.8	155	104	226	151
	D	87.0	58.1	136	90.8	168	112	195	130	254	170	311	208	452	302

STD = standard hole
OVS = oversized hole
SSLT = short-slotted hole oriented with length transverse to the line of force
SSLP = short-slotted hole oriented with length parallel to the line of force
LSL = long-slotted hole oriented with length transverse or parallel to the line of force
S = single shear
D = double shear

Hole Type	LRFD	ASD
STD and SSLT	$\phi = 1.00$	$\Omega = 1.50$
OVS and SSLP	$\phi = 0.85$	$\Omega = 1.76$
LSL	$\phi = 0.70$	$\Omega = 2.14$

Table G.3 Continued.

Slip-Critical Connections
Available Slip Resistance, kN
(Class Faying B Surface, μ=0.40)

Grade 10.9 Bolt															
Hole Type	**Loading**	**Nominal Bolt Diameter, d, mm**													
		16		**20**		**22**		**24**		**27**		**30**		**36**	
		Minimum Bolt Pretension, kN													
		110		**172**		**212**		**247**		**321**		**393**		**572**	
		ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
STD/SSLT	**S**	49.7	33.1	77.7	51.8	95.8	68.7	112	74.4	145	96.7	178	118	259	172
	D	99.4	66.3	155	104	192	137	223	149	290	193	355	237	517	345
OVS/SSLP	**S**	42.3	28.3	66.1	44.2	81.5	58.5	94.9	63.4	123	82.4	151	101	220	147
	D	84.5	56.5	132	88.3	163	117	190	127	247	165	302	202	440	294
LSL	**S**	34.8	23.2	54.4	36.3	67.1	48.1	78.2	52.2	102	67.8	124	83.0	181	121
	D	69.6	46.5	109	72.7	134	96.3	156	104	203	136	249	166	362	242

STD = standard hole
OVS = oversized hole
SSLT = short-slotted hole oriented with length transverse to the line of force
SSLP = short-slotted hole oriented with length parallel to the line of force
LSL = long-slotted hole oriented with length transverse or parallel to the line of force
S = single shear
D = double shear

Hole Type	**LRFD**	**ASD**
STD and SSLT	$\phi = 1.00$	$\Omega = 1.50$
OVS and SSLP	$\phi = 0.85$	$\Omega = 1.76$
LSL	$\phi = 0.70$	$\Omega = 2.14$

Table G.3 Continued.

Slip-Critical Connections
Available Slip Resistance, kN
(Class Faying C Surface, μ=0.30)

Grade 10.9 Bolt

Hole Type	Loading	Nominal Bolt Diameter, *d*, mm													
		16		20		22		24		27		30		36	
		Minimum Bolt Pretension, kN													
		110		172		212		247		321		393		572	
		ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
STD/SSLT	**S**	37.3	24.9	58.3	38.9	71.9	47.9	83.7	55.8	109	72.5	133	88.8	194	129
	D	74.6	49.7	117	77.7	144	95.8	167	112	218	145	266	178	388	259
OVS/SSLP	**S**	31.7	21.2	49.6	33.1	61.1	40.8	71.2	47.6	92.5	61.8	113	75.7	165	110
	D	63.4	42.4	99.1	66.3	122	81.7	142	95.2	185	124	226	151	330	220
LSL	**S**	26.1	17.4	40.8	27.2	50.3	33.6	58.6	39.1	76.2	50.9	93.3	62.3	136	90.6
	D	52.2	34.9	81.6	54.5	101	67.2	117	78.3	152	102	187	125	271	181

STD = standard hole
OVS = oversized hole
SSLT = short-slotted hole oriented with length transverse to the line of force
SSLP = short-slotted hole oriented with length parallel to the line of force
LSL = long-slotted hole oriented with length transverse or parallel to the line of force
S = single shear
D = double shear

Hole Type	LRFD	ASD
STD and SSLT	$\phi = 1.00$	$\Omega = 1.50$
OVS and SSLP	$\phi = 0.85$	$\Omega = 1.76$
LSL	$\phi = 0.70$	$\Omega = 2.14$

Table G.3 Continued.

Slip-Critical Connections
Available Slip Resistance, kN
(Class Faying D Surface, μ=0.20)

Hole Type	**Loading**	**Grade 10.9 Bolt**													
		Nominal Bolt Diameter, *d*, mm													
		16		**20**		**22**		**24**		**27**		**30**		**36**	
		Minimum Bolt Pretension, kN													
		110		**172**		**212**		**247**		**321**		**393**		**572**	
		ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
		LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
STD/SSLT	**S**	24.9	16.6	38.9	25.9	47.9	31.9	55.8	37.2	72.5	48.4	88.8	59.2	129	86.2
	D	49.7	33.1	77.7	51.8	95.8	63.9	112	74.4	145	96.7	178	118	259	172
OVS/SSLP	**S**	21.1	14.1	33.0	22.1	40.7	27.2	47.4	31.7	61.7	41.2	75.5	50.5	110	73.5
	D	42.3	28.3	66.1	44.2	81.5	54.4	94.9	63.4	123	82.4	151	101	220	147
LSL	**S**	17.4	11.6	27.2	18.2	33.5	22.4	39.1	26.1	50.8	33.9	62.2	41.5	90.5	60.4
	D	34.8	23.2	54.4	36.3	67.1	44.8	78.2	52.2	102	67.8	124	83.0	181	121

STD = standard hole
OVS = oversized hole
SSLT = short-slotted hole oriented with length transverse to the line of force
SSLP = short-slotted hole oriented with length parallel to the line of force
LSL = long-slotted hole oriented with length transverse or parallel to the line of force
S = single shear
D = double shear

Hole Type	**LRFD**	**ASD**
STD and SSLT	$\phi = 1.00$	$\Omega = 1.50$
OVS and SSLP	$\phi = 0.85$	$\Omega = 1.76$
LSL	$\phi = 0.70$	$\Omega = 2.14$

Table G.4 Available bearing and tearout strength at bolts holes based on bolt spacing.

Available Bearing and Tearout Strength at Bolt Holes
Based on Bolt Spacing
kN/mm thickness

Hole Type	Bolt Spacing, s, mm	F_u, MPa	Nominal Bolt Diameter, d, mm													
			16		20		22		24		27		30		36	
			ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
STD/SSLT	$3d$	360	9.72	6.48	12.3	8.21	13.6	9.07	14.9	9.94	16.5	11.0	18.5	12.3	22.4	14.9
		430	11.6	7.74	14.7	9.80	16.3	10.8	17.8	11.9	19.7	13.2	22.1	14.7	26.7	17.8
		510	13.8	9.18	17.4	11.6	19.3	12.9	21.1	14.1	23.4	15.6	26.2	17.4	31.7	21.1
	75 mm	360	10.4	6.91	13.0	8.64	14.3	9.5	15.6	10.4	–	–	–	–	–	–
		430	12.4	8.26	15.5	10.3	17.0	11.4	18.6	12.4	–	–	–	–	–	–
		510	14.7	9.79	18.4	12.2	20.2	13.5	22.0	14.7	–	–	–	–	–	–
SSLP	$3d$	360	8.42	5.62	11.0	7.34	11.7	7.78	13.0	8.64	14.3	9.5	16.2	10.8	20.1	13.4
		430	10.1	6.71	13.2	8.77	13.9	9.29	15.5	10.3	17.0	11.4	19.4	12.9	24.0	16.0
		510	10.1	6.71	18.4	12.2	13.9	9.29	15.5	10.3	17.0	11.4	19.4	12.9	33.0	22.0
	75 mm	360	10.4	6.91	13.0	8.64	14.3	9.50	13.9	9.29	–	–	–	–	–	–
		430	12.4	8.26	15.5	10.3	17.0	11.4	16.6	11.1	–	–	–	–	–	–
		510	14.7	9.79	18.4	12.2	20.2	13.5	19.7	13.2	–	–	–	–	–	–
OVS	$3d$	360	9.07	6.05	11.7	7.78	12.3	8.21	13.6	9.07	14.9	9.94	16.8	11.2	20.7	13.8
		430	10.8	7.22	13.9	9.29	14.7	9.80	16.3	10.8	17.8	11.9	20.1	13.4	24.8	16.5
		510	12.9	8.57	16.5	11.0	17.4	11.6	19.3	12.9	21.1	14.1	23.9	15.9	29.4	19.6
	75 mm	360	10.4	6.91	13.0	8.64	14.3	9.50	14.6	9.72	–	–	–	–	–	–
		430	12.4	8.26	15.5	10.3	17.0	11.4	17.4	11.6	–	–	–	–	–	–
		510	14.7	9.79	18.4	12.2	20.2	13.5	20.7	13.8	–	–	–	–	–	–
LSLP	$3d$	360	2.59	1.73	3.24	2.16	3.56	2.38	3.89	2.59	4.54	3.02	4.86	3.24	5.83	3.89
		430	3.10	2.06	3.87	2.58	4.26	2.84	4.64	3.10	5.42	3.61	5.81	3.87	6.97	4.64
		510	3.67	2.45	4.59	3.06	5.05	3.37	5.51	3.67	6.43	4.28	6.89	4.59	8.26	5.51
	75 mm	360	10.4	6.91	8.10	5.40	6.48	4.32	4.86	3.24	–	–	–	–	–	–
		430	12.4	8.26	9.68	6.45	7.74	5.16	5.81	3.87	–	–	–	–	–	–
		510	14.7	9.79	11.5	7.65	9.18	6.12	6.89	4.59	–	–	–	–	–	–
LSLT	$3d$	360	8.10	5.40	10.3	6.84	11.3	7.56	12.4	8.28	13.8	9.18	15.4	10.3	18.6	12.4
		430	9.68	6.45	12.3	8.17	13.5	9.03	14.8	9.89	16.4	11.0	18.4	12.3	22.3	14.8
		510	11.5	7.65	14.5	9.69	16.1	10.7	17.6	11.7	19.5	13.0	21.8	14.5	26.4	17.6
	75 mm	360	8.64	5.76	10.8	7.20	11.9	7.92	13.0	8.64	–	–	–	–	–	–
		430	10.3	6.88	12.9	8.60	14.2	9.46	15.5	10.3	–	–	–	–	–	–
		510	12.2	8.16	15.3	10.2	16.8	11.2	18.4	12.2	–	–	–	–	–	–
STD, SSLT, SSLP, OVS, LSLP	$s \geq s_{full}$	360	10.4	6.91	13.0	8.64	14.3	9.50	15.6	10.4	17.5	11.7	19.4	13.0	23.3	15.6
		430	12.4	8.26	15.5	10.3	17.0	11.4	18.6	12.4	20.9	13.9	23.2	15.5	27.9	18.6
		510	14.7	9.79	18.4	12.2	20.2	13.5	22.0	14.7	24.8	16.5	27.5	18.4	33.0	22.0
LSLT	$s \geq s_{full}$	360	8.64	5.76	10.8	7.20	11.9	7.92	13	8.64	14.6	9.72	16.2	10.8	19.4	13.0
		430	10.3	6.88	12.9	8.60	14.2	9.46	15.5	10.3	17.4	11.6	19.4	12.9	23.2	15.5
		510	12.2	8.16	15.3	10.2	16.8	11.2	18.4	12.2	20.7	13.8	23.0	15.3	27.5	18.4
Spacing for full bearing and tearout strength, s_{full}, mm		STD, SSLT, LSLT	50.0		62.0		68.0		74.0		84.0		93.0		111	
		OVS	52.0		64.0		72.0		78.0		89.0		98.0		116	
		SSLP	54.0		66.0		74.0		80.0		91.0		100		118	
		LSLP	72.0		90.0		99.0		108		121		135		162	
Minimum spacing = $3d$, mm			48.0		60.0		66.0		72.0		81.0		90.0		108	

STD = standard hole
OVS = oversized hole
SSLT = short–slotted hole oriented with length transverse to the line of force
SSLP = short–slotted hole oriented with length parallel to the line of force
LSLP = long–slotted hole oriented with length parallel to the line of force
LSLT = long–slotted hole oriented with length transverse to the line of force

LRFD	ASD	– Indicates spacing less than minimum spacing required per Turkish Structural Steel Code.
$\phi = 0.75$	$\Omega = 2.00$	Note: Spacing indicated is from the center of the hole or slot to the center of the adjacent hole or slot in the line of force. Hole deformation is considered.

Table G.5 Available bearing and tearout strength at bolt holes based on edge distance.

Available Bearing and Tearout Strength at Bolt Holes
Based on Edge Distance
kN/mm thickness

Hole Type	Edge Distance, l_e, mm	F_u, MPa	Nominal Bolt Diameter, d, mm													
			16		20		22		24		27		30		36	
			ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω	ϕr_n	r_n/Ω
			LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
STD/SSLT	32	360	7.45	4.97	6.80	4.54	6.48	4.32	6.16	4.10	5.51	3.67	5.02	3.35	4.05	2.70
		430	8.90	5.93	8.13	5.42	7.74	5.16	7.35	4.90	6.58	4.39	6.00	4.00	4.84	3.23
		510	10.6	7.04	9.64	6.43	9.18	6.12	8.72	5.81	7.80	5.20	7.11	4.74	5.74	3.83
	50	360	10.4	6.91	12.6	8.42	12.3	8.21	12.0	7.99	11.3	7.56	10.9	7.24	9.88	6.59
		430	12.4	8.26	15.1	10.1	14.7	9.80	14.3	9.55	13.5	9.03	13.0	8.64	11.8	7.87
		510	14.7	9.79	17.9	11.9	17.4	11.6	17.0	11.3	16.1	10.7	15.4	10.3	14.0	9.33
SSLP	32	360	6.80	4.54	6.16	4.10	5.51	3.67	5.18	3.46	4.37	2.92	3.89	2.59	2.92	1.94
		430	8.13	5.42	7.35	4.90	6.58	4.39	6.19	4.13	5.22	3.48	4.64	3.10	3.48	2.32
		510	9.64	6.43	8.72	5.81	7.80	5.20	7.34	4.90	6.20	4.13	5.51	3.67	4.13	2.75
	50	360	10.4	6.91	12.0	7.99	11.3	7.56	11.0	7.34	10.2	6.80	9.72	6.48	8.75	5.83
		430	12.4	8.26	14.3	9.55	13.5	9.03	13.2	8.77	12.2	8.13	11.6	7.74	10.4	6.97
		510	9.64	9.79	8.72	11.3	7.80	10.7	7.34	10.4	6.20	9.64	5.51	9.18	4.13	8.26
OVS	32	360	7.13	4.75	6.48	4.32	5.83	3.89	5.51	3.67	4.70	3.13	4.21	2.81	3.24	2.16
		430	8.51	5.68	7.74	5.16	6.97	4.64	6.58	4.39	5.61	3.74	5.03	3.35	3.87	2.58
		510	10.1	6.73	9.18	6.12	8.26	5.51	7.80	5.20	6.66	4.44	5.97	3.98	4.59	3.06
	50	360	10.4	6.91	12.3	8.21	11.7	7.78	11.3	7.56	10.5	7.02	10.0	6.70	9.07	6.05
		430	12.4	8.26	14.7	9.80	13.9	9.29	13.5	9.03	12.6	8.39	12.0	8.00	10.8	7.22
		510	14.7	9.79	17.4	11.6	16.5	11.0	16.1	10.7	14.9	9.95	14.2	9.49	12.9	8.57
LSLP	32	360	3.89	2.59	2.27	1.51	1.46	0.972	0.648	0.432	–	–	–	–	–	–
		430	4.64	3.10	2.71	1.81	1.74	1.16	0.774	0.516	–	–	–	–	–	–
		510	5.51	3.67	3.21	2.14	2.07	1.38	0.918	0.612	–	–	–	–	–	–
	50	360	9.72	6.48	8.10	5.40	7.29	4.86	6.48	4.32	5.35	3.56	4.05	2.70	1.62	1.08
		430	11.6	7.74	9.68	6.45	8.71	5.81	7.74	5.16	6.39	4.26	4.84	3.23	1.94	1.29
		510	13.8	9.18	11.5	7.65	10.3	6.89	9.18	6.12	7.57	5.05	5.74	3.83	2.30	1.53
LSLT	32	360	6.21	4.14	5.67	3.78	5.40	3.60	5.13	3.42	4.59	3.06	4.19	2.79	3.38	2.25
		430	7.42	4.95	6.77	4.52	6.45	4.30	6.13	4.09	5.48	3.66	5.00	3.33	4.03	2.69
		510	8.80	5.87	8.03	5.36	7.65	5.10	7.27	4.85	6.50	4.34	5.93	3.95	4.78	3.19
	50	360	8.64	5.76	10.5	7.02	10.3	6.84	9.99	6.66	9.45	6.30	9.05	6.03	8.24	5.49
		430	10.3	6.88	12.6	8.39	12.3	8.17	11.9	7.96	11.3	7.53	10.8	7.20	9.84	6.56
		510	12.2	8.16	14.9	9.95	14.5	9.69	14.2	9.44	13.4	8.93	12.8	8.54	11.7	7.78
STD, SSLT, SSLP, OVS, LSLP	$l_e \geq l_{e\,full}$	360	10.4	6.91	13.0	8.64	14.3	9.50	15.6	10.4	17.5	11.7	19.4	13.0	23.3	15.6
		430	12.4	8.26	15.5	10.3	17.0	11.4	18.6	12.4	20.9	13.9	23.2	15.5	27.9	18.6
		510	14.7	9.79	18.4	12.2	20.2	13.5	22.0	14.7	24.8	16.5	27.5	18.4	33.0	22.0
LSLT	$l_e \geq l_{e\,full}$	360	8.64	5.76	10.8	7.20	11.9	7.92	13.0	8.64	14.6	9.72	16.2	10.8	19.4	13.0
		430	10.3	6.88	12.9	8.60	14.2	9.46	15.5	10.3	17.4	11.6	19.4	12.9	23.2	15.5
		510	12.2	8.16	15.3	10.2	16.8	11.2	18.4	12.2	20.7	13.8	23.0	15.3	27.5	18.4
Edge distance for full bearing and tearout strength, $l_e > l_{e\,full}$, mm		STD, SSLT, LSLT	41.0		51.0		56.0		61.0		69.0		76.5		91.5	
		OVS	42.0		52.0		58.0		63.0		71.5		79.0		94.0	
		SSLP	43.0		53.0		59.0		64.0		72.5		80.0		95.0	
		LSLP	52.0		65.0		71.5		78.0		87.5		97.5		117	

STD = standard hole
SSLT = short–slotted hole oriented with length transverse to the line of force
SSLP = short–slotted hole oriented with length parallel to the line of force
OVS = oversized hole
LSLP = long–slotted hole oriented with length parallel to the line of force
LSLT = long–slotted hole oriented with length transverse to the line of force

LRFD	ASD	– Indicates edge distance not applicable.
$\phi = 0.75$	$\Omega = 2.00$	Note: Edge distance indicated is from the center of the hole or slot to the edge of the element in the line of force. Hole deformation is considered.

Table G.6 C coefficients for eccentrically loaded bolt groups.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 0°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

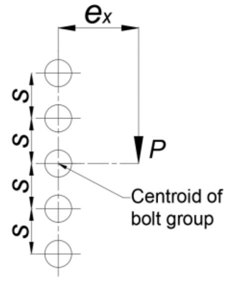
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n										
		2	3	4	5	6	7	8	9	10	11	12
75	25.0	1.63	2.71	3.75	4.77	5.77	6.77	7.76	8.75	9.74	10.7	11.7
	50.0	1.18	2.22	3.32	4.39	5.45	6.48	7.51	8.52	9.53	10.5	11.5
	75.0	0.878	1.75	2.81	3.90	4.98	6.06	7.12	8.17	9.20	10.2	11.3
	100	0.689	1.40	2.36	3.40	4.47	5.56	6.64	7.72	8.78	9.84	10.9
	125	0.564	1.15	2.01	2.95	3.98	5.05	6.13	7.22	8.30	9.38	10.4
	150	0.476	0.967	1.73	2.58	3.55	4.57	5.63	6.70	7.79	8.87	9.96
	175	0.411	0.834	1.51	2.28	3.17	4.13	5.15	6.20	7.27	8.36	9.44
	200	0.362	0.732	1.34	2.04	2.85	3.75	4.72	5.73	6.78	7.85	8.93
	225	0.323	0.652	1.21	1.83	2.59	3.42	4.34	5.31	6.32	7.36	8.42
	250	0.291	0.587	1.09	1.66	2.36	3.14	4.00	4.92	5.89	6.90	7.94
	300	0.243	0.490	0.919	1.40	2.00	2.68	3.44	4.27	5.15	6.09	7.06
	350	0.209	0.420	0.792	1.21	1.74	2.33	3.01	3.75	4.55	5.41	6.31
	400	0.183	0.368	0.695	1.06	1.53	2.06	2.67	3.33	4.06	4.85	5.68
	450	0.163	0.327	0.620	0.947	1.37	1.84	2.39	3.00	3.66	4.38	5.15
	500	0.147	0.294	0.559	0.853	1.24	1.67	2.16	2.72	3.33	3.99	4.70
	600	0.122	0.245	0.467	0.712	1.03	1.40	1.82	2.29	2.81	3.37	3.99
	700	0.105	0.210	0.400	0.611	0.889	1.20	1.57	1.97	2.42	2.92	3.45
	800	0.0919	0.184	0.351	0.535	0.780	1.05	1.37	1.73	2.13	2.57	3.04
	900	0.0817	0.164	0.312	0.476	0.694	0.936	1.22	1.54	1.90	2.29	2.72
	C', mm	73.6	147	281	429	627	845	1110	1400	1730	2090	2490
150	25.0	1.86	2.88	3.88	4.87	5.86	6.84	7.83	8.81	9.80	10.8	11.8
	50.0	1.63	2.71	3.75	4.77	5.77	6.77	7.76	8.75	9.74	10.7	11.7
	75	1.39	2.48	3.56	4.60	5.63	6.65	7.65	8.66	9.66	10.7	11.6
	100	1.18	2.22	3.32	4.39	5.45	6.48	7.51	8.52	9.53	10.5	11.5
	125	1.01	1.98	3.07	4.15	5.23	6.28	7.33	8.36	9.38	10.4	11.4
	150	0.878	1.75	2.81	3.90	4.98	6.06	7.12	8.17	9.20	10.2	11.3
	175	0.773	1.56	2.58	3.64	4.73	5.81	6.89	7.95	9.00	10.0	11.1
	200	0.689	1.40	2.36	3.40	4.47	5.56	6.64	7.72	8.78	9.84	10.9
	225	0.621	1.26	2.17	3.17	4.22	5.30	6.39	7.47	8.55	9.61	10.7
	250	0.564	1.15	2.01	2.95	3.98	5.05	6.13	7.22	8.30	9.38	10.4
	300	0.476	0.967	1.73	2.58	3.55	4.57	5.63	6.70	7.79	8.87	9.96
	350	0.411	0.834	1.51	2.28	3.17	4.13	5.15	6.20	7.27	8.36	9.44
	400	0.362	0.732	1.34	2.04	2.85	3.75	4.72	5.73	6.78	7.85	8.93
	450	0.323	0.652	1.21	1.83	2.59	3.42	4.34	5.31	6.32	7.36	8.42
	500	0.291	0.587	1.09	1.66	2.36	3.14	4.00	4.92	5.89	6.90	7.94
	600	0.243	0.490	0.919	1.40	2.00	2.68	3.44	4.27	5.15	6.09	7.06
	700	0.209	0.420	0.792	1.21	1.74	2.33	3.01	3.75	4.55	5.41	6.31
	800	0.183	0.368	0.695	1.06	1.53	2.06	2.67	3.33	4.06	4.85	5.68
	900	0.163	0.327	0.620	0.947	1.37	1.84	2.39	3.00	3.66	4.38	5.15
	C', mm	147	294	563	857	1250	1690	2220	2800	3460	4170	4980

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 15°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

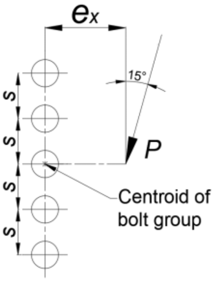
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n										
		2	3	4	5	6	7	8	9	10	11	12
75	25.0	1.61	2.69	3.72	4.74	5.74	6.74	7.73	8.72	9.71	10.7	11.7
	50.0	1.15	2.20	3.28	4.34	5.39	6.42	7.44	8.46	9.47	10.5	11.5
	75.0	0.856	1.76	2.78	3.85	4.92	5.98	7.03	8.08	9.11	10.1	11.2
	100	0.674	1.42	2.35	3.36	4.41	5.48	6.55	7.61	8.67	9.72	10.8
	125	0.554	1.17	2.00	2.94	3.94	4.98	6.04	7.11	8.18	9.24	10.3
	150	0.470	0.994	1.73	2.58	3.52	4.52	5.55	6.61	7.67	8.74	9.81
	175	0.408	0.859	1.52	2.30	3.16	4.11	5.10	6.13	7.17	8.23	9.30
	200	0.360	0.755	1.35	2.06	2.86	3.74	4.69	5.68	6.70	7.74	8.80
	225	0.322	0.673	1.22	1.86	2.60	3.43	4.32	5.27	6.26	7.27	8.31
	250	0.291	0.607	1.10	1.69	2.38	3.15	4.00	4.90	5.85	6.84	7.85
	300	0.245	0.507	0.932	1.43	2.03	2.71	3.46	4.28	5.15	6.06	7.01
	350	0.211	0.435	0.805	1.24	1.76	2.37	3.04	3.78	4.57	5.41	6.30
	400	0.185	0.380	0.708	1.09	1.56	2.10	2.70	3.37	4.09	4.87	5.69
	450	0.165	0.338	0.632	0.974	1.39	1.88	2.43	3.04	3.70	4.42	5.18
	500	0.149	0.305	0.571	0.879	1.26	1.70	2.20	2.76	3.37	4.03	4.74
	600	0.125	0.254	0.478	0.735	1.06	1.43	1.86	2.33	2.86	3.43	4.04
	700	0.107	0.218	0.411	0.631	0.911	1.23	1.60	2.02	2.47	2.97	3.51
	800	0.0940	0.190	0.360	0.553	0.800	1.08	1.41	1.77	2.18	2.62	3.10
	900	0.0837	0.169	0.321	0.492	0.712	0.965	1.26	1.58	1.95	2.34	2.78
150	25.0	1.85	2.87	3.87	4.86	5.84	6.83	7.81	8.80	9.78	10.8	11.7
	50.0	1.61	2.69	3.72	4.74	5.74	6.74	7.73	8.72	9.71	10.7	11.7
	75.0	1.36	2.45	3.52	4.56	5.59	6.60	7.61	8.61	9.61	10.6	11.6
	100	1.15	2.20	3.28	4.34	5.39	6.42	7.44	8.46	9.47	10.5	11.5
	125	0.984	1.96	3.02	4.10	5.16	6.21	7.25	8.28	9.30	10.3	11.3
	150	0.856	1.76	2.78	3.85	4.92	5.98	7.03	8.08	9.11	10.1	11.2
	175	0.755	1.57	2.55	3.60	4.66	5.73	6.80	7.85	8.90	9.94	11.0
	200	0.674	1.42	2.35	3.36	4.41	5.48	6.55	7.61	8.67	9.72	10.8
	225	0.608	1.29	2.16	3.14	4.17	5.23	6.30	7.36	8.43	9.49	10.5
	250	0.554	1.17	2.00	2.94	3.94	4.98	6.04	7.11	8.18	9.24	10.3
	300	0.470	0.994	1.73	2.58	3.52	4.52	5.55	6.61	7.67	8.74	9.81
	350	0.408	0.859	1.52	2.30	3.16	4.11	5.10	6.13	7.17	8.23	9.30
	400	0.360	0.755	1.35	2.06	2.86	3.74	4.69	5.68	6.70	7.74	8.80
	450	0.322	0.673	1.22	1.86	2.60	3.43	4.32	5.27	6.26	7.27	8.31
	500	0.291	0.607	1.10	1.69	2.38	3.15	4.00	4.90	5.85	6.84	7.85
	600	0.245	0.507	0.932	1.43	2.03	2.71	3.46	4.28	5.15	6.06	7.01
	700	0.211	0.435	0.805	1.24	1.76	2.37	3.04	3.78	4.57	5.41	6.30
	800	0.185	0.380	0.708	1.09	1.56	2.10	2.70	3.37	4.09	4.87	5.69
	900	0.165	0.338	0.632	0.974	1.39	1.88	2.43	3.04	3.70	4.42	5.18

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 30°

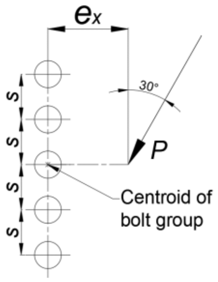
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n										
		2	3	4	5	6	7	8	9	10	11	12
75	25.0	1.59	2.66	3.69	4.70	5.70	6.70	7.69	8.69	9.67	10.7	11.6
	50.0	1.14	2.20	3.25	4.29	5.33	6.36	7.38	8.39	9.39	10.4	11.4
	75.0	0.862	1.80	2.79	3.83	4.87	5.92	6.95	7.99	9.01	10.0	11.1
	100	0.690	1.50	2.40	3.39	4.41	5.45	6.49	7.53	8.57	9.61	10.6
	125	0.574	1.27	2.08	3.00	3.98	4.99	6.02	7.06	8.10	9.15	10.2
	150	0.492	1.09	1.82	2.67	3.60	4.57	5.58	6.60	7.64	8.68	9.72
	175	0.430	0.946	1.61	2.40	3.27	4.20	5.17	6.17	7.18	8.21	9.25
	200	0.382	0.835	1.44	2.17	2.98	3.86	4.79	5.76	6.75	7.77	8.79
	225	0.343	0.746	1.30	1.98	2.74	3.57	4.46	5.39	6.35	7.34	8.35
	250	0.312	0.674	1.19	1.82	2.52	3.31	4.15	5.05	5.98	6.95	7.93
	300	0.264	0.563	1.01	1.55	2.17	2.87	3.64	4.46	5.33	6.24	7.17
	350	0.228	0.484	0.873	1.35	1.90	2.53	3.23	3.98	4.78	5.63	6.51
	400	0.201	0.424	0.771	1.20	1.69	2.26	2.89	3.58	4.33	5.11	5.94
	450	0.180	0.377	0.690	1.07	1.52	2.04	2.62	3.25	3.94	4.67	5.45
	500	0.163	0.339	0.624	0.971	1.37	1.85	2.38	2.97	3.61	4.29	5.02
	600	0.137	0.283	0.525	0.814	1.16	1.57	2.02	2.53	3.09	3.69	4.33
	700	0.118	0.243	0.452	0.701	1.00	1.36	1.75	2.20	2.69	3.22	3.79
	800	0.103	0.212	0.397	0.614	0.880	1.19	1.54	1.94	2.38	2.85	3.37
	900	0.0922	0.189	0.354	0.547	0.785	1.07	1.38	1.74	2.13	2.56	3.03
150	25.0	1.84	2.85	3.85	4.84	5.83	6.81	7.80	8.78	9.76	10.7	11.7
	50.0	1.59	2.66	3.69	4.70	5.70	6.70	7.69	8.69	9.67	10.7	11.6
	75.0	1.34	2.43	3.48	4.51	5.53	6.55	7.55	8.55	9.55	10.5	11.5
	100	1.14	2.20	3.25	4.29	5.33	6.36	7.38	8.39	9.39	10.4	11.4
	125	0.982	1.99	3.02	4.06	5.11	6.14	7.17	8.20	9.21	10.2	11.2
	150	0.862	1.80	2.79	3.83	4.87	5.92	6.95	7.99	9.01	10.0	11.1
	175	0.766	1.64	2.59	3.60	4.64	5.68	6.72	7.76	8.80	9.83	10.9
	200	0.690	1.50	2.40	3.39	4.41	5.45	6.49	7.53	8.57	9.61	10.6
	225	0.627	1.37	2.23	3.19	4.19	5.22	6.25	7.30	8.34	9.38	10.4
	250	0.574	1.27	2.08	3.00	3.98	4.99	6.02	7.06	8.10	9.15	10.2
	300	0.492	1.09	1.82	2.67	3.60	4.57	5.58	6.60	7.64	8.68	9.72
	350	0.430	0.946	1.61	2.40	3.27	4.20	5.17	6.17	7.18	8.21	9.25
	400	0.382	0.835	1.44	2.17	2.98	3.86	4.79	5.76	6.75	7.77	8.79
	450	0.343	0.746	1.30	1.98	2.74	3.57	4.46	5.39	6.35	7.34	8.35
	500	0.312	0.674	1.19	1.82	2.52	3.31	4.15	5.05	5.98	6.95	7.93
	600	0.264	0.563	1.01	1.55	2.17	2.87	3.64	4.46	5.33	6.24	7.17
	700	0.228	0.484	0.873	1.35	1.90	2.53	3.23	3.98	4.78	5.63	6.51
	800	0.201	0.424	0.771	1.20	1.69	2.26	2.89	3.58	4.33	5.11	5.94
	900	0.180	0.377	0.690	1.07	1.52	2.04	2.62	3.25	3.94	4.67	5.45

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 45°

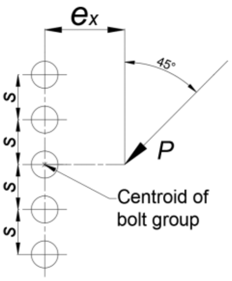
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n										
		2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
75	25.0	1.57	2.64	3.66	4.67	5.66	6.66	7.65	8.64	9.63	10.6	11.6
	50.0	1.17	2.23	3.25	4.27	5.29	6.30	7.31	8.31	9.32	10.3	11.3
	75.0	0.917	1.89	2.87	3.87	4.88	5.90	6.91	7.93	8.94	9.95	11.0
	100	0.753	1.63	2.54	3.50	4.49	5.49	6.50	7.52	8.53	9.54	10.6
	125	0.638	1.42	2.25	3.17	4.13	5.11	6.11	7.11	8.12	9.14	10.1
	150	0.553	1.25	2.01	2.88	3.80	4.76	5.73	6.72	7.72	8.73	9.74
	175	0.488	1.11	1.81	2.63	3.51	4.43	5.38	6.36	7.34	8.34	9.34
	200	0.437	0.993	1.64	2.41	3.25	4.14	5.06	6.01	6.98	7.96	8.95
	225	0.396	0.896	1.49	2.22	3.02	3.87	4.77	5.69	6.64	7.61	8.58
	250	0.361	0.814	1.37	2.06	2.82	3.63	4.49	5.39	6.32	7.27	8.23
	300	0.308	0.685	1.17	1.79	2.47	3.22	4.02	4.86	5.74	6.65	7.58
	350	0.268	0.590	1.03	1.58	2.20	2.88	3.62	4.41	5.24	6.11	6.99
	400	0.238	0.517	0.910	1.41	1.97	2.60	3.29	4.03	4.81	5.63	6.48
	450	0.213	0.461	0.818	1.27	1.78	2.36	3.00	3.70	4.43	5.21	6.02
	500	0.193	0.415	0.742	1.16	1.62	2.16	2.76	3.41	4.10	4.84	5.61
	600	0.163	0.346	0.627	0.981	1.38	1.85	2.37	2.94	3.56	4.22	4.92
	700	0.141	0.297	0.542	0.848	1.19	1.61	2.08	2.58	3.14	3.73	4.37
	800	0.124	0.260	0.478	0.746	1.05	1.43	1.84	2.30	2.80	3.34	3.92
	900	0.111	0.231	0.427	0.666	0.943	1.28	1.65	2.07	2.53	3.02	3.55
150	25.0	1.82	2.83	3.83	4.82	5.81	6.79	7.78	8.76	9.74	10.7	11.7
	50.0	1.57	2.64	3.66	4.67	5.66	6.66	7.65	8.64	9.63	10.6	11.6
	75.0	1.35	2.43	3.46	4.48	5.49	6.49	7.49	8.49	9.48	10.5	11.5
	100	1.17	2.23	3.25	4.27	5.29	6.30	7.31	8.31	9.32	10.3	11.3
	125	1.03	2.05	3.06	4.07	5.09	6.10	7.11	8.12	9.13	10.1	11.1
	150	0.917	1.89	2.87	3.87	4.88	5.90	6.91	7.93	8.94	9.95	11.0
	175	0.827	1.75	2.70	3.68	4.68	5.69	6.71	7.72	8.74	9.75	10.8
	200	0.753	1.63	2.54	3.50	4.49	5.49	6.50	7.52	8.53	9.54	10.6
	225	0.690	1.52	2.39	3.33	4.30	5.30	6.30	7.31	8.33	9.34	10.4
	250	0.638	1.42	2.25	3.17	4.13	5.11	6.11	7.11	8.12	9.14	10.1
	300	0.553	1.25	2.01	2.88	3.80	4.76	5.73	6.72	7.72	8.73	9.74
	350	0.488	1.11	1.81	2.63	3.51	4.43	5.38	6.36	7.34	8.34	9.34
	400	0.437	0.993	1.64	2.41	3.25	4.14	5.06	6.01	6.98	7.96	8.95
	450	0.396	0.896	1.49	2.22	3.02	3.87	4.77	5.69	6.64	7.61	8.58
	500	0.361	0.814	1.37	2.06	2.82	3.63	4.49	5.39	6.32	7.27	8.23
	600	0.308	0.685	1.17	1.79	2.47	3.22	4.02	4.86	5.74	6.65	7.58
	700	0.268	0.590	1.03	1.58	2.20	2.88	3.62	4.41	5.24	6.11	6.99
	800	0.238	0.517	0.910	1.41	1.97	2.60	3.29	4.03	4.81	5.63	6.48
	900	0.213	0.461	0.818	1.27	1.78	2.36	3.00	3.70	4.43	5.21	6.02

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 60°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

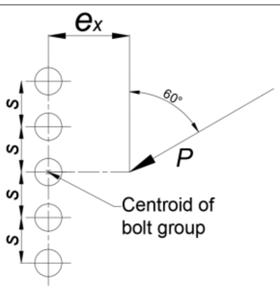
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n										
		2	3	4	5	6	7	8	9	10	11	12
75	25.0	1.60	2.65	3.65	4.64	5.63	6.62	7.61	8.59	9.58	10.6	11.5
	50.0	1.27	2.32	3.32	4.31	5.30	6.29	7.28	8.27	9.26	10.3	11.2
	75.0	1.05	2.05	3.02	4.00	4.98	5.97	6.95	7.94	8.93	9.92	10.9
	100	0.891	1.83	2.77	3.72	4.69	5.66	6.64	7.62	8.61	9.59	10.6
	125	0.774	1.65	2.54	3.47	4.41	5.37	6.34	7.31	8.29	9.27	10.3
	150	0.684	1.49	2.34	3.24	4.16	5.10	6.06	7.02	7.99	8.97	9.94
	175	0.613	1.37	2.17	3.03	3.92	4.85	5.79	6.74	7.70	8.67	9.64
	200	0.555	1.26	2.01	2.83	3.71	4.61	5.54	6.48	7.43	8.39	9.35
	225	0.507	1.16	1.87	2.66	3.51	4.39	5.30	6.23	7.17	8.12	9.07
	250	0.467	1.07	1.74	2.50	3.32	4.19	5.08	5.99	6.92	7.86	8.80
	300	0.403	0.931	1.52	2.22	3.00	3.82	4.67	5.55	6.45	7.37	8.30
	350	0.355	0.815	1.35	2.00	2.73	3.50	4.32	5.16	6.03	6.92	7.83
	400	0.316	0.721	1.21	1.81	2.49	3.23	4.00	4.81	5.65	6.51	7.40
	450	0.286	0.645	1.09	1.66	2.30	2.98	3.72	4.50	5.31	6.14	7.00
	500	0.260	0.583	0.996	1.53	2.12	2.77	3.47	4.21	4.99	5.80	6.63
	600	0.221	0.488	0.848	1.32	1.84	2.41	3.05	3.73	4.45	5.21	5.99
	700	0.192	0.419	0.738	1.15	1.61	2.13	2.71	3.34	4.00	4.70	5.44
	800	0.170	0.367	0.653	1.02	1.43	1.91	2.44	3.02	3.63	4.28	4.97
	900	0.153	0.326	0.586	0.920	1.29	1.72	2.21	2.74	3.31	3.92	4.57
150	25.0	1.81	2.82	3.81	4.79	5.78	6.76	7.75	8.73	9.71	10.7	11.7
	50.0	1.60	2.65	3.65	4.64	5.63	6.62	7.61	8.59	9.58	10.6	11.5
	75.0	1.42	2.48	3.48	4.47	5.47	6.46	7.45	8.44	9.42	10.4	11.4
	100	1.27	2.32	3.32	4.31	5.30	6.29	7.28	8.27	9.26	10.3	11.2
	125	1.15	2.18	3.17	4.15	5.14	6.13	7.12	8.11	9.10	10.1	11.1
	150	1.05	2.05	3.02	4.00	4.98	5.97	6.95	7.94	8.93	9.92	10.9
	175	0.963	1.93	2.89	3.86	4.83	5.81	6.79	7.78	8.77	9.76	10.7
	200	0.891	1.83	2.77	3.72	4.69	5.66	6.64	7.62	8.61	9.59	10.6
	225	0.828	1.73	2.65	3.59	4.55	5.51	6.49	7.47	8.45	9.43	10.4
	250	0.774	1.65	2.54	3.47	4.41	5.37	6.34	7.31	8.29	9.27	10.3
	300	0.684	1.49	2.34	3.24	4.16	5.10	6.06	7.02	7.99	8.97	9.94
	350	0.613	1.37	2.17	3.03	3.92	4.85	5.79	6.74	7.70	8.67	9.64
	400	0.555	1.26	2.01	2.83	3.71	4.61	5.54	6.48	7.43	8.39	9.35
	450	0.507	1.16	1.87	2.66	3.51	4.39	5.30	6.23	7.17	8.12	9.07
	500	0.467	1.07	1.74	2.50	3.32	4.19	5.08	5.99	6.92	7.86	8.80
	600	0.403	0.931	1.52	2.22	3.00	3.82	4.67	5.55	6.45	7.37	8.30
	700	0.355	0.815	1.35	2.00	2.73	3.50	4.32	5.16	6.03	6.92	7.83
	800	0.316	0.721	1.21	1.81	2.49	3.23	4.00	4.81	5.65	6.51	7.40
	900	0.286	0.645	1.09	1.66	2.30	2.98	3.72	4.50	5.31	6.14	7.00

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 75°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

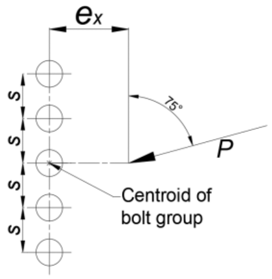
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n										
		2	3	4	5	6	7	8	9	10	11	12
75	25.0	1.71	2.72	3.70	4.68	5.66	6.64	7.62	8.60	9.58	10.6	11.5
	50.0	1.49	2.51	3.49	4.46	5.44	6.41	7.39	8.36	9.34	10.3	11.3
	75.0	1.32	2.33	3.30	4.27	5.23	6.20	7.17	8.14	9.12	10.1	11.1
	100	1.18	2.18	3.14	4.09	5.05	6.01	6.97	7.94	8.91	9.88	10.9
	125	1.07	2.04	2.99	3.93	4.88	5.83	6.79	7.75	8.71	9.68	10.6
	150	0.981	1.92	2.85	3.79	4.73	5.67	6.62	7.57	8.53	9.49	10.4
	175	0.903	1.82	2.73	3.65	4.58	5.52	6.46	7.40	8.35	9.31	10.3
	200	0.836	1.72	2.62	3.52	4.44	5.37	6.30	7.24	8.19	9.13	10.1
	225	0.779	1.63	2.51	3.40	4.31	5.23	6.16	7.09	8.03	8.97	9.92
	250	0.729	1.55	2.41	3.29	4.19	5.10	6.02	6.94	7.88	8.81	9.75
	300	0.646	1.41	2.23	3.07	3.95	4.84	5.75	6.66	7.59	8.51	9.45
	350	0.580	1.30	2.06	2.88	3.73	4.60	5.50	6.40	7.31	8.23	9.15
	400	0.527	1.20	1.92	2.70	3.52	4.38	5.26	6.15	7.05	7.96	8.88
	450	0.482	1.11	1.78	2.53	3.33	4.17	5.03	5.91	6.80	7.70	8.61
	500	0.444	1.03	1.66	2.38	3.16	3.97	4.82	5.68	6.56	7.45	8.35
	600	0.384	0.894	1.46	2.12	2.85	3.63	4.44	5.27	6.13	6.99	7.87
	700	0.339	0.785	1.29	1.90	2.59	3.33	4.11	4.91	5.73	6.57	7.43
	800	0.303	0.696	1.16	1.73	2.38	3.08	3.81	4.58	5.37	6.19	7.02
	900	0.273	0.623	1.05	1.58	2.19	2.85	3.55	4.28	5.05	5.84	6.65
150	25.0	1.84	2.83	3.81	4.80	5.78	6.76	7.74	8.72	9.70	10.7	11.7
	50.0	1.71	2.72	3.70	4.68	5.66	6.64	7.62	8.60	9.58	10.6	11.5
	75.0	1.60	2.61	3.59	4.57	5.54	6.52	7.50	8.48	9.46	10.4	11.4
	100	1.49	2.51	3.49	4.46	5.44	6.41	7.39	8.36	9.34	10.3	11.3
	125	1.40	2.42	3.39	4.36	5.33	6.30	7.28	8.25	9.23	10.2	11.2
	150	1.32	2.33	3.30	4.27	5.23	6.20	7.17	8.14	9.12	10.1	11.1
	175	1.25	2.25	3.22	4.18	5.14	6.10	7.07	8.04	9.01	9.99	11.0
	200	1.18	2.18	3.14	4.09	5.05	6.01	6.97	7.94	8.91	9.88	10.9
	225	1.13	2.11	3.06	4.01	4.96	5.92	6.88	7.84	8.81	9.78	10.7
	250	1.07	2.04	2.99	3.93	4.88	5.83	6.79	7.75	8.71	9.68	10.6
	300	0.981	1.92	2.85	3.79	4.73	5.67	6.62	7.57	8.53	9.49	10.4
	350	0.903	1.82	2.73	3.65	4.58	5.52	6.46	7.40	8.35	9.31	10.3
	400	0.836	1.72	2.62	3.52	4.44	5.37	6.30	7.24	8.19	9.13	10.1
	450	0.779	1.63	2.51	3.40	4.31	5.23	6.16	7.09	8.03	8.97	9.92
	500	0.729	1.55	2.41	3.29	4.19	5.10	6.02	6.94	7.88	8.81	9.75
	600	0.646	1.41	2.23	3.07	3.95	4.84	5.75	6.66	7.59	8.51	9.45
	700	0.580	1.30	2.06	2.88	3.73	4.60	5.50	6.40	7.31	8.23	9.15
	800	0.527	1.20	1.92	2.70	3.52	4.38	5.26	6.15	7.05	7.96	8.88
	900	0.482	1.11	1.78	2.53	3.33	4.17	5.03	5.91	6.80	7.70	8.61

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 0°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

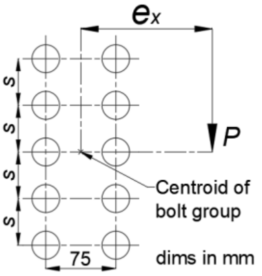
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	0.841	2.54	4.48	6.59	8.72	10.8	12.9	15.0	17.0	19.0	21.0	23.0
	75	0.654	2.03	3.68	5.67	7.77	9.91	12.0	14.2	16.3	18.3	20.4	22.5
	100	0.535	1.67	3.06	4.86	6.84	8.93	11.1	13.2	15.4	17.5	19.6	21.7
	125	0.453	1.42	2.59	4.21	6.01	8.00	10.1	12.2	14.4	16.5	18.7	20.8
	150	0.393	1.22	2.25	3.69	5.32	7.17	9.16	11.2	13.4	15.5	17.7	19.8
	175	0.346	1.08	1.99	3.27	4.74	6.46	8.33	10.3	12.4	14.5	16.7	18.8
	200	0.310	0.958	1.78	2.93	4.27	5.86	7.60	9.49	11.5	13.6	15.7	17.8
	225	0.280	0.863	1.60	2.65	3.87	5.34	6.97	8.75	10.7	12.6	14.7	16.8
	250	0.256	0.785	1.46	2.42	3.53	4.90	6.42	8.10	9.91	11.8	13.8	15.9
	300	0.218	0.663	1.24	2.06	3.01	4.19	5.51	7.01	8.63	10.4	12.2	14.1
	350	0.190	0.574	1.08	1.78	2.62	3.66	4.82	6.15	7.61	9.19	10.9	12.7
	400	0.168	0.506	0.951	1.57	2.32	3.24	4.27	5.47	6.79	8.23	9.78	11.4
	450	0.151	0.451	0.851	1.41	2.07	2.90	3.83	4.92	6.11	7.43	8.85	10.4
	500	0.137	0.408	0.769	1.27	1.88	2.63	3.48	4.47	5.55	6.76	8.07	9.48
	600	0.115	0.342	0.645	1.07	1.58	2.21	2.93	3.77	4.69	5.72	6.85	8.06
	700	0.0998	0.294	0.555	0.918	1.36	1.90	2.53	3.25	4.05	4.95	5.93	7.00
	800	0.0879	0.258	0.487	0.805	1.19	1.67	2.22	2.86	3.57	4.36	5.23	6.18
	900	0.0785	0.229	0.434	0.717	1.06	1.49	1.98	2.55	3.18	3.90	4.67	5.52
	C', mm	73.6	208	395	651	967	1350	1800	2330	2910	3570	4290	5090
150	50	0.841	3.24	5.39	7.47	9.51	11.5	13.5	15.5	17.5	19.5	21.5	23.4
	75	0.654	2.79	4.93	7.07	9.17	11.2	13.3	15.3	17.3	19.3	21.3	23.3
	100	0.535	2.41	4.44	6.60	8.75	10.9	12.9	15.0	17.0	19.0	21.1	23.1
	125	0.453	2.10	3.97	6.11	8.27	10.4	12.5	14.6	16.7	18.7	20.8	22.8
	150	0.393	1.85	3.55	5.62	7.77	9.93	12.1	14.2	16.3	18.4	20.4	22.5
	175	0.346	1.64	3.18	5.17	7.27	9.43	11.6	13.7	15.9	18.0	20.1	22.1
	200	0.310	1.47	2.87	4.75	6.79	8.92	11.1	13.2	15.4	17.5	19.6	21.7
	225	0.280	1.34	2.61	4.39	6.34	8.43	10.6	12.7	14.9	17.1	19.2	21.3
	250	0.256	1.22	2.39	4.06	5.92	7.96	10.1	12.2	14.4	16.6	18.7	20.8
	300	0.218	1.04	2.04	3.52	5.20	7.10	9.12	11.2	13.4	15.5	17.7	19.9
	350	0.190	0.901	1.77	3.09	4.61	6.36	8.27	10.3	12.4	14.5	16.7	18.8
	400	0.168	0.795	1.57	2.75	4.12	5.74	7.52	9.44	11.5	13.5	15.7	17.8
	450	0.151	0.711	1.41	2.48	3.72	5.21	6.87	8.68	10.6	12.6	14.7	16.8
	500	0.137	0.643	1.28	2.25	3.38	4.77	6.31	8.02	9.85	11.8	13.8	15.9
	600	0.115	0.539	1.07	1.90	2.86	4.06	5.40	6.91	8.55	10.3	12.2	14.1
	700	0.0998	0.464	0.926	1.64	2.47	3.52	4.70	6.05	7.52	9.12	10.8	12.6
	800	0.0879	0.407	0.813	1.44	2.18	3.11	4.16	5.36	6.69	8.15	9.71	11.4
	900	0.0785	0.363	0.725	1.29	1.94	2.78	3.72	4.81	6.02	7.34	8.78	10.3
	C', mm	73.6	329	662	1170	1780	2560	3450	4500	5660	6980	8420	10000

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 15°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

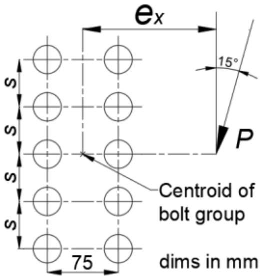
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	0.871	2.54	4.47	6.53	8.63	10.7	12.8	14.8	16.9	18.9	20.9	22.9
	75	0.677	2.04	3.71	5.63	7.69	9.80	11.9	14.0	16.1	18.2	20.2	22.3
	100	0.554	1.69	3.11	4.85	6.79	8.84	10.9	13.1	15.2	17.3	19.4	21.5
	125	0.469	1.44	2.66	4.21	6.00	7.94	9.98	12.1	14.2	16.3	18.4	20.5
	150	0.406	1.25	2.31	3.70	5.34	7.15	9.09	11.1	13.2	15.3	17.4	19.6
	175	0.359	1.10	2.04	3.29	4.79	6.46	8.30	10.2	12.3	14.3	16.4	18.6
	200	0.321	0.981	1.83	2.96	4.32	5.87	7.60	9.45	11.4	13.4	15.5	17.6
	225	0.290	0.885	1.65	2.68	3.94	5.37	6.99	8.74	10.6	12.5	14.6	16.6
	250	0.265	0.806	1.51	2.45	3.61	4.93	6.45	8.11	9.88	11.8	13.7	15.7
	300	0.226	0.682	1.28	2.09	3.08	4.24	5.58	7.05	8.66	10.4	12.2	14.1
	350	0.197	0.591	1.11	1.82	2.69	3.71	4.90	6.21	7.67	9.23	10.9	12.7
	400	0.174	0.521	0.980	1.61	2.38	3.29	4.36	5.54	6.86	8.29	9.83	11.5
	450	0.156	0.466	0.877	1.44	2.13	2.96	3.92	4.99	6.20	7.51	8.93	10.4
	500	0.142	0.421	0.794	1.31	1.93	2.68	3.56	4.54	5.65	6.85	8.16	9.57
	600	0.120	0.353	0.666	1.10	1.62	2.26	3.00	3.84	4.79	5.82	6.96	8.17
	700	0.103	0.303	0.573	0.944	1.40	1.95	2.59	3.32	4.15	5.05	6.05	7.12
	800	0.0910	0.266	0.503	0.829	1.23	1.72	2.28	2.93	3.66	4.46	5.34	6.29
	900	0.0813	0.237	0.448	0.739	1.10	1.53	2.04	2.61	3.27	3.98	4.78	5.64
150	50	0.871	3.21	5.35	7.42	9.45	11.5	13.5	15.4	17.4	19.4	21.4	23.4
	75	0.677	2.76	4.88	7.00	9.09	11.1	13.2	15.2	17.2	19.2	21.2	23.2
	100	0.554	2.38	4.40	6.53	8.65	10.7	12.8	14.9	16.9	18.9	20.9	22.9
	125	0.469	2.07	3.96	6.04	8.17	10.3	12.4	14.5	16.5	18.6	20.6	22.6
	150	0.406	1.83	3.56	5.56	7.67	9.80	11.9	14.0	16.1	18.2	20.2	22.3
	175	0.359	1.63	3.22	5.12	7.19	9.30	11.4	13.6	15.7	17.8	19.8	21.9
	200	0.321	1.47	2.92	4.73	6.72	8.81	10.9	13.1	15.2	17.3	19.4	21.5
	225	0.290	1.34	2.66	4.37	6.29	8.33	10.4	12.6	14.7	16.8	18.9	21.0
	250	0.265	1.23	2.45	4.05	5.90	7.88	9.95	12.1	14.2	16.3	18.5	20.6
	300	0.226	1.05	2.09	3.53	5.21	7.06	9.04	11.1	13.2	15.3	17.5	19.6
	350	0.197	0.912	1.83	3.11	4.64	6.35	8.22	10.2	12.2	14.3	16.4	18.6
	400	0.174	0.808	1.62	2.77	4.17	5.75	7.51	9.38	11.4	13.4	15.5	17.6
	450	0.156	0.724	1.45	2.50	3.77	5.24	6.88	8.66	10.5	12.5	14.5	16.6
	500	0.142	0.656	1.32	2.28	3.45	4.80	6.34	8.02	9.81	11.7	13.7	15.7
	600	0.120	0.552	1.11	1.93	2.93	4.10	5.46	6.95	8.57	10.3	12.1	14.0
	700	0.103	0.476	0.955	1.67	2.54	3.57	4.77	6.11	7.57	9.15	10.8	12.6
	800	0.0910	0.418	0.840	1.47	2.24	3.16	4.24	5.43	6.77	8.21	9.75	11.4
	900	0.0813	0.373	0.749	1.32	2.00	2.83	3.80	4.89	6.10	7.42	8.85	10.4

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 30°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

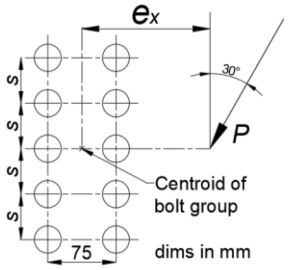
$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
75	50	0.969	2.60	4.52	6.53	8.58	10.6	12.7	14.7	16.7	18.8	20.8	22.8
	75	0.754	2.12	3.83	5.71	7.71	9.75	11.8	13.9	15.9	18.0	20.0	22.1
	100	0.617	1.78	3.29	4.99	6.88	8.87	10.9	13.0	15.0	17.1	19.2	21.2
	125	0.522	1.53	2.85	4.39	6.16	8.06	10.0	12.1	14.1	16.2	18.3	20.3
	150	0.453	1.34	2.51	3.89	5.54	7.33	9.23	11.2	13.2	15.3	17.3	19.4
	175	0.400	1.19	2.23	3.48	5.01	6.70	8.50	10.4	12.4	14.4	16.4	18.5
	200	0.358	1.07	2.00	3.15	4.57	6.14	7.86	9.68	11.6	13.5	15.6	17.6
	225	0.324	0.967	1.81	2.87	4.19	5.66	7.28	9.02	10.9	12.8	14.7	16.7
	250	0.295	0.883	1.66	2.64	3.86	5.24	6.77	8.43	10.2	12.0	13.9	15.9
	300	0.252	0.751	1.41	2.27	3.33	4.54	5.91	7.43	9.04	10.8	12.5	14.4
	350	0.219	0.652	1.23	1.98	2.93	3.99	5.24	6.61	8.09	9.67	11.3	13.1
	400	0.194	0.576	1.08	1.76	2.60	3.56	4.69	5.94	7.30	8.77	10.3	12.0
	450	0.174	0.516	0.972	1.58	2.34	3.21	4.24	5.38	6.64	8.00	9.45	11.0
	500	0.158	0.466	0.880	1.43	2.12	2.92	3.87	4.92	6.08	7.34	8.70	10.1
	600	0.133	0.391	0.739	1.21	1.79	2.48	3.29	4.18	5.19	6.29	7.48	8.75
	700	0.115	0.337	0.637	1.04	1.55	2.14	2.85	3.63	4.52	5.49	6.54	7.68
	800	0.101	0.296	0.559	0.918	1.36	1.89	2.51	3.21	4.00	4.87	5.81	6.83
	900	0.0907	0.264	0.499	0.819	1.21	1.69	2.25	2.87	3.59	4.37	5.22	6.15
150	50	0.969	3.20	5.31	7.36	9.39	11.4	13.4	15.4	17.4	19.3	21.3	
	75	0.754	2.75	4.86	6.95	9.01	11.0	13.1	15.1	17.1	19.1	21.1	23.1
	100	0.617	2.39	4.42	6.49	8.57	10.6	12.7	14.7	16.8	18.8	20.8	22.8
	125	0.522	2.10	4.02	6.04	8.11	10.2	12.3	14.3	16.4	18.4	20.4	22.5
	150	0.453	1.87	3.67	5.61	7.66	9.73	11.8	13.9	15.9	18.0	20.0	22.1
	175	0.400	1.69	3.36	5.21	7.21	9.27	11.3	13.4	15.5	17.6	19.6	21.7
	200	0.358	1.53	3.08	4.84	6.79	8.82	10.9	13.0	15.0	17.1	19.2	21.3
	225	0.324	1.40	2.84	4.51	6.40	8.39	10.4	12.5	14.6	16.7	18.7	20.8
	250	0.295	1.29	2.63	4.21	6.04	7.98	9.99	12.0	14.1	16.2	18.3	20.4
	300	0.252	1.12	2.28	3.70	5.39	7.23	9.16	11.2	13.2	15.3	17.3	19.4
	350	0.219	0.980	2.00	3.29	4.86	6.57	8.41	10.3	12.3	14.4	16.4	18.5
	400	0.194	0.872	1.78	2.95	4.40	6.01	7.75	9.60	11.5	13.5	15.5	17.6
	450	0.174	0.785	1.60	2.68	4.02	5.52	7.17	8.93	10.8	12.7	14.7	16.7
	500	0.158	0.714	1.45	2.45	3.69	5.09	6.65	8.33	10.1	12.0	13.9	15.9
	600	0.133	0.603	1.23	2.08	3.17	4.39	5.79	7.32	8.95	10.7	12.5	14.3
	700	0.115	0.522	1.06	1.82	2.77	3.85	5.11	6.49	7.99	9.59	11.3	13.0
	800	0.101	0.460	0.932	1.61	2.45	3.42	4.56	5.82	7.20	8.68	10.2	11.9
	900	0.0907	0.411	0.832	1.44	2.20	3.08	4.12	5.27	6.53	7.90	9.37	10.9

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 45°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

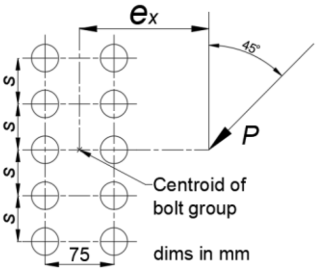
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.17	2.79	4.67	6.62	8.61	10.6	12.6	14.6	16.6	18.6	20.6	22.6
	75	0.917	2.32	4.06	5.92	7.85	9.83	11.8	13.8	15.9	17.9	19.9	21.9
	100	0.753	1.99	3.57	5.31	7.16	9.09	11.1	13.1	15.1	17.1	19.1	21.1
	125	0.638	1.74	3.17	4.78	6.53	8.39	10.3	12.3	14.3	16.3	18.3	20.3
	150	0.553	1.54	2.84	4.33	5.98	7.76	9.63	11.6	13.5	15.5	17.5	19.5
	175	0.488	1.38	2.57	3.93	5.49	7.20	9.00	10.9	12.8	14.7	16.7	18.7
	200	0.437	1.25	2.33	3.60	5.06	6.70	8.43	10.2	12.1	14.0	16.0	17.9
	225	0.396	1.14	2.13	3.31	4.69	6.25	7.91	9.67	11.5	13.4	15.3	17.2
	250	0.361	1.05	1.96	3.06	4.36	5.85	7.44	9.13	10.9	12.7	14.6	16.5
	300	0.308	0.896	1.68	2.65	3.83	5.17	6.63	8.20	9.86	11.6	13.4	15.2
	350	0.268	0.783	1.47	2.33	3.40	4.61	5.95	7.41	8.97	10.6	12.3	14.1
	400	0.238	0.694	1.31	2.08	3.05	4.16	5.38	6.74	8.20	9.75	11.4	13.0
	450	0.213	0.623	1.17	1.88	2.76	3.77	4.91	6.18	7.55	9.00	10.5	12.1
	500	0.193	0.565	1.06	1.71	2.52	3.45	4.51	5.69	6.97	8.34	9.80	11.3
	600	0.163	0.475	0.897	1.45	2.14	2.94	3.87	4.91	6.04	7.26	8.57	9.95
	700	0.141	0.410	0.774	1.26	1.86	2.56	3.38	4.30	5.30	6.41	7.59	8.85
	800	0.124	0.360	0.681	1.11	1.64	2.27	3.00	3.82	4.73	5.73	6.80	7.94
	900	0.111	0.321	0.607	0.991	1.47	2.03	2.70	3.44	4.26	5.17	6.15	7.20
150	50	1.17	3.24	5.30	7.32	9.33	11.3	13.3	15.3	17.3	19.2	21.2	23.2
	75	0.917	2.84	4.90	6.93	8.95	11.0	13.0	15.0	17.0	19.0	20.9	22.9
	100	0.753	2.51	4.52	6.53	8.55	10.6	12.6	14.6	16.6	18.6	20.6	22.6
	125	0.638	2.24	4.17	6.14	8.15	10.2	12.2	14.2	16.2	18.3	20.3	22.3
	150	0.553	2.03	3.86	5.78	7.76	9.77	11.8	13.8	15.8	17.9	19.9	21.9
	175	0.488	1.85	3.59	5.45	7.39	9.38	11.4	13.4	15.4	17.5	19.5	21.5
	200	0.437	1.70	3.35	5.13	7.03	9.00	11.0	13.0	15.0	17.1	19.1	21.1
	225	0.396	1.57	3.13	4.85	6.70	8.63	10.6	12.6	14.6	16.6	18.7	20.7
	250	0.361	1.46	2.94	4.58	6.38	8.28	10.2	12.2	14.2	16.2	18.3	20.3
	300	0.308	1.28	2.60	4.11	5.81	7.64	9.54	11.5	13.5	15.5	17.5	19.5
	350	0.268	1.13	2.32	3.71	5.31	7.06	8.89	10.8	12.7	14.7	16.7	18.7
	400	0.238	1.01	2.09	3.36	4.88	6.55	8.31	10.1	12.0	14.0	15.9	17.9
	450	0.213	0.919	1.90	3.07	4.50	6.09	7.78	9.56	11.4	13.3	15.2	17.2
	500	0.193	0.840	1.73	2.83	4.18	5.69	7.31	9.02	10.8	12.7	14.5	16.5
	600	0.163	0.715	1.47	2.43	3.64	5.00	6.48	8.08	9.76	11.5	13.3	15.2
	700	0.141	0.622	1.28	2.13	3.22	4.45	5.80	7.28	8.86	10.5	12.2	14.0
	800	0.124	0.550	1.13	1.90	2.88	3.99	5.24	6.62	8.09	9.65	11.3	13.0
	900	0.111	0.493	1.01	1.71	2.61	3.62	4.77	6.05	7.43	8.90	10.4	12.1

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 60°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = C r_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

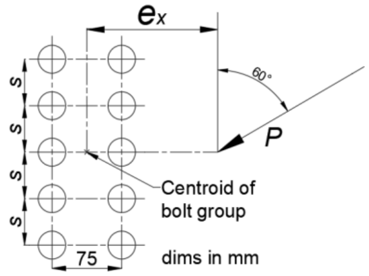
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.51	3.17	4.97	6.85	8.77	10.7	12.7	14.6	16.6	18.6	20.5	22.5
	75	1.24	2.76	4.47	6.30	8.18	10.1	12.0	14.0	16.0	17.9	19.9	21.9
	100	1.04	2.43	4.04	5.81	7.65	9.53	11.4	13.4	15.3	17.3	19.2	21.2
	125	0.886	2.16	3.70	5.39	7.17	9.01	10.9	12.8	14.7	16.7	18.6	20.6
	150	0.773	1.95	3.40	5.01	6.73	8.52	10.4	12.2	14.1	16.1	18.0	19.9
	175	0.684	1.77	3.13	4.67	6.33	8.07	9.88	11.7	13.6	15.5	17.4	19.4
	200	0.613	1.62	2.90	4.37	5.96	7.65	9.42	11.2	13.1	15.0	16.9	18.8
	225	0.556	1.49	2.70	4.09	5.62	7.26	8.98	10.8	12.6	14.5	16.3	18.2
	250	0.508	1.38	2.52	3.84	5.31	6.89	8.58	10.3	12.1	14.0	15.8	17.7
	300	0.434	1.20	2.21	3.40	4.76	6.25	7.85	9.53	11.3	13.0	14.9	16.7
	350	0.378	1.06	1.96	3.05	4.30	5.71	7.23	8.83	10.5	12.2	14.0	15.8
	400	0.335	0.945	1.76	2.75	3.92	5.24	6.68	8.20	9.79	11.5	13.2	14.9
	450	0.301	0.854	1.60	2.51	3.59	4.84	6.19	7.64	9.16	10.8	12.4	14.1
	500	0.273	0.777	1.46	2.30	3.32	4.48	5.76	7.14	8.60	10.1	11.7	13.4
	600	0.230	0.659	1.24	1.97	2.87	3.90	5.04	6.29	7.64	9.06	10.6	12.1
	700	0.199	0.571	1.07	1.72	2.52	3.44	4.47	5.61	6.85	8.17	9.55	11.0
	800	0.176	0.503	0.948	1.52	2.24	3.07	4.01	5.06	6.20	7.41	8.70	10.1
	900	0.157	0.450	0.848	1.37	2.02	2.77	3.63	4.59	5.65	6.77	7.98	9.26
150	50	1.51	3.39	5.36	7.33	9.30	11.3	13.2	15.2	17.2	19.2	21.1	23.1
	75	1.24	3.08	5.04	7.01	8.98	11.0	12.9	14.9	16.9	18.9	20.8	22.8
	100	1.04	2.80	4.73	6.69	8.66	10.6	12.6	14.6	16.6	18.5	20.5	22.5
	125	0.886	2.57	4.45	6.39	8.34	10.3	12.3	14.2	16.2	18.2	20.2	22.2
	150	0.773	2.37	4.20	6.11	8.05	10.0	12.0	13.9	15.9	17.9	19.8	21.8
	175	0.684	2.19	3.98	5.85	7.76	9.70	11.6	13.6	15.6	17.5	19.5	21.5
	200	0.613	2.04	3.77	5.61	7.49	9.41	11.3	13.3	15.3	17.2	19.2	21.2
	225	0.556	1.91	3.59	5.38	7.24	9.13	11.1	13.0	14.9	16.9	18.9	20.8
	250	0.508	1.80	3.42	5.17	6.99	8.87	10.8	12.7	14.6	16.6	18.6	20.5
	300	0.434	1.60	3.11	4.78	6.54	8.37	10.2	12.1	14.1	16.0	17.9	19.9
	350	0.378	1.44	2.85	4.43	6.13	7.91	9.74	11.6	13.5	15.4	17.4	19.3
	400	0.335	1.31	2.63	4.12	5.74	7.47	9.27	11.1	13.0	14.9	16.8	18.7
	450	0.301	1.20	2.43	3.84	5.40	7.08	8.83	10.6	12.5	14.4	16.3	18.2
	500	0.273	1.10	2.26	3.58	5.08	6.71	8.43	10.2	12.0	13.9	15.7	17.6
	600	0.230	0.952	1.97	3.15	4.53	6.06	7.69	9.39	11.1	12.9	14.8	16.6
	700	0.199	0.836	1.73	2.80	4.08	5.52	7.06	8.68	10.4	12.1	13.9	15.7
	800	0.176	0.745	1.54	2.52	3.70	5.05	6.51	8.05	9.66	11.3	13.1	14.8
	900	0.157	0.671	1.39	2.28	3.39	4.65	6.02	7.49	9.03	10.6	12.3	14.0

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 75°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

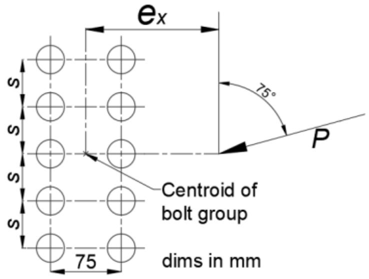
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.84	3.63	5.44	7.29	9.16	11.1	13.0	14.9	16.8	18.8	20.7	22.7
	75	1.71	3.41	5.16	6.97	8.82	10.7	12.6	14.5	16.4	18.4	20.3	22.2
	100	1.57	3.19	4.90	6.67	8.49	10.3	12.2	14.1	16.0	17.9	19.9	21.8
	125	1.44	2.98	4.64	6.39	8.18	10.0	11.9	13.8	15.7	17.6	19.5	21.4
	150	1.31	2.79	4.41	6.12	7.89	9.71	11.6	13.4	15.3	17.2	19.1	21.0
	175	1.20	2.61	4.19	5.88	7.62	9.42	11.2	13.1	15.0	16.9	18.7	20.6
	200	1.10	2.45	3.99	5.65	7.37	9.14	11.0	12.8	14.6	16.5	18.4	20.3
	225	1.01	2.31	3.81	5.43	7.14	8.89	10.7	12.5	14.3	16.2	18.1	20.0
	250	0.934	2.18	3.63	5.23	6.91	8.65	10.4	12.2	14.1	15.9	17.8	19.6
	300	0.809	1.95	3.33	4.86	6.49	8.19	9.94	11.7	13.5	15.3	17.2	19.0
	350	0.712	1.76	3.06	4.53	6.10	7.76	9.47	11.2	13.0	14.8	16.6	18.4
	400	0.635	1.61	2.83	4.23	5.75	7.36	9.03	10.7	12.5	14.3	16.1	17.9
	450	0.572	1.48	2.63	3.96	5.42	6.98	8.61	10.3	12.0	13.8	15.6	17.4
	500	0.521	1.36	2.45	3.72	5.12	6.63	8.23	9.88	11.6	13.3	15.1	16.8
	600	0.441	1.18	2.15	3.30	4.60	6.02	7.53	9.12	10.8	12.4	14.2	15.9
	700	0.382	1.04	1.91	2.95	4.16	5.49	6.93	8.45	10.0	11.7	13.3	15.0
	800	0.337	0.923	1.71	2.67	3.78	5.04	6.41	7.86	9.37	10.9	12.6	14.2
	900	0.301	0.832	1.55	2.43	3.47	4.65	5.94	7.32	8.78	10.3	11.9	13.5
150	50	1.84	3.65	5.55	7.47	9.41	11.4	13.3	15.3	17.2	19.2	21.1	23.1
	75	1.71	3.49	5.36	7.27	9.20	11.1	13.1	15.0	17.0	18.9	20.9	22.9
	100	1.57	3.32	5.18	7.08	8.99	10.9	12.9	14.8	16.8	18.7	20.7	22.6
	125	1.44	3.16	5.01	6.89	8.80	10.7	12.7	14.6	16.5	18.5	20.4	22.4
	150	1.31	3.01	4.84	6.72	8.62	10.5	12.5	14.4	16.3	18.3	20.2	22.2
	175	1.20	2.88	4.69	6.55	8.44	10.3	12.3	14.2	16.1	18.1	20.0	21.9
	200	1.10	2.75	4.54	6.39	8.27	10.2	12.1	14.0	15.9	17.9	19.8	21.7
	225	1.01	2.63	4.40	6.24	8.11	9.99	11.9	13.8	15.7	17.7	19.6	21.5
	250	0.934	2.52	4.27	6.09	7.95	9.83	11.7	13.6	15.5	17.5	19.4	21.3
	300	0.809	2.32	4.03	5.82	7.65	9.51	11.4	13.3	15.2	17.1	19.0	20.9
	350	0.712	2.15	3.82	5.57	7.38	9.22	11.1	13.0	14.8	16.7	18.6	20.6
	400	0.635	2.00	3.62	5.35	7.13	8.95	10.8	12.7	14.5	16.4	18.3	20.2
	450	0.572	1.87	3.44	5.14	6.90	8.69	10.5	12.4	14.2	16.1	18.0	19.9
	500	0.521	1.75	3.28	4.94	6.67	8.45	10.3	12.1	13.9	15.8	17.7	19.5
	600	0.441	1.55	2.98	4.57	6.24	7.98	9.75	11.6	13.4	15.2	17.1	18.9
	700	0.382	1.40	2.74	4.24	5.85	7.54	9.28	11.0	12.8	14.7	16.5	18.3
	800	0.337	1.27	2.52	3.95	5.49	7.13	8.83	10.6	12.3	14.1	16.0	17.8
	900	0.301	1.16	2.33	3.68	5.16	6.75	8.41	10.1	11.9	13.6	15.4	17.3

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 0°

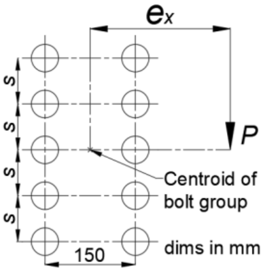
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.18	2.79	4.61	6.62	8.69	10.8	12.8	14.9	16.9	19.0	21.0	23.0
	75	0.982	2.37	3.97	5.83	7.83	9.91	12.0	14.1	16.2	18.3	20.3	22.4
	100	0.841	2.04	3.45	5.15	7.01	9.02	11.1	13.2	15.3	17.4	19.5	21.6
	125	0.736	1.79	3.03	4.57	6.29	8.18	10.2	12.3	14.4	16.5	18.6	20.8
	150	0.654	1.59	2.69	4.09	5.67	7.43	9.34	11.3	13.4	15.5	17.7	19.8
	175	0.589	1.43	2.43	3.70	5.13	6.78	8.58	10.5	12.5	14.6	16.7	18.8
	200	0.535	1.30	2.21	3.37	4.68	6.22	7.90	9.72	11.6	13.7	15.7	17.8
	225	0.491	1.19	2.02	3.09	4.30	5.73	7.30	9.02	10.9	12.8	14.8	16.9
	250	0.453	1.09	1.86	2.85	3.97	5.30	6.77	8.40	10.1	12.0	14.0	16.0
	300	0.393	0.943	1.61	2.46	3.44	4.60	5.89	7.35	8.93	10.6	12.4	14.3
	350	0.346	0.829	1.42	2.16	3.03	4.06	5.20	6.51	7.93	9.48	11.1	12.9
	400	0.310	0.739	1.27	1.93	2.70	3.62	4.65	5.83	7.12	8.53	10.0	11.7
	450	0.280	0.666	1.14	1.74	2.44	3.27	4.21	5.28	6.45	7.74	9.13	10.6
	500	0.256	0.606	1.04	1.58	2.22	2.98	3.84	4.81	5.88	7.08	8.36	9.75
	600	0.218	0.514	0.880	1.34	1.88	2.52	3.25	4.09	5.01	6.03	7.13	8.34
	700	0.190	0.445	0.763	1.16	1.63	2.19	2.82	3.55	4.35	5.24	6.21	7.27
	800	0.168	0.393	0.673	1.02	1.44	1.93	2.49	3.13	3.84	4.63	5.49	6.43
	900	0.151	0.352	0.601	0.912	1.28	1.72	2.23	2.80	3.44	4.15	4.92	5.77
	C', mm	147	329	559	843	1190	1590	2060	2590	3190	3850	4590	5380
150	50	1.18	3.26	5.36	7.44	9.48	11.5	13.5	15.5	17.5	19.5	21.4	23.4
	75	0.982	2.87	4.93	7.04	9.14	11.2	13.2	15.3	17.3	19.3	21.3	23.3
	100	0.841	2.54	4.48	6.59	8.72	10.8	12.9	15.0	17.0	19.0	21.0	23.0
	125	0.736	2.26	4.06	6.12	8.25	10.4	12.5	14.6	16.7	18.7	20.7	22.8
	150	0.654	2.03	3.68	5.67	7.77	9.91	12.0	14.2	16.3	18.3	20.4	22.5
	175	0.589	1.84	3.34	5.24	7.29	9.42	11.6	13.7	15.8	17.9	20.0	22.1
	200	0.535	1.67	3.06	4.86	6.84	8.93	11.1	13.2	15.4	17.5	19.6	21.7
	225	0.491	1.54	2.81	4.52	6.41	8.45	10.6	12.7	14.9	17.0	19.2	21.3
	250	0.453	1.42	2.59	4.21	6.01	8.00	10.1	12.2	14.4	16.5	18.7	20.8
	300	0.393	1.22	2.25	3.69	5.32	7.17	9.16	11.2	13.4	15.5	17.7	19.8
	350	0.346	1.08	1.99	3.27	4.74	6.46	8.33	10.3	12.4	14.5	16.7	18.8
	400	0.310	0.958	1.78	2.93	4.27	5.86	7.60	9.49	11.5	13.6	15.7	17.8
	450	0.280	0.863	1.60	2.65	3.87	5.34	6.97	8.75	10.7	12.6	14.7	16.8
	500	0.256	0.785	1.46	2.42	3.53	4.90	6.42	8.10	9.91	11.8	13.8	15.9
	600	0.218	0.663	1.24	2.06	3.01	4.19	5.51	7.01	8.63	10.4	12.2	14.1
	700	0.190	0.574	1.08	1.78	2.62	3.66	4.82	6.15	7.61	9.19	10.9	12.7
	800	0.168	0.506	0.951	1.57	2.32	3.24	4.27	5.47	6.79	8.23	9.78	11.4
	900	0.151	0.451	0.851	1.41	2.07	2.90	3.83	4.92	6.11	7.43	8.85	10.4
	C', mm	147	416	789	1300	1930	2710	3610	4650	5830	7140	8590	10200

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 15°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

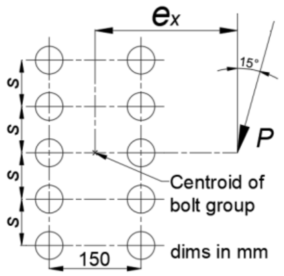
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.22	2.82	4.64	6.60	8.64	10.7	12.7	14.8	16.8	18.8	20.9	22.9
	75	1.02	2.40	4.02	5.84	7.80	9.84	11.9	14.0	16.1	18.1	20.2	22.2
	100	0.87	2.08	3.51	5.17	7.01	8.97	11.0	13.1	15.2	17.2	19.3	21.4
	125	0.76	1.83	3.10	4.60	6.31	8.16	10.1	12.2	14.2	16.3	18.4	20.5
	150	0.68	1.63	2.77	4.13	5.71	7.44	9.31	11.3	13.3	15.4	17.5	19.6
	175	0.61	1.47	2.50	3.74	5.20	6.81	8.57	10.4	12.4	14.4	16.5	18.6
	200	0.55	1.33	2.27	3.41	4.76	6.25	7.92	9.70	11.6	13.6	15.6	17.6
	225	0.51	1.22	2.08	3.14	4.38	5.77	7.34	9.03	10.8	12.7	14.7	16.7
	250	0.47	1.12	1.92	2.90	4.05	5.35	6.83	8.43	10.1	12.0	13.9	15.8
	300	0.41	0.972	1.66	2.51	3.52	4.66	5.97	7.40	8.97	10.6	12.4	14.2
	350	0.36	0.855	1.46	2.21	3.10	4.12	5.30	6.58	8.00	9.53	11.2	12.9
	400	0.32	0.762	1.30	1.98	2.77	3.69	4.75	5.91	7.21	8.60	10.1	11.7
	450	0.29	0.688	1.18	1.78	2.50	3.34	4.30	5.35	6.55	7.83	9.22	10.7
	500	0.27	0.626	1.07	1.62	2.28	3.05	3.92	4.90	5.99	7.17	8.46	9.84
	600	0.23	0.531	0.908	1.38	1.93	2.59	3.33	4.17	5.11	6.13	7.25	8.45
	700	0.20	0.46	0.787	1.19	1.68	2.24	2.90	3.63	4.45	5.34	6.33	7.39
	800	0.17	0.406	0.695	1.05	1.48	1.98	2.56	3.21	3.94	4.73	5.61	6.55
	900	0.16	0.364	0.621	0.94	1.32	1.77	2.29	2.87	3.53	4.25	5.04	5.89
150	50	1.22	3.25	5.33	7.40	9.43	11.4	13.4	15.4	17.4	19.4	21.4	23.4
	75	1.02	2.87	4.90	6.99	9.06	11.1	13.2	15.2	17.2	19.2	21.2	23.2
	100	0.87	2.54	4.47	6.53	8.63	10.7	12.8	14.8	16.9	18.9	20.9	22.9
	125	0.76	2.26	4.07	6.07	8.17	10.3	12.4	14.4	16.5	18.6	20.6	22.6
	150	0.68	2.04	3.71	5.63	7.69	9.80	11.9	14.0	16.1	18.2	20.2	22.3
	175	0.61	1.85	3.39	5.22	7.23	9.31	11.4	13.5	15.6	17.7	19.8	21.9
	200	0.55	1.69	3.11	4.85	6.79	8.84	10.9	13.1	15.2	17.3	19.4	21.5
	225	0.51	1.55	2.87	4.51	6.38	8.38	10.5	12.6	14.7	16.8	18.9	21.0
	250	0.47	1.44	2.66	4.21	6.00	7.94	9.98	12.1	14.2	16.3	18.4	20.5
	300	0.41	1.25	2.31	3.70	5.34	7.15	9.09	11.1	13.2	15.3	17.4	19.6
	350	0.36	1.10	2.04	3.29	4.79	6.46	8.30	10.2	12.3	14.3	16.4	18.6
	400	0.32	0.981	1.83	2.96	4.32	5.87	7.60	9.45	11.4	13.4	15.5	17.6
	450	0.29	0.885	1.65	2.68	3.94	5.37	6.99	8.74	10.6	12.5	14.6	16.6
	500	0.27	0.806	1.51	2.45	3.61	4.93	6.45	8.11	9.88	11.8	13.7	15.7
	600	0.23	0.682	1.28	2.09	3.08	4.24	5.58	7.05	8.66	10.4	12.2	14.1
	700	0.20	0.591	1.11	1.82	2.69	3.71	4.90	6.21	7.67	9.23	10.9	12.7
	800	0.17	0.521	0.98	1.61	2.38	3.29	4.36	5.54	6.86	8.29	9.83	11.5
	900	0.16	0.466	0.877	1.44	2.13	2.96	3.92	4.99	6.20	7.51	8.93	10.4

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 30°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = C r_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

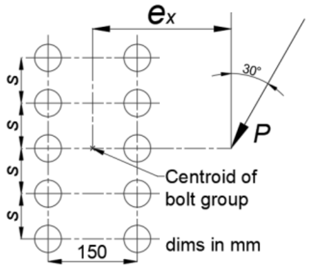
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.35	2.95	4.76	6.68	8.67	10.7	12.7	14.7	16.7	18.7	20.7	22.7
	75	1.13	2.53	4.19	5.98	7.89	9.87	11.9	13.9	16.0	18.0	20.0	22.0
	100	0.969	2.21	3.71	5.37	7.17	9.08	11.0	13.1	15.1	17.1	19.2	21.2
	125	0.848	1.96	3.32	4.83	6.52	8.34	10.2	12.2	14.2	16.3	18.3	20.4
	150	0.754	1.75	2.99	4.37	5.95	7.67	9.5	11.4	13.4	15.4	17.4	19.5
	175	0.679	1.59	2.71	3.98	5.46	7.08	8.82	10.7	12.6	14.5	16.5	18.6
	200	0.617	1.45	2.48	3.65	5.03	6.56	8.21	9.97	11.8	13.7	15.7	17.7
	225	0.566	1.33	2.28	3.37	4.66	6.10	7.66	9.35	11.1	13.0	14.9	16.9
	250	0.522	1.23	2.11	3.13	4.34	5.69	7.17	8.78	10.5	12.3	14.1	16.1
	300	0.453	1.07	1.83	2.73	3.80	5.00	6.33	7.81	9.38	11.0	12.8	14.6
	350	0.400	0.943	1.61	2.42	3.37	4.45	5.66	7.00	8.45	9.99	11.6	13.3
	400	0.358	0.843	1.44	2.16	3.03	4.00	5.11	6.34	7.66	9.10	10.6	12.2
	450	0.324	0.762	1.30	1.96	2.74	3.63	4.65	5.78	7.00	8.34	9.76	11.3
	500	0.295	0.694	1.19	1.79	2.50	3.32	4.26	5.30	6.43	7.68	9.01	10.4
	600	0.252	0.589	1.01	1.52	2.13	2.83	3.64	4.54	5.54	6.63	7.79	9.05
	700	0.219	0.512	0.874	1.32	1.85	2.47	3.18	3.97	4.85	5.81	6.85	7.97
	800	0.194	0.452	0.771	1.16	1.63	2.18	2.81	3.52	4.30	5.17	6.10	7.11
	900	0.174	0.405	0.690	1.04	1.46	1.96	2.52	3.16	3.87	4.65	5.49	6.42
150	50	1.35	3.29	5.33	7.36	9.38	11.4	13.4	15.4	17.3	19.3	21.3	
	75	1.13	2.91	4.92	6.96	9.01	11.0	13.1	15.1	17.1	19.1	21.1	23.0
	100	0.969	2.60	4.52	6.53	8.58	10.6	12.7	14.7	16.7	18.8	20.8	22.8
	125	0.848	2.33	4.16	6.11	8.14	10.2	12.3	14.3	16.4	18.4	20.4	22.4
	150	0.754	2.12	3.83	5.71	7.71	9.75	11.8	13.9	15.9	18.0	20.0	22.1
	175	0.679	1.93	3.54	5.34	7.28	9.31	11.4	13.4	15.5	17.6	19.6	21.7
	200	0.617	1.78	3.29	4.99	6.88	8.87	10.9	13.0	15.0	17.1	19.2	21.2
	225	0.566	1.65	3.06	4.68	6.51	8.45	10.5	12.5	14.6	16.7	18.7	20.8
	250	0.522	1.53	2.85	4.39	6.16	8.06	10.0	12.1	14.1	16.2	18.3	20.3
	300	0.453	1.34	2.51	3.89	5.54	7.33	9.23	11.2	13.2	15.3	17.3	19.4
	350	0.400	1.19	2.23	3.48	5.01	6.70	8.50	10.4	12.4	14.4	16.4	18.5
	400	0.358	1.07	2.00	3.15	4.57	6.14	7.86	9.68	11.6	13.5	15.6	17.6
	450	0.324	0.967	1.81	2.87	4.19	5.66	7.28	9.02	10.9	12.8	14.7	16.7
	500	0.295	0.883	1.66	2.64	3.86	5.24	6.77	8.43	10.2	12.0	13.9	15.9
	600	0.252	0.751	1.41	2.27	3.33	4.54	5.91	7.43	9.04	10.8	12.5	14.4
	700	0.219	0.652	1.23	1.98	2.93	3.99	5.24	6.61	8.09	9.67	11.3	13.1
	800	0.194	0.576	1.08	1.76	2.60	3.56	4.69	5.94	7.30	8.77	10.3	12.0
	900	0.174	0.516	0.972	1.58	2.34	3.21	4.24	5.38	6.64	8.00	9.45	11.0

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 45°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

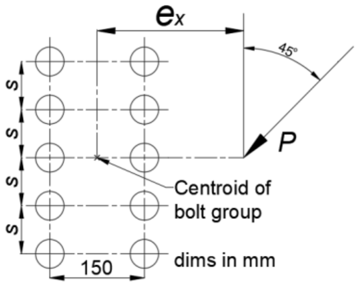
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.57	3.24	5.02	6.89	8.81	10.8	12.7	14.7	16.7	18.7	20.6	22.6
	75	1.35	2.84	4.50	6.28	8.14	10.1	12.0	14.0	16.0	17.9	19.9	21.9
	100	1.17	2.51	4.05	5.74	7.52	9.38	11.3	13.2	15.2	17.2	19.2	21.2
	125	1.03	2.24	3.68	5.27	6.96	8.75	10.6	12.5	14.5	16.4	18.4	20.4
	150	0.917	2.03	3.36	4.85	6.46	8.17	9.97	11.8	13.7	15.7	17.6	19.6
	175	0.827	1.85	3.09	4.49	6.00	7.64	9.38	11.2	13.1	15.0	16.9	18.9
	200	0.753	1.70	2.86	4.16	5.59	7.16	8.84	10.6	12.4	14.3	16.2	18.1
	225	0.690	1.57	2.65	3.87	5.23	6.73	8.34	10.0	11.8	13.6	15.5	17.4
	250	0.638	1.46	2.47	3.62	4.90	6.34	7.89	9.53	11.2	13.0	14.9	16.7
	300	0.553	1.28	2.16	3.19	4.35	5.67	7.10	8.62	10.2	11.9	13.7	15.5
	350	0.488	1.13	1.92	2.84	3.91	5.11	6.43	7.84	9.36	11.0	12.6	14.4
	400	0.437	1.01	1.72	2.56	3.54	4.64	5.86	7.18	8.61	10.1	11.7	13.3
	450	0.396	0.919	1.56	2.33	3.23	4.25	5.37	6.61	7.95	9.38	10.9	12.4
	500	0.361	0.840	1.43	2.13	2.96	3.91	4.96	6.12	7.38	8.72	10.1	11.6
	600	0.308	0.715	1.22	1.82	2.54	3.36	4.28	5.31	6.43	7.63	8.92	10.3
	700	0.268	0.622	1.06	1.59	2.22	2.94	3.76	4.68	5.68	6.77	7.93	9.17
	800	0.238	0.550	0.937	1.41	1.97	2.61	3.35	4.18	5.08	6.07	7.13	8.26
	900	0.213	0.493	0.839	1.26	1.77	2.35	3.02	3.77	4.59	5.49	6.47	7.51
150	50	1.57	3.42	5.38	7.36	9.34	11.3	13.3	15.3	17.3	19.2	21.2	23.2
	75	1.35	3.08	5.02	7.00	8.99	11.0	13.0	15.0	17.0	19.0	20.9	22.9
	100	1.17	2.79	4.67	6.62	8.61	10.6	12.6	14.6	16.6	18.6	20.6	22.6
	125	1.03	2.54	4.34	6.26	8.23	10.2	12.2	14.2	16.2	18.3	20.3	22.3
	150	0.917	2.32	4.06	5.92	7.85	9.83	11.8	13.8	15.9	17.9	19.9	21.9
	175	0.827	2.15	3.80	5.60	7.50	9.45	11.4	13.4	15.5	17.5	19.5	21.5
	200	0.753	1.99	3.57	5.31	7.16	9.09	11.1	13.1	15.1	17.1	19.1	21.1
	225	0.690	1.86	3.36	5.04	6.84	8.73	10.7	12.7	14.7	16.7	18.7	20.7
	250	0.638	1.74	3.17	4.78	6.53	8.39	10.3	12.3	14.3	16.3	18.3	20.3
	300	0.553	1.54	2.84	4.33	5.98	7.76	9.63	11.6	13.5	15.5	17.5	19.5
	350	0.488	1.38	2.57	3.93	5.49	7.20	9.00	10.9	12.8	14.7	16.7	18.7
	400	0.437	1.25	2.33	3.60	5.06	6.70	8.43	10.2	12.1	14.0	16.0	17.9
	450	0.396	1.14	2.13	3.31	4.69	6.25	7.91	9.67	11.5	13.4	15.3	17.2
	500	0.361	1.05	1.96	3.06	4.36	5.85	7.44	9.13	10.9	12.7	14.6	16.5
	600	0.308	0.896	1.68	2.65	3.83	5.17	6.63	8.20	9.86	11.6	13.4	15.2
	700	0.268	0.783	1.47	2.33	3.40	4.61	5.95	7.41	8.97	10.6	12.3	14.1
	800	0.238	0.694	1.31	2.08	3.05	4.16	5.38	6.74	8.20	9.75	11.4	13.0
	900	0.213	0.623	1.17	1.88	2.76	3.77	4.91	6.18	7.55	9.00	10.5	12.1

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 60°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

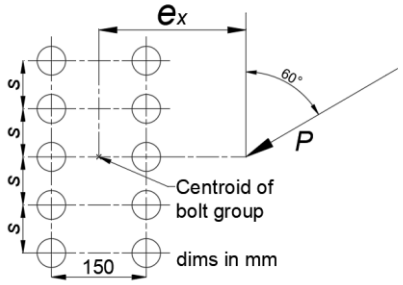
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.80	3.59	5.40	7.23	9.09	11.0	12.9	14.8	16.8	18.7	20.6	22.6
	75	1.66	3.32	5.03	6.79	8.60	10.5	12.3	14.2	16.2	18.1	20.0	22.0
	100	1.51	3.05	4.67	6.36	8.12	9.94	11.8	13.7	15.6	17.5	19.4	21.4
	125	1.36	2.80	4.33	5.96	7.67	9.44	11.3	13.1	15.0	16.9	18.8	20.8
	150	1.24	2.57	4.03	5.60	7.25	8.99	10.8	12.6	14.5	16.3	18.2	20.2
	175	1.13	2.38	3.77	5.28	6.89	8.57	10.3	12.1	13.9	15.8	17.7	19.6
	200	1.04	2.21	3.53	4.99	6.55	8.19	9.89	11.6	13.4	15.3	17.1	19.0
	225	0.956	2.05	3.32	4.72	6.23	7.82	9.48	11.2	13.0	14.8	16.6	18.5
	250	0.886	1.92	3.13	4.47	5.93	7.47	9.09	10.8	12.5	14.3	16.1	18.0
	300	0.773	1.70	2.80	4.04	5.39	6.84	8.38	10.0	11.7	13.4	15.2	17.0
	350	0.684	1.52	2.53	3.66	4.92	6.29	7.76	9.32	10.9	12.6	14.3	16.1
	400	0.613	1.38	2.30	3.35	4.52	5.82	7.22	8.70	10.3	11.9	13.5	15.3
	450	0.556	1.25	2.10	3.07	4.18	5.40	6.73	8.15	9.64	11.2	12.8	14.5
	500	0.508	1.15	1.93	2.84	3.87	5.03	6.29	7.64	9.07	10.6	12.1	13.8
	600	0.434	0.989	1.66	2.46	3.38	4.41	5.55	6.78	8.10	9.50	11.0	12.5
	700	0.378	0.864	1.46	2.16	2.98	3.92	4.95	6.08	7.30	8.60	9.96	11.4
	800	0.335	0.767	1.30	1.93	2.67	3.52	4.46	5.50	6.63	7.83	9.10	10.4
	900	0.301	0.689	1.17	1.74	2.41	3.18	4.05	5.01	6.06	7.18	8.37	9.63
150	50	1.80	3.62	5.50	7.42	9.37	11.3	13.3	15.2	17.2	19.2	21.1	23.1
	75	1.66	3.40	5.24	7.14	9.07	11.0	13.0	14.9	16.9	18.9	20.8	22.8
	100	1.51	3.17	4.97	6.85	8.77	10.7	12.7	14.6	16.6	18.6	20.5	22.5
	125	1.36	2.95	4.71	6.57	8.47	10.4	12.4	14.3	16.3	18.2	20.2	22.2
	150	1.24	2.76	4.47	6.30	8.18	10.1	12.0	14.0	16.0	17.9	19.9	21.9
	175	1.13	2.58	4.25	6.04	7.91	9.81	11.7	13.7	15.6	17.6	19.6	21.5
	200	1.04	2.43	4.04	5.81	7.65	9.53	11.4	13.4	15.3	17.3	19.2	21.2
	225	0.956	2.29	3.86	5.59	7.40	9.26	11.2	13.1	15.0	17.0	18.9	20.9
	250	0.886	2.16	3.70	5.39	7.17	9.01	10.9	12.8	14.7	16.7	18.6	20.6
	300	0.773	1.95	3.40	5.01	6.73	8.52	10.4	12.2	14.1	16.1	18.0	19.9
	350	0.684	1.77	3.13	4.67	6.33	8.07	9.88	11.7	13.6	15.5	17.4	19.4
	400	0.613	1.62	2.90	4.37	5.96	7.65	9.42	11.2	13.1	15.0	16.9	18.8
	450	0.556	1.49	2.70	4.09	5.62	7.26	8.98	10.8	12.6	14.5	16.3	18.2
	500	0.508	1.38	2.52	3.84	5.31	6.89	8.58	10.3	12.1	14.0	15.8	17.7
	600	0.434	1.20	2.21	3.40	4.76	6.25	7.85	9.53	11.3	13.0	14.9	16.7
	700	0.378	1.06	1.96	3.05	4.30	5.71	7.23	8.83	10.5	12.2	14.0	15.8
	800	0.335	0.945	1.76	2.75	3.92	5.24	6.68	8.20	9.79	11.5	13.2	14.9
	900	0.301	0.854	1.60	2.51	3.59	4.84	6.19	7.64	9.16	10.8	12.4	14.1

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 75°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

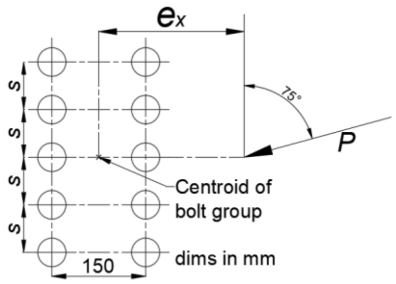
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.93	3.83	5.72	7.60	9.48	11.4	13.3	15.2	17.1	19.0	20.9	22.8
	75	1.89	3.75	5.58	7.42	9.25	11.1	13.0	14.8	16.7	18.6	20.5	22.5
	100	1.84	3.64	5.43	7.21	9.01	10.8	12.7	14.5	16.4	18.3	20.2	22.1
	125	1.78	3.52	5.26	7.00	8.77	10.6	12.4	14.2	16.1	17.9	19.8	21.7
	150	1.71	3.40	5.08	6.79	8.52	10.3	12.1	13.9	15.7	17.6	19.5	21.3
	175	1.64	3.27	4.91	6.58	8.28	10.0	11.8	13.6	15.4	17.3	19.1	21.0
	200	1.57	3.14	4.74	6.37	8.05	9.77	11.5	13.3	15.1	16.9	18.8	20.6
	225	1.51	3.02	4.57	6.17	7.82	9.52	11.3	13.0	14.8	16.6	18.5	20.3
	250	1.44	2.90	4.41	5.98	7.60	9.28	11.0	12.7	14.5	16.3	18.2	20.0
	300	1.31	2.67	4.10	5.61	7.19	8.83	10.5	12.2	14.0	15.8	17.6	19.4
	350	1.20	2.46	3.83	5.28	6.81	8.41	10.1	11.8	13.5	15.2	17.0	18.8
	400	1.10	2.28	3.58	4.97	6.46	8.02	9.64	11.3	13.0	14.8	16.5	18.3
	450	1.01	2.12	3.35	4.70	6.14	7.66	9.24	10.9	12.6	14.3	16.0	17.8
	500	0.934	1.98	3.15	4.44	5.84	7.31	8.86	10.5	12.1	13.8	15.5	17.3
	600	0.809	1.74	2.81	4.00	5.30	6.69	8.17	9.71	11.3	12.9	14.6	16.3
	700	0.712	1.55	2.52	3.62	4.83	6.15	7.56	9.04	10.6	12.2	13.8	15.5
	800	0.635	1.39	2.28	3.30	4.43	5.68	7.02	8.43	9.92	11.5	13.0	14.7
	900	0.572	1.26	2.08	3.03	4.09	5.26	6.54	7.89	9.32	10.8	12.3	13.9
150	50	1.93	3.82	5.70	7.60	9.51	11.4	13.4	15.3	17.3	19.2	21.2	23.1
	75	1.89	3.73	5.57	7.44	9.34	11.2	13.2	15.1	17.0	19.0	20.9	22.9
	100	1.84	3.63	5.44	7.29	9.16	11.1	13.0	14.9	16.8	18.8	20.7	22.7
	125	1.78	3.52	5.30	7.13	8.99	10.9	12.8	14.7	16.6	18.6	20.5	22.4
	150	1.71	3.41	5.16	6.97	8.82	10.7	12.6	14.5	16.4	18.4	20.3	22.2
	175	1.64	3.30	5.03	6.82	8.65	10.5	12.4	14.3	16.2	18.1	20.1	22.0
	200	1.57	3.19	4.90	6.67	8.49	10.3	12.2	14.1	16.0	17.9	19.9	21.8
	225	1.51	3.09	4.77	6.53	8.34	10.2	12.1	13.9	15.8	17.8	19.7	21.6
	250	1.44	2.98	4.64	6.39	8.18	10.0	11.9	13.8	15.7	17.6	19.5	21.4
	300	1.31	2.79	4.41	6.12	7.89	9.71	11.6	13.4	15.3	17.2	19.1	21.0
	350	1.20	2.61	4.19	5.88	7.62	9.42	11.2	13.1	15.0	16.9	18.7	20.6
	400	1.10	2.45	3.99	5.65	7.37	9.14	11.0	12.8	14.6	16.5	18.4	20.3
	450	1.01	2.31	3.81	5.43	7.14	8.89	10.7	12.5	14.3	16.2	18.1	20.0
	500	0.934	2.18	3.63	5.23	6.91	8.65	10.4	12.2	14.1	15.9	17.8	19.6
	600	0.809	1.95	3.33	4.86	6.49	8.19	9.94	11.7	13.5	15.3	17.2	19.0
	700	0.712	1.76	3.06	4.53	6.10	7.76	9.47	11.2	13.0	14.8	16.6	18.4
	800	0.635	1.61	2.83	4.23	5.75	7.36	9.03	10.7	12.5	14.3	16.1	17.9
	900	0.572	1.48	2.63	3.96	5.42	6.98	8.61	10.3	12.0	13.8	15.6	17.4

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 0°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = C r_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

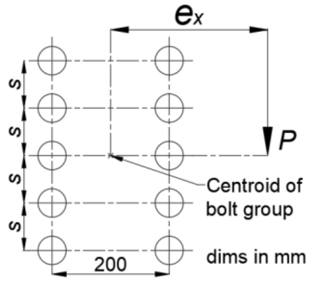
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.31	2.91	4.71	6.65	8.68	10.7	12.8	14.9	16.9	18.9	21.0	23.0
	75	1.12	2.54	4.14	5.95	7.90	9.93	12.0	14.1	16.2	18.2	20.3	22.4
	100	0.982	2.24	3.66	5.33	7.15	9.10	11.1	13.2	15.3	17.4	19.5	21.6
	125	0.872	1.99	3.27	4.80	6.48	8.33	10.3	12.3	14.4	16.5	18.6	20.7
	150	0.785	1.80	2.95	4.35	5.90	7.63	9.49	11.5	13.5	15.6	17.7	19.8
	175	0.714	1.63	2.68	3.97	5.40	7.02	8.77	10.6	12.6	14.6	16.7	18.8
	200	0.654	1.49	2.46	3.65	4.97	6.48	8.13	9.91	11.8	13.8	15.8	17.9
	225	0.604	1.38	2.27	3.37	4.59	6.01	7.55	9.24	11.0	12.9	14.9	17.0
	250	0.561	1.28	2.11	3.13	4.27	5.59	7.04	8.64	10.4	12.2	14.1	16.1
	300	0.491	1.11	1.84	2.73	3.73	4.90	6.19	7.63	9.18	10.8	12.6	14.5
	350	0.436	0.987	1.63	2.42	3.31	4.36	5.50	6.80	8.20	9.73	11.4	13.1
	400	0.393	0.886	1.47	2.17	2.98	3.91	4.95	6.13	7.40	8.80	10.3	11.9
	450	0.357	0.803	1.33	1.97	2.70	3.55	4.50	5.57	6.73	8.02	9.39	10.9
	500	0.327	0.734	1.22	1.80	2.47	3.25	4.12	5.10	6.17	7.35	8.62	9.99
	600	0.280	0.627	1.04	1.53	2.10	2.77	3.51	4.35	5.28	6.30	7.39	8.59
	700	0.245	0.546	0.905	1.33	1.83	2.41	3.06	3.79	4.60	5.50	6.46	7.51
	800	0.218	0.484	0.802	1.18	1.62	2.13	2.71	3.36	4.08	4.87	5.73	6.67
	900	0.196	0.435	0.719	1.06	1.45	1.91	2.43	3.01	3.66	4.37	5.15	5.99
	C', mm	196	419	683	997	1360	1790	2270	2820	3430	4110	4850	5660
150	50	1.31	3.28	5.35	7.42	9.46	11.5	13.5	15.5	17.5	19.5	21.4	23.4
	75	1.12	2.93	4.94	7.03	9.12	11.2	13.2	15.2	17.3	19.3	21.3	23.2
	100	0.982	2.63	4.52	6.59	8.70	10.8	12.9	14.9	17.0	19.0	21.0	23.0
	125	0.872	2.37	4.13	6.15	8.25	10.4	12.5	14.6	16.6	18.7	20.7	22.8
	150	0.785	2.15	3.78	5.72	7.78	9.90	12.0	14.1	16.2	18.3	20.4	22.4
	175	0.714	1.97	3.46	5.32	7.33	9.42	11.6	13.7	15.8	17.9	20.0	22.1
	200	0.654	1.81	3.19	4.95	6.89	8.95	11.1	13.2	15.3	17.5	19.6	21.7
	225	0.604	1.67	2.95	4.62	6.48	8.49	10.6	12.7	14.9	17.0	19.1	21.2
	250	0.561	1.55	2.75	4.33	6.10	8.05	10.1	12.2	14.4	16.5	18.7	20.8
	300	0.491	1.35	2.40	3.82	5.43	7.25	9.21	11.3	13.4	15.5	17.7	19.8
	350	0.436	1.20	2.14	3.41	4.86	6.56	8.40	10.4	12.4	14.5	16.7	18.8
	400	0.393	1.08	1.92	3.07	4.40	5.96	7.69	9.56	11.5	13.6	15.7	17.8
	450	0.357	0.975	1.75	2.79	4.00	5.46	7.06	8.83	10.7	12.7	14.7	16.8
	500	0.327	0.890	1.60	2.56	3.67	5.02	6.52	8.18	9.97	11.9	13.8	15.9
	600	0.280	0.758	1.37	2.18	3.14	4.32	5.62	7.11	8.71	10.4	12.3	14.2
	700	0.245	0.659	1.19	1.90	2.75	3.78	4.93	6.26	7.70	9.27	11.0	12.7
	800	0.218	0.583	1.05	1.68	2.44	3.35	4.38	5.58	6.88	8.31	9.85	11.5
	900	0.196	0.522	0.945	1.51	2.19	3.01	3.94	5.02	6.21	7.52	8.93	10.4
	C', mm	196	491	890	1420	2060	2840	3750	4800	5980	7300	8750	10300

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 15°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

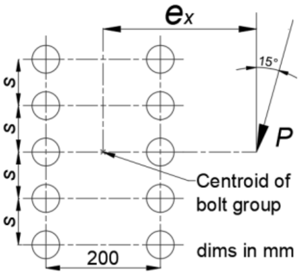
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.35	2.96	4.75	6.67	8.66	10.7	12.7	14.8	16.8	18.8	20.8	22.8
	75	1.16	2.58	4.20	5.98	7.89	9.89	11.9	14.0	16.0	18.1	20.1	22.2
	100	1.02	2.28	3.73	5.37	7.17	9.08	11.1	13.1	15.2	17.2	19.3	21.4
	125	0.903	2.03	3.35	4.85	6.53	8.33	10.2	12.2	14.3	16.3	18.4	20.5
	150	0.813	1.84	3.03	4.40	5.96	7.66	9.48	11.4	13.4	15.4	17.5	19.6
	175	0.739	1.67	2.76	4.02	5.47	7.06	8.79	10.6	12.5	14.5	16.6	18.6
	200	0.677	1.53	2.53	3.70	5.05	6.53	8.17	9.91	11.8	13.7	15.7	17.7
	225	0.625	1.42	2.34	3.43	4.68	6.07	7.61	9.27	11.0	12.9	14.8	16.8
	250	0.581	1.31	2.17	3.19	4.36	5.66	7.12	8.69	10.4	12.2	14.0	16.0
	300	0.508	1.15	1.90	2.79	3.82	4.97	6.28	7.69	9.23	10.9	12.6	14.4
	350	0.452	1.02	1.69	2.48	3.40	4.43	5.61	6.88	8.28	9.79	11.4	13.1
	400	0.406	0.914	1.51	2.23	3.05	3.99	5.05	6.21	7.50	8.88	10.4	11.9
	450	0.369	0.829	1.37	2.02	2.77	3.63	4.60	5.66	6.84	8.11	9.48	10.9
	500	0.339	0.758	1.26	1.85	2.54	3.32	4.21	5.19	6.28	7.45	8.73	10.1
	600	0.290	0.648	1.07	1.58	2.16	2.84	3.60	4.45	5.39	6.40	7.52	8.71
	700	0.254	0.565	0.935	1.37	1.89	2.47	3.14	3.88	4.71	5.61	6.59	7.64
	800	0.226	0.501	0.828	1.22	1.67	2.19	2.78	3.44	4.18	4.98	5.86	6.80
	900	0.203	0.450	0.743	1.09	1.50	1.96	2.49	3.09	3.75	4.47	5.27	6.12
150	50	1.35	3.29	5.33	7.38	9.42	11.4	13.4	15.4	17.4	19.4	21.4	23.3
	75	1.16	2.94	4.92	6.99	9.05	11.1	13.1	15.2	17.2	19.2	21.2	23.1
	100	1.02	2.64	4.52	6.55	8.63	10.7	12.8	14.8	16.9	18.9	20.9	22.9
	125	0.903	2.38	4.15	6.11	8.18	10.3	12.4	14.4	16.5	18.5	20.6	22.6
	150	0.813	2.17	3.81	5.70	7.72	9.80	11.9	14.0	16.1	18.1	20.2	22.2
	175	0.739	1.99	3.52	5.31	7.28	9.33	11.4	13.5	15.6	17.7	19.8	21.9
	200	0.677	1.83	3.25	4.95	6.86	8.87	10.9	13.1	15.2	17.3	19.4	21.4
	225	0.625	1.69	3.02	4.63	6.46	8.43	10.5	12.6	14.7	16.8	18.9	21.0
	250	0.581	1.58	2.81	4.34	6.10	8.00	10.0	12.1	14.2	16.3	18.4	20.5
	300	0.508	1.38	2.47	3.84	5.45	7.23	9.15	11.2	13.2	15.3	17.4	19.6
	350	0.452	1.23	2.20	3.44	4.91	6.56	8.38	10.3	12.3	14.4	16.5	18.6
	400	0.406	1.10	1.98	3.11	4.46	5.98	7.69	9.52	11.4	13.4	15.5	17.6
	450	0.369	1.00	1.80	2.83	4.08	5.49	7.09	8.82	10.7	12.6	14.6	16.6
	500	0.339	0.915	1.65	2.60	3.75	5.06	6.56	8.20	9.96	11.8	13.7	15.7
	600	0.290	0.780	1.41	2.23	3.22	4.36	5.70	7.15	8.74	10.4	12.2	14.1
	700	0.254	0.679	1.23	1.95	2.82	3.83	5.02	6.32	7.76	9.31	11.0	12.7
	800	0.226	0.601	1.09	1.73	2.50	3.41	4.47	5.64	6.96	8.38	9.90	11.5
	900	0.203	0.539	0.975	1.55	2.25	3.07	4.03	5.09	6.30	7.60	9.01	10.5

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 30°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

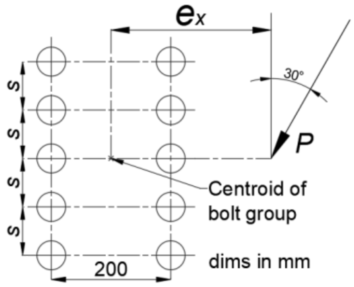
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
75	50	1.49	3.12	4.91	6.80	8.74	10.7	12.7	14.7	16.7	18.7	20.7	22.7
	75	1.29	2.74	4.39	6.16	8.04	9.98	12.0	14.0	16.0	18.0	20.0	22.1
	100	1.13	2.43	3.95	5.60	7.37	9.24	11.2	13.2	15.2	17.2	19.2	21.3
	125	1.00	2.18	3.58	5.10	6.77	8.55	10.4	12.4	14.3	16.3	18.4	20.4
	150	0.905	1.98	3.26	4.67	6.23	7.93	9.72	11.6	13.5	15.5	17.5	19.5
	175	0.823	1.81	2.99	4.30	5.76	7.37	9.08	10.9	12.8	14.7	16.7	18.7
	200	0.754	1.67	2.76	3.97	5.35	6.87	8.49	10.2	12.0	13.9	15.8	17.8
	225	0.696	1.55	2.56	3.69	4.98	6.42	7.96	9.62	11.4	13.2	15.1	17.0
	250	0.647	1.44	2.38	3.44	4.66	6.02	7.49	9.07	10.8	12.5	14.3	16.2
	300	0.566	1.26	2.09	3.03	4.13	5.34	6.66	8.12	9.67	11.3	13.0	14.8
	350	0.503	1.12	1.86	2.71	3.69	4.78	5.99	7.33	8.75	10.3	11.9	13.6
	400	0.453	1.01	1.67	2.44	3.33	4.33	5.44	6.66	7.98	9.39	10.9	12.5
	450	0.412	0.918	1.52	2.22	3.03	3.95	4.97	6.10	7.32	8.64	10.0	11.5
	500	0.377	0.841	1.39	2.03	2.78	3.62	4.57	5.62	6.75	7.98	9.30	10.7
	600	0.324	0.719	1.19	1.74	2.38	3.11	3.93	4.84	5.83	6.92	8.08	9.32
	700	0.283	0.628	1.04	1.52	2.08	2.72	3.44	4.24	5.13	6.09	7.12	8.24
	800	0.252	0.557	0.919	1.35	1.84	2.41	3.06	3.77	4.57	5.43	6.36	7.37
	900	0.227	0.500	0.825	1.21	1.66	2.17	2.75	3.39	4.11	4.89	5.74	6.66
150	50	1.49	3.36	5.36	7.37	9.38	11.4	13.4	15.4	17.3	19.3	21.3	23.3
	75	1.29	3.02	4.97	6.99	9.01	11.0	13.1	15.1	17.1	19.1	21.1	23.0
	100	1.13	2.73	4.60	6.58	8.61	10.6	12.7	14.7	16.7	18.7	20.8	22.8
	125	1.00	2.48	4.26	6.18	8.18	10.2	12.3	14.3	16.4	18.4	20.4	22.4
	150	0.905	2.27	3.96	5.80	7.76	9.78	11.8	13.9	15.9	18.0	20.0	22.1
	175	0.823	2.09	3.68	5.44	7.36	9.35	11.4	13.4	15.5	17.6	19.6	21.7
	200	0.754	1.93	3.43	5.11	6.97	8.93	10.9	13.0	15.1	17.1	19.2	21.2
	225	0.696	1.80	3.21	4.81	6.61	8.53	10.5	12.5	14.6	16.7	18.7	20.8
	250	0.647	1.68	3.01	4.53	6.27	8.14	10.1	12.1	14.1	16.2	18.3	20.3
	300	0.566	1.49	2.67	4.05	5.67	7.43	9.31	11.3	13.3	15.3	17.4	19.4
	350	0.503	1.33	2.39	3.65	5.15	6.81	8.60	10.5	12.4	14.4	16.5	18.5
	400	0.453	1.20	2.16	3.31	4.71	6.27	7.96	9.76	11.6	13.6	15.6	17.6
	450	0.412	1.09	1.97	3.03	4.34	5.79	7.39	9.12	10.9	12.8	14.8	16.8
	500	0.377	1.00	1.81	2.80	4.01	5.37	6.88	8.53	10.3	12.1	14.0	15.9
	600	0.324	0.859	1.55	2.41	3.48	4.68	6.04	7.53	9.14	10.8	12.6	14.5
	700	0.283	0.750	1.35	2.12	3.06	4.13	5.36	6.72	8.19	9.76	11.4	13.2
	800	0.252	0.665	1.20	1.89	2.73	3.69	4.81	6.05	7.40	8.86	10.4	12.0
	900	0.227	0.597	1.08	1.70	2.46	3.34	4.36	5.50	6.74	8.09	9.53	11.1

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 45°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

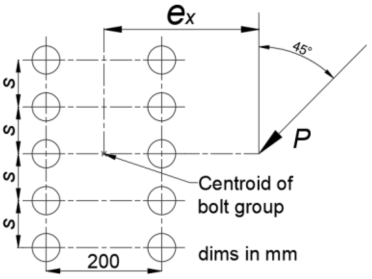
$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.70	3.43	5.22	7.06	8.95	10.9	12.8	14.8	16.7	18.7	20.7	22.7
	75	1.51	3.09	4.76	6.52	8.35	10.2	12.2	14.1	16.1	18.0	20.0	22.0
	100	1.35	2.78	4.34	6.01	7.78	9.60	11.5	13.4	15.3	17.3	19.3	21.3
	125	1.21	2.52	3.97	5.57	7.25	9.01	10.8	12.7	14.6	16.6	18.5	20.5
	150	1.10	2.30	3.67	5.17	6.78	8.47	10.2	12.1	13.9	15.9	17.8	19.7
	175	0.999	2.12	3.40	4.82	6.35	7.97	9.67	11.5	13.3	15.2	17.1	19.0
	200	0.917	1.96	3.17	4.51	5.96	7.51	9.15	10.9	12.7	14.5	16.4	18.3
	225	0.848	1.82	2.96	4.23	5.60	7.08	8.67	10.3	12.1	13.9	15.7	17.6
	250	0.788	1.70	2.78	3.97	5.28	6.70	8.24	9.85	11.5	13.3	15.1	16.9
	300	0.690	1.50	2.46	3.54	4.73	6.04	7.46	8.97	10.6	12.2	13.9	15.7
	350	0.614	1.34	2.21	3.18	4.27	5.48	6.80	8.20	9.70	11.3	12.9	14.6
	400	0.553	1.21	2.00	2.88	3.89	5.01	6.23	7.54	8.95	10.4	12.0	13.6
	450	0.503	1.11	1.82	2.64	3.56	4.60	5.74	6.97	8.30	9.71	11.2	12.7
	500	0.461	1.02	1.67	2.42	3.29	4.25	5.31	6.47	7.73	9.06	10.5	11.9
	600	0.396	0.872	1.43	2.09	2.84	3.68	4.62	5.65	6.77	7.96	9.23	10.6
	700	0.346	0.763	1.26	1.83	2.49	3.24	4.07	5.00	6.00	7.08	8.24	9.47
	800	0.308	0.678	1.12	1.63	2.22	2.89	3.64	4.47	5.38	6.37	7.43	8.56
	900	0.277	0.610	1.00	1.46	2.00	2.60	3.29	4.04	4.87	5.78	6.75	7.79
150	50	1.70	3.52	5.44	7.40	9.37	11.3	13.3	15.3	17.3	19.2	21.2	23.2
	75	1.51	3.23	5.11	7.06	9.03	11.0	13.0	15.0	17.0	19.0	20.9	22.9
	100	1.35	2.96	4.79	6.70	8.67	10.7	12.6	14.6	16.6	18.6	20.6	22.6
	125	1.21	2.72	4.48	6.36	8.30	10.3	12.3	14.3	16.3	18.3	20.3	22.3
	150	1.10	2.51	4.20	6.03	7.94	9.90	11.9	13.9	15.9	17.9	19.9	21.9
	175	0.999	2.33	3.96	5.73	7.60	9.53	11.5	13.5	15.5	17.5	19.5	21.5
	200	0.917	2.18	3.73	5.45	7.27	9.17	11.1	13.1	15.1	17.1	19.1	21.1
	225	0.848	2.04	3.53	5.19	6.96	8.83	10.8	12.7	14.7	16.7	18.7	20.7
	250	0.788	1.92	3.35	4.94	6.67	8.50	10.4	12.3	14.3	16.3	18.3	20.3
	300	0.690	1.71	3.02	4.50	6.13	7.88	9.73	11.6	13.6	15.5	17.5	19.5
	350	0.614	1.55	2.75	4.12	5.65	7.33	9.11	11.0	12.9	14.8	16.8	18.7
	400	0.553	1.41	2.51	3.78	5.22	6.83	8.55	10.3	12.2	14.1	16.0	18.0
	450	0.503	1.29	2.31	3.49	4.85	6.39	8.04	9.77	11.6	13.4	15.3	17.3
	500	0.461	1.19	2.13	3.24	4.53	6.00	7.57	9.25	11.0	12.8	14.7	16.6
	600	0.396	1.03	1.84	2.82	3.99	5.32	6.76	8.32	9.97	11.7	13.5	15.3
	700	0.346	0.901	1.62	2.50	3.55	4.76	6.09	7.53	9.08	10.7	12.4	14.2
	800	0.308	0.802	1.44	2.23	3.20	4.30	5.52	6.86	8.32	9.85	11.5	13.1
	900	0.277	0.722	1.30	2.02	2.90	3.91	5.04	6.30	7.66	9.10	10.6	12.2

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 60°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = C r_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

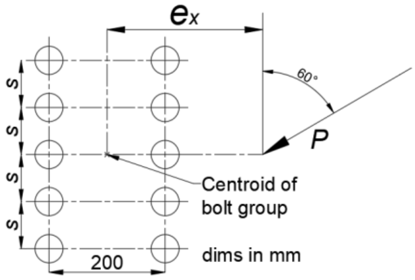
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.86	3.71	5.56	7.41	9.27	11.2	13.0	15.0	16.9	18.8	20.7	22.7
	75	1.77	3.52	5.29	7.07	8.87	10.7	12.6	14.5	16.4	18.3	20.2	22.1
	100	1.66	3.31	4.99	6.70	8.45	10.2	12.1	13.9	15.8	17.7	19.6	21.5
	125	1.54	3.10	4.70	6.34	8.04	9.78	11.6	13.4	15.3	17.1	19.0	20.9
	150	1.43	2.90	4.41	6.00	7.64	9.35	11.1	12.9	14.7	16.6	18.5	20.4
	175	1.33	2.71	4.15	5.68	7.27	8.94	10.7	12.4	14.2	16.1	17.9	19.8
	200	1.24	2.53	3.92	5.39	6.94	8.56	10.2	12.0	13.8	15.6	17.4	19.3
	225	1.16	2.38	3.70	5.12	6.63	8.22	9.86	11.6	13.3	15.1	16.9	18.7
	250	1.08	2.24	3.51	4.88	6.34	7.89	9.49	11.2	12.9	14.6	16.4	18.2
	300	0.956	2.00	3.17	4.44	5.82	7.28	8.81	10.4	12.1	13.8	15.5	17.3
	350	0.855	1.81	2.88	4.07	5.36	6.73	8.19	9.72	11.3	13.0	14.7	16.4
	400	0.773	1.64	2.64	3.74	4.95	6.25	7.64	9.11	10.6	12.2	13.9	15.6
	450	0.704	1.51	2.43	3.46	4.59	5.83	7.15	8.56	10.0	11.6	13.2	14.8
	500	0.647	1.39	2.25	3.21	4.28	5.45	6.71	8.06	9.48	11.0	12.5	14.1
	600	0.556	1.20	1.95	2.80	3.76	4.81	5.96	7.19	8.50	9.88	11.3	12.8
	700	0.487	1.06	1.72	2.48	3.34	4.29	5.34	6.47	7.68	8.97	10.3	11.7
	800	0.434	0.943	1.54	2.22	3.00	3.87	4.83	5.87	6.99	8.19	9.46	10.8
	900	0.391	0.850	1.39	2.01	2.72	3.52	4.40	5.36	6.41	7.53	8.71	9.96
150	50	1.86	3.72	5.59	7.50	9.42	11.4	13.3	15.3	17.2	19.2	21.2	23.1
	75	1.77	3.54	5.37	7.25	9.15	11.1	13.0	15.0	16.9	18.9	20.9	22.8
	100	1.66	3.36	5.13	6.98	8.87	10.8	12.7	14.7	16.6	18.6	20.6	22.5
	125	1.54	3.17	4.90	6.72	8.59	10.5	12.4	14.4	16.3	18.3	20.2	22.2
	150	1.43	2.99	4.67	6.46	8.31	10.2	12.1	14.1	16.0	18.0	19.9	21.9
	175	1.33	2.82	4.46	6.21	8.04	9.92	11.8	13.8	15.7	17.7	19.6	21.6
	200	1.24	2.67	4.26	5.98	7.79	9.65	11.5	13.5	15.4	17.3	19.3	21.3
	225	1.16	2.52	4.08	5.76	7.55	9.39	11.3	13.2	15.1	17.0	19.0	20.9
	250	1.08	2.40	3.91	5.56	7.32	9.13	11.0	12.9	14.8	16.7	18.7	20.6
	300	0.956	2.17	3.61	5.20	6.90	8.66	10.5	12.3	14.2	16.1	18.1	20.0
	350	0.855	1.98	3.35	4.87	6.51	8.23	10.0	11.8	13.7	15.6	17.5	19.4
	400	0.773	1.82	3.11	4.57	6.15	7.81	9.55	11.4	13.2	15.1	16.9	18.8
	450	0.704	1.69	2.91	4.30	5.81	7.43	9.13	10.9	12.7	14.5	16.4	18.3
	500	0.647	1.57	2.72	4.05	5.50	7.07	8.73	10.5	12.2	14.1	15.9	17.8
	600	0.556	1.37	2.41	3.61	4.96	6.43	8.00	9.67	11.4	13.1	14.9	16.8
	700	0.487	1.22	2.15	3.25	4.49	5.88	7.38	8.97	10.6	12.3	14.1	15.9
	800	0.434	1.09	1.94	2.94	4.10	5.41	6.83	8.34	9.92	11.6	13.3	15.0
	900	0.391	0.988	1.76	2.69	3.77	5.00	6.35	7.78	9.30	10.9	12.5	14.2

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 75°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

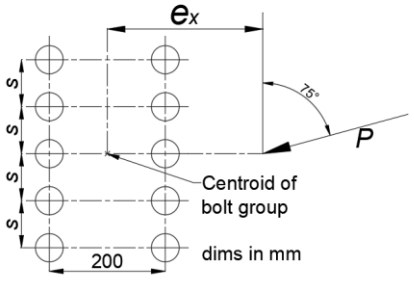
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.94	3.87	5.79	7.70	9.60	11.5	13.4	15.3	17.2	19.1	21.1	23.0
	75	1.92	3.82	5.70	7.57	9.44	11.3	13.2	15.1	16.9	18.8	20.7	22.6
	100	1.89	3.75	5.60	7.43	9.26	11.1	12.9	14.8	16.6	18.5	20.4	22.3
	125	1.85	3.67	5.48	7.27	9.07	10.9	12.7	14.5	16.4	18.2	20.1	22.0
	150	1.81	3.59	5.35	7.11	8.87	10.6	12.4	14.2	16.1	17.9	19.7	21.6
	175	1.76	3.50	5.22	6.94	8.67	10.4	12.2	14.0	15.8	17.6	19.4	21.3
	200	1.71	3.40	5.08	6.76	8.46	10.2	11.9	13.7	15.5	17.3	19.1	21.0
	225	1.66	3.30	4.94	6.59	8.26	9.96	11.7	13.4	15.2	17.0	18.8	20.6
	250	1.61	3.20	4.80	6.42	8.06	9.73	11.4	13.2	14.9	16.7	18.5	20.3
	300	1.51	3.01	4.53	6.08	7.67	9.30	11.0	12.7	14.4	16.2	17.9	19.7
	350	1.41	2.82	4.27	5.76	7.31	8.90	10.5	12.2	13.9	15.6	17.4	19.2
	400	1.31	2.65	4.03	5.46	6.96	8.52	10.1	11.8	13.4	15.1	16.9	18.6
	450	1.23	2.48	3.80	5.19	6.64	8.16	9.73	11.3	13.0	14.7	16.4	18.1
	500	1.15	2.34	3.60	4.93	6.34	7.82	9.35	10.9	12.6	14.2	15.9	17.6
	600	1.01	2.08	3.23	4.48	5.80	7.20	8.67	10.2	11.8	13.4	15.0	16.7
	700	0.900	1.87	2.93	4.08	5.33	6.65	8.05	9.52	11.0	12.6	14.2	15.9
	800	0.809	1.69	2.67	3.75	4.91	6.17	7.51	8.91	10.4	11.9	13.5	15.1
	900	0.734	1.54	2.45	3.45	4.55	5.74	7.01	8.36	9.77	11.2	12.8	14.3
150	50	1.94	3.86	5.76	7.67	9.58	11.5	13.4	15.4	17.3	19.3	21.2	23.2
	75	1.92	3.80	5.67	7.55	9.44	11.3	13.3	15.2	17.1	19.0	21.0	22.9
	100	1.89	3.74	5.57	7.42	9.28	11.2	13.1	15.0	16.9	18.8	20.8	22.7
	125	1.85	3.66	5.46	7.28	9.13	11.0	12.9	14.8	16.7	18.6	20.6	22.5
	150	1.81	3.58	5.35	7.15	8.98	10.8	12.7	14.6	16.5	18.4	20.4	22.3
	175	1.76	3.49	5.23	7.01	8.82	10.7	12.5	14.4	16.3	18.2	20.2	22.1
	200	1.71	3.40	5.12	6.87	8.67	10.5	12.4	14.2	16.1	18.0	20.0	21.9
	225	1.66	3.31	5.00	6.74	8.53	10.3	12.2	14.1	16.0	17.9	19.8	21.7
	250	1.61	3.22	4.89	6.61	8.38	10.2	12.0	13.9	15.8	17.7	19.6	21.5
	300	1.51	3.05	4.67	6.36	8.10	9.89	11.7	13.6	15.4	17.3	19.2	21.1
	350	1.41	2.88	4.46	6.12	7.84	9.60	11.4	13.2	15.1	17.0	18.8	20.7
	400	1.31	2.73	4.26	5.89	7.59	9.33	11.1	12.9	14.8	16.6	18.5	20.4
	450	1.23	2.58	4.08	5.67	7.35	9.08	10.8	12.6	14.5	16.3	18.2	20.1
	500	1.15	2.45	3.90	5.47	7.13	8.83	10.6	12.4	14.2	16.0	17.9	19.7
	600	1.01	2.21	3.59	5.10	6.71	8.38	10.1	11.9	13.6	15.4	17.3	19.1
	700	0.900	2.01	3.32	4.77	6.32	7.96	9.65	11.4	13.1	14.9	16.7	18.5
	800	0.809	1.84	3.08	4.47	5.97	7.56	9.21	10.9	12.6	14.4	16.2	18.0
	900	0.734	1.70	2.87	4.19	5.64	7.19	8.80	10.5	12.2	13.9	15.7	17.5

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 0°

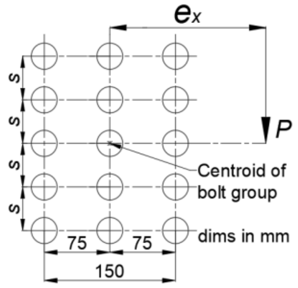
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.71	4.07	6.81	9.86	13.0	16.1	19.2	22.3	25.4	28.5	31.5	34.5
	75	1.42	3.40	5.79	8.61	11.7	14.8	18.0	21.1	24.3	27.4	30.5	33.6
	100	1.21	2.90	4.97	7.53	10.4	13.4	16.6	19.7	22.9	26.1	29.3	32.4
	125	1.05	2.51	4.34	6.64	9.24	12.1	15.2	18.3	21.5	24.7	27.9	31.1
	150	0.915	2.21	3.85	5.91	8.27	11.0	13.9	16.9	20.0	23.2	26.4	29.7
	175	0.807	1.96	3.44	5.31	7.46	9.95	12.7	15.6	18.6	21.8	24.9	28.2
	200	0.717	1.76	3.11	4.80	6.78	9.09	11.6	14.4	17.3	20.4	23.5	26.7
	225	0.643	1.60	2.83	4.38	6.20	8.34	10.7	13.3	16.1	19.1	22.1	25.2
	250	0.581	1.46	2.59	4.02	5.71	7.70	9.91	12.4	15.0	17.8	20.8	23.8
	300	0.487	1.24	2.21	3.44	4.91	6.65	8.59	10.8	13.2	15.7	18.5	21.3
	350	0.418	1.08	1.92	3.00	4.30	5.83	7.57	9.53	11.7	14.0	16.5	19.1
	400	0.367	0.950	1.70	2.66	3.82	5.19	6.75	8.51	10.4	12.6	14.9	17.3
	450	0.326	0.850	1.52	2.39	3.43	4.67	6.08	7.68	9.45	11.4	13.5	15.8
	500	0.294	0.769	1.37	2.16	3.11	4.24	5.53	6.99	8.61	10.4	12.3	14.4
	600	0.245	0.645	1.15	1.82	2.62	3.57	4.67	5.92	7.30	8.84	10.5	12.3
	700	0.210	0.555	0.991	1.57	2.26	3.08	4.04	5.12	6.33	7.67	9.13	10.7
	800	0.184	0.487	0.869	1.38	1.98	2.71	3.55	4.51	5.58	6.77	8.06	9.47
	900	0.163	0.434	0.774	1.23	1.77	2.42	3.17	4.03	4.99	6.05	7.21	8.48
	C', mm	147	395	701	1120	1610	2210	2900	3690	4580	5580	6670	7870
150	50	1.71	4.85	8.03	11.2	14.2	17.2	20.3	23.2	26.2	29.2	32.2	35.1
	75	1.42	4.24	7.36	10.6	13.7	16.8	19.9	22.9	25.9	28.9	31.9	34.9
	100	1.21	3.72	6.66	9.86	13.1	16.2	19.3	22.4	25.5	28.5	31.6	34.6
	125	1.05	3.29	6.00	9.14	12.4	15.6	18.7	21.9	25.0	28.1	31.1	34.2
	150	0.915	2.93	5.41	8.44	11.6	14.8	18.1	21.2	24.4	27.5	30.6	33.7
	175	0.807	2.63	4.90	7.79	10.9	14.1	17.3	20.5	23.7	26.9	30.0	33.1
	200	0.717	2.38	4.46	7.20	10.2	13.4	16.6	19.8	23.0	26.2	29.4	32.5
	225	0.643	2.17	4.09	6.67	9.54	12.6	15.8	19.1	22.3	25.5	28.7	31.9
	250	0.581	2.00	3.78	6.20	8.94	11.9	15.1	18.3	21.5	24.8	28.0	31.2
	300	0.487	1.71	3.27	5.41	7.88	10.7	13.7	16.8	20.0	23.3	26.5	29.7
	350	0.418	1.49	2.87	4.78	7.01	9.61	12.4	15.4	18.6	21.7	25.0	28.2
	400	0.367	1.32	2.55	4.28	6.29	8.69	11.3	14.2	17.2	20.3	23.5	26.7
	450	0.326	1.19	2.30	3.86	5.70	7.91	10.4	13.1	15.9	18.9	22.0	25.2
	500	0.294	1.08	2.09	3.51	5.20	7.25	9.54	12.1	14.8	17.7	20.7	23.8
	600	0.245	0.905	1.76	2.97	4.42	6.19	8.18	10.4	12.9	15.5	18.3	21.2
	700	0.210	0.781	1.52	2.57	3.84	5.39	7.14	9.15	11.3	13.7	16.3	19.0
	800	0.184	0.686	1.33	2.27	3.39	4.77	6.33	8.13	10.1	12.3	14.6	17.1
	900	0.163	0.611	1.19	2.03	3.03	4.27	5.67	7.30	9.10	11.1	13.2	15.5
	C', mm	147	559	1080	1860	2790	3960	5300	6870	8620	10600	12800	15100

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 15°

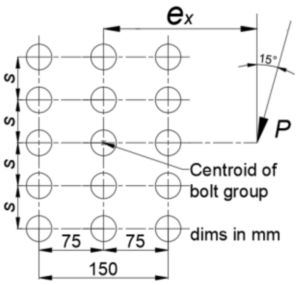
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.77	4.10	6.84	9.82	12.9	16.0	19.1	22.2	25.2	28.3	31.3	34.3
	75	1.47	3.45	5.86	8.61	11.6	14.7	17.8	20.9	24.1	27.2	30.2	33.3
	100	1.25	2.95	5.07	7.55	10.3	13.3	16.4	19.5	22.7	25.8	29.0	32.1
	125	1.08	2.57	4.44	6.67	9.26	12.1	15.0	18.1	21.3	24.4	27.6	30.7
	150	0.945	2.26	3.93	5.96	8.33	10.9	13.8	16.8	19.8	23.0	26.1	29.3
	175	0.834	2.01	3.52	5.37	7.55	9.97	12.7	15.5	18.5	21.5	24.7	27.8
	200	0.741	1.81	3.18	4.87	6.88	9.13	11.6	14.4	17.2	20.2	23.2	26.4
	225	0.665	1.64	2.90	4.45	6.30	8.39	10.8	13.3	16.1	18.9	21.9	25.0
	250	0.601	1.50	2.65	4.10	5.81	7.76	9.99	12.4	15.0	17.8	20.7	23.6
	300	0.504	1.28	2.27	3.52	5.01	6.74	8.71	10.9	13.2	15.8	18.4	21.2
	350	0.433	1.11	1.98	3.08	4.40	5.93	7.69	9.62	11.8	14.1	16.5	19.1
	400	0.380	0.980	1.75	2.73	3.91	5.29	6.87	8.62	10.6	12.7	15.0	17.4
	450	0.338	0.877	1.57	2.45	3.51	4.77	6.20	7.80	9.59	11.5	13.6	15.9
	500	0.304	0.793	1.42	2.22	3.19	4.33	5.65	7.12	8.76	10.5	12.5	14.6
	600	0.254	0.666	1.19	1.87	2.69	3.66	4.78	6.04	7.45	8.99	10.7	12.5
	700	0.217	0.573	1.02	1.61	2.32	3.17	4.14	5.24	6.47	7.82	9.31	10.9
	800	0.190	0.503	0.898	1.42	2.04	2.79	3.65	4.62	5.72	6.92	8.24	9.66
	900	0.169	0.448	0.800	1.26	1.82	2.49	3.26	4.13	5.11	6.19	7.38	8.66
150	50	1.77	4.83	7.98	11.1	14.1	17.2	20.2	23.1	26.1	29.1	32.1	35.0
	75	1.47	4.22	7.31	10.5	13.6	16.7	19.7	22.8	25.8	28.8	31.8	34.7
	100	1.25	3.71	6.63	9.77	12.9	16.1	19.2	22.2	25.3	28.3	31.4	34.4
	125	1.08	3.28	6.01	9.06	12.2	15.4	18.5	21.7	24.8	27.8	30.9	33.9
	150	0.945	2.94	5.45	8.38	11.5	14.7	17.8	21.0	24.1	27.2	30.3	33.4
	175	0.834	2.65	4.97	7.75	10.8	13.9	17.1	20.3	23.5	26.6	29.7	32.8
	200	0.741	2.40	4.55	7.17	10.1	13.2	16.4	19.6	22.7	25.9	29.1	32.2
	225	0.665	2.20	4.18	6.66	9.49	12.5	15.6	18.8	22.0	25.2	28.4	31.5
	250	0.601	2.02	3.86	6.20	8.92	11.8	14.9	18.1	21.3	24.4	27.6	30.8
	300	0.504	1.74	3.34	5.43	7.91	10.6	13.6	16.6	19.8	22.9	26.1	29.3
	350	0.433	1.52	2.94	4.82	7.07	9.60	12.4	15.3	18.4	21.5	24.6	27.8
	400	0.380	1.35	2.62	4.32	6.38	8.71	11.3	14.1	17.0	20.1	23.2	26.3
	450	0.338	1.22	2.36	3.91	5.79	7.95	10.4	13.0	15.8	18.8	21.8	24.9
	500	0.304	1.10	2.14	3.57	5.30	7.30	9.59	12.1	14.8	17.6	20.5	23.5
	600	0.254	0.930	1.81	3.03	4.52	6.26	8.28	10.5	12.9	15.5	18.2	21.0
	700	0.217	0.803	1.56	2.63	3.93	5.47	7.26	9.24	11.4	13.8	16.3	18.9
	800	0.190	0.706	1.37	2.32	3.47	4.85	6.45	8.23	10.2	12.4	14.7	17.1
	900	0.169	0.630	1.23	2.08	3.11	4.35	5.80	7.41	9.23	11.2	13.3	15.6

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 30°

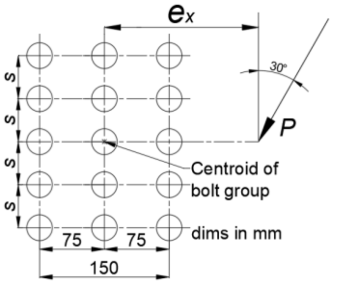
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	1.94	4.26	6.99	9.90	12.9	15.9	19.0	22.0	25.1	28.1	31.1	34.1
	75	1.61	3.63	6.09	8.80	11.7	14.7	17.7	20.8	23.9	26.9	30.0	33.0
	100	1.37	3.15	5.35	7.83	10.6	13.5	16.4	19.5	22.6	25.7	28.7	31.8
	125	1.19	2.77	4.74	7.00	9.54	12.3	15.2	18.2	21.2	24.3	27.4	30.5
	150	1.04	2.45	4.23	6.30	8.67	11.3	14.1	16.9	19.9	23.0	26.0	29.1
	175	0.923	2.19	3.81	5.71	7.92	10.4	13.0	15.8	18.7	21.7	24.7	27.8
	200	0.822	1.98	3.45	5.22	7.27	9.58	12.1	14.7	17.5	20.4	23.4	26.4
	225	0.739	1.80	3.16	4.79	6.71	8.88	11.2	13.8	16.5	19.3	22.2	25.2
	250	0.669	1.65	2.90	4.42	6.22	8.26	10.5	12.9	15.5	18.2	21.1	24.0
	300	0.561	1.41	2.49	3.82	5.41	7.22	9.23	11.5	13.8	16.4	19.0	21.7
	350	0.483	1.23	2.18	3.36	4.78	6.40	8.22	10.2	12.4	14.8	17.2	19.8
	400	0.423	1.08	1.93	2.99	4.26	5.73	7.40	9.25	11.2	13.4	15.7	18.2
	450	0.376	0.972	1.73	2.69	3.85	5.18	6.71	8.41	10.3	12.3	14.4	16.7
	500	0.339	0.880	1.57	2.44	3.50	4.73	6.14	7.70	9.42	11.3	13.3	15.4
	600	0.283	0.739	1.32	2.06	2.96	4.01	5.22	6.58	8.08	9.72	11.5	13.4
	700	0.243	0.637	1.14	1.78	2.56	3.48	4.54	5.73	7.05	8.51	10.1	11.8
	800	0.212	0.559	0.999	1.57	2.26	3.07	4.01	5.07	6.25	7.55	8.96	10.5
	900	0.189	0.498	0.890	1.40	2.02	2.75	3.59	4.54	5.61	6.78	8.06	9.44
150	50	1.94	4.86	7.96	11.0	14.1	17.1	20.1	23.0	26.0	29.0	32.0	34.9
	75	1.61	4.27	7.32	10.4	13.5	16.5	19.6	22.6	25.6	28.6	31.6	34.6
	100	1.37	3.78	6.70	9.75	12.8	15.9	19.0	22.1	25.1	28.1	31.1	34.1
	125	1.19	3.39	6.14	9.10	12.2	15.3	18.4	21.5	24.5	27.6	30.6	33.6
	150	1.04	3.06	5.64	8.48	11.5	14.6	17.7	20.8	23.9	27.0	30.0	33.1
	175	0.923	2.78	5.19	7.91	10.9	13.9	17.0	20.1	23.2	26.3	29.4	32.5
	200	0.822	2.54	4.80	7.38	10.2	13.3	16.3	19.4	22.5	25.7	28.8	31.9
	225	0.739	2.34	4.45	6.90	9.67	12.6	15.7	18.7	21.8	25.0	28.1	31.2
	250	0.669	2.16	4.14	6.46	9.14	12.0	15.0	18.1	21.2	24.3	27.4	30.5
	300	0.561	1.87	3.61	5.71	8.20	10.9	13.8	16.8	19.8	22.9	26.0	29.1
	350	0.483	1.65	3.20	5.10	7.41	9.95	12.7	15.6	18.5	21.5	24.6	27.7
	400	0.423	1.47	2.86	4.60	6.74	9.11	11.7	14.5	17.3	20.3	23.3	26.3
	450	0.376	1.33	2.58	4.19	6.17	8.39	10.8	13.5	16.2	19.1	22.0	25.0
	500	0.339	1.21	2.35	3.84	5.68	7.75	10.1	12.6	15.2	18.0	20.9	23.8
	600	0.283	1.02	2.00	3.29	4.89	6.71	8.78	11.1	13.5	16.1	18.8	21.5
	700	0.243	0.884	1.73	2.86	4.28	5.90	7.77	9.83	12.1	14.4	17.0	19.6
	800	0.212	0.779	1.52	2.54	3.80	5.25	6.95	8.83	10.9	13.1	15.4	17.9
	900	0.189	0.696	1.36	2.27	3.41	4.73	6.28	8.00	9.88	11.9	14.1	16.4

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 45°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

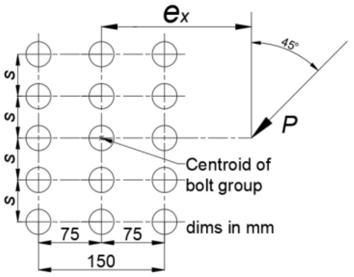
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.23	4.67	7.33	10.2	13.1	16.0	19.0	22.0	25.0	27.9	30.9	33.9
	75	1.89	4.06	6.50	9.19	12.0	14.9	17.9	20.8	23.8	26.8	29.8	32.8
	100	1.63	3.57	5.84	8.36	11.1	13.9	16.8	19.7	22.7	25.7	28.7	31.7
	125	1.42	3.17	5.27	7.63	10.2	12.9	15.7	18.6	21.5	24.5	27.5	30.5
	150	1.25	2.84	4.78	6.99	9.40	12.0	14.7	17.5	20.4	23.4	26.3	29.3
	175	1.11	2.57	4.36	6.42	8.70	11.2	13.8	16.6	19.4	22.3	25.2	28.2
	200	0.993	2.33	3.99	5.92	8.09	10.4	13.0	15.7	18.4	21.2	24.1	27.0
	225	0.896	2.13	3.68	5.49	7.54	9.80	12.2	14.8	17.5	20.3	23.1	26.0
	250	0.814	1.96	3.40	5.10	7.05	9.21	11.6	14.0	16.6	19.3	22.1	24.9
	300	0.685	1.68	2.95	4.46	6.22	8.19	10.3	12.7	15.1	17.7	20.3	23.0
	350	0.590	1.47	2.59	3.95	5.55	7.35	9.34	11.5	13.8	16.2	18.7	21.3
	400	0.517	1.31	2.31	3.54	4.99	6.65	8.49	10.5	12.6	14.9	17.3	19.8
	450	0.461	1.17	2.08	3.20	4.54	6.06	7.77	9.64	11.7	13.8	16.1	18.5
	500	0.415	1.06	1.89	2.92	4.15	5.56	7.15	8.90	10.8	12.8	15.0	17.2
	600	0.346	0.897	1.60	2.48	3.54	4.76	6.15	7.70	9.39	11.2	13.1	15.2
	700	0.297	0.774	1.38	2.15	3.08	4.16	5.39	6.77	8.27	9.91	11.7	13.5
	800	0.260	0.681	1.22	1.89	2.72	3.68	4.79	6.03	7.39	8.87	10.5	12.2
	900	0.231	0.607	1.08	1.69	2.44	3.30	4.30	5.42	6.66	8.02	9.49	11.1
150	50	2.23	5.02	8.00	11.0	14.0	17.0	20.0	22.9	25.9	28.9	31.8	34.8
	75	1.89	4.50	7.44	10.4	13.4	16.5	19.5	22.5	25.4	28.4	31.4	34.4
	100	1.63	4.05	6.89	9.86	12.9	15.9	18.9	21.9	24.9	27.9	30.9	33.9
	125	1.42	3.68	6.40	9.30	12.3	15.3	18.3	21.3	24.4	27.4	30.4	33.4
	150	1.25	3.36	5.96	8.78	11.7	14.7	17.7	20.7	23.8	26.8	29.8	32.8
	175	1.11	3.09	5.57	8.29	11.2	14.1	17.1	20.1	23.2	26.2	29.2	32.2
	200	0.993	2.86	5.22	7.84	10.6	13.6	16.5	19.5	22.6	25.6	28.6	31.6
	225	0.896	2.65	4.90	7.43	10.2	13.0	16.0	18.9	22.0	25.0	28.0	31.0
	250	0.814	2.47	4.61	7.04	9.69	12.5	15.4	18.4	21.4	24.4	27.4	30.4
	300	0.685	2.16	4.11	6.35	8.85	11.6	14.4	17.3	20.2	23.2	26.2	29.2
	350	0.590	1.92	3.69	5.75	8.11	10.7	13.4	16.2	19.1	22.1	25.0	28.0
	400	0.517	1.72	3.34	5.25	7.47	9.94	12.6	15.3	18.1	21.0	23.9	26.9
	450	0.461	1.56	3.04	4.82	6.91	9.26	11.8	14.4	17.2	20.0	22.9	25.8
	500	0.415	1.43	2.79	4.44	6.43	8.66	11.1	13.6	16.3	19.0	21.9	24.7
	600	0.346	1.22	2.38	3.84	5.62	7.64	9.84	12.2	14.7	17.3	20.0	22.8
	700	0.297	1.06	2.08	3.37	4.98	6.81	8.82	11.0	13.4	15.8	18.4	21.1
	800	0.260	0.937	1.84	3.00	4.46	6.12	7.97	10.0	12.2	14.5	17.0	19.5
	900	0.231	0.839	1.65	2.71	4.04	5.56	7.27	9.18	11.2	13.4	15.7	18.1

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 60°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

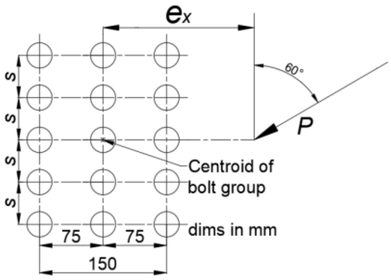
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.59	5.21	7.88	10.6	13.4	16.3	19.2	22.1	25.0	27.9	30.9	33.8
	75	2.32	4.73	7.26	9.91	12.6	15.5	18.3	21.2	24.1	27.0	29.9	32.9
	100	2.07	4.29	6.69	9.23	11.9	14.6	17.5	20.3	23.2	26.1	29.0	31.9
	125	1.84	3.90	6.18	8.63	11.2	13.9	16.6	19.5	22.3	25.2	28.1	31.0
	150	1.65	3.56	5.73	8.08	10.6	13.2	15.9	18.7	21.5	24.3	27.2	30.1
	175	1.49	3.27	5.32	7.59	10.0	12.6	15.2	17.9	20.7	23.5	26.3	29.2
	200	1.35	3.01	4.95	7.13	9.48	12.0	14.5	17.2	19.9	22.7	25.5	28.4
	225	1.23	2.78	4.63	6.71	8.98	11.4	13.9	16.5	19.2	21.9	24.7	27.5
	250	1.12	2.58	4.34	6.33	8.52	10.9	13.3	15.9	18.5	21.2	24.0	26.8
	300	0.955	2.25	3.84	5.67	7.70	9.91	12.3	14.7	17.3	19.9	22.6	25.3
	350	0.827	1.98	3.43	5.11	7.00	9.08	11.3	13.7	16.1	18.7	21.3	23.9
	400	0.727	1.77	3.09	4.64	6.40	8.36	10.5	12.7	15.1	17.5	20.1	22.6
	450	0.649	1.60	2.81	4.24	5.89	7.73	9.74	11.9	14.2	16.5	18.9	21.5
	500	0.585	1.46	2.57	3.90	5.44	7.18	9.09	11.1	13.3	15.6	17.9	20.4
	600	0.489	1.24	2.20	3.35	4.72	6.27	7.99	9.85	11.9	14.0	16.2	18.5
	700	0.419	1.07	1.91	2.93	4.15	5.55	7.10	8.81	10.6	12.6	14.7	16.8
	800	0.367	0.948	1.69	2.60	3.70	4.97	6.38	7.95	9.65	11.5	13.4	15.4
	900	0.327	0.848	1.51	2.34	3.34	4.49	5.79	7.23	8.80	10.5	12.3	14.2
150	50	2.59	5.32	8.16	11.1	14.0	16.9	19.9	22.8	25.8	28.7	31.7	34.6
	75	2.32	4.93	7.73	10.6	13.5	16.5	19.4	22.4	25.3	28.3	31.2	34.2
	100	2.07	4.57	7.31	10.2	13.1	16.0	18.9	21.9	24.9	27.8	30.8	33.7
	125	1.84	4.25	6.91	9.73	12.6	15.5	18.5	21.4	24.4	27.3	30.3	33.2
	150	1.65	3.95	6.55	9.32	12.2	15.1	18.0	20.9	23.9	26.8	29.8	32.8
	175	1.49	3.69	6.22	8.94	11.8	14.6	17.5	20.5	23.4	26.4	29.3	32.3
	200	1.35	3.46	5.92	8.58	11.4	14.2	17.1	20.0	22.9	25.9	28.8	31.8
	225	1.23	3.25	5.64	8.25	11.0	13.8	16.7	19.6	22.5	25.4	28.3	31.3
	250	1.12	3.06	5.39	7.94	10.6	13.4	16.2	19.1	22.0	24.9	27.9	30.8
	300	0.955	2.73	4.92	7.37	9.97	12.7	15.5	18.3	21.2	24.0	27.0	29.9
	350	0.827	2.46	4.52	6.85	9.36	12.0	14.7	17.5	20.3	23.2	26.1	29.0
	400	0.727	2.23	4.18	6.39	8.80	11.4	14.0	16.8	19.6	22.4	25.2	28.1
	450	0.649	2.04	3.87	5.97	8.28	10.8	13.4	16.1	18.8	21.6	24.4	27.3
	500	0.585	1.88	3.60	5.59	7.81	10.2	12.8	15.4	18.1	20.9	23.7	26.5
	600	0.489	1.63	3.15	4.94	6.99	9.25	11.7	14.2	16.8	19.5	22.2	25.0
	700	0.419	1.43	2.79	4.41	6.31	8.44	10.7	13.1	15.6	18.2	20.9	23.6
	800	0.367	1.27	2.49	3.97	5.74	7.74	9.90	12.2	14.6	17.1	19.7	22.3
	900	0.327	1.15	2.25	3.61	5.26	7.13	9.17	11.4	13.7	16.1	18.6	21.1

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 75°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = C r_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

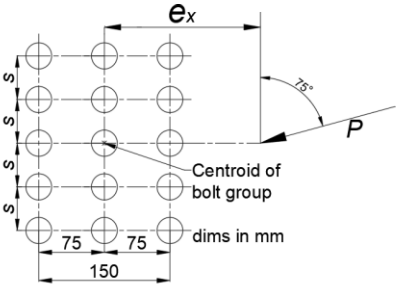
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.86	5.68	8.47	11.3	14.1	16.9	19.7	22.6	25.5	28.4	31.3	34.2
	75	2.77	5.49	8.19	10.9	13.7	16.4	19.2	22.1	24.9	27.8	30.6	33.5
	100	2.66	5.27	7.89	10.5	13.2	16.0	18.7	21.5	24.4	27.2	30.1	32.9
	125	2.53	5.04	7.58	10.2	12.8	15.5	18.3	21.0	23.8	26.7	29.5	32.4
	150	2.40	4.80	7.27	9.81	12.4	15.1	17.8	20.5	23.3	26.1	29.0	31.8
	175	2.26	4.57	6.97	9.47	12.0	14.7	17.4	20.1	22.8	25.6	28.4	31.3
	200	2.13	4.35	6.68	9.13	11.7	14.3	16.9	19.6	22.4	25.1	27.9	30.7
	225	2.00	4.13	6.41	8.82	11.3	13.9	16.5	19.2	21.9	24.7	27.4	30.2
	250	1.89	3.93	6.15	8.51	11.0	13.5	16.1	18.8	21.5	24.2	27.0	29.7
	300	1.67	3.56	5.67	7.95	10.3	12.8	15.4	18.0	20.7	23.4	26.1	28.8
	350	1.49	3.25	5.25	7.44	9.77	12.2	14.7	17.3	19.9	22.6	25.3	28.0
	400	1.34	2.97	4.87	6.98	9.23	11.6	14.1	16.6	19.2	21.8	24.5	27.2
	450	1.21	2.73	4.54	6.56	8.74	11.0	13.5	15.9	18.5	21.1	23.7	26.4
	500	1.10	2.52	4.24	6.18	8.28	10.5	12.9	15.3	17.8	20.4	23.0	25.6
	600	0.931	2.19	3.75	5.52	7.48	9.59	11.8	14.2	16.6	19.1	21.6	24.2
	700	0.803	1.93	3.34	4.97	6.79	8.78	10.9	13.2	15.5	17.9	20.4	22.9
	800	0.706	1.72	3.01	4.51	6.20	8.08	10.1	12.3	14.5	16.8	19.2	21.7
	900	0.629	1.55	2.74	4.12	5.70	7.47	9.40	11.5	13.6	15.9	18.2	20.6
150	50	2.86	5.66	8.47	11.3	14.2	17.1	20.0	22.9	25.9	28.8	31.7	34.7
	75	2.77	5.48	8.24	11.1	13.9	16.8	19.7	22.6	25.5	28.5	31.4	34.3
	100	2.66	5.30	8.01	10.8	13.6	16.5	19.4	22.3	25.2	28.1	31.0	34.0
	125	2.53	5.10	7.78	10.5	13.4	16.2	19.1	22.0	24.9	27.8	30.7	33.6
	150	2.40	4.91	7.56	10.3	13.1	15.9	18.8	21.7	24.6	27.5	30.4	33.3
	175	2.26	4.72	7.34	10.1	12.8	15.7	18.5	21.4	24.3	27.2	30.1	33.0
	200	2.13	4.54	7.14	9.83	12.6	15.4	18.2	21.1	24.0	26.9	29.7	32.7
	225	2.00	4.37	6.94	9.61	12.4	15.1	18.0	20.8	23.7	26.6	29.4	32.3
	250	1.89	4.21	6.75	9.40	12.1	14.9	17.7	20.6	23.4	26.3	29.2	32.0
	300	1.67	3.90	6.39	9.00	11.7	14.4	17.2	20.0	22.9	25.7	28.6	31.5
	350	1.49	3.63	6.06	8.63	11.3	14.0	16.8	19.6	22.4	25.2	28.0	30.9
	400	1.34	3.39	5.75	8.29	10.9	13.6	16.3	19.1	21.9	24.7	27.5	30.4
	450	1.21	3.17	5.47	7.96	10.6	13.2	15.9	18.7	21.4	24.2	27.0	29.9
	500	1.10	2.97	5.22	7.65	10.2	12.8	15.5	18.2	21.0	23.8	26.6	29.4
	600	0.931	2.65	4.76	7.10	9.57	12.1	14.8	17.5	20.2	22.9	25.7	28.5
	700	0.803	2.38	4.37	6.60	8.99	11.5	14.1	16.7	19.4	22.1	24.8	27.6
	800	0.706	2.16	4.03	6.15	8.45	10.9	13.4	16.0	18.6	21.3	24.0	26.8
	900	0.629	1.97	3.73	5.75	7.96	10.3	12.8	15.3	17.9	20.6	23.3	26.0

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 0°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

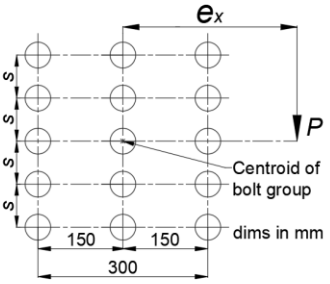
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.15	4.55	7.17	10.0	13.0	16.0	19.1	22.2	25.3	28.3	31.3	34.4
	75	1.91	4.06	6.43	9.06	11.9	14.9	17.9	21.0	24.1	27.2	30.3	33.4
	100	1.71	3.65	5.80	8.23	10.9	13.7	16.7	19.8	22.9	26.0	29.1	32.3
	125	1.55	3.31	5.27	7.51	9.97	12.6	15.5	18.5	21.5	24.7	27.8	31.0
	150	1.42	3.02	4.82	6.88	9.16	11.7	14.4	17.3	20.2	23.3	26.4	29.6
	175	1.31	2.77	4.44	6.34	8.46	10.8	13.4	16.1	19.0	22.0	25.1	28.2
	200	1.21	2.56	4.10	5.87	7.85	10.1	12.5	15.1	17.8	20.7	23.7	26.8
	225	1.12	2.38	3.81	5.46	7.31	9.39	11.7	14.1	16.8	19.6	22.5	25.5
	250	1.05	2.21	3.55	5.09	6.84	8.79	10.9	13.3	15.8	18.5	21.3	24.2
	300	0.915	1.94	3.12	4.48	6.03	7.78	9.70	11.8	14.1	16.5	19.1	21.9
	350	0.807	1.72	2.77	3.99	5.38	6.95	8.69	10.6	12.7	14.9	17.3	19.9
	400	0.717	1.53	2.48	3.58	4.84	6.27	7.85	9.60	11.5	13.6	15.8	18.1
	450	0.643	1.38	2.25	3.25	4.40	5.70	7.15	8.75	10.5	12.4	14.4	16.6
	500	0.581	1.26	2.05	2.96	4.02	5.21	6.55	8.03	9.65	11.4	13.3	15.3
	600	0.487	1.06	1.73	2.52	3.42	4.45	5.60	6.88	8.29	9.82	11.5	13.2
	700	0.418	0.919	1.50	2.19	2.97	3.87	4.88	6.00	7.24	8.59	10.0	11.6
	800	0.367	0.809	1.32	1.93	2.63	3.42	4.32	5.32	6.42	7.62	8.93	10.3
	900	0.326	0.722	1.18	1.72	2.35	3.06	3.87	4.77	5.76	6.84	8.02	9.29
	C', mm	294	662	1080	1590	2170	2850	3600	4450	5390	6430	7560	8790
150	50	2.15	4.94	7.98	11.1	14.1	17.2	20.2	23.2	26.2	29.2	32.1	35.1
	75	1.91	4.48	7.39	10.5	13.6	16.7	19.8	22.8	25.8	28.8	31.8	34.8
	100	1.71	4.07	6.81	9.86	13.0	16.1	19.2	22.3	25.4	28.5	31.5	34.5
	125	1.55	3.71	6.27	9.22	12.3	15.5	18.6	21.8	24.9	28.0	31.0	34.1
	150	1.42	3.40	5.79	8.61	11.7	14.8	18.0	21.1	24.3	27.4	30.5	33.6
	175	1.31	3.13	5.35	8.05	11.0	14.1	17.3	20.5	23.6	26.8	29.9	33.0
	200	1.21	2.90	4.97	7.53	10.4	13.4	16.6	19.7	22.9	26.1	29.3	32.4
	225	1.12	2.69	4.64	7.07	9.78	12.7	15.9	19.0	22.2	25.4	28.6	31.8
	250	1.05	2.51	4.34	6.64	9.24	12.1	15.2	18.3	21.5	24.7	27.9	31.1
	300	0.915	2.21	3.85	5.91	8.27	11.0	13.9	16.9	20.0	23.2	26.4	29.7
	350	0.807	1.96	3.44	5.31	7.46	9.95	12.7	15.6	18.6	21.8	24.9	28.2
	400	0.717	1.76	3.11	4.80	6.78	9.09	11.6	14.4	17.3	20.4	23.5	26.7
	450	0.643	1.60	2.83	4.38	6.20	8.34	10.7	13.3	16.1	19.1	22.1	25.2
	500	0.581	1.46	2.59	4.02	5.71	7.70	9.91	12.4	15.0	17.8	20.8	23.8
	600	0.487	1.24	2.21	3.44	4.91	6.65	8.59	10.8	13.2	15.7	18.5	21.3
	700	0.418	1.08	1.92	3.00	4.30	5.83	7.57	9.53	11.7	14.0	16.5	19.1
	800	0.367	0.950	1.70	2.66	3.82	5.19	6.75	8.51	10.4	12.6	14.9	17.3
	900	0.326	0.850	1.52	2.39	3.43	4.67	6.08	7.68	9.45	11.4	13.5	15.8
	C', mm	294	789	1400	2240	3220	4420	5790	7390	9160	11200	13300	15700

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 15°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

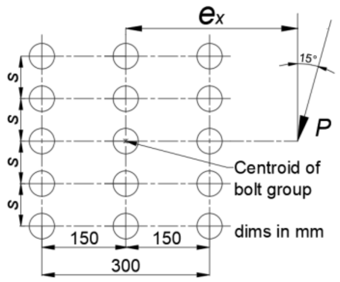
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.22	4.62	7.25	10.1	13.0	16.0	19.0	22.1	25.1	28.2	31.2	34.2
	75	1.97	4.13	6.53	9.13	11.9	14.8	17.9	20.9	24.0	27.1	30.1	33.2
	100	1.77	3.72	5.91	8.31	10.9	13.7	16.7	19.7	22.7	25.8	28.9	32.0
	125	1.61	3.38	5.39	7.60	10.1	12.7	15.5	18.4	21.4	24.5	27.6	30.7
	150	1.47	3.10	4.93	6.98	9.28	11.8	14.4	17.2	20.2	23.2	26.2	29.3
	175	1.35	2.85	4.54	6.45	8.59	10.9	13.4	16.1	19.0	21.9	24.9	27.9
	200	1.25	2.63	4.21	5.98	7.98	10.2	12.6	15.1	17.8	20.7	23.6	26.6
	225	1.16	2.44	3.91	5.57	7.45	9.51	11.8	14.2	16.8	19.5	22.4	25.3
	250	1.08	2.28	3.65	5.21	6.97	8.92	11.1	13.4	15.9	18.5	21.2	24.1
	300	0.945	2.00	3.20	4.59	6.16	7.91	9.84	11.9	14.2	16.6	19.2	21.8
	350	0.834	1.77	2.85	4.09	5.50	7.08	8.84	10.7	12.8	15.0	17.4	19.9
	400	0.741	1.58	2.56	3.68	4.96	6.40	8.00	9.75	11.7	13.7	15.9	18.2
	450	0.665	1.43	2.31	3.34	4.51	5.83	7.30	8.91	10.7	12.6	14.6	16.8
	500	0.601	1.30	2.11	3.05	4.12	5.34	6.70	8.19	9.82	11.6	13.5	15.5
	600	0.504	1.10	1.79	2.59	3.52	4.56	5.74	7.03	8.45	10.0	11.7	13.4
	700	0.433	0.950	1.55	2.25	3.06	3.98	5.01	6.15	7.40	8.77	10.2	11.8
	800	0.380	0.836	1.37	1.99	2.70	3.52	4.43	5.45	6.57	7.79	9.12	10.5
	900	0.338	0.746	1.22	1.78	2.42	3.15	3.98	4.89	5.90	7.01	8.20	9.49
150	50	2.22	4.97	7.97	11.0	14.1	17.1	20.1	23.1	26.1	29.1	32.0	35.0
	75	1.97	4.50	7.39	10.4	13.5	16.6	19.7	22.7	25.7	28.7	31.7	34.7
	100	1.77	4.10	6.84	9.82	12.9	16.0	19.1	22.2	25.2	28.3	31.3	34.3
	125	1.61	3.75	6.32	9.20	12.2	15.4	18.5	21.6	24.7	27.7	30.8	33.8
	150	1.47	3.45	5.86	8.61	11.6	14.7	17.8	20.9	24.1	27.2	30.2	33.3
	175	1.35	3.18	5.44	8.05	11.0	14.0	17.1	20.2	23.4	26.5	29.6	32.7
	200	1.25	2.95	5.07	7.55	10.3	13.3	16.4	19.5	22.7	25.8	29.0	32.1
	225	1.16	2.75	4.73	7.09	9.78	12.7	15.7	18.8	22.0	25.1	28.3	31.4
	250	1.08	2.57	4.44	6.67	9.26	12.1	15.0	18.1	21.3	24.4	27.6	30.7
	300	0.945	2.26	3.93	5.96	8.33	10.9	13.8	16.8	19.8	23.0	26.1	29.3
	350	0.834	2.01	3.52	5.37	7.55	9.97	12.7	15.5	18.5	21.5	24.7	27.8
	400	0.741	1.81	3.18	4.87	6.88	9.13	11.6	14.4	17.2	20.2	23.2	26.4
	450	0.665	1.64	2.90	4.45	6.30	8.39	10.8	13.3	16.1	18.9	21.9	25.0
	500	0.601	1.50	2.65	4.10	5.81	7.76	9.99	12.4	15.0	17.8	20.7	23.6
	600	0.504	1.28	2.27	3.52	5.01	6.74	8.71	10.9	13.2	15.8	18.4	21.2
	700	0.433	1.11	1.98	3.08	4.40	5.93	7.69	9.62	11.8	14.1	16.5	19.1
	800	0.380	0.980	1.75	2.73	3.91	5.29	6.87	8.62	10.6	12.7	15.0	17.4
	900	0.338	0.877	1.57	2.45	3.51	4.77	6.20	7.80	9.59	11.5	13.6	15.9

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 30°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

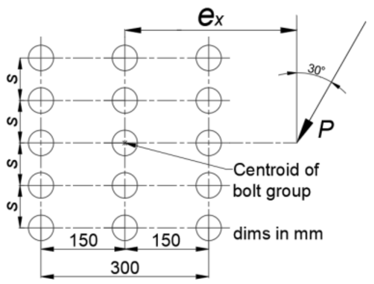
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.40	4.89	7.53	10.3	13.2	16.1	19.1	22.1	25.1	28.1	31.1	34.1
	75	2.15	4.40	6.84	9.45	12.2	15.1	18.0	21.0	24.0	27.0	30.0	33.0
	100	1.94	3.99	6.24	8.69	11.3	14.0	16.9	19.8	22.8	25.8	28.8	31.9
	125	1.76	3.65	5.74	8.02	10.5	13.1	15.8	18.7	21.6	24.6	27.6	30.6
	150	1.61	3.35	5.29	7.42	9.72	12.2	14.8	17.6	20.4	23.4	26.3	29.3
	175	1.49	3.10	4.90	6.89	9.06	11.4	13.9	16.6	19.3	22.2	25.1	28.1
	200	1.37	2.87	4.55	6.42	8.47	10.7	13.1	15.6	18.3	21.1	23.9	26.8
	225	1.28	2.67	4.24	6.00	7.94	10.1	12.4	14.8	17.4	20.0	22.8	25.7
	250	1.19	2.49	3.97	5.63	7.47	9.49	11.7	14.0	16.5	19.1	21.8	24.6
	300	1.04	2.19	3.50	4.98	6.64	8.48	10.5	12.6	14.9	17.3	19.9	22.5
	350	0.923	1.95	3.12	4.46	5.97	7.64	9.46	11.4	13.6	15.8	18.2	20.7
	400	0.822	1.75	2.81	4.03	5.40	6.93	8.61	10.4	12.4	14.5	16.7	19.1
	450	0.739	1.58	2.55	3.66	4.92	6.33	7.89	9.59	11.4	13.4	15.5	17.7
	500	0.669	1.44	2.33	3.35	4.52	5.82	7.27	8.85	10.6	12.4	14.4	16.4
	600	0.561	1.22	1.98	2.86	3.87	5.00	6.26	7.65	9.16	10.8	12.5	14.4
	700	0.483	1.06	1.72	2.49	3.37	4.37	5.48	6.71	8.06	9.51	11.1	12.7
	800	0.423	0.929	1.52	2.20	2.99	3.88	4.87	5.97	7.18	8.49	9.91	11.4
	900	0.376	0.830	1.36	1.97	2.68	3.48	4.38	5.38	6.47	7.66	8.95	10.3
150	50	2.40	5.11	8.05	11.0	14.0	17.0	20.0	23.0	26.0	29.0	31.9	34.9
	75	2.15	4.66	7.51	10.5	13.5	16.5	19.6	22.6	25.6	28.6	31.6	34.5
	100	1.94	4.26	6.99	9.90	12.9	15.9	19.0	22.0	25.1	28.1	31.1	34.1
	125	1.76	3.92	6.52	9.34	12.3	15.3	18.4	21.4	24.5	27.5	30.6	33.6
	150	1.61	3.63	6.09	8.80	11.7	14.7	17.7	20.8	23.9	26.9	30.0	33.0
	175	1.49	3.38	5.70	8.29	11.1	14.1	17.1	20.2	23.2	26.3	29.4	32.5
	200	1.37	3.15	5.35	7.83	10.6	13.5	16.4	19.5	22.6	25.7	28.7	31.8
	225	1.28	2.95	5.03	7.40	10.0	12.9	15.8	18.8	21.9	25.0	28.1	31.2
	250	1.19	2.77	4.74	7.00	9.54	12.3	15.2	18.2	21.2	24.3	27.4	30.5
	300	1.04	2.45	4.23	6.30	8.67	11.3	14.1	16.9	19.9	23.0	26.0	29.1
	350	0.923	2.19	3.81	5.71	7.92	10.4	13.0	15.8	18.7	21.7	24.7	27.8
	400	0.822	1.98	3.45	5.22	7.27	9.58	12.1	14.7	17.5	20.4	23.4	26.4
	450	0.739	1.80	3.16	4.79	6.71	8.88	11.2	13.8	16.5	19.3	22.2	25.2
	500	0.669	1.65	2.90	4.42	6.22	8.26	10.5	12.9	15.5	18.2	21.1	24.0
	600	0.561	1.41	2.49	3.82	5.41	7.22	9.23	11.5	13.8	16.4	19.0	21.7
	700	0.483	1.23	2.18	3.36	4.78	6.40	8.22	10.2	12.4	14.8	17.2	19.8
	800	0.423	1.08	1.93	2.99	4.26	5.73	7.40	9.25	11.2	13.4	15.7	18.2
	900	0.376	0.972	1.73	2.69	3.85	5.18	6.71	8.41	10.3	12.3	14.4	16.7

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 45°

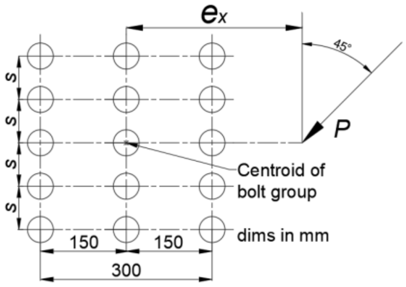
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.64	5.30	8.00	10.8	13.6	16.4	19.3	22.2	25.2	28.1	31.1	34.0
	75	2.43	4.90	7.44	10.1	12.8	15.6	18.4	21.3	24.2	27.1	30.1	33.0
	100	2.23	4.52	6.89	9.38	12.0	14.7	17.5	20.3	23.2	26.1	29.0	32.0
	125	2.05	4.17	6.40	8.75	11.2	13.8	16.5	19.3	22.1	25.0	27.9	30.9
	150	1.89	3.86	5.96	8.20	10.6	13.1	15.7	18.4	21.2	24.0	26.9	29.8
	175	1.75	3.59	5.57	7.70	9.99	12.4	14.9	17.5	20.2	23.0	25.8	28.7
	200	1.63	3.35	5.22	7.25	9.43	11.7	14.2	16.7	19.3	22.1	24.8	27.7
	225	1.52	3.13	4.90	6.83	8.91	11.1	13.5	15.9	18.5	21.2	23.9	26.7
	250	1.42	2.94	4.61	6.45	8.44	10.6	12.8	15.2	17.7	20.3	23.0	25.7
	300	1.25	2.60	4.11	5.78	7.60	9.58	11.7	13.9	16.3	18.7	21.3	23.9
	350	1.11	2.32	3.69	5.21	6.90	8.73	10.7	12.8	15.0	17.4	19.8	22.3
	400	0.993	2.09	3.34	4.74	6.29	8.00	9.85	11.8	13.9	16.1	18.5	20.9
	450	0.896	1.90	3.04	4.33	5.77	7.36	9.10	11.0	12.9	15.0	17.2	19.5
	500	0.814	1.73	2.79	3.98	5.33	6.81	8.44	10.2	12.1	14.1	16.2	18.4
	600	0.685	1.47	2.38	3.42	4.60	5.91	7.35	8.91	10.6	12.4	14.3	16.3
	700	0.590	1.28	2.08	2.99	4.03	5.20	6.49	7.90	9.42	11.1	12.8	14.6
	800	0.517	1.13	1.84	2.65	3.59	4.63	5.80	7.07	8.46	9.95	11.6	13.2
	900	0.461	1.01	1.65	2.38	3.23	4.17	5.23	6.40	7.67	9.04	10.5	12.1
150	50	2.64	5.38	8.22	11.1	14.1	17.0	20.0	22.9	25.9	28.9	31.8	34.8
	75	2.43	5.02	7.78	10.7	13.6	16.5	19.5	22.5	25.5	28.4	31.4	34.4
	100	2.23	4.67	7.33	10.2	13.1	16.0	19.0	22.0	25.0	27.9	30.9	33.9
	125	2.05	4.34	6.90	9.66	12.5	15.5	18.4	21.4	24.4	27.4	30.4	33.4
	150	1.89	4.06	6.50	9.19	12.0	14.9	17.9	20.8	23.8	26.8	29.8	32.8
	175	1.75	3.80	6.16	8.76	11.5	14.4	17.3	20.3	23.3	26.3	29.3	32.3
	200	1.63	3.57	5.84	8.36	11.1	13.9	16.8	19.7	22.7	25.7	28.7	31.7
	225	1.52	3.36	5.54	7.99	10.6	13.4	16.2	19.1	22.1	25.1	28.1	31.1
	250	1.42	3.17	5.27	7.63	10.2	12.9	15.7	18.6	21.5	24.5	27.5	30.5
	300	1.25	2.84	4.78	6.99	9.40	12.0	14.7	17.5	20.4	23.4	26.3	29.3
	350	1.11	2.57	4.36	6.42	8.70	11.2	13.8	16.6	19.4	22.3	25.2	28.2
	400	0.993	2.33	3.99	5.92	8.09	10.4	13.0	15.7	18.4	21.2	24.1	27.0
	450	0.896	2.13	3.68	5.49	7.54	9.80	12.2	14.8	17.5	20.3	23.1	26.0
	500	0.814	1.96	3.40	5.10	7.05	9.21	11.6	14.0	16.6	19.3	22.1	24.9
	600	0.685	1.68	2.95	4.46	6.22	8.19	10.3	12.7	15.1	17.7	20.3	23.0
	700	0.590	1.47	2.59	3.95	5.55	7.35	9.34	11.5	13.8	16.2	18.7	21.3
	800	0.517	1.31	2.31	3.54	4.99	6.65	8.49	10.5	12.6	14.9	17.3	19.8
	900	0.461	1.17	2.08	3.20	4.54	6.06	7.77	9.64	11.7	13.8	16.1	18.5

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 60°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

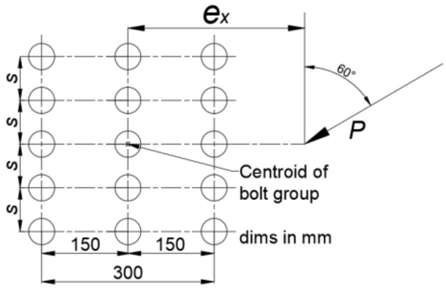
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.83	5.64	8.45	11.2	14.1	16.9	19.7	22.6	25.5	28.3	31.2	34.1
	75	2.72	5.42	8.13	10.8	13.6	16.3	19.1	21.9	24.7	27.6	30.5	33.4
	100	2.59	5.18	7.77	10.4	13.0	15.7	18.4	21.2	24.0	26.8	29.7	32.5
	125	2.46	4.92	7.40	9.92	12.5	15.1	17.8	20.5	23.2	26.0	28.8	31.7
	150	2.32	4.66	7.03	9.46	11.9	14.5	17.1	19.8	22.5	25.2	28.0	30.8
	175	2.19	4.41	6.68	9.02	11.4	13.9	16.5	19.1	21.7	24.5	27.2	30.0
	200	2.07	4.17	6.35	8.61	11.0	13.4	15.9	18.4	21.1	23.7	26.5	29.2
	225	1.95	3.95	6.04	8.22	10.5	12.9	15.3	17.8	20.4	23.0	25.7	28.4
	250	1.84	3.74	5.75	7.86	10.1	12.4	14.8	17.3	19.8	22.4	25.0	27.7
	300	1.65	3.38	5.22	7.19	9.28	11.5	13.8	16.2	18.6	21.1	23.7	26.3
	350	1.49	3.06	4.76	6.61	8.58	10.7	12.9	15.2	17.5	20.0	22.5	25.0
	400	1.35	2.79	4.37	6.09	7.95	9.93	12.0	14.2	16.5	18.9	21.3	23.8
	450	1.23	2.55	4.02	5.64	7.39	9.28	11.3	13.4	15.6	17.9	20.3	22.7
	500	1.12	2.35	3.72	5.24	6.90	8.69	10.6	12.6	14.8	17.0	19.3	21.6
	600	0.955	2.02	3.22	4.57	6.06	7.68	9.43	11.3	13.3	15.4	17.5	19.8
	700	0.827	1.76	2.84	4.04	5.39	6.86	8.47	10.2	12.0	14.0	16.0	18.1
	800	0.727	1.56	2.53	3.61	4.84	6.19	7.66	9.26	11.0	12.8	14.7	16.7
	900	0.649	1.40	2.27	3.26	4.38	5.62	6.98	8.46	10.1	11.7	13.5	15.4
150	50	2.83	5.64	8.46	11.3	14.2	17.1	20.0	22.9	25.9	28.8	31.7	34.7
	75	2.72	5.44	8.19	11.0	13.8	16.7	19.6	22.5	25.5	28.4	31.3	34.3
	100	2.59	5.21	7.88	10.6	13.4	16.3	19.2	22.1	25.0	27.9	30.9	33.8
	125	2.46	4.97	7.57	10.3	13.0	15.9	18.7	21.6	24.6	27.5	30.4	33.4
	150	2.32	4.73	7.26	9.91	12.6	15.5	18.3	21.2	24.1	27.0	29.9	32.9
	175	2.19	4.51	6.97	9.56	12.3	15.0	17.9	20.7	23.6	26.6	29.5	32.4
	200	2.07	4.29	6.69	9.23	11.9	14.6	17.5	20.3	23.2	26.1	29.0	31.9
	225	1.95	4.09	6.43	8.92	11.5	14.3	17.0	19.9	22.7	25.6	28.5	31.5
	250	1.84	3.90	6.18	8.63	11.2	13.9	16.6	19.5	22.3	25.2	28.1	31.0
	300	1.65	3.56	5.73	8.08	10.6	13.2	15.9	18.7	21.5	24.3	27.2	30.1
	350	1.49	3.27	5.32	7.59	10.0	12.6	15.2	17.9	20.7	23.5	26.3	29.2
	400	1.35	3.01	4.95	7.13	9.48	12.0	14.5	17.2	19.9	22.7	25.5	28.4
	450	1.23	2.78	4.63	6.71	8.98	11.4	13.9	16.5	19.2	21.9	24.7	27.5
	500	1.12	2.58	4.34	6.33	8.52	10.9	13.3	15.9	18.5	21.2	24.0	26.8
	600	0.955	2.25	3.84	5.67	7.70	9.91	12.3	14.7	17.3	19.9	22.6	25.3
	700	0.827	1.98	3.43	5.11	7.00	9.08	11.3	13.7	16.1	18.7	21.3	23.9
	800	0.727	1.77	3.09	4.64	6.40	8.36	10.5	12.7	15.1	17.5	20.1	22.6
	900	0.649	1.60	2.81	4.24	5.89	7.73	9.74	11.9	14.2	16.5	18.9	21.5

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 75°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

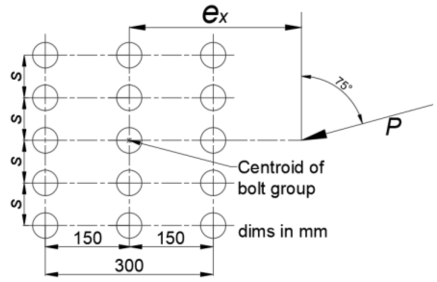
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.92	5.83	8.72	11.6	14.5	17.4	20.2	23.1	26.0	28.8	31.7	34.6
	75	2.89	5.77	8.63	11.5	14.3	17.1	20.0	22.8	25.6	28.5	31.3	34.2
	100	2.86	5.70	8.51	11.3	14.1	16.9	19.7	22.5	25.3	28.1	30.9	33.7
	125	2.82	5.61	8.38	11.1	13.9	16.6	19.3	22.1	24.9	27.6	30.4	33.2
	150	2.77	5.51	8.22	10.9	13.6	16.3	19.0	21.7	24.5	27.2	30.0	32.8
	175	2.72	5.40	8.06	10.7	13.4	16.0	18.7	21.4	24.1	26.8	29.5	32.3
	200	2.66	5.28	7.89	10.5	13.1	15.7	18.3	21.0	23.7	26.4	29.1	31.8
	225	2.60	5.16	7.71	10.3	12.8	15.4	18.0	20.6	23.3	26.0	28.7	31.4
	250	2.53	5.04	7.53	10.0	12.5	15.1	17.7	20.3	22.9	25.6	28.2	30.9
	300	2.40	4.78	7.16	9.57	12.0	14.5	17.0	19.6	22.1	24.8	27.4	30.1
	350	2.26	4.52	6.80	9.12	11.5	13.9	16.4	18.9	21.4	24.0	26.6	29.3
	400	2.13	4.27	6.45	8.68	11.0	13.3	15.7	18.2	20.7	23.3	25.9	28.5
	450	2.00	4.03	6.12	8.27	10.5	12.8	15.2	17.6	20.1	22.6	25.1	27.7
	500	1.89	3.81	5.80	7.88	10.0	12.3	14.6	17.0	19.4	21.9	24.4	27.0
	600	1.67	3.41	5.24	7.17	9.22	11.4	13.6	15.9	18.2	20.6	23.1	25.6
	700	1.49	3.06	4.75	6.56	8.49	10.5	12.6	14.9	17.1	19.5	21.9	24.3
	800	1.34	2.77	4.33	6.02	7.84	9.77	11.8	13.9	16.1	18.4	20.7	23.1
	900	1.21	2.52	3.97	5.56	7.27	9.10	11.0	13.1	15.2	17.4	19.7	22.0
150	50	2.92	5.82	8.69	11.6	14.4	17.3	20.2	23.1	26.0	28.9	31.9	34.8
	75	2.89	5.75	8.59	11.4	14.3	17.1	20.0	22.9	25.7	28.6	31.6	34.5
	100	2.86	5.68	8.47	11.3	14.1	16.9	19.7	22.6	25.5	28.4	31.3	34.2
	125	2.82	5.59	8.33	11.1	13.9	16.7	19.5	22.3	25.2	28.1	30.9	33.8
	150	2.77	5.49	8.19	10.9	13.7	16.4	19.2	22.1	24.9	27.8	30.6	33.5
	175	2.72	5.38	8.04	10.7	13.4	16.2	19.0	21.8	24.6	27.5	30.4	33.2
	200	2.66	5.27	7.89	10.5	13.2	16.0	18.7	21.5	24.4	27.2	30.1	32.9
	225	2.60	5.16	7.73	10.4	13.0	15.7	18.5	21.3	24.1	26.9	29.8	32.6
	250	2.53	5.04	7.58	10.2	12.8	15.5	18.3	21.0	23.8	26.7	29.5	32.4
	300	2.40	4.80	7.27	9.81	12.4	15.1	17.8	20.5	23.3	26.1	29.0	31.8
	350	2.26	4.57	6.97	9.47	12.0	14.7	17.4	20.1	22.8	25.6	28.4	31.3
	400	2.13	4.35	6.68	9.13	11.7	14.3	16.9	19.6	22.4	25.1	27.9	30.7
	450	2.00	4.13	6.41	8.82	11.3	13.9	16.5	19.2	21.9	24.7	27.4	30.2
	500	1.89	3.93	6.15	8.51	11.0	13.5	16.1	18.8	21.5	24.2	27.0	29.7
	600	1.67	3.56	5.67	7.95	10.3	12.8	15.4	18.0	20.7	23.4	26.1	28.8
	700	1.49	3.25	5.25	7.44	9.77	12.2	14.7	17.3	19.9	22.6	25.3	28.0
	800	1.34	2.97	4.87	6.98	9.23	11.6	14.1	16.6	19.2	21.8	24.5	27.2
	900	1.21	2.73	4.54	6.56	8.74	11.0	13.5	15.9	18.5	21.1	23.7	26.4

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 0°

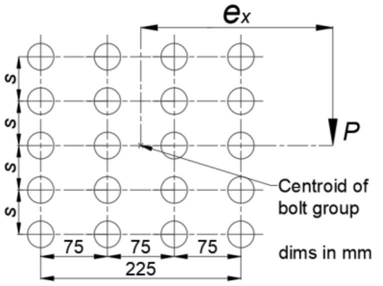
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.60	5.70	9.24	13.2	17.2	21.4	25.5	29.7	33.8	37.8	41.9	45.9
	75	2.23	4.92	8.05	11.7	15.6	19.7	23.9	28.1	32.3	36.4	40.6	44.7
	100	1.94	4.30	7.09	10.4	14.0	18.0	22.1	26.3	30.5	34.7	38.9	43.1
	125	1.69	3.79	6.30	9.29	12.6	16.4	20.3	24.4	28.6	32.8	37.1	41.3
	150	1.49	3.37	5.65	8.37	11.4	14.9	18.7	22.6	26.7	30.9	35.2	39.4
	175	1.32	3.03	5.10	7.59	10.4	13.7	17.2	21.0	24.9	29.0	33.2	37.5
	200	1.18	2.74	4.63	6.92	9.56	12.6	15.9	19.5	23.3	27.2	31.3	35.5
	225	1.07	2.50	4.24	6.35	8.81	11.6	14.7	18.1	21.7	25.6	29.6	33.7
	250	0.979	2.29	3.89	5.86	8.15	10.8	13.7	16.9	20.3	24.0	27.9	31.9
	300	0.835	1.96	3.34	5.06	7.06	9.37	12.0	14.8	17.9	21.3	24.9	28.6
	350	0.728	1.72	2.92	4.44	6.21	8.27	10.6	13.2	16.0	19.1	22.3	25.8
	400	0.645	1.52	2.59	3.95	5.54	7.39	9.48	11.8	14.4	17.2	20.2	23.4
	450	0.580	1.37	2.33	3.55	4.99	6.67	8.57	10.7	13.1	15.6	18.4	21.3
	500	0.526	1.24	2.11	3.23	4.53	6.07	7.81	9.77	11.9	14.3	16.9	19.6
	600	0.444	1.04	1.78	2.72	3.83	5.14	6.62	8.30	10.2	12.2	14.4	16.8
	700	0.384	0.901	1.54	2.35	3.31	4.45	5.73	7.20	8.82	10.6	12.6	14.7
	800	0.338	0.792	1.36	2.07	2.91	3.92	5.05	6.35	7.79	9.38	11.1	13.0
	900	0.302	0.707	1.21	1.85	2.60	3.50	4.51	5.68	6.96	8.39	9.95	11.6
	C', mm	281	651	1120	1700	2400	3230	4170	5250	6460	7800	9270	10900
150	50	2.60	6.48	10.7	14.8	18.9	23.0	27.0	31.0	34.9	38.9	42.9	46.8
	75	2.23	5.75	9.79	14.0	18.2	22.3	26.4	30.5	34.5	38.5	42.5	46.5
	100	1.94	5.12	8.91	13.1	17.4	21.6	25.7	29.8	33.9	38.0	42.0	46.0
	125	1.69	4.58	8.10	12.2	16.4	20.7	24.9	29.1	33.2	37.4	41.4	45.5
	150	1.49	4.13	7.37	11.3	15.5	19.7	24.0	28.2	32.4	36.6	40.7	44.9
	175	1.32	3.74	6.74	10.5	14.5	18.8	23.0	27.3	31.6	35.8	40.0	44.1
	200	1.18	3.41	6.20	9.73	13.6	17.8	22.1	26.4	30.6	34.9	39.1	43.3
	225	1.07	3.13	5.73	9.05	12.8	16.9	21.1	25.4	29.7	34.0	38.2	42.5
	250	0.979	2.89	5.31	8.45	12.0	16.0	20.1	24.4	28.7	33.0	37.3	41.5
	300	0.835	2.50	4.63	7.43	10.7	14.3	18.3	22.4	26.7	31.0	35.3	39.6
	350	0.728	2.19	4.09	6.60	9.53	12.9	16.7	20.6	24.7	29.0	33.2	37.6
	400	0.645	1.95	3.65	5.93	8.59	11.7	15.2	19.0	22.9	27.0	31.3	35.5
	450	0.580	1.76	3.29	5.37	7.81	10.7	14.0	17.5	21.3	25.3	29.4	33.6
	500	0.526	1.60	2.99	4.90	7.15	9.85	12.9	16.2	19.8	23.6	27.6	31.7
	600	0.444	1.35	2.53	4.16	6.10	8.44	11.1	14.0	17.3	20.7	24.4	28.3
	700	0.384	1.17	2.19	3.61	5.31	7.37	9.69	12.3	15.2	18.4	21.8	25.3
	800	0.338	1.03	1.93	3.19	4.69	6.53	8.61	11.0	13.6	16.5	19.6	22.9
	900	0.302	0.915	1.72	2.85	4.20	5.85	7.73	9.89	12.3	14.9	17.7	20.8
	C', mm	281	843	1590	2640	3910	5470	7270	9370	11700	14400	17300	20400

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 15°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

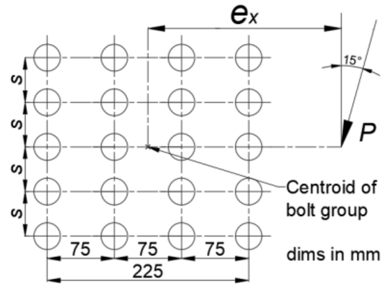
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.68	5.77	9.31	13.2	17.2	21.3	25.4	29.5	33.5	37.6	41.6	45.7
	75	2.30	5.00	8.17	11.7	15.6	19.6	23.7	27.8	32.0	36.1	40.2	44.3
	100	1.99	4.38	7.22	10.4	14.0	17.9	21.9	26.0	30.2	34.4	38.5	42.7
	125	1.74	3.88	6.43	9.37	12.7	16.3	20.2	24.2	28.3	32.5	36.7	40.9
	150	1.53	3.45	5.77	8.47	11.6	15.0	18.6	22.5	26.5	30.6	34.8	39.0
	175	1.36	3.10	5.21	7.71	10.6	13.7	17.2	20.9	24.8	28.8	32.9	37.1
	200	1.22	2.81	4.74	7.05	9.70	12.7	15.9	19.5	23.2	27.1	31.1	35.2
	225	1.11	2.57	4.34	6.48	8.95	11.7	14.8	18.1	21.7	25.5	29.4	33.4
	250	1.01	2.36	4.00	5.98	8.29	10.9	13.8	17.0	20.4	24.0	27.7	31.6
	300	0.864	2.02	3.44	5.18	7.21	9.52	12.1	15.0	18.0	21.4	24.8	28.5
	350	0.754	1.77	3.01	4.55	6.36	8.43	10.8	13.3	16.1	19.2	22.4	25.8
	400	0.668	1.57	2.68	4.05	5.67	7.54	9.66	12.0	14.6	17.3	20.3	23.5
	450	0.600	1.41	2.40	3.65	5.12	6.81	8.74	10.9	13.2	15.8	18.6	21.5
	500	0.545	1.28	2.18	3.32	4.66	6.21	7.98	9.95	12.1	14.5	17.1	19.8
	600	0.460	1.08	1.84	2.80	3.94	5.26	6.78	8.47	10.4	12.4	14.6	17.0
	700	0.398	0.931	1.59	2.43	3.41	4.56	5.89	7.37	9.02	10.8	12.8	14.9
	800	0.350	0.819	1.40	2.14	3.00	4.03	5.19	6.51	7.98	9.59	11.3	13.2
	900	0.313	0.731	1.25	1.91	2.68	3.60	4.65	5.83	7.15	8.59	10.2	11.9
150	50	2.68	6.48	10.6	14.7	18.8	22.8	26.8	30.8	34.8	38.8	42.7	46.7
	75	2.30	5.75	9.75	13.9	18.1	22.2	26.2	30.3	34.3	38.3	42.3	46.3
	100	1.99	5.13	8.91	13.0	17.2	21.4	25.5	29.6	33.7	37.7	41.8	45.8
	125	1.74	4.61	8.14	12.1	16.3	20.5	24.7	28.8	32.9	37.0	41.1	45.2
	150	1.53	4.17	7.45	11.2	15.3	19.5	23.7	27.9	32.1	36.3	40.4	44.5
	175	1.36	3.79	6.84	10.4	14.4	18.6	22.8	27.0	31.2	35.4	39.6	43.7
	200	1.22	3.46	6.30	9.71	13.6	17.6	21.8	26.0	30.3	34.5	38.7	42.9
	225	1.11	3.19	5.83	9.05	12.8	16.7	20.8	25.1	29.3	33.5	37.7	42.0
	250	1.01	2.94	5.42	8.47	12.0	15.9	19.9	24.1	28.3	32.5	36.8	41.0
	300	0.864	2.55	4.73	7.47	10.7	14.3	18.2	22.2	26.4	30.6	34.8	39.1
	350	0.754	2.24	4.18	6.66	9.62	12.9	16.6	20.5	24.5	28.6	32.8	37.1
	400	0.668	2.00	3.74	6.00	8.71	11.8	15.2	18.9	22.8	26.8	30.9	35.1
	450	0.600	1.80	3.38	5.45	7.94	10.8	14.0	17.5	21.2	25.1	29.1	33.2
	500	0.545	1.64	3.08	4.98	7.28	9.92	12.9	16.2	19.8	23.5	27.4	31.4
	600	0.460	1.39	2.60	4.25	6.23	8.54	11.2	14.1	17.3	20.7	24.3	28.1
	700	0.398	1.20	2.26	3.69	5.43	7.48	9.85	12.5	15.4	18.5	21.8	25.3
	800	0.350	1.06	1.99	3.26	4.81	6.65	8.77	11.1	13.8	16.6	19.7	22.9
	900	0.313	0.944	1.78	2.92	4.31	5.97	7.89	10.0	12.4	15.1	17.9	20.9

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 30°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

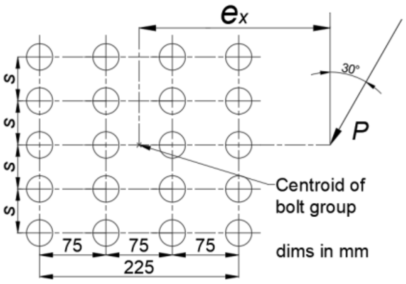
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.90	6.06	9.59	13.4	17.3	21.3	25.3	29.4	33.4	37.4	41.4	45.4
	75	2.50	5.31	8.52	12.0	15.8	19.7	23.7	27.8	31.8	35.9	40.0	44.0
	100	2.18	4.70	7.62	10.9	14.4	18.2	22.1	26.1	30.1	34.2	38.3	42.4
	125	1.91	4.18	6.85	9.86	13.2	16.7	20.5	24.4	28.4	32.5	36.5	40.6
	150	1.69	3.75	6.19	8.98	12.1	15.5	19.1	22.8	26.7	30.7	34.8	38.9
	175	1.51	3.38	5.63	8.21	11.1	14.3	17.8	21.4	25.2	29.1	33.1	37.1
	200	1.36	3.07	5.14	7.55	10.3	13.3	16.6	20.0	23.7	27.5	31.4	35.4
	225	1.23	2.81	4.73	6.97	9.54	12.4	15.5	18.8	22.3	26.0	29.8	33.7
	250	1.13	2.59	4.37	6.46	8.88	11.6	14.5	17.7	21.1	24.6	28.3	32.1
	300	0.963	2.23	3.78	5.62	7.78	10.2	12.9	15.8	18.9	22.2	25.7	29.3
	350	0.840	1.95	3.32	4.96	6.90	9.08	11.5	14.2	17.1	20.1	23.4	26.8
	400	0.745	1.73	2.96	4.43	6.19	8.17	10.4	12.9	15.5	18.3	21.4	24.6
	450	0.669	1.56	2.66	4.00	5.60	7.41	9.46	11.7	14.2	16.8	19.7	22.7
	500	0.607	1.42	2.42	3.65	5.11	6.77	8.67	10.8	13.1	15.5	18.2	21.0
	600	0.512	1.20	2.04	3.09	4.34	5.77	7.41	9.22	11.2	13.4	15.7	18.2
	700	0.443	1.03	1.77	2.68	3.77	5.01	6.46	8.05	9.82	11.8	13.8	16.1
	800	0.390	0.911	1.56	2.36	3.32	4.43	5.71	7.14	8.72	10.5	12.3	14.4
	900	0.349	0.813	1.39	2.11	2.97	3.97	5.12	6.40	7.84	9.41	11.1	12.9
150	50	2.90	6.59	10.6	14.7	18.7	22.7	26.7	30.7	34.7	38.6	42.6	46.5
	75	2.50	5.88	9.83	13.9	18.0	22.0	26.1	30.1	34.1	38.1	42.1	46.1
	100	2.18	5.30	9.05	13.0	17.1	21.2	25.3	29.4	33.4	37.5	41.5	45.5
	125	1.91	4.81	8.35	12.2	16.3	20.4	24.5	28.6	32.7	36.7	40.8	44.8
	150	1.69	4.38	7.72	11.4	15.4	19.5	23.6	27.7	31.8	35.9	40.0	44.1
	175	1.51	4.01	7.15	10.7	14.6	18.6	22.7	26.8	30.9	35.1	39.2	43.3
	200	1.36	3.69	6.64	10.0	13.8	17.7	21.8	25.9	30.0	34.2	38.3	42.4
	225	1.23	3.41	6.19	9.41	13.0	16.9	20.9	25.0	29.1	33.3	37.4	41.5
	250	1.13	3.16	5.79	8.85	12.3	16.1	20.1	24.1	28.2	32.3	36.5	40.6
	300	0.963	2.76	5.09	7.88	11.1	14.7	18.5	22.4	26.4	30.5	34.6	38.8
	350	0.840	2.44	4.54	7.08	10.1	13.4	17.0	20.8	24.7	28.7	32.8	36.9
	400	0.745	2.18	4.08	6.41	9.21	12.3	15.7	19.4	23.2	27.1	31.1	35.1
	450	0.669	1.97	3.70	5.85	8.45	11.4	14.6	18.1	21.7	25.5	29.4	33.4
	500	0.607	1.80	3.38	5.37	7.80	10.5	13.6	16.9	20.4	24.1	27.9	31.8
	600	0.512	1.53	2.87	4.61	6.74	9.16	11.9	14.9	18.1	21.5	25.1	28.8
	700	0.443	1.32	2.49	4.02	5.91	8.07	10.5	13.3	16.2	19.4	22.7	26.2
	800	0.390	1.17	2.20	3.57	5.26	7.20	9.45	11.9	14.6	17.6	20.7	23.9
	900	0.349	1.05	1.97	3.21	4.73	6.49	8.55	10.8	13.3	16.0	18.9	22.0

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 45°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = C r_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

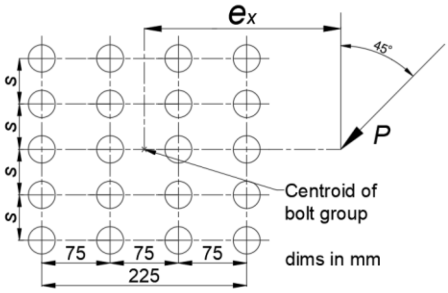
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	3.25	6.62	10.2	13.8	17.6	21.5	25.4	29.4	33.3	37.3	41.3	45.2
	75	2.87	5.92	9.19	12.7	16.4	20.2	24.0	28.0	31.9	35.9	39.9	43.8
	100	2.54	5.31	8.36	11.7	15.2	18.8	22.6	26.5	30.4	34.4	38.3	42.3
	125	2.25	4.78	7.63	10.8	14.1	17.6	21.3	25.1	28.9	32.9	36.8	40.8
	150	2.01	4.33	6.99	9.94	13.1	16.5	20.1	23.7	27.5	31.4	35.3	39.2
	175	1.81	3.93	6.42	9.20	12.2	15.5	18.9	22.5	26.2	30.0	33.8	37.7
	200	1.64	3.60	5.92	8.55	11.4	14.5	17.8	21.3	24.9	28.6	32.4	36.3
	225	1.49	3.31	5.49	7.96	10.7	13.7	16.9	20.2	23.8	27.4	31.1	34.9
	250	1.37	3.06	5.10	7.44	10.1	12.9	16.0	19.2	22.6	26.2	29.8	33.5
	300	1.17	2.65	4.46	6.55	8.93	11.6	14.4	17.4	20.6	24.0	27.5	31.1
	350	1.03	2.33	3.95	5.83	8.00	10.4	13.1	15.9	18.9	22.1	25.4	28.8
	400	0.910	2.08	3.54	5.24	7.23	9.47	11.9	14.6	17.4	20.4	23.6	26.8
	450	0.818	1.88	3.20	4.75	6.59	8.65	10.9	13.4	16.1	18.9	21.9	25.0
	500	0.742	1.71	2.92	4.35	6.04	7.96	10.1	12.4	14.9	17.6	20.5	23.4
	600	0.627	1.45	2.48	3.71	5.18	6.84	8.71	10.8	13.0	15.4	18.0	20.7
	700	0.542	1.26	2.15	3.23	4.52	5.99	7.65	9.50	11.5	13.7	16.0	18.5
	800	0.478	1.11	1.89	2.86	4.00	5.31	6.81	8.48	10.3	12.3	14.4	16.7
	900	0.427	0.991	1.69	2.56	3.59	4.77	6.13	7.64	9.30	11.1	13.1	15.2
150	50	3.25	6.89	10.8	14.7	18.7	22.6	26.6	30.6	34.5	38.5	42.4	46.4
	75	2.87	6.28	10.1	14.0	18.0	22.0	25.9	29.9	33.9	37.9	41.9	45.8
	100	2.54	5.74	9.38	13.3	17.2	21.2	25.2	29.2	33.2	37.2	41.2	45.2
	125	2.25	5.27	8.75	12.5	16.5	20.4	24.4	28.5	32.5	36.5	40.5	44.5
	150	2.01	4.85	8.20	11.9	15.7	19.7	23.7	27.7	31.7	35.7	39.7	43.8
	175	1.81	4.49	7.70	11.3	15.0	18.9	22.9	26.9	30.9	34.9	39.0	43.0
	200	1.64	4.16	7.25	10.7	14.4	18.2	22.1	26.1	30.1	34.1	38.2	42.2
	225	1.49	3.87	6.83	10.1	13.7	17.5	21.4	25.3	29.3	33.3	37.4	41.4
	250	1.37	3.62	6.45	9.65	13.1	16.8	20.7	24.6	28.5	32.5	36.6	40.6
	300	1.17	3.19	5.78	8.75	12.0	15.6	19.3	23.1	27.0	31.0	35.0	39.0
	350	1.03	2.84	5.21	7.97	11.1	14.5	18.0	21.8	25.6	29.5	33.4	37.4
	400	0.910	2.56	4.74	7.30	10.2	13.5	16.9	20.5	24.3	28.1	32.0	35.9
	450	0.818	2.33	4.33	6.72	9.48	12.6	15.9	19.4	23.0	26.7	30.6	34.4
	500	0.742	2.13	3.98	6.21	8.83	11.8	14.9	18.3	21.8	25.5	29.2	33.0
	600	0.627	1.82	3.42	5.38	7.74	10.4	13.3	16.4	19.8	23.2	26.8	30.5
	700	0.542	1.59	2.99	4.74	6.87	9.30	12.0	14.9	18.0	21.3	24.7	28.2
	800	0.478	1.41	2.65	4.22	6.17	8.38	10.8	13.5	16.5	19.5	22.8	26.1
	900	0.427	1.26	2.38	3.81	5.59	7.62	9.89	12.4	15.1	18.0	21.1	24.3

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 60°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

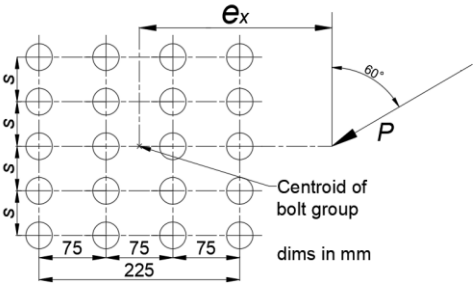
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	3.63	7.24	10.9	14.5	18.3	22.0	25.8	29.7	33.5	37.4	41.3	45.2
	75	3.37	6.77	10.2	13.7	17.4	21.0	24.8	28.6	32.4	36.3	40.1	44.0
	100	3.10	6.27	9.55	12.9	16.4	20.0	23.7	27.5	31.3	35.1	38.9	42.8
	125	2.84	5.80	8.92	12.2	15.6	19.1	22.7	26.4	30.1	33.9	37.7	41.6
	150	2.60	5.36	8.33	11.5	14.8	18.2	21.7	25.4	29.0	32.8	36.6	40.4
	175	2.38	4.96	7.79	10.8	14.0	17.4	20.9	24.4	28.0	31.7	35.5	39.3
	200	2.19	4.60	7.30	10.2	13.3	16.6	20.0	23.5	27.1	30.7	34.4	38.2
	225	2.02	4.28	6.85	9.68	12.7	15.9	19.2	22.6	26.1	29.7	33.4	37.1
	250	1.87	3.99	6.45	9.17	12.1	15.2	18.4	21.8	25.3	28.8	32.4	36.1
	300	1.62	3.51	5.75	8.27	11.0	13.9	17.0	20.3	23.6	27.0	30.6	34.1
	350	1.43	3.12	5.18	7.50	10.1	12.8	15.8	18.9	22.1	25.4	28.9	32.3
	400	1.27	2.81	4.70	6.85	9.23	11.8	14.7	17.6	20.7	24.0	27.3	30.7
	450	1.15	2.56	4.29	6.28	8.52	11.0	13.7	16.5	19.5	22.6	25.8	29.1
	500	1.04	2.34	3.95	5.80	7.89	10.2	12.8	15.5	18.4	21.4	24.5	27.7
	600	0.881	2.00	3.39	5.01	6.87	8.98	11.3	13.8	16.4	19.2	22.1	25.2
	700	0.764	1.74	2.96	4.39	6.07	7.97	10.1	12.3	14.8	17.4	20.1	23.0
	800	0.673	1.54	2.63	3.91	5.43	7.15	9.06	11.1	13.4	15.8	18.4	21.1
	900	0.602	1.38	2.36	3.52	4.91	6.48	8.22	10.2	12.3	14.5	16.9	19.4
150	50	3.63	7.29	11.0	14.9	18.7	22.6	26.6	30.5	34.4	38.3	42.3	46.2
	75	3.37	6.88	10.5	14.3	18.2	22.1	26.0	29.9	33.8	37.8	41.7	45.6
	100	3.10	6.46	10.0	13.8	17.6	21.5	25.4	29.3	33.2	37.1	41.1	45.0
	125	2.84	6.06	9.55	13.2	17.0	20.8	24.7	28.6	32.6	36.5	40.4	44.4
	150	2.60	5.69	9.09	12.7	16.4	20.2	24.1	28.0	31.9	35.8	39.8	43.7
	175	2.38	5.34	8.66	12.2	15.9	19.7	23.5	27.4	31.3	35.2	39.1	43.1
	200	2.19	5.03	8.27	11.7	15.4	19.1	22.9	26.8	30.7	34.6	38.5	42.4
	225	2.02	4.74	7.90	11.3	14.9	18.6	22.4	26.2	30.1	33.9	37.9	41.8
	250	1.87	4.47	7.55	10.9	14.4	18.1	21.8	25.6	29.5	33.3	37.2	41.1
	300	1.62	4.01	6.93	10.1	13.6	17.1	20.8	24.5	28.3	32.2	36.0	39.9
	350	1.43	3.63	6.38	9.46	12.8	16.2	19.8	23.5	27.2	31.0	34.9	38.7
	400	1.27	3.31	5.91	8.84	12.0	15.4	18.9	22.5	26.2	30.0	33.8	37.6
	450	1.15	3.04	5.49	8.28	11.3	14.6	18.0	21.6	25.2	28.9	32.7	36.5
	500	1.04	2.81	5.12	7.77	10.7	13.9	17.2	20.7	24.3	28.0	31.7	35.4
	600	0.881	2.44	4.49	6.90	9.62	12.6	15.8	19.1	22.6	26.1	29.7	33.4
	700	0.764	2.15	3.99	6.18	8.70	11.5	14.5	17.7	21.0	24.5	28.0	31.6
	800	0.673	1.91	3.58	5.58	7.93	10.6	13.4	16.5	19.7	23.0	26.4	29.9
	900	0.602	1.73	3.24	5.08	7.27	9.76	12.5	15.4	18.4	21.6	24.9	28.3

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 75°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

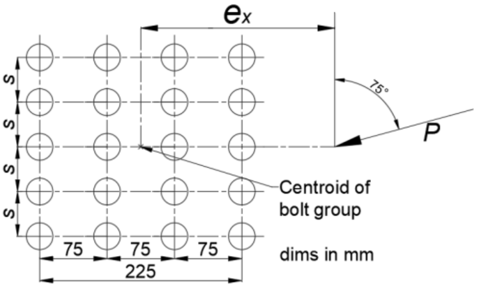
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	3.86	7.68	11.5	15.3	19.0	22.8	26.6	30.4	34.2	38.1	41.9	45.8
	75	3.79	7.53	11.2	14.9	18.6	22.3	26.1	29.8	33.6	37.4	41.2	45.0
	100	3.70	7.34	11.0	14.6	18.2	21.8	25.5	29.2	32.9	36.7	40.5	44.3
	125	3.59	7.13	10.6	14.2	17.7	21.3	24.9	28.6	32.3	36.0	39.8	43.5
	150	3.47	6.89	10.3	13.8	17.2	20.8	24.4	28.0	31.7	35.4	39.1	42.8
	175	3.34	6.65	9.97	13.3	16.8	20.3	23.8	27.4	31.0	34.7	38.4	42.1
	200	3.20	6.40	9.64	12.9	16.3	19.8	23.3	26.8	30.4	34.1	37.8	41.5
	225	3.07	6.15	9.31	12.5	15.9	19.3	22.7	26.3	29.9	33.5	37.1	40.8
	250	2.94	5.91	8.98	12.2	15.4	18.8	22.2	25.7	29.3	32.9	36.5	40.2
	300	2.68	5.45	8.36	11.4	14.6	17.9	21.3	24.7	28.2	31.8	35.4	39.0
	350	2.45	5.03	7.79	10.7	13.8	17.0	20.4	23.8	27.2	30.7	34.3	37.8
	400	2.24	4.65	7.28	10.1	13.1	16.3	19.5	22.9	26.3	29.7	33.2	36.8
	450	2.06	4.31	6.81	9.54	12.5	15.5	18.7	22.0	25.3	28.8	32.2	35.7
	500	1.90	4.01	6.40	9.03	11.9	14.8	18.0	21.2	24.5	27.8	31.3	34.8
	600	1.63	3.51	5.69	8.13	10.8	13.6	16.6	19.6	22.8	26.1	29.5	32.9
	700	1.43	3.11	5.11	7.36	9.83	12.5	15.3	18.3	21.4	24.6	27.8	31.1
	800	1.27	2.79	4.62	6.71	9.02	11.5	14.2	17.1	20.0	23.1	26.3	29.5
	900	1.14	2.53	4.22	6.15	8.31	10.7	13.3	16.0	18.8	21.8	24.9	28.0
150	50	3.86	7.66	11.4	15.2	19.1	22.9	26.8	30.7	34.6	38.5	42.4	46.3
	75	3.79	7.50	11.2	15.0	18.7	22.6	26.4	30.3	34.1	38.0	41.9	45.8
	100	3.70	7.32	11.0	14.7	18.4	22.2	26.0	29.9	33.7	37.6	41.5	45.4
	125	3.59	7.12	10.7	14.3	18.1	21.8	25.6	29.5	33.3	37.2	41.0	44.9
	150	3.47	6.91	10.4	14.0	17.7	21.5	25.3	29.1	32.9	36.7	40.6	44.5
	175	3.34	6.70	10.2	13.7	17.4	21.1	24.9	28.7	32.5	36.3	40.2	44.1
	200	3.20	6.49	9.91	13.5	17.1	20.8	24.5	28.3	32.1	35.9	39.8	43.6
	225	3.07	6.28	9.66	13.2	16.8	20.5	24.2	28.0	31.7	35.6	39.4	43.2
	250	2.94	6.08	9.42	12.9	16.5	20.1	23.9	27.6	31.4	35.2	39.0	42.8
	300	2.68	5.69	8.95	12.4	15.9	19.5	23.2	26.9	30.7	34.5	38.3	42.1
	350	2.45	5.33	8.51	11.9	15.4	19.0	22.6	26.3	30.0	33.8	37.5	41.3
	400	2.24	4.99	8.10	11.4	14.9	18.4	22.0	25.7	29.4	33.1	36.9	40.6
	450	2.06	4.69	7.72	11.0	14.4	17.9	21.5	25.1	28.8	32.5	36.2	40.0
	500	1.90	4.42	7.36	10.6	13.9	17.4	21.0	24.5	28.2	31.9	35.6	39.3
	600	1.63	3.95	6.74	9.83	13.1	16.5	20.0	23.5	27.1	30.7	34.4	38.1
	700	1.43	3.57	6.21	9.16	12.3	15.6	19.0	22.5	26.1	29.7	33.3	36.9
	800	1.27	3.25	5.74	8.56	11.6	14.8	18.2	21.6	25.1	28.6	32.2	35.8
	900	1.14	2.98	5.33	8.02	10.9	14.1	17.3	20.7	24.1	27.6	31.2	34.8

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 0°

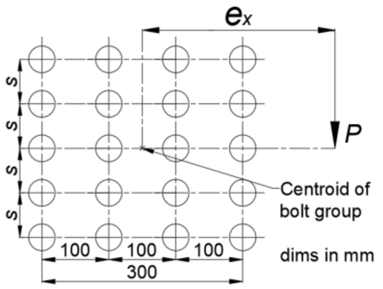
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.82	5.98	9.46	13.3	17.2	21.3	25.5	29.6	33.7	37.7	41.8	45.8
	75	2.50	5.31	8.43	12.0	15.7	19.7	23.8	28.0	32.1	36.3	40.4	44.6
	100	2.23	4.74	7.58	10.8	14.3	18.2	22.1	26.3	30.4	34.6	38.8	43.0
	125	2.01	4.27	6.86	9.82	13.1	16.7	20.5	24.5	28.6	32.8	37.0	41.2
	150	1.81	3.86	6.24	8.96	12.0	15.4	19.0	22.9	26.9	31.0	35.2	39.4
	175	1.64	3.52	5.70	8.22	11.0	14.2	17.6	21.3	25.2	29.2	33.3	37.5
	200	1.49	3.22	5.24	7.57	10.2	13.2	16.4	19.9	23.6	27.5	31.5	35.6
	225	1.36	2.96	4.83	7.01	9.48	12.3	15.3	18.6	22.1	25.9	29.8	33.8
	250	1.25	2.73	4.47	6.51	8.83	11.4	14.3	17.4	20.8	24.4	28.2	32.1
	300	1.07	2.37	3.89	5.68	7.74	10.1	12.6	15.5	18.5	21.8	25.3	28.9
	350	0.938	2.08	3.42	5.02	6.86	8.95	11.3	13.8	16.6	19.6	22.8	26.2
	400	0.835	1.86	3.05	4.49	6.15	8.04	10.2	12.5	15.0	17.8	20.7	23.9
	450	0.752	1.67	2.75	4.06	5.56	7.29	9.22	11.4	13.7	16.2	19.0	21.9
	500	0.684	1.52	2.50	3.70	5.07	6.65	8.43	10.4	12.6	14.9	17.5	20.2
	600	0.580	1.29	2.12	3.14	4.30	5.66	7.18	8.88	10.8	12.8	15.0	17.4
	700	0.503	1.12	1.84	2.72	3.73	4.92	6.24	7.73	9.37	11.2	13.1	15.2
	800	0.444	0.985	1.62	2.40	3.30	4.34	5.51	6.84	8.29	9.90	11.6	13.5
	900	0.397	0.880	1.45	2.15	2.95	3.89	4.94	6.12	7.43	8.88	10.4	12.1
	C', mm	375	820	1360	2000	2750	3620	4610	5720	6960	8330	9830	11500
150	50	2.82	6.54	10.6	14.8	18.9	22.9	26.9	30.9	34.9	38.9	42.8	46.8
	75	2.50	5.90	9.81	14.0	18.1	22.3	26.4	30.4	34.5	38.5	42.5	46.4
	100	2.23	5.33	9.01	13.1	17.3	21.5	25.7	29.8	33.9	37.9	42.0	46.0
	125	2.01	4.84	8.27	12.2	16.4	20.6	24.8	29.0	33.2	37.3	41.4	45.4
	150	1.81	4.42	7.60	11.4	15.5	19.7	23.9	28.2	32.4	36.5	40.7	44.8
	175	1.64	4.05	7.02	10.6	14.6	18.8	23.0	27.3	31.5	35.7	39.9	44.1
	200	1.49	3.73	6.51	9.93	13.7	17.8	22.0	26.3	30.6	34.8	39.1	43.3
	225	1.36	3.45	6.06	9.30	12.9	16.9	21.1	25.3	29.6	33.9	38.1	42.4
	250	1.25	3.20	5.66	8.72	12.2	16.1	20.2	24.4	28.6	32.9	37.2	41.5
	300	1.07	2.80	4.98	7.73	10.9	14.5	18.4	22.5	26.7	30.9	35.2	39.5
	350	0.938	2.47	4.43	6.92	9.81	13.2	16.8	20.7	24.8	29.0	33.2	37.5
	400	0.835	2.21	3.98	6.25	8.90	12.0	15.4	19.1	23.0	27.1	31.3	35.5
	450	0.752	2.00	3.60	5.68	8.13	11.0	14.2	17.7	21.4	25.3	29.4	33.6
	500	0.684	1.82	3.29	5.21	7.47	10.1	13.1	16.4	19.9	23.7	27.7	31.7
	600	0.580	1.55	2.79	4.45	6.40	8.72	11.3	14.3	17.5	20.9	24.5	28.3
	700	0.503	1.34	2.42	3.87	5.59	7.64	9.96	12.6	15.4	18.6	21.9	25.4
	800	0.444	1.18	2.14	3.43	4.95	6.79	8.87	11.2	13.8	16.7	19.7	23.0
	900	0.397	1.06	1.92	3.07	4.44	6.10	7.98	10.1	12.5	15.1	17.9	20.9
	C', mm	375	986	1790	2870	4180	5760	7590	9700	12100	14700	17600	20800

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 15°

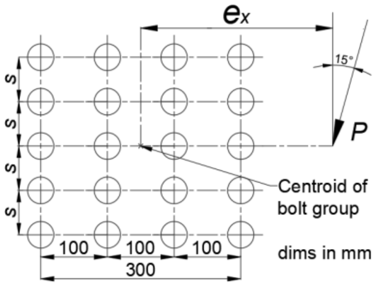
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	2.91	6.06	9.56	13.3	17.2	21.3	25.3	29.4	33.5	37.5	41.6	45.6
	75	2.57	5.40	8.57	12.0	15.8	19.7	23.7	27.8	31.9	36.0	40.1	44.2
	100	2.30	4.84	7.72	10.9	14.4	18.2	22.1	26.1	30.2	34.3	38.5	42.6
	125	2.06	4.37	6.99	9.93	13.2	16.7	20.5	24.4	28.4	32.5	36.7	40.8
	150	1.86	3.96	6.37	9.09	12.1	15.5	19.0	22.8	26.7	30.8	34.9	39.0
	175	1.69	3.61	5.83	8.36	11.2	14.3	17.7	21.3	25.1	29.0	33.0	37.1
	200	1.53	3.31	5.36	7.72	10.4	13.3	16.5	19.9	23.6	27.4	31.3	35.3
	225	1.40	3.04	4.95	7.15	9.64	12.4	15.4	18.7	22.2	25.8	29.6	33.6
	250	1.29	2.81	4.59	6.65	8.99	11.6	14.5	17.6	20.9	24.4	28.1	31.9
	300	1.11	2.44	3.99	5.82	7.90	10.2	12.8	15.6	18.7	21.9	25.3	28.9
	350	0.971	2.15	3.52	5.15	7.02	9.12	11.5	14.0	16.8	19.8	22.9	26.3
	400	0.864	1.92	3.15	4.61	6.30	8.21	10.3	12.7	15.2	18.0	20.9	24.0
	450	0.778	1.73	2.84	4.17	5.71	7.45	9.41	11.6	13.9	16.5	19.2	22.1
	500	0.708	1.57	2.59	3.80	5.21	6.81	8.61	10.6	12.8	15.1	17.7	20.4
	600	0.600	1.33	2.19	3.23	4.43	5.80	7.36	9.07	11.0	13.0	15.3	17.6
	700	0.521	1.15	1.90	2.80	3.85	5.05	6.41	7.91	9.58	11.4	13.4	15.5
	800	0.460	1.02	1.68	2.48	3.40	4.46	5.67	7.01	8.50	10.1	11.9	13.8
	900	0.411	0.910	1.50	2.22	3.04	4.00	5.08	6.29	7.63	9.09	10.7	12.4
150	50	2.91	6.57	10.6	14.7	18.8	22.8	26.8	30.8	34.8	38.7	42.7	46.7
	75	2.57	5.93	9.81	13.9	18.0	22.1	26.2	30.2	34.3	38.3	42.3	46.3
	100	2.30	5.37	9.04	13.0	17.2	21.3	25.5	29.6	33.6	37.7	41.7	45.7
	125	2.06	4.89	8.33	12.2	16.3	20.4	24.6	28.8	32.9	37.0	41.1	45.1
	150	1.86	4.48	7.70	11.4	15.4	19.5	23.7	27.9	32.1	36.2	40.3	44.4
	175	1.69	4.12	7.13	10.6	14.5	18.6	22.8	27.0	31.2	35.3	39.5	43.6
	200	1.53	3.80	6.62	9.94	13.7	17.7	21.8	26.0	30.2	34.4	38.6	42.8
	225	1.40	3.52	6.17	9.32	12.9	16.8	20.9	25.1	29.3	33.5	37.7	41.9
	250	1.29	3.27	5.77	8.76	12.2	16.0	20.0	24.1	28.3	32.5	36.7	41.0
	300	1.11	2.86	5.09	7.80	11.0	14.5	18.3	22.3	26.4	30.6	34.8	39.0
	350	0.971	2.54	4.53	7.00	9.92	13.2	16.8	20.6	24.6	28.7	32.8	37.0
	400	0.864	2.27	4.08	6.34	9.02	12.0	15.4	19.0	22.9	26.9	30.9	35.1
	450	0.778	2.06	3.70	5.78	8.25	11.1	14.2	17.7	21.3	25.2	29.1	33.2
	500	0.708	1.88	3.38	5.30	7.60	10.2	13.2	16.4	19.9	23.6	27.5	31.4
	600	0.600	1.59	2.88	4.54	6.54	8.84	11.5	14.4	17.5	20.9	24.5	28.2
	700	0.521	1.38	2.50	3.96	5.72	7.77	10.1	12.7	15.6	18.7	22.0	25.4
	800	0.460	1.22	2.21	3.51	5.08	6.92	9.03	11.4	14.0	16.8	19.8	23.1
	900	0.411	1.09	1.98	3.15	4.56	6.22	8.15	10.3	12.7	15.3	18.1	21.0

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 30°

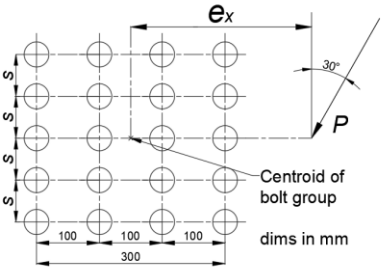
Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where
P = required force, P_u or P_a, kN
r_n = nominal strength per bolt, kN
e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm
s = bolt spacing, mm
C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	3.14	6.41	9.91	13.6	17.5	21.4	25.4	29.4	33.4	37.4	41.4	45.4
	75	2.79	5.75	8.95	12.4	16.1	19.9	23.9	27.9	31.9	35.9	40.0	44.0
	100	2.50	5.19	8.16	11.4	14.9	18.5	22.4	26.3	30.3	34.3	38.3	42.4
	125	2.25	4.71	7.45	10.5	13.7	17.2	20.9	24.7	28.6	32.6	36.7	40.7
	150	2.04	4.29	6.83	9.65	12.7	16.0	19.6	23.2	27.1	31.0	35.0	39.0
	175	1.85	3.93	6.28	8.92	11.8	15.0	18.3	21.9	25.6	29.4	33.3	37.3
	200	1.69	3.61	5.80	8.27	11.0	14.0	17.2	20.6	24.2	27.9	31.7	35.6
	225	1.55	3.33	5.38	7.70	10.3	13.1	16.2	19.4	22.9	26.5	30.2	34.0
	250	1.43	3.08	5.00	7.19	9.64	12.3	15.2	18.4	21.7	25.2	28.8	32.5
	300	1.23	2.68	4.37	6.32	8.52	11.0	13.6	16.5	19.6	22.8	26.2	29.7
	350	1.08	2.36	3.87	5.62	7.61	9.83	12.3	14.9	17.8	20.8	24.0	27.3
	400	0.963	2.11	3.47	5.05	6.86	8.89	11.1	13.6	16.2	19.0	22.0	25.2
	450	0.868	1.91	3.14	4.57	6.24	8.10	10.2	12.4	14.9	17.5	20.3	23.3
	500	0.789	1.74	2.86	4.18	5.71	7.43	9.35	11.5	13.8	16.2	18.8	21.6
	600	0.669	1.48	2.43	3.56	4.88	6.36	8.03	9.87	11.9	14.1	16.4	18.9
	700	0.580	1.28	2.11	3.10	4.25	5.55	7.02	8.65	10.4	12.4	14.5	16.7
	800	0.512	1.13	1.86	2.74	3.76	4.92	6.23	7.69	9.29	11.0	12.9	14.9
	900	0.459	1.01	1.67	2.45	3.37	4.41	5.60	6.91	8.36	9.95	11.7	13.5
150	50	3.14	6.74	10.7	14.7	18.7	22.7	26.7	30.7	34.7	38.6	42.6	46.5
	75	2.79	6.12	9.94	13.9	18.0	22.0	26.1	30.1	34.1	38.1	42.1	46.0
	100	2.50	5.58	9.23	13.1	17.2	21.2	25.3	29.4	33.4	37.4	41.5	45.5
	125	2.25	5.13	8.58	12.4	16.3	20.4	24.5	28.6	32.6	36.7	40.8	44.8
	150	2.04	4.73	8.00	11.6	15.5	19.5	23.6	27.7	31.8	35.9	40.0	44.1
	175	1.85	4.38	7.47	10.9	14.7	18.7	22.7	26.8	30.9	35.1	39.2	43.3
	200	1.69	4.06	6.98	10.3	14.0	17.9	21.9	25.9	30.1	34.2	38.3	42.4
	225	1.55	3.78	6.55	9.72	13.3	17.1	21.0	25.1	29.2	33.3	37.4	41.5
	250	1.43	3.53	6.15	9.18	12.6	16.3	20.2	24.2	28.3	32.4	36.5	40.6
	300	1.23	3.10	5.47	8.24	11.4	14.9	18.6	22.5	26.5	30.6	34.7	38.8
	350	1.08	2.76	4.90	7.46	10.4	13.7	17.2	21.0	24.8	28.8	32.9	37.0
	400	0.963	2.48	4.43	6.79	9.54	12.6	16.0	19.6	23.3	27.2	31.2	35.2
	450	0.868	2.25	4.04	6.22	8.79	11.7	14.9	18.3	21.9	25.7	29.5	33.5
	500	0.789	2.06	3.70	5.72	8.14	10.9	13.9	17.1	20.6	24.2	28.0	31.9
	600	0.669	1.76	3.17	4.93	7.06	9.48	12.2	15.1	18.3	21.7	25.2	28.9
	700	0.580	1.53	2.76	4.32	6.22	8.38	10.8	13.5	16.4	19.6	22.9	26.3
	800	0.512	1.35	2.45	3.84	5.54	7.50	9.73	12.2	14.9	17.8	20.9	24.1
	900	0.459	1.21	2.19	3.46	5.00	6.77	8.82	11.1	13.6	16.3	19.1	22.2

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 45°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

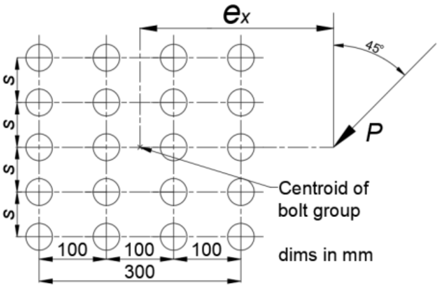
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	3.46	6.96	10.5	14.2	18.0	21.8	25.6	29.5	33.5	37.4	41.3	45.3
	75	3.15	6.38	9.73	13.2	16.8	20.6	24.4	28.2	32.1	36.1	40.0	44.0
	100	2.87	5.84	8.97	12.3	15.7	19.3	23.1	26.9	30.7	34.6	38.6	42.5
	125	2.61	5.36	8.30	11.4	14.7	18.2	21.8	25.5	29.3	33.2	37.1	41.0
	150	2.39	4.93	7.69	10.7	13.8	17.2	20.7	24.3	28.0	31.8	35.6	39.5
	175	2.19	4.55	7.15	9.98	13.0	16.2	19.6	23.1	26.7	30.4	34.2	38.1
	200	2.01	4.21	6.66	9.34	12.2	15.3	18.6	22.0	25.5	29.2	32.9	36.7
	225	1.86	3.90	6.21	8.76	11.5	14.5	17.7	21.0	24.4	27.9	31.6	35.3
	250	1.72	3.63	5.82	8.24	10.9	13.8	16.8	20.0	23.3	26.8	30.4	34.0
	300	1.49	3.18	5.14	7.33	9.76	12.4	15.2	18.2	21.4	24.7	28.1	31.6
	350	1.31	2.82	4.59	6.58	8.81	11.3	13.9	16.7	19.7	22.8	26.1	29.5
	400	1.17	2.53	4.14	5.95	8.00	10.3	12.7	15.4	18.2	21.2	24.3	27.5
	450	1.06	2.29	3.76	5.43	7.32	9.44	11.7	14.2	16.9	19.7	22.7	25.7
	500	0.964	2.10	3.44	4.98	6.74	8.71	10.9	13.2	15.7	18.4	21.2	24.2
	600	0.818	1.79	2.94	4.26	5.81	7.53	9.43	11.5	13.8	16.2	18.7	21.4
	700	0.710	1.56	2.56	3.73	5.09	6.61	8.31	10.2	12.2	14.4	16.7	19.2
	800	0.627	1.38	2.26	3.31	4.52	5.89	7.42	9.11	11.0	12.9	15.1	17.3
	900	0.561	1.23	2.03	2.97	4.06	5.30	6.69	8.23	9.91	11.7	13.7	15.8
150	50	3.46	7.09	10.9	14.8	18.7	22.7	26.6	30.6	34.5	38.5	42.4	46.4
	75	3.15	6.58	10.3	14.1	18.1	22.0	26.0	30.0	33.9	37.9	41.9	45.8
	100	2.87	6.09	9.65	13.4	17.3	21.3	25.3	29.3	33.2	37.2	41.2	45.2
	125	2.61	5.66	9.07	12.8	16.6	20.5	24.5	28.5	32.5	36.5	40.5	44.5
	150	2.39	5.26	8.54	12.1	15.9	19.8	23.8	27.7	31.7	35.8	39.8	43.8
	175	2.19	4.91	8.07	11.6	15.2	19.1	23.0	27.0	31.0	35.0	39.0	43.0
	200	2.01	4.59	7.63	11.0	14.6	18.4	22.3	26.2	30.2	34.2	38.2	42.2
	225	1.86	4.30	7.23	10.5	14.0	17.7	21.5	25.4	29.4	33.4	37.4	41.4
	250	1.72	4.04	6.85	10.0	13.4	17.1	20.8	24.7	28.6	32.6	36.6	40.6
	300	1.49	3.59	6.19	9.14	12.4	15.9	19.5	23.3	27.2	31.1	35.0	39.0
	350	1.31	3.22	5.62	8.38	11.4	14.8	18.3	22.0	25.8	29.6	33.5	37.5
	400	1.17	2.91	5.13	7.71	10.6	13.8	17.2	20.8	24.4	28.2	32.1	36.0
	450	1.06	2.66	4.71	7.12	9.87	12.9	16.2	19.6	23.2	26.9	30.7	34.5
	500	0.964	2.44	4.35	6.61	9.22	12.1	15.3	18.6	22.1	25.7	29.4	33.2
	600	0.818	2.10	3.76	5.76	8.11	10.8	13.6	16.7	20.0	23.4	27.0	30.6
	700	0.710	1.83	3.30	5.08	7.22	9.64	12.3	15.2	18.2	21.5	24.9	28.3
	800	0.627	1.63	2.94	4.54	6.50	8.71	11.2	13.8	16.7	19.8	23.0	26.3
	900	0.561	1.46	2.64	4.11	5.89	7.93	10.2	12.7	15.4	18.3	21.3	24.5

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 60°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

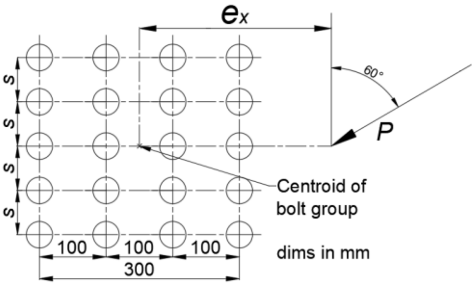
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	3.74	7.46	11.2	14.9	18.6	22.4	26.2	30.0	33.8	37.7	41.5	45.4
	75	3.57	7.12	10.7	14.3	17.9	21.6	25.3	29.0	32.8	36.6	40.5	44.3
	100	3.37	6.75	10.2	13.6	17.1	20.7	24.3	28.0	31.8	35.5	39.4	43.2
	125	3.17	6.36	9.61	12.9	16.3	19.8	23.4	27.0	30.7	34.4	38.2	42.0
	150	2.97	5.99	9.09	12.3	15.6	19.0	22.5	26.1	29.7	33.4	37.1	40.9
	175	2.78	5.63	8.59	11.7	14.9	18.2	21.6	25.1	28.7	32.3	36.0	39.8
	200	2.60	5.29	8.13	11.1	14.2	17.5	20.8	24.3	27.8	31.3	35.0	38.7
	225	2.44	4.98	7.69	10.6	13.6	16.8	20.1	23.4	26.9	30.4	34.0	37.7
	250	2.28	4.69	7.28	10.1	13.0	16.1	19.3	22.6	26.1	29.5	33.1	36.7
	300	2.02	4.18	6.56	9.16	11.9	14.9	18.0	21.2	24.4	27.8	31.3	34.8
	350	1.80	3.76	5.95	8.38	11.0	13.8	16.7	19.8	23.0	26.3	29.6	33.1
	400	1.62	3.40	5.43	7.70	10.2	12.8	15.6	18.6	21.6	24.8	28.1	31.4
	450	1.47	3.10	4.99	7.11	9.42	11.9	14.6	17.4	20.4	23.5	26.7	29.9
	500	1.34	2.85	4.61	6.59	8.76	11.1	13.7	16.4	19.3	22.2	25.3	28.5
	600	1.15	2.45	3.99	5.73	7.67	9.82	12.2	14.6	17.3	20.1	23.0	26.0
	700	0.997	2.15	3.51	5.06	6.80	8.76	10.9	13.2	15.6	18.2	20.9	23.8
	800	0.881	1.91	3.13	4.52	6.11	7.89	9.83	11.9	14.2	16.6	19.2	21.8
	900	0.790	1.72	2.81	4.08	5.53	7.16	8.95	10.9	13.0	15.3	17.7	20.2
150	50	3.74	7.47	11.2	15.0	18.9	22.7	26.6	30.5	34.5	38.4	42.3	46.2
	75	3.57	7.16	10.8	14.6	18.4	22.2	26.1	30.0	33.9	37.8	41.7	45.7
	100	3.37	6.82	10.4	14.1	17.8	21.6	25.5	29.4	33.3	37.2	41.1	45.1
	125	3.17	6.47	9.94	13.5	17.3	21.1	24.9	28.8	32.7	36.6	40.5	44.4
	150	2.97	6.14	9.52	13.1	16.7	20.5	24.3	28.2	32.1	36.0	39.9	43.8
	175	2.78	5.82	9.11	12.6	16.2	19.9	23.7	27.6	31.4	35.3	39.2	43.2
	200	2.60	5.52	8.73	12.1	15.7	19.4	23.2	27.0	30.8	34.7	38.6	42.5
	225	2.44	5.24	8.37	11.7	15.2	18.9	22.6	26.4	30.2	34.1	38.0	41.9
	250	2.28	4.98	8.03	11.3	14.8	18.4	22.1	25.8	29.6	33.5	37.4	41.3
	300	2.02	4.51	7.41	10.6	13.9	17.5	21.1	24.8	28.5	32.3	36.2	40.0
	350	1.80	4.10	6.86	9.91	13.2	16.6	20.1	23.8	27.5	31.2	35.0	38.9
	400	1.62	3.76	6.37	9.29	12.4	15.8	19.2	22.8	26.5	30.2	33.9	37.7
	450	1.47	3.46	5.94	8.74	11.8	15.0	18.4	21.9	25.5	29.2	32.9	36.6
	500	1.34	3.21	5.56	8.23	11.2	14.3	17.6	21.0	24.6	28.2	31.9	35.6
	600	1.15	2.79	4.91	7.34	10.1	13.0	16.2	19.5	22.9	26.4	30.0	33.6
	700	0.997	2.47	4.38	6.61	9.13	11.9	14.9	18.1	21.3	24.7	28.2	31.8
	800	0.881	2.21	3.95	5.99	8.33	11.0	13.8	16.8	20.0	23.2	26.6	30.1
	900	0.790	2.00	3.58	5.46	7.65	10.1	12.8	15.7	18.7	21.9	25.1	28.5

Table G.6 Continued.

C Coefficients for Eccentrically Loaded Bolt Groups
Angle = 75°

Available strength of a bolt group, ϕR_n or R_n/Ω is determined with

$$R_n = Cr_n$$

or

LRFD	ASD
$C_{min} = \dfrac{P_u}{\phi r_n}$	$C_{min} = \dfrac{\Omega P_a}{r_n}$

where

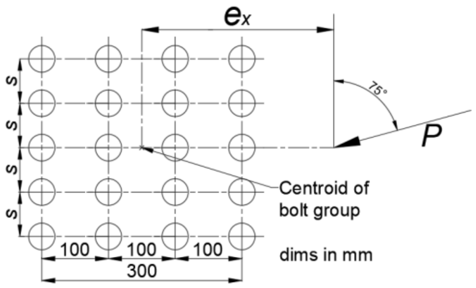
P = required force, P_u or P_a, kN

r_n = nominal strength per bolt, kN

e_x = horizantal distance from the centroid of the bolt group to the line of action of P, mm

s = bolt spacing, mm

C = coefficient tabulated below



s, mm	e_x, mm	Number of Bolts in One Vertical Row, n											
		1	2	3	4	5	6	7	8	9	10	11	12
75	50	3.89	7.75	11.6	15.4	19.3	23.1	26.9	30.7	34.5	38.4	42.2	46.0
	75	3.84	7.66	11.4	15.2	19.0	22.7	26.5	30.2	34.0	37.8	41.6	45.4
	100	3.79	7.54	11.3	15.0	18.6	22.3	26.0	29.7	33.5	37.2	41.0	44.8
	125	3.72	7.40	11.0	14.7	18.3	21.9	25.6	29.2	32.9	36.6	40.4	44.1
	150	3.64	7.25	10.8	14.4	17.9	21.5	25.1	28.7	32.4	36.0	39.7	43.4
	175	3.56	7.08	10.6	14.0	17.5	21.1	24.6	28.2	31.8	35.4	39.1	42.8
	200	3.47	6.90	10.3	13.7	17.2	20.6	24.1	27.7	31.2	34.9	38.5	42.2
	225	3.37	6.71	10.0	13.4	16.8	20.2	23.6	27.2	30.7	34.3	37.9	41.5
	250	3.27	6.52	9.77	13.0	16.4	19.7	23.2	26.6	30.2	33.7	37.3	40.9
	300	3.07	6.13	9.23	12.4	15.6	18.9	22.3	25.7	29.1	32.6	36.2	39.8
	350	2.87	5.76	8.71	11.7	14.9	18.1	21.4	24.7	28.1	31.6	35.1	38.6
	400	2.68	5.40	8.22	11.1	14.2	17.3	20.5	23.8	27.2	30.6	34.1	37.6
	450	2.50	5.07	7.76	10.6	13.5	16.6	19.7	23.0	26.3	29.7	33.1	36.6
	500	2.34	4.76	7.33	10.0	12.9	15.9	19.0	22.2	25.4	28.8	32.2	35.6
	600	2.06	4.23	6.57	9.10	11.8	14.6	17.6	20.7	23.8	27.1	30.4	33.7
	700	1.82	3.78	5.94	8.30	10.8	13.5	16.4	19.3	22.4	25.5	28.7	32.0
	800	1.63	3.41	5.41	7.61	10.0	12.6	15.3	18.1	21.0	24.1	27.2	30.4
	900	1.48	3.11	4.95	7.01	9.26	11.7	14.3	17.0	19.8	22.8	25.8	28.9
150	50	3.89	7.73	11.6	15.4	19.2	23.1	26.9	30.8	34.7	38.5	42.4	46.3
	75	3.84	7.64	11.4	15.2	18.9	22.7	26.6	30.4	34.3	38.1	42.0	45.9
	100	3.79	7.51	11.2	14.9	18.7	22.4	26.2	30.0	33.9	37.7	41.6	45.5
	125	3.72	7.38	11.0	14.7	18.4	22.1	25.9	29.7	33.5	37.3	41.2	45.1
	150	3.64	7.23	10.8	14.4	18.1	21.8	25.5	29.3	33.1	36.9	40.8	44.6
	175	3.56	7.06	10.6	14.1	17.8	21.5	25.2	28.9	32.7	36.6	40.4	44.2
	200	3.47	6.90	10.4	13.9	17.5	21.1	24.8	28.6	32.4	36.2	40.0	43.8
	225	3.37	6.73	10.1	13.6	17.2	20.8	24.5	28.2	32.0	35.8	39.6	43.4
	250	3.27	6.55	9.92	13.4	16.9	20.5	24.2	27.9	31.7	35.4	39.2	43.0
	300	3.07	6.21	9.48	12.9	16.4	19.9	23.6	27.2	31.0	34.7	38.5	42.3
	350	2.87	5.88	9.06	12.4	15.8	19.4	23.0	26.6	30.3	34.0	37.8	41.6
	400	2.68	5.56	8.67	11.9	15.3	18.8	22.4	26.0	29.7	33.4	37.1	40.9
	450	2.50	5.27	8.29	11.5	14.9	18.3	21.9	25.4	29.1	32.8	36.5	40.2
	500	2.34	4.99	7.93	11.1	14.4	17.8	21.3	24.9	28.5	32.1	35.8	39.5
	600	2.06	4.50	7.29	10.3	13.6	16.9	20.4	23.9	27.4	31.0	34.6	38.3
	700	1.82	4.08	6.73	9.67	12.8	16.1	19.4	22.9	26.4	30.0	33.6	37.2
	800	1.63	3.73	6.25	9.06	12.1	15.3	18.6	22.0	25.4	28.9	32.5	36.1
	900	1.48	3.43	5.82	8.51	11.4	14.5	17.7	21.1	24.5	28.0	31.5	35.1

APPENDIX H

DESIGN TABLES FOR WELDS

Table H.1 C coefficients for concentrically loaded weld group elements.

C Coefficients for Concentrically Loaded Weld Group Elements							
Load angle on weld element, degrees	**Largest load angle on any weld group element, degrees**						
	90	**75**	**60**	**45**	**30**	**15**	**0**
0	0.829	0.851	0.877	0.910	0.950	0.994	1.00
15	1.02	1.04	1.05	1.07	1.06	0.881	
30	1.16	1.17	1.18	1.17	1.10		
45	1.29	1.30	1.29	1.26			
60	1.40	1.40	1.38				
75	1.48	1.47					
90	1.50						

Table H.2 Electrode strength coefficient, C_1.

Electrode Strength Coefficient, C_1		
Electrode	**F_{EXX} (MPa)**	**C_1**
E43	430	0.880
E49	490	1.00
E55	550	1.01
E57	570	1.05
Note: An additional reduction factor of 0.90 is used for E55 and E57 electrodes.		

Table H.3 C coefficients for eccentrically loaded weld groups.

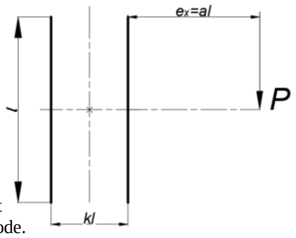
C Coefficients for Eccentrically Loaded Weld Groups Angle = 0°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

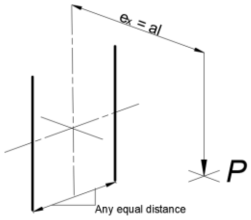
LRFD			ASD		
$C_{min}=\frac{P_u}{\phi C_1 t_e l}$	$t_{min}=\frac{P_u}{\phi C C_1 l}$	$l_{min}=\frac{P_u}{\phi C C_1 t_e}$	$C_{min}=\frac{\Omega P_a}{C_1 t_e l}$	$t_{min}=\frac{\Omega P_a}{C C_1 l}$	$l_{min}=\frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Special case (load not in plane of weld group). Use C-values for $k = 0$.



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588	0.588
0.10	0.588	0.589	0.588	0.587	0.585	0.583	0.580	0.577	0.574	0.571	0.567	0.561	0.554	0.548	0.542	0.536
0.15	0.581	0.580	0.578	0.576	0.573	0.570	0.566	0.563	0.559	0.556	0.553	0.546	0.540	0.534	0.529	0.524
0.20	0.558	0.557	0.555	0.553	0.550	0.547	0.544	0.542	0.539	0.536	0.534	0.529	0.524	0.519	0.515	0.510
0.25	0.526	0.526	0.525	0.523	0.522	0.520	0.519	0.517	0.516	0.514	0.513	0.510	0.506	0.503	0.500	0.496
0.30	0.492	0.492	0.492	0.492	0.492	0.492	0.492	0.492	0.492	0.491	0.491	0.490	0.489	0.487	0.485	0.483
0.40	0.424	0.424	0.426	0.429	0.433	0.436	0.439	0.442	0.445	0.447	0.449	0.452	0.454	0.455	0.455	0.455
0.50	0.365	0.366	0.369	0.374	0.381	0.387	0.393	0.398	0.403	0.407	0.411	0.417	0.422	0.425	0.428	0.430
0.60	0.318	0.319	0.323	0.329	0.337	0.346	0.353	0.360	0.367	0.372	0.377	0.386	0.393	0.398	0.403	0.406
0.70	0.280	0.281	0.285	0.293	0.302	0.311	0.320	0.328	0.335	0.342	0.348	0.359	0.367	0.374	0.380	0.384
0.80	0.249	0.250	0.255	0.263	0.272	0.282	0.292	0.300	0.308	0.316	0.322	0.334	0.344	0.352	0.359	0.364
0.90	0.224	0.225	0.230	0.238	0.248	0.258	0.267	0.276	0.285	0.293	0.300	0.313	0.323	0.332	0.340	0.346
1.0	0.203	0.204	0.209	0.217	0.227	0.237	0.247	0.256	0.265	0.273	0.280	0.293	0.305	0.314	0.322	0.329
1.2	0.171	0.172	0.177	0.185	0.194	0.204	0.214	0.223	0.231	0.239	0.247	0.261	0.273	0.283	0.292	0.300
1.4	0.148	0.149	0.154	0.161	0.169	0.179	0.188	0.197	0.205	0.213	0.221	0.235	0.247	0.258	0.267	0.276
1.6	0.130	0.131	0.135	0.142	0.150	0.159	0.168	0.176	0.184	0.192	0.199	0.213	0.225	0.236	0.246	0.254
1.8	0.116	0.117	0.121	0.127	0.135	0.143	0.151	0.159	0.167	0.175	0.182	0.195	0.207	0.218	0.228	0.236
2.0	0.104	0.105	0.109	0.115	0.122	0.130	0.137	0.145	0.153	0.160	0.167	0.180	0.192	0.202	0.212	0.220
2.2	0.0948	0.0960	0.0997	0.105	0.112	0.119	0.126	0.133	0.140	0.147	0.154	0.167	0.178	0.189	0.198	0.207
2.4	0.0870	0.0881	0.0916	0.0966	0.103	0.109	0.116	0.123	0.130	0.137	0.143	0.155	0.166	0.177	0.186	0.194
2.6	0.0804	0.0814	0.0847	0.0894	0.0951	0.101	0.108	0.114	0.121	0.127	0.134	0.145	0.156	0.166	0.175	0.183
2.8	0.0747	0.0757	0.0788	0.0832	0.0885	0.0944	0.101	0.107	0.113	0.119	0.125	0.136	0.147	0.157	0.165	0.174
3.0	0.0697	0.0707	0.0736	0.0777	0.0828	0.0884	0.0943	0.100	0.106	0.112	0.118	0.129	0.139	0.148	0.157	0.165

Table H.3 Continued.

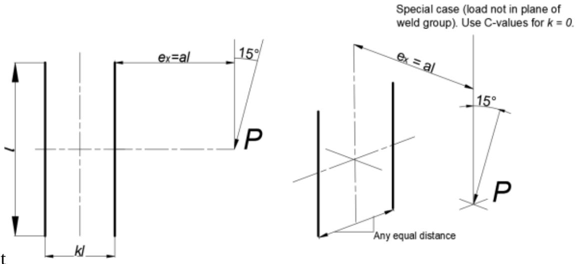
C Coefficients for Eccentrically Loaded Weld Groups Angle = 15°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)


Special case (load not in plane of weld group). Use C-values for $k = 0$.

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627
0.10	0.601	0.600	0.599	0.598	0.597	0.595	0.594	0.592	0.590	0.589	0.587	0.583	0.580	0.578	0.575	0.572
0.15	0.584	0.584	0.583	0.581	0.579	0.577	0.576	0.574	0.572	0.571	0.570	0.567	0.564	0.561	0.559	0.557
0.20	0.558	0.557	0.556	0.555	0.554	0.553	0.553	0.552	0.551	0.550	0.549	0.548	0.546	0.545	0.544	0.542
0.25	0.526	0.526	0.526	0.526	0.526	0.526	0.526	0.526	0.527	0.527	0.528	0.528	0.528	0.528	0.527	0.527
0.30	0.492	0.492	0.493	0.495	0.496	0.498	0.500	0.501	0.503	0.504	0.505	0.508	0.510	0.511	0.512	0.512
0.40	0.426	0.426	0.428	0.432	0.437	0.443	0.447	0.452	0.456	0.460	0.463	0.469	0.473	0.477	0.480	0.483
0.50	0.369	0.370	0.373	0.379	0.386	0.393	0.401	0.407	0.414	0.419	0.424	0.433	0.440	0.446	0.451	0.455
0.60	0.322	0.323	0.327	0.334	0.343	0.352	0.361	0.369	0.376	0.383	0.390	0.401	0.410	0.418	0.424	0.430
0.70	0.285	0.286	0.290	0.298	0.307	0.317	0.327	0.336	0.345	0.352	0.360	0.372	0.383	0.392	0.400	0.407
0.80	0.254	0.255	0.260	0.268	0.278	0.288	0.298	0.308	0.317	0.326	0.333	0.347	0.359	0.369	0.378	0.385
0.90	0.229	0.230	0.235	0.243	0.253	0.264	0.274	0.284	0.293	0.302	0.310	0.325	0.337	0.348	0.358	0.366
1.0	0.208	0.209	0.214	0.222	0.232	0.243	0.253	0.263	0.273	0.282	0.290	0.305	0.318	0.329	0.340	0.348
1.2	0.175	0.177	0.182	0.190	0.199	0.209	0.220	0.229	0.239	0.248	0.256	0.271	0.285	0.297	0.308	0.317
1.4	0.152	0.153	0.158	0.165	0.174	0.184	0.193	0.203	0.212	0.221	0.229	0.244	0.258	0.270	0.281	0.291
1.6	0.133	0.135	0.139	0.146	0.154	0.163	0.173	0.182	0.190	0.199	0.207	0.222	0.235	0.247	0.258	0.268
1.8	0.119	0.120	0.125	0.131	0.139	0.147	0.156	0.164	0.173	0.181	0.188	0.203	0.216	0.228	0.239	0.249
2.0	0.107	0.109	0.113	0.119	0.126	0.133	0.142	0.150	0.158	0.165	0.173	0.187	0.200	0.211	0.222	0.232
2.2	0.0978	0.0989	0.103	0.108	0.115	0.122	0.130	0.138	0.145	0.152	0.160	0.173	0.186	0.197	0.208	0.217
2.4	0.0898	0.0909	0.0944	0.0996	0.106	0.113	0.120	0.127	0.134	0.141	0.148	0.161	0.173	0.184	0.195	0.204
2.6	0.0829	0.0840	0.0874	0.0922	0.0980	0.105	0.111	0.118	0.125	0.132	0.138	0.151	0.163	0.173	0.183	0.193
2.8	0.0771	0.0781	0.0813	0.0858	0.0913	0.0974	0.104	0.110	0.117	0.123	0.130	0.142	0.153	0.163	0.173	0.182
3.0	0.0720	0.0730	0.0760	0.0802	0.0854	0.0912	0.0973	0.104	0.110	0.116	0.122	0.134	0.144	0.155	0.164	0.173

Table H.3 Continued.

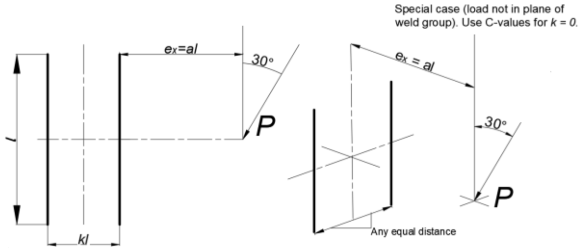
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 30°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692
0.10	0.641	0.641	0.641	0.641	0.643	0.644	0.645	0.645	0.646	0.646	0.646	0.646	0.646	0.645	0.644	0.642
0.15	0.609	0.608	0.608	0.608	0.609	0.609	0.609	0.610	0.611	0.612	0.614	0.616	0.618	0.620	0.620	0.620
0.20	0.577	0.578	0.578	0.579	0.579	0.580	0.582	0.583	0.584	0.586	0.587	0.589	0.592	0.594	0.597	0.599
0.25	0.545	0.545	0.546	0.547	0.549	0.552	0.555	0.557	0.558	0.561	0.563	0.566	0.570	0.573	0.575	0.578
0.30	0.511	0.510	0.512	0.515	0.519	0.523	0.527	0.531	0.534	0.537	0.540	0.546	0.550	0.554	0.557	0.560
0.40	0.447	0.447	0.450	0.455	0.461	0.467	0.475	0.481	0.487	0.492	0.497	0.506	0.513	0.519	0.524	0.528
0.50	0.391	0.392	0.395	0.402	0.410	0.419	0.428	0.436	0.444	0.451	0.457	0.469	0.478	0.487	0.493	0.499
0.60	0.345	0.346	0.350	0.357	0.366	0.377	0.387	0.397	0.406	0.414	0.422	0.436	0.447	0.457	0.466	0.473
0.70	0.307	0.308	0.313	0.320	0.330	0.341	0.352	0.363	0.374	0.383	0.391	0.406	0.419	0.430	0.440	0.448
0.80	0.275	0.276	0.281	0.290	0.300	0.311	0.323	0.334	0.345	0.355	0.364	0.380	0.394	0.406	0.416	0.426
0.90	0.249	0.250	0.255	0.264	0.275	0.286	0.298	0.309	0.320	0.330	0.339	0.356	0.371	0.384	0.395	0.405
1.0	0.227	0.228	0.233	0.242	0.253	0.265	0.276	0.288	0.298	0.308	0.318	0.335	0.350	0.364	0.376	0.386
1.2	0.193	0.194	0.199	0.208	0.218	0.229	0.240	0.252	0.262	0.272	0.282	0.299	0.315	0.329	0.341	0.352
1.4	0.167	0.168	0.174	0.182	0.191	0.202	0.212	0.223	0.233	0.243	0.252	0.270	0.285	0.300	0.312	0.324
1.6	0.147	0.149	0.154	0.161	0.170	0.180	0.190	0.200	0.210	0.219	0.229	0.245	0.261	0.275	0.288	0.299
1.8	0.131	0.133	0.138	0.145	0.153	0.162	0.172	0.181	0.191	0.200	0.208	0.225	0.240	0.254	0.267	0.278
2.0	0.119	0.120	0.125	0.131	0.139	0.148	0.157	0.166	0.174	0.183	0.192	0.208	0.222	0.236	0.248	0.260
2.2	0.108	0.110	0.114	0.120	0.127	0.135	0.144	0.152	0.161	0.169	0.177	0.192	0.207	0.220	0.232	0.243
2.4	0.0995	0.101	0.105	0.110	0.117	0.125	0.133	0.141	0.149	0.157	0.165	0.179	0.193	0.206	0.218	0.229
2.6	0.0920	0.0932	0.0968	0.102	0.109	0.116	0.124	0.131	0.139	0.146	0.154	0.168	0.181	0.194	0.205	0.216
2.8	0.0855	0.0867	0.0901	0.0951	0.101	0.108	0.115	0.123	0.130	0.137	0.144	0.158	0.171	0.183	0.194	0.204
3.0	0.0799	0.0810	0.0842	0.0890	0.0947	0.101	0.108	0.115	0.122	0.129	0.136	0.149	0.161	0.173	0.184	0.194

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 45°

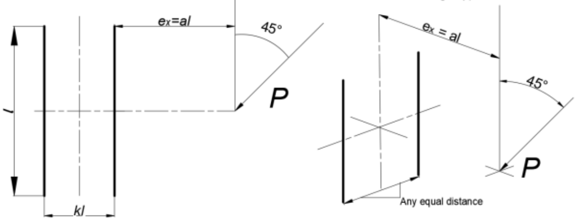
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min}=\frac{P_u}{\phi C_1 t_e l}$	$t_{min}=\frac{P_u}{\phi C C_1 l}$	$l_{min}=\frac{P_u}{\phi C C_1 t_e}$	$C_{min}=\frac{\Omega P_a}{C_1 t_e l}$	$t_{min}=\frac{\Omega P_a}{C C_1 l}$	$l_{min}=\frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)

Special case (load not in plane of weld group). Use C-values for $k = 0$.



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763
0.10	0.711	0.712	0.713	0.715	0.718	0.721	0.724	0.727	0.729	0.732	0.734	0.737	0.739	0.741	0.742	0.743
0.15	0.663	0.663	0.666	0.671	0.676	0.682	0.687	0.692	0.697	0.702	0.706	0.713	0.719	0.724	0.727	0.730
0.20	0.622	0.623	0.624	0.629	0.633	0.640	0.647	0.655	0.662	0.668	0.674	0.685	0.694	0.701	0.707	0.713
0.25	0.587	0.588	0.590	0.594	0.599	0.605	0.612	0.619	0.626	0.635	0.642	0.655	0.667	0.676	0.685	0.692
0.30	0.554	0.554	0.557	0.562	0.568	0.575	0.582	0.590	0.597	0.604	0.612	0.627	0.640	0.651	0.661	0.670
0.40	0.492	0.492	0.496	0.502	0.510	0.519	0.529	0.538	0.547	0.555	0.563	0.577	0.591	0.604	0.616	0.626
0.50	0.437	0.438	0.443	0.450	0.459	0.471	0.482	0.493	0.503	0.513	0.522	0.537	0.551	0.564	0.576	0.588
0.60	0.391	0.392	0.397	0.406	0.416	0.428	0.441	0.453	0.464	0.475	0.485	0.503	0.518	0.531	0.543	0.554
0.70	0.352	0.353	0.359	0.367	0.379	0.392	0.405	0.417	0.430	0.442	0.452	0.471	0.488	0.502	0.515	0.526
0.80	0.319	0.320	0.326	0.335	0.347	0.360	0.374	0.387	0.400	0.412	0.423	0.443	0.460	0.476	0.489	0.501
0.90	0.291	0.292	0.298	0.308	0.320	0.333	0.347	0.360	0.373	0.385	0.397	0.417	0.436	0.452	0.466	0.478
1.0	0.267	0.268	0.274	0.284	0.296	0.310	0.323	0.337	0.350	0.362	0.373	0.395	0.413	0.430	0.444	0.457
1.2	0.229	0.230	0.236	0.246	0.258	0.271	0.284	0.297	0.310	0.322	0.334	0.355	0.374	0.391	0.406	0.420
1.4	0.199	0.201	0.207	0.216	0.228	0.240	0.252	0.265	0.278	0.289	0.301	0.322	0.341	0.358	0.374	0.388
1.6	0.176	0.178	0.184	0.193	0.203	0.215	0.227	0.239	0.251	0.262	0.273	0.294	0.313	0.330	0.346	0.360
1.8	0.158	0.160	0.165	0.173	0.183	0.195	0.206	0.217	0.229	0.240	0.250	0.270	0.289	0.306	0.321	0.335
2.0	0.143	0.145	0.150	0.158	0.167	0.177	0.188	0.199	0.210	0.220	0.231	0.250	0.268	0.285	0.300	0.314
2.2	0.131	0.132	0.137	0.145	0.153	0.163	0.173	0.184	0.194	0.204	0.214	0.232	0.250	0.266	0.281	0.295
2.4	0.121	0.122	0.127	0.133	0.142	0.151	0.160	0.170	0.180	0.190	0.199	0.217	0.234	0.249	0.264	0.278
2.6	0.112	0.113	0.117	0.124	0.131	0.140	0.149	0.159	0.168	0.177	0.186	0.203	0.220	0.235	0.249	0.263
2.8	0.104	0.105	0.109	0.115	0.123	0.131	0.139	0.148	0.157	0.166	0.175	0.191	0.207	0.222	0.236	0.249
3.0	0.0972	0.0985	0.102	0.108	0.115	0.123	0.131	0.139	0.148	0.156	0.165	0.181	0.196	0.210	0.224	0.236

Table H.3 Continued.

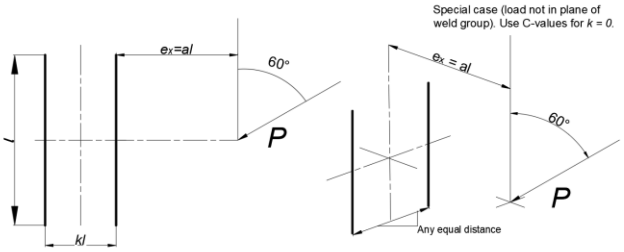
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 60°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825
0.10	0.771	0.772	0.776	0.783	0.790	0.797	0.803	0.807	0.810	0.812	0.814	0.815	0.816	0.816	0.816	0.816
0.15	0.731	0.733	0.738	0.746	0.756	0.767	0.778	0.786	0.793	0.799	0.803	0.808	0.811	0.812	0.813	0.814
0.20	0.691	0.693	0.699	0.708	0.720	0.733	0.747	0.760	0.771	0.780	0.787	0.796	0.802	0.806	0.808	0.810
0.25	0.656	0.657	0.662	0.670	0.684	0.698	0.714	0.730	0.744	0.757	0.767	0.782	0.791	0.798	0.802	0.805
0.30	0.624	0.625	0.631	0.639	0.650	0.665	0.682	0.699	0.716	0.731	0.744	0.764	0.778	0.787	0.794	0.798
0.40	0.568	0.569	0.575	0.584	0.596	0.609	0.624	0.640	0.659	0.677	0.695	0.724	0.745	0.761	0.772	0.781
0.50	0.518	0.519	0.526	0.535	0.548	0.562	0.578	0.593	0.608	0.626	0.645	0.680	0.708	0.730	0.746	0.758
0.60	0.474	0.476	0.482	0.493	0.506	0.521	0.537	0.554	0.568	0.585	0.599	0.636	0.668	0.695	0.716	0.733
0.70	0.435	0.437	0.444	0.455	0.469	0.485	0.501	0.518	0.534	0.549	0.565	0.595	0.629	0.658	0.683	0.704
0.80	0.401	0.403	0.410	0.422	0.436	0.453	0.469	0.486	0.503	0.519	0.534	0.562	0.592	0.623	0.650	0.674
0.90	0.371	0.373	0.380	0.392	0.407	0.424	0.441	0.458	0.475	0.490	0.506	0.534	0.560	0.589	0.618	0.643
1.0	0.344	0.346	0.354	0.366	0.381	0.398	0.415	0.432	0.448	0.465	0.480	0.508	0.534	0.560	0.587	0.613
1.2	0.301	0.303	0.310	0.322	0.337	0.353	0.370	0.387	0.404	0.420	0.435	0.463	0.489	0.513	0.535	0.560
1.4	0.266	0.268	0.276	0.287	0.301	0.317	0.334	0.350	0.366	0.382	0.397	0.425	0.450	0.474	0.495	0.516
1.6	0.238	0.240	0.247	0.259	0.272	0.287	0.303	0.319	0.334	0.350	0.364	0.392	0.417	0.440	0.461	0.481
1.8	0.215	0.217	0.224	0.235	0.248	0.262	0.277	0.292	0.307	0.322	0.336	0.363	0.388	0.411	0.432	0.451
2.0	0.196	0.198	0.205	0.215	0.227	0.241	0.255	0.269	0.284	0.298	0.312	0.338	0.362	0.385	0.405	0.425
2.2	0.180	0.182	0.188	0.198	0.209	0.222	0.236	0.250	0.264	0.277	0.290	0.316	0.339	0.361	0.382	0.401
2.4	0.166	0.168	0.174	0.183	0.194	0.206	0.219	0.233	0.246	0.259	0.272	0.296	0.319	0.341	0.361	0.379
2.6	0.154	0.156	0.162	0.170	0.181	0.192	0.205	0.217	0.230	0.242	0.255	0.278	0.301	0.322	0.342	0.360
2.8	0.144	0.146	0.151	0.159	0.169	0.180	0.192	0.204	0.216	0.228	0.240	0.263	0.285	0.305	0.324	0.342
3.0	0.135	0.137	0.142	0.149	0.159	0.169	0.181	0.192	0.204	0.215	0.227	0.249	0.270	0.290	0.308	0.326

Table H.3 Continued.

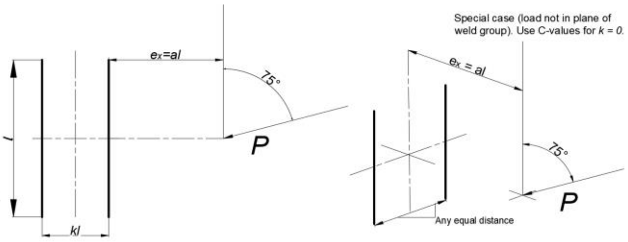
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 75°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min}=\frac{P_u}{\phi C_1 t_e l}$	$t_{min}=\frac{P_u}{\phi C C_1 l}$	$l_{min}=\frac{P_u}{\phi C C_1 t_e}$	$C_{min}=\frac{\Omega P_a}{C_1 t_e l}$	$t_{min}=\frac{\Omega P_a}{C C_1 l}$	$l_{min}=\frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867
0.10	0.820	0.823	0.833	0.844	0.852	0.858	0.861	0.863	0.864	0.864	0.864	0.864	0.864	0.864	0.864	0.864
0.15	0.794	0.797	0.809	0.823	0.837	0.846	0.853	0.857	0.860	0.862	0.862	0.863	0.864	0.864	0.864	0.864
0.20	0.769	0.773	0.785	0.802	0.819	0.832	0.842	0.849	0.854	0.857	0.859	0.861	0.862	0.863	0.863	0.863
0.25	0.747	0.749	0.761	0.780	0.799	0.816	0.830	0.839	0.846	0.851	0.855	0.859	0.861	0.862	0.862	0.863
0.30	0.725	0.728	0.738	0.758	0.780	0.800	0.816	0.828	0.837	0.844	0.849	0.855	0.858	0.860	0.861	0.862
0.40	0.685	0.688	0.697	0.715	0.740	0.765	0.786	0.803	0.816	0.827	0.834	0.845	0.851	0.855	0.857	0.859
0.50	0.650	0.652	0.661	0.677	0.703	0.730	0.755	0.776	0.793	0.806	0.817	0.833	0.842	0.848	0.852	0.855
0.60	0.616	0.619	0.629	0.645	0.668	0.695	0.723	0.747	0.768	0.785	0.798	0.818	0.831	0.840	0.846	0.850
0.70	0.586	0.588	0.598	0.615	0.636	0.663	0.692	0.718	0.742	0.762	0.778	0.802	0.819	0.830	0.838	0.844
0.80	0.557	0.559	0.570	0.587	0.608	0.633	0.662	0.690	0.716	0.738	0.757	0.786	0.805	0.819	0.829	0.836
0.90	0.530	0.533	0.543	0.560	0.581	0.605	0.634	0.662	0.690	0.714	0.735	0.768	0.791	0.808	0.820	0.829
1.0	0.505	0.508	0.519	0.536	0.556	0.580	0.607	0.636	0.664	0.690	0.713	0.749	0.776	0.795	0.809	0.820
1.2	0.460	0.463	0.474	0.491	0.511	0.534	0.559	0.587	0.616	0.643	0.668	0.711	0.744	0.769	0.787	0.801
1.4	0.421	0.424	0.436	0.452	0.472	0.494	0.518	0.544	0.572	0.600	0.626	0.673	0.710	0.740	0.762	0.780
1.6	0.388	0.391	0.402	0.418	0.437	0.459	0.482	0.507	0.532	0.560	0.587	0.635	0.677	0.710	0.736	0.757
1.8	0.358	0.361	0.372	0.388	0.407	0.428	0.450	0.473	0.498	0.524	0.551	0.600	0.643	0.680	0.710	0.734
2.0	0.333	0.336	0.346	0.361	0.380	0.400	0.422	0.444	0.468	0.492	0.517	0.567	0.611	0.650	0.682	0.709
2.2	0.310	0.313	0.323	0.338	0.355	0.375	0.396	0.418	0.440	0.463	0.487	0.536	0.580	0.620	0.655	0.684
2.4	0.290	0.293	0.302	0.317	0.334	0.353	0.373	0.395	0.416	0.438	0.460	0.508	0.552	0.592	0.628	0.659
2.6	0.272	0.275	0.285	0.298	0.315	0.333	0.353	0.373	0.394	0.415	0.437	0.481	0.525	0.565	0.602	0.635
2.8	0.256	0.259	0.268	0.281	0.297	0.315	0.334	0.354	0.374	0.394	0.415	0.457	0.500	0.540	0.577	0.610
3.0	0.242	0.245	0.254	0.266	0.281	0.299	0.317	0.336	0.356	0.375	0.395	0.435	0.477	0.516	0.553	0.587

Table H.3 Continued

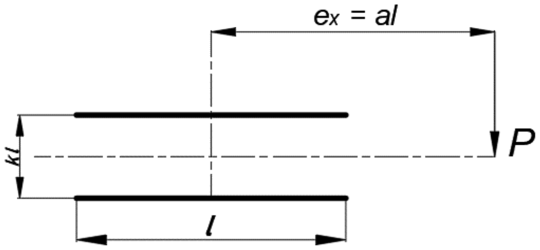
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 0°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min}= \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min}= \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	***k***															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882	0.882
0.10	0.685	0.693	0.711	0.737	0.764	0.789	0.810	0.826	0.839	0.848	0.855	0.864	0.869	0.872	0.874	0.875
0.15	0.619	0.626	0.641	0.666	0.697	0.726	0.753	0.777	0.796	0.812	0.824	0.841	0.852	0.859	0.864	0.867
0.20	0.561	0.567	0.582	0.604	0.634	0.666	0.697	0.725	0.750	0.770	0.788	0.813	0.831	0.842	0.851	0.856
0.25	0.511	0.516	0.531	0.551	0.577	0.610	0.644	0.675	0.703	0.727	0.749	0.782	0.805	0.822	0.834	0.843
0.30	0.466	0.472	0.486	0.506	0.530	0.560	0.593	0.627	0.657	0.685	0.709	0.748	0.778	0.799	0.815	0.827
0.40	0.394	0.399	0.412	0.430	0.453	0.478	0.507	0.539	0.573	0.604	0.632	0.680	0.719	0.749	0.772	0.790
0.50	0.340	0.344	0.356	0.372	0.393	0.416	0.441	0.469	0.498	0.532	0.562	0.615	0.659	0.696	0.725	0.749
0.60	0.297	0.301	0.312	0.327	0.345	0.366	0.389	0.414	0.441	0.469	0.500	0.555	0.603	0.644	0.678	0.706
0.70	0.263	0.267	0.276	0.290	0.308	0.326	0.348	0.370	0.394	0.419	0.446	0.502	0.552	0.595	0.632	0.663
0.80	0.236	0.239	0.248	0.261	0.276	0.294	0.313	0.334	0.356	0.378	0.402	0.455	0.505	0.549	0.588	0.622
0.90	0.213	0.216	0.224	0.236	0.251	0.267	0.285	0.304	0.324	0.344	0.366	0.414	0.463	0.507	0.547	0.583
1.0	0.194	0.197	0.205	0.216	0.229	0.245	0.261	0.279	0.297	0.316	0.336	0.379	0.426	0.470	0.510	0.546
1.2	0.165	0.168	0.174	0.184	0.195	0.209	0.223	0.239	0.255	0.271	0.288	0.324	0.364	0.406	0.445	0.481
1.4	0.143	0.145	0.151	0.160	0.170	0.182	0.195	0.208	0.222	0.237	0.252	0.284	0.318	0.355	0.391	0.426
1.6	0.126	0.128	0.134	0.141	0.150	0.161	0.172	0.185	0.197	0.210	0.224	0.252	0.282	0.313	0.347	0.380
1.8	0.113	0.115	0.120	0.126	0.135	0.144	0.155	0.165	0.177	0.189	0.201	0.227	0.253	0.281	0.311	0.342
2.0	0.102	0.104	0.108	0.114	0.122	0.131	0.140	0.150	0.161	0.172	0.182	0.206	0.230	0.255	0.281	0.310
2.2	0.0932	0.0947	0.0987	0.104	0.111	0.119	0.128	0.137	0.147	0.157	0.167	0.188	0.210	0.233	0.257	0.282
2.4	0.0857	0.0871	0.0908	0.0960	0.102	0.110	0.118	0.126	0.135	0.144	0.154	0.174	0.194	0.215	0.236	0.259
2.6	0.0793	0.0806	0.0840	0.0889	0.0949	0.102	0.109	0.117	0.125	0.134	0.143	0.161	0.180	0.199	0.219	0.240
2.8	0.0738	0.0750	0.0782	0.0827	0.0883	0.0946	0.101	0.109	0.117	0.125	0.133	0.150	0.168	0.186	0.204	0.223
3.0	0.0690	0.0701	0.0731	0.0774	0.0826	0.0885	0.0950	0.102	0.109	0.117	0.124	0.140	0.157	0.174	0.191	0.209

Table H.3 Continued.

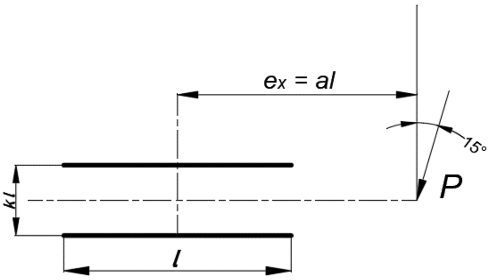
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 15°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			**ASD**		
$C_{min}=\frac{P_u}{\phi C_1 t_e l}$	$t_{min}=\frac{P_u}{\phi C C_1 l}$	$l_{min}=\frac{P_u}{\phi C C_1 t_e}$	$C_{min}=\frac{\Omega P_a}{C_1 t_e l}$	$t_{min}=\frac{\Omega P_a}{C C_1 l}$	$l_{min}=\frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	***k***															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867	0.867
0.10	0.695	0.698	0.707	0.726	0.751	0.774	0.794	0.810	0.822	0.832	0.839	0.848	0.853	0.857	0.859	0.860
0.15	0.630	0.632	0.642	0.658	0.681	0.709	0.736	0.759	0.778	0.794	0.806	0.824	0.836	0.843	0.848	0.852
0.20	0.572	0.575	0.585	0.602	0.623	0.649	0.678	0.705	0.730	0.751	0.768	0.795	0.813	0.825	0.834	0.840
0.25	0.522	0.525	0.535	0.552	0.573	0.597	0.625	0.654	0.681	0.706	0.728	0.762	0.786	0.804	0.816	0.826
0.30	0.477	0.480	0.492	0.508	0.529	0.552	0.578	0.607	0.635	0.662	0.686	0.727	0.757	0.780	0.796	0.809
0.40	0.405	0.408	0.419	0.435	0.455	0.478	0.501	0.526	0.553	0.581	0.607	0.655	0.695	0.726	0.751	0.770
0.50	0.350	0.353	0.363	0.379	0.397	0.418	0.440	0.464	0.488	0.513	0.539	0.589	0.633	0.670	0.701	0.726
0.60	0.306	0.309	0.319	0.334	0.351	0.371	0.392	0.413	0.436	0.458	0.482	0.530	0.575	0.615	0.650	0.680
0.70	0.271	0.274	0.284	0.297	0.314	0.332	0.352	0.372	0.392	0.414	0.435	0.480	0.523	0.564	0.600	0.633
0.80	0.243	0.246	0.255	0.267	0.282	0.300	0.318	0.337	0.357	0.376	0.397	0.437	0.479	0.518	0.555	0.589
0.90	0.220	0.223	0.231	0.243	0.257	0.273	0.290	0.308	0.327	0.345	0.364	0.401	0.440	0.478	0.513	0.547
1.0	0.201	0.203	0.211	0.222	0.235	0.250	0.267	0.284	0.301	0.318	0.336	0.371	0.406	0.442	0.477	0.510
1.2	0.171	0.173	0.180	0.189	0.201	0.214	0.229	0.244	0.259	0.275	0.290	0.322	0.353	0.384	0.416	0.446
1.4	0.148	0.150	0.156	0.165	0.175	0.187	0.200	0.213	0.227	0.241	0.255	0.283	0.311	0.339	0.367	0.395
1.6	0.131	0.133	0.138	0.146	0.155	0.166	0.177	0.190	0.202	0.215	0.228	0.253	0.279	0.304	0.329	0.354
1.8	0.117	0.119	0.123	0.130	0.139	0.149	0.159	0.170	0.182	0.193	0.205	0.228	0.252	0.275	0.298	0.321
2.0	0.106	0.107	0.112	0.118	0.126	0.135	0.144	0.154	0.165	0.176	0.186	0.208	0.230	0.251	0.272	0.293
2.2	0.0964	0.0980	0.102	0.108	0.115	0.123	0.132	0.141	0.151	0.161	0.171	0.191	0.211	0.231	0.251	0.270
2.4	0.0887	0.0901	0.0938	0.0992	0.106	0.113	0.122	0.130	0.139	0.148	0.158	0.176	0.195	0.214	0.232	0.250
2.6	0.0821	0.0834	0.0869	0.0919	0.0980	0.105	0.113	0.121	0.129	0.138	0.146	0.164	0.182	0.199	0.216	0.233
2.8	0.0764	0.0776	0.0808	0.0855	0.0913	0.0978	0.105	0.112	0.120	0.128	0.136	0.153	0.170	0.186	0.202	0.218
3.0	0.0714	0.0725	0.0756	0.0800	0.0854	0.0915	0.0981	0.105	0.113	0.120	0.128	0.143	0.159	0.175	0.190	0.205

Table H.3 Continued.

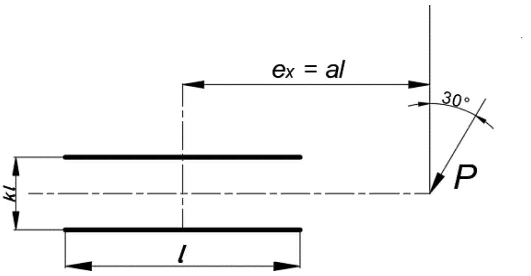
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 30°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

$P =$ required force, P_u or P_a, kN
$t_e =$ effective throat dimension, mm
a = e_x/l
$e_x =$ horizantal component of eccentricity of P with respect to centroid of weld group, mm
$C =$ coefficient tabulated below
$C_1 =$ electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.2	1.4	1.6	1.8	2.0
0.00	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825
0.10	0.713	0.714	0.720	0.728	0.739	0.752	0.764	0.775	0.783	0.790	0.796	0.803	0.807	0.810	0.811	0.812
0.15	0.650	0.651	0.656	0.664	0.677	0.692	0.708	0.724	0.739	0.752	0.763	0.779	0.789	0.796	0.800	0.804
0.20	0.598	0.599	0.604	0.613	0.623	0.637	0.653	0.671	0.689	0.707	0.722	0.747	0.764	0.776	0.784	0.791
0.25	0.551	0.552	0.558	0.567	0.579	0.593	0.608	0.623	0.641	0.660	0.678	0.710	0.734	0.751	0.764	0.774
0.30	0.509	0.510	0.517	0.527	0.540	0.554	0.570	0.585	0.600	0.617	0.636	0.671	0.700	0.723	0.740	0.754
0.40	0.437	0.439	0.446	0.457	0.471	0.488	0.504	0.520	0.537	0.552	0.568	0.598	0.632	0.661	0.686	0.706
0.50	0.381	0.383	0.390	0.402	0.417	0.433	0.450	0.467	0.484	0.500	0.515	0.544	0.570	0.600	0.629	0.654
0.60	0.335	0.337	0.345	0.357	0.372	0.388	0.405	0.423	0.439	0.455	0.471	0.499	0.525	0.549	0.576	0.602
0.70	0.298	0.300	0.308	0.320	0.335	0.351	0.368	0.385	0.401	0.417	0.433	0.461	0.486	0.510	0.533	0.557
0.80	0.268	0.270	0.278	0.290	0.304	0.320	0.336	0.353	0.369	0.384	0.400	0.428	0.453	0.476	0.498	0.519
0.90	0.243	0.245	0.253	0.264	0.278	0.293	0.309	0.325	0.341	0.356	0.371	0.398	0.424	0.447	0.468	0.488
1.0	0.222	0.224	0.232	0.242	0.256	0.270	0.285	0.301	0.316	0.331	0.345	0.372	0.397	0.420	0.442	0.461
1.2	0.189	0.191	0.198	0.208	0.220	0.233	0.247	0.261	0.276	0.290	0.303	0.329	0.353	0.375	0.396	0.415
1.4	0.164	0.166	0.173	0.182	0.192	0.204	0.217	0.231	0.244	0.257	0.269	0.294	0.317	0.338	0.358	0.377
1.6	0.145	0.147	0.153	0.161	0.171	0.182	0.194	0.206	0.218	0.230	0.242	0.265	0.287	0.307	0.327	0.345
1.8	0.130	0.132	0.137	0.144	0.153	0.164	0.175	0.186	0.197	0.208	0.219	0.241	0.262	0.282	0.300	0.317
2.0	0.118	0.119	0.124	0.131	0.139	0.149	0.159	0.169	0.180	0.190	0.201	0.221	0.241	0.259	0.277	0.294
2.2	0.107	0.109	0.113	0.120	0.127	0.136	0.145	0.155	0.165	0.175	0.185	0.204	0.223	0.240	0.257	0.273
2.4	0.0988	0.100	0.104	0.110	0.117	0.125	0.134	0.143	0.153	0.162	0.171	0.189	0.207	0.224	0.240	0.255
2.6	0.0914	0.0928	0.0966	0.102	0.109	0.116	0.124	0.133	0.142	0.150	0.159	0.176	0.193	0.209	0.225	0.239
2.8	0.0851	0.0863	0.0899	0.0950	0.101	0.108	0.116	0.124	0.132	0.141	0.149	0.165	0.181	0.196	0.211	0.225
3.0	0.0795	0.0807	0.0841	0.0889	0.0948	0.102	0.109	0.116	0.124	0.132	0.140	0.155	0.171	0.185	0.199	0.213

Table H.3 Continued.

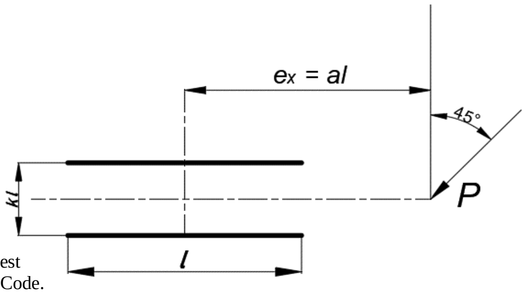
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 45°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763	0.763
0.10	0.711	0.712	0.713	0.715	0.718	0.721	0.724	0.727	0.729	0.732	0.734	0.737	0.740	0.741	0.742	0.743
0.15	0.663	0.663	0.666	0.671	0.676	0.682	0.687	0.692	0.697	0.702	0.706	0.713	0.719	0.724	0.728	0.730
0.20	0.622	0.623	0.624	0.629	0.633	0.640	0.647	0.655	0.662	0.668	0.674	0.685	0.694	0.701	0.708	0.713
0.25	0.587	0.588	0.590	0.594	0.599	0.605	0.612	0.619	0.627	0.635	0.642	0.656	0.667	0.676	0.685	0.692
0.30	0.554	0.554	0.557	0.562	0.568	0.575	0.582	0.590	0.597	0.604	0.612	0.627	0.640	0.651	0.661	0.670
0.40	0.492	0.492	0.496	0.502	0.510	0.519	0.529	0.538	0.547	0.555	0.563	0.577	0.591	0.604	0.616	0.626
0.50	0.438	0.438	0.443	0.450	0.460	0.471	0.482	0.493	0.503	0.513	0.522	0.537	0.551	0.564	0.576	0.588
0.60	0.391	0.392	0.397	0.406	0.416	0.428	0.441	0.453	0.464	0.475	0.485	0.503	0.518	0.531	0.543	0.554
0.70	0.352	0.353	0.359	0.368	0.379	0.392	0.405	0.418	0.430	0.442	0.452	0.471	0.488	0.502	0.515	0.526
0.80	0.319	0.320	0.326	0.335	0.347	0.360	0.374	0.387	0.400	0.412	0.423	0.443	0.460	0.476	0.489	0.501
0.90	0.291	0.292	0.298	0.308	0.320	0.333	0.347	0.360	0.373	0.385	0.397	0.417	0.436	0.452	0.466	0.478
1.0	0.267	0.268	0.274	0.284	0.297	0.310	0.323	0.337	0.350	0.362	0.373	0.395	0.413	0.430	0.444	0.457
1.2	0.229	0.230	0.236	0.246	0.258	0.271	0.284	0.297	0.310	0.322	0.334	0.355	0.374	0.391	0.406	0.420
1.4	0.199	0.201	0.207	0.216	0.228	0.240	0.252	0.265	0.278	0.289	0.301	0.322	0.341	0.358	0.374	0.388
1.6	0.177	0.178	0.184	0.193	0.203	0.215	0.227	0.239	0.251	0.263	0.273	0.294	0.313	0.330	0.346	0.360
1.8	0.158	0.160	0.165	0.173	0.184	0.195	0.206	0.218	0.229	0.240	0.250	0.270	0.289	0.306	0.321	0.336
2.0	0.143	0.145	0.150	0.158	0.167	0.177	0.188	0.199	0.210	0.220	0.231	0.250	0.268	0.285	0.300	0.314
2.2	0.131	0.133	0.137	0.145	0.153	0.163	0.173	0.184	0.194	0.204	0.214	0.232	0.250	0.266	0.281	0.295
2.4	0.121	0.122	0.127	0.133	0.142	0.151	0.160	0.170	0.180	0.190	0.199	0.217	0.234	0.250	0.264	0.278
2.6	0.112	0.113	0.117	0.124	0.132	0.140	0.149	0.159	0.168	0.177	0.186	0.203	0.220	0.235	0.249	0.263
2.8	0.104	0.105	0.109	0.115	0.123	0.131	0.139	0.148	0.157	0.166	0.175	0.191	0.207	0.222	0.236	0.249
3.0	0.0972	0.0985	0.102	0.108	0.115	0.123	0.131	0.139	0.148	0.156	0.165	0.181	0.196	0.210	0.224	0.236

Table H.3 Continued.

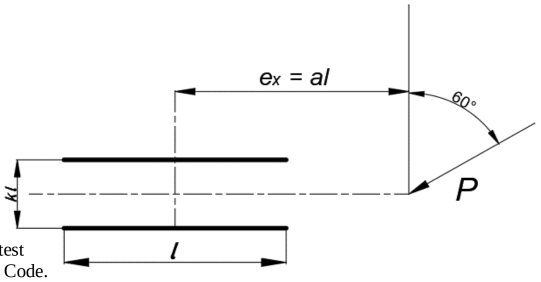
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 60°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.0	1.2	1.4	1.6	1.8	2.0
0.00	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692	0.692
0.10	0.674	0.674	0.674	0.674	0.673	0.673	0.672	0.672	0.671	0.670	0.670	0.668	0.666	0.664	0.662	0.660
0.15	0.654	0.654	0.654	0.654	0.654	0.655	0.655	0.655	0.655	0.655	0.655	0.654	0.653	0.651	0.650	0.648
0.20	0.630	0.630	0.630	0.630	0.630	0.631	0.632	0.633	0.635	0.636	0.636	0.637	0.638	0.637	0.637	0.636
0.25	0.612	0.612	0.611	0.612	0.612	0.612	0.613	0.614	0.615	0.616	0.617	0.620	0.622	0.623	0.623	0.623
0.30	0.594	0.594	0.594	0.595	0.595	0.596	0.596	0.598	0.598	0.599	0.601	0.603	0.605	0.608	0.609	0.610
0.40	0.557	0.557	0.558	0.559	0.561	0.563	0.565	0.566	0.569	0.571	0.572	0.575	0.578	0.581	0.583	0.585
0.50	0.518	0.518	0.520	0.523	0.526	0.530	0.533	0.537	0.540	0.543	0.545	0.550	0.554	0.558	0.561	0.564
0.60	0.481	0.481	0.483	0.486	0.491	0.497	0.502	0.507	0.511	0.516	0.520	0.527	0.532	0.537	0.541	0.545
0.70	0.445	0.445	0.448	0.452	0.458	0.465	0.473	0.479	0.485	0.490	0.495	0.504	0.511	0.517	0.523	0.527
0.80	0.411	0.411	0.415	0.421	0.428	0.437	0.444	0.453	0.460	0.466	0.472	0.482	0.491	0.499	0.505	0.510
0.90	0.381	0.382	0.386	0.392	0.401	0.410	0.419	0.428	0.436	0.444	0.450	0.462	0.472	0.481	0.488	0.494
1.0	0.355	0.355	0.360	0.367	0.376	0.386	0.396	0.406	0.414	0.422	0.430	0.443	0.454	0.464	0.472	0.479
1.2	0.309	0.310	0.315	0.323	0.333	0.344	0.355	0.366	0.376	0.385	0.393	0.408	0.421	0.432	0.442	0.450
1.4	0.273	0.274	0.279	0.287	0.298	0.309	0.321	0.332	0.343	0.353	0.362	0.378	0.392	0.404	0.415	0.424
1.6	0.243	0.245	0.250	0.258	0.269	0.281	0.293	0.304	0.315	0.325	0.334	0.351	0.366	0.379	0.390	0.400
1.8	0.219	0.221	0.226	0.235	0.245	0.257	0.268	0.280	0.291	0.300	0.310	0.328	0.343	0.356	0.368	0.379
2.0	0.200	0.201	0.206	0.215	0.225	0.236	0.248	0.259	0.270	0.280	0.289	0.307	0.322	0.336	0.349	0.360
2.2	0.183	0.184	0.190	0.198	0.208	0.219	0.230	0.241	0.251	0.261	0.271	0.288	0.304	0.318	0.331	0.342
2.4	0.169	0.170	0.175	0.183	0.193	0.203	0.214	0.225	0.235	0.245	0.254	0.272	0.287	0.302	0.314	0.326
2.6	0.156	0.158	0.163	0.171	0.180	0.190	0.201	0.211	0.221	0.231	0.240	0.257	0.272	0.287	0.300	0.311
2.8	0.146	0.147	0.152	0.160	0.169	0.178	0.188	0.198	0.208	0.218	0.227	0.244	0.259	0.273	0.286	0.298
3.0	0.136	0.138	0.143	0.150	0.158	0.168	0.178	0.187	0.197	0.206	0.215	0.232	0.247	0.261	0.273	0.285

Table H.3 Continued.

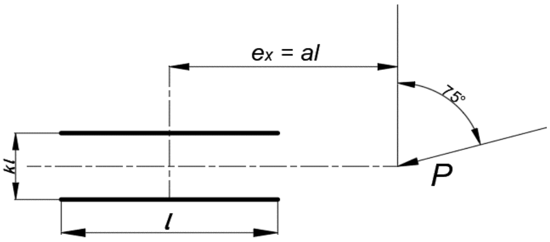
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 75°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.0	1.2	1.4	1.6	1.8	2.0
0.00	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627	0.627
0.10	0.604	0.605	0.606	0.607	0.608	0.609	0.609	0.609	0.609	0.609	0.608	0.606	0.604	0.601	0.598	0.595
0.15	0.609	0.610	0.610	0.610	0.610	0.610	0.609	0.608	0.607	0.606	0.605	0.602	0.599	0.596	0.593	0.590
0.20	0.607	0.608	0.608	0.607	0.607	0.606	0.605	0.604	0.603	0.602	0.600	0.598	0.595	0.592	0.589	0.586
0.25	0.606	0.606	0.606	0.605	0.604	0.603	0.602	0.601	0.600	0.598	0.597	0.594	0.590	0.587	0.585	0.582
0.30	0.604	0.604	0.604	0.603	0.602	0.601	0.599	0.598	0.596	0.595	0.593	0.590	0.586	0.584	0.581	0.578
0.40	0.599	0.599	0.598	0.597	0.595	0.593	0.591	0.590	0.588	0.586	0.585	0.581	0.578	0.575	0.573	0.570
0.50	0.590	0.590	0.589	0.587	0.585	0.584	0.582	0.581	0.579	0.577	0.576	0.572	0.569	0.567	0.564	0.562
0.60	0.579	0.579	0.578	0.576	0.575	0.573	0.571	0.570	0.568	0.567	0.565	0.563	0.561	0.558	0.556	0.554
0.70	0.564	0.564	0.563	0.562	0.561	0.560	0.559	0.558	0.557	0.556	0.555	0.552	0.551	0.549	0.548	0.546
0.80	0.549	0.549	0.548	0.547	0.546	0.546	0.545	0.545	0.544	0.544	0.543	0.542	0.541	0.540	0.539	0.538
0.90	0.532	0.532	0.532	0.532	0.531	0.531	0.531	0.531	0.531	0.532	0.532	0.532	0.532	0.531	0.530	0.530
1.0	0.514	0.514	0.515	0.515	0.516	0.516	0.517	0.517	0.518	0.519	0.520	0.521	0.522	0.522	0.522	0.521
1.2	0.477	0.477	0.478	0.481	0.483	0.486	0.488	0.490	0.493	0.494	0.496	0.499	0.502	0.504	0.505	0.506
1.4	0.441	0.441	0.443	0.447	0.451	0.456	0.460	0.464	0.467	0.471	0.473	0.478	0.482	0.485	0.488	0.490
1.6	0.408	0.409	0.411	0.416	0.421	0.428	0.433	0.439	0.443	0.448	0.452	0.458	0.464	0.468	0.472	0.475
1.8	0.378	0.379	0.382	0.387	0.394	0.401	0.409	0.415	0.421	0.426	0.431	0.439	0.446	0.452	0.456	0.460
2.0	0.351	0.352	0.356	0.362	0.369	0.378	0.386	0.393	0.400	0.406	0.411	0.421	0.429	0.436	0.441	0.446
2.2	0.327	0.328	0.332	0.339	0.347	0.356	0.365	0.373	0.380	0.387	0.393	0.404	0.413	0.421	0.427	0.432
2.4	0.305	0.306	0.311	0.318	0.327	0.336	0.346	0.354	0.362	0.370	0.376	0.388	0.398	0.407	0.414	0.420
2.6	0.286	0.287	0.291	0.299	0.308	0.318	0.328	0.337	0.346	0.353	0.361	0.373	0.384	0.393	0.401	0.407
2.8	0.268	0.270	0.274	0.282	0.292	0.302	0.312	0.322	0.330	0.338	0.346	0.359	0.371	0.380	0.389	0.396
3.0	0.253	0.254	0.259	0.267	0.277	0.287	0.297	0.307	0.316	0.325	0.332	0.346	0.358	0.368	0.377	0.385

Table H.3 Continued.

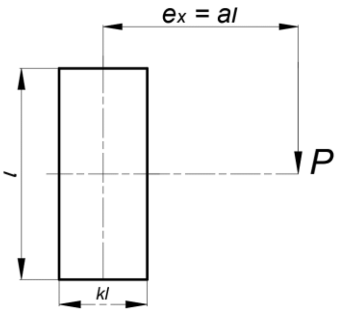
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 0°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2
(1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.0	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.0	0.588	0.647	0.706	0.764	0.853	0.941	1.03	1.12	1.21	1.29	1.38	1.56	1.73	1.91	2.09	2.26
0.10	0.588	0.650	0.723	0.799	0.878	0.958	1.04	1.12	1.20	1.28	1.37	1.53	1.70	1.86	2.03	2.20
0.15	0.581	0.645	0.713	0.785	0.859	0.935	1.01	1.09	1.17	1.25	1.33	1.48	1.64	1.81	1.97	2.13
0.20	0.558	0.623	0.689	0.757	0.827	0.899	0.972	1.05	1.12	1.20	1.27	1.43	1.58	1.74	1.90	2.06
0.25	0.526	0.590	0.655	0.721	0.788	0.856	0.926	0.998	1.07	1.14	1.22	1.37	1.52	1.67	1.83	1.99
0.30	0.492	0.553	0.616	0.680	0.745	0.811	0.878	0.947	1.02	1.09	1.16	1.31	1.45	1.61	1.76	1.91
0.40	0.424	0.479	0.537	0.598	0.659	0.721	0.784	0.849	0.915	0.982	1.05	1.19	1.33	1.48	1.63	1.78
0.50	0.365	0.414	0.467	0.524	0.582	0.641	0.700	0.761	0.823	0.887	0.952	1.09	1.22	1.37	1.51	1.66
0.60	0.318	0.361	0.408	0.461	0.516	0.571	0.628	0.685	0.744	0.805	0.867	0.995	1.13	1.26	1.41	1.55
0.70	0.280	0.318	0.361	0.409	0.460	0.513	0.566	0.621	0.677	0.734	0.793	0.916	1.04	1.18	1.31	1.45
0.80	0.249	0.283	0.322	0.366	0.414	0.465	0.515	0.566	0.619	0.674	0.730	0.847	0.969	1.10	1.23	1.36
0.90	0.224	0.255	0.290	0.331	0.376	0.423	0.471	0.520	0.569	0.621	0.674	0.786	0.902	1.02	1.15	1.28
1.0	0.203	0.231	0.264	0.302	0.344	0.388	0.433	0.479	0.526	0.575	0.626	0.731	0.843	0.959	1.08	1.20
1.2	0.171	0.195	0.223	0.256	0.293	0.333	0.373	0.414	0.456	0.500	0.545	0.640	0.741	0.848	0.959	1.07
1.4	0.148	0.168	0.193	0.222	0.255	0.290	0.326	0.363	0.401	0.441	0.482	0.568	0.660	0.757	0.860	0.967
1.6	0.130	0.148	0.170	0.196	0.225	0.257	0.290	0.323	0.358	0.394	0.430	0.509	0.593	0.683	0.778	0.877
1.8	0.116	0.132	0.152	0.175	0.202	0.230	0.260	0.291	0.322	0.355	0.389	0.461	0.539	0.622	0.709	0.802
2.0	0.104	0.119	0.137	0.158	0.182	0.209	0.236	0.264	0.293	0.323	0.354	0.421	0.493	0.570	0.651	0.738
2.2	0.0948	0.108	0.125	0.144	0.167	0.190	0.216	0.242	0.269	0.296	0.326	0.387	0.454	0.526	0.602	0.683
2.4	0.0870	0.0991	0.115	0.133	0.153	0.175	0.199	0.223	0.248	0.274	0.301	0.358	0.421	0.488	0.559	0.635
2.6	0.0804	0.0916	0.106	0.123	0.142	0.162	0.184	0.207	0.230	0.254	0.279	0.333	0.392	0.455	0.522	0.593
2.8	0.0747	0.0851	0.0986	0.114	0.132	0.151	0.171	0.193	0.214	0.237	0.261	0.312	0.367	0.426	0.489	0.556
3.0	0.0698	0.0794	0.0921	0.107	0.123	0.141	0.160	0.180	0.201	0.222	0.245	0.292	0.344	0.400	0.460	0.524

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 15°

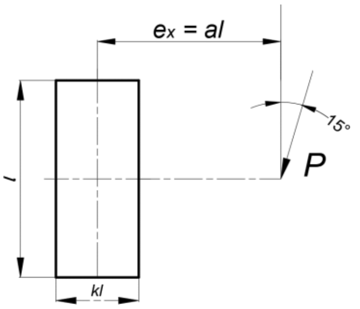
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			**ASD**		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2
(1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.



a	*k*															
	0.0	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.0	0.627	0.696	0.782	0.869	0.955	1.04	1.13	1.21	1.30	1.39	1.47	1.65	1.82	1.99	2.16	2.34
0.10	0.601	0.669	0.745	0.824	0.904	0.985	1.07	1.15	1.23	1.31	1.40	1.56	1.73	1.90	2.07	2.23
0.15	0.584	0.656	0.728	0.802	0.877	0.953	1.03	1.11	1.19	1.26	1.34	1.50	1.66	1.82	1.99	2.15
0.20	0.558	0.627	0.698	0.770	0.842	0.914	0.988	1.06	1.14	1.21	1.29	1.44	1.60	1.75	1.91	2.07
0.25	0.526	0.591	0.660	0.730	0.799	0.870	0.941	1.01	1.08	1.16	1.23	1.38	1.53	1.69	1.84	2.00
0.30	0.492	0.554	0.618	0.686	0.755	0.823	0.892	0.962	1.03	1.10	1.17	1.32	1.47	1.62	1.77	1.93
0.40	0.426	0.480	0.539	0.602	0.666	0.732	0.797	0.863	0.930	0.997	1.07	1.21	1.35	1.50	1.65	1.80
0.50	0.369	0.417	0.469	0.527	0.588	0.650	0.712	0.775	0.839	0.903	0.969	1.10	1.24	1.38	1.53	1.68
0.60	0.322	0.365	0.412	0.464	0.521	0.580	0.640	0.699	0.759	0.821	0.884	1.01	1.15	1.29	1.43	1.57
0.70	0.285	0.322	0.365	0.413	0.465	0.521	0.578	0.634	0.692	0.751	0.811	0.935	1.06	1.20	1.33	1.47
0.80	0.254	0.288	0.327	0.371	0.420	0.471	0.526	0.580	0.634	0.690	0.747	0.865	0.989	1.12	1.25	1.39
0.90	0.229	0.260	0.295	0.336	0.381	0.430	0.482	0.532	0.584	0.637	0.691	0.804	0.922	1.05	1.17	1.30
1.0	0.208	0.236	0.269	0.307	0.350	0.395	0.443	0.492	0.540	0.591	0.642	0.749	0.862	0.980	1.10	1.23
1.2	0.175	0.199	0.228	0.261	0.299	0.340	0.382	0.425	0.468	0.514	0.561	0.658	0.760	0.869	0.981	1.10
1.4	0.152	0.172	0.198	0.227	0.261	0.297	0.335	0.374	0.413	0.453	0.496	0.584	0.678	0.777	0.882	0.991
1.6	0.133	0.151	0.174	0.201	0.231	0.263	0.298	0.333	0.368	0.405	0.443	0.525	0.611	0.702	0.799	0.901
1.8	0.119	0.135	0.156	0.180	0.207	0.236	0.268	0.300	0.332	0.366	0.401	0.476	0.555	0.640	0.730	0.824
2.0	0.107	0.122	0.141	0.163	0.187	0.214	0.243	0.273	0.302	0.333	0.366	0.435	0.508	0.587	0.671	0.759
2.2	0.0978	0.111	0.129	0.148	0.171	0.196	0.222	0.249	0.277	0.306	0.336	0.400	0.468	0.542	0.620	0.703
2.4	0.0898	0.102	0.118	0.136	0.157	0.180	0.205	0.230	0.256	0.283	0.310	0.370	0.434	0.503	0.576	0.654
2.6	0.0830	0.0944	0.109	0.126	0.146	0.167	0.189	0.213	0.237	0.263	0.289	0.344	0.404	0.469	0.538	0.611
2.8	0.0771	0.0877	0.102	0.118	0.136	0.155	0.176	0.199	0.221	0.245	0.270	0.322	0.378	0.439	0.504	0.574
3.0	0.0720	0.0820	0.0950	0.110	0.127	0.145	0.165	0.186	0.208	0.230	0.253	0.302	0.356	0.413	0.475	0.540

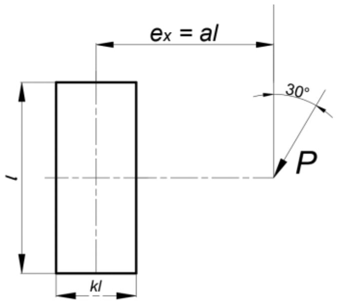
Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 30°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where



P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.0	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.0	0.692	0.774	0.855	0.937	1.02	1.10	1.18	1.26	1.34	1.43	1.51	1.67	1.83	2.00	2.16	2.32
0.10	0.641	0.729	0.813	0.895	0.976	1.06	1.14	1.22	1.30	1.38	1.46	1.62	1.78	1.95	2.11	2.28
0.15	0.609	0.687	0.768	0.849	0.929	1.01	1.09	1.17	1.24	1.32	1.40	1.56	1.72	1.89	2.05	2.21
0.20	0.577	0.650	0.725	0.803	0.880	0.957	1.03	1.11	1.19	1.26	1.34	1.50	1.66	1.82	1.98	2.15
0.25	0.545	0.611	0.682	0.756	0.831	0.907	0.982	1.06	1.13	1.20	1.28	1.43	1.59	1.75	1.91	2.07
0.30	0.511	0.573	0.640	0.710	0.783	0.856	0.931	1.00	1.08	1.15	1.22	1.37	1.52	1.68	1.84	2.00
0.40	0.447	0.502	0.561	0.624	0.692	0.761	0.833	0.905	0.975	1.05	1.12	1.26	1.41	1.56	1.71	1.87
0.50	0.391	0.440	0.493	0.551	0.614	0.679	0.747	0.816	0.886	0.953	1.02	1.16	1.30	1.45	1.60	1.75
0.60	0.345	0.388	0.437	0.490	0.548	0.610	0.674	0.740	0.807	0.873	0.939	1.07	1.21	1.35	1.50	1.65
0.70	0.307	0.346	0.390	0.440	0.494	0.552	0.613	0.675	0.740	0.803	0.866	0.995	1.13	1.27	1.41	1.55
0.80	0.275	0.311	0.351	0.397	0.448	0.502	0.560	0.621	0.681	0.741	0.802	0.926	1.05	1.19	1.33	1.47
0.90	0.249	0.281	0.319	0.362	0.410	0.461	0.516	0.572	0.630	0.687	0.745	0.864	0.988	1.12	1.25	1.39
1.0	0.227	0.257	0.292	0.332	0.377	0.426	0.477	0.531	0.586	0.639	0.695	0.809	0.928	1.05	1.18	1.31
1.2	0.193	0.218	0.249	0.284	0.324	0.368	0.414	0.462	0.511	0.560	0.610	0.714	0.824	0.939	1.06	1.18
1.4	0.167	0.189	0.216	0.248	0.284	0.323	0.364	0.408	0.452	0.496	0.542	0.638	0.739	0.846	0.957	1.07
1.6	0.147	0.167	0.191	0.220	0.252	0.287	0.325	0.364	0.405	0.445	0.487	0.575	0.669	0.767	0.871	0.980
1.8	0.132	0.149	0.172	0.198	0.227	0.259	0.293	0.329	0.365	0.403	0.441	0.523	0.609	0.702	0.798	0.900
2.0	0.119	0.135	0.155	0.179	0.206	0.235	0.266	0.299	0.333	0.368	0.403	0.479	0.560	0.645	0.736	0.831
2.2	0.108	0.123	0.142	0.164	0.189	0.215	0.244	0.274	0.306	0.338	0.371	0.441	0.517	0.597	0.682	0.772
2.4	0.0995	0.113	0.131	0.151	0.174	0.198	0.225	0.253	0.283	0.312	0.343	0.409	0.480	0.555	0.635	0.720
2.6	0.0920	0.105	0.121	0.140	0.161	0.184	0.209	0.235	0.262	0.291	0.319	0.381	0.447	0.519	0.594	0.674
2.8	0.0855	0.0973	0.113	0.130	0.150	0.172	0.195	0.219	0.245	0.271	0.299	0.356	0.419	0.486	0.557	0.633
3.0	0.0799	0.0909	0.105	0.122	0.140	0.161	0.182	0.205	0.230	0.254	0.280	0.335	0.394	0.457	0.525	0.597

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 45°

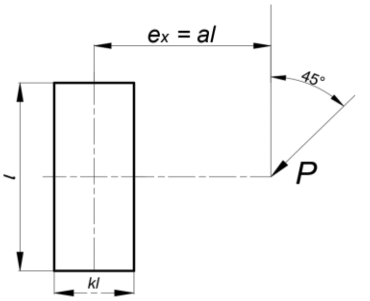
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min}=\frac{P_u}{\phi C_1 t_e l}$	$t_{min}=\frac{P_u}{\phi C C_1 l}$	$l_{min}=\frac{P_u}{\phi C C_1 t_e}$	$C_{min}=\frac{\Omega P_a}{C_1 t_e l}$	$t_{min}=\frac{\Omega P_a}{C C_1 l}$	$l_{min}=\frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2
(1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.



a	k															
	0.0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.0	1.2	1.4	1.6	1.8	2.0
0.0	0.763	0.814	0.889	0.963	1.04	1.11	1.18	1.26	1.33	1.41	1.48	1.63	1.78	1.93	2.07	2.22
0.10	0.711	0.790	0.868	0.945	1.02	1.10	1.18	1.25	1.33	1.41	1.49	1.64	1.80	1.95	2.11	2.26
0.15	0.663	0.744	0.823	0.900	0.977	1.05	1.13	1.21	1.29	1.37	1.45	1.61	1.76	1.92	2.08	2.24
0.20	0.622	0.697	0.773	0.850	0.927	1.00	1.08	1.16	1.24	1.32	1.40	1.56	1.72	1.88	2.04	2.20
0.25	0.587	0.656	0.728	0.801	0.876	0.953	1.03	1.11	1.19	1.27	1.35	1.51	1.67	1.83	2.00	2.16
0.30	0.554	0.617	0.685	0.756	0.829	0.904	0.980	1.06	1.14	1.22	1.30	1.46	1.62	1.78	1.95	2.11
0.40	0.492	0.548	0.609	0.675	0.744	0.815	0.888	0.964	1.04	1.12	1.20	1.36	1.52	1.68	1.84	2.01
0.50	0.438	0.488	0.544	0.605	0.670	0.739	0.809	0.882	0.957	1.03	1.11	1.26	1.42	1.58	1.74	1.91
0.60	0.391	0.437	0.489	0.546	0.608	0.673	0.741	0.812	0.885	0.959	1.03	1.18	1.33	1.49	1.64	1.81
0.70	0.352	0.394	0.442	0.496	0.554	0.616	0.682	0.751	0.820	0.892	0.965	1.10	1.25	1.40	1.56	1.71
0.80	0.319	0.358	0.402	0.453	0.508	0.568	0.631	0.696	0.764	0.832	0.902	1.04	1.18	1.32	1.47	1.63
0.90	0.291	0.327	0.369	0.416	0.469	0.526	0.585	0.648	0.713	0.778	0.846	0.977	1.11	1.25	1.40	1.55
1.0	0.267	0.300	0.340	0.384	0.435	0.488	0.546	0.606	0.667	0.730	0.794	0.921	1.05	1.19	1.33	1.48
1.2	0.229	0.258	0.292	0.333	0.378	0.427	0.479	0.533	0.590	0.648	0.707	0.825	0.948	1.07	1.21	1.34
1.4	0.199	0.225	0.257	0.293	0.334	0.378	0.426	0.475	0.527	0.580	0.635	0.745	0.859	0.978	1.10	1.23
1.6	0.177	0.200	0.228	0.262	0.299	0.339	0.382	0.427	0.475	0.524	0.574	0.677	0.784	0.896	1.01	1.13
1.8	0.158	0.179	0.205	0.236	0.269	0.307	0.346	0.388	0.431	0.477	0.524	0.619	0.720	0.825	0.935	1.05
2.0	0.143	0.162	0.186	0.215	0.246	0.280	0.316	0.355	0.395	0.437	0.481	0.570	0.664	0.763	0.867	0.976
2.2	0.131	0.148	0.171	0.196	0.226	0.257	0.291	0.326	0.364	0.403	0.443	0.527	0.616	0.709	0.807	0.910
2.4	0.121	0.137	0.158	0.181	0.208	0.238	0.269	0.303	0.337	0.374	0.412	0.491	0.574	0.662	0.755	0.853
2.6	0.112	0.127	0.146	0.168	0.194	0.221	0.250	0.282	0.314	0.348	0.384	0.458	0.537	0.620	0.709	0.801
2.8	0.104	0.118	0.136	0.157	0.180	0.206	0.234	0.263	0.294	0.326	0.360	0.429	0.504	0.583	0.667	0.755
3.0	0.0972	0.110	0.128	0.147	0.169	0.193	0.219	0.247	0.276	0.306	0.338	0.404	0.475	0.550	0.630	0.714

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 60°

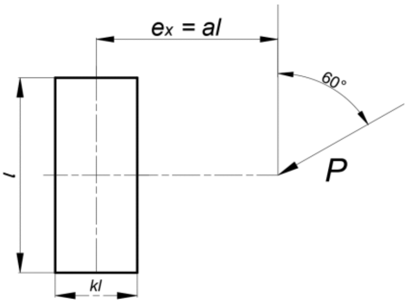
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2
(1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.



a	*k*															
	0.0	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.0	0.825	0.884	0.953	1.02	1.09	1.16	1.23	1.30	1.37	1.44	1.51	1.65	1.78	1.92	2.06	2.20
0.10	0.771	0.839	0.909	0.981	1.05	1.13	1.20	1.28	1.35	1.42	1.49	1.64	1.78	1.92	2.06	2.19
0.15	0.731	0.800	0.869	0.941	1.02	1.09	1.17	1.25	1.32	1.40	1.47	1.62	1.76	1.90	2.04	2.19
0.20	0.691	0.761	0.830	0.900	0.974	1.05	1.13	1.21	1.29	1.37	1.44	1.59	1.74	1.89	2.03	2.17
0.25	0.656	0.723	0.792	0.861	0.934	1.01	1.09	1.17	1.25	1.33	1.41	1.56	1.72	1.86	2.01	2.15
0.30	0.624	0.689	0.756	0.824	0.896	0.972	1.05	1.13	1.21	1.29	1.37	1.53	1.69	1.84	1.99	2.13
0.40	0.568	0.627	0.690	0.757	0.826	0.899	0.976	1.06	1.14	1.22	1.30	1.46	1.62	1.78	1.93	2.09
0.50	0.518	0.572	0.632	0.697	0.765	0.837	0.912	0.991	1.07	1.15	1.23	1.40	1.56	1.72	1.87	2.03
0.60	0.474	0.525	0.581	0.644	0.711	0.781	0.855	0.931	1.01	1.09	1.17	1.33	1.50	1.66	1.81	1.97
0.70	0.435	0.483	0.537	0.596	0.662	0.730	0.803	0.877	0.953	1.03	1.11	1.27	1.44	1.60	1.75	1.91
0.80	0.401	0.446	0.497	0.555	0.618	0.685	0.755	0.827	0.901	0.978	1.06	1.22	1.38	1.54	1.69	1.85
0.90	0.371	0.413	0.462	0.518	0.578	0.643	0.711	0.782	0.854	0.928	1.00	1.16	1.32	1.48	1.64	1.79
1.0	0.344	0.385	0.431	0.485	0.543	0.606	0.672	0.740	0.810	0.882	0.956	1.11	1.26	1.42	1.58	1.73
1.2	0.301	0.336	0.379	0.428	0.483	0.541	0.603	0.666	0.733	0.801	0.871	1.02	1.16	1.31	1.47	1.62
1.4	0.266	0.298	0.337	0.383	0.434	0.487	0.544	0.604	0.666	0.731	0.797	0.934	1.07	1.22	1.36	1.51
1.6	0.238	0.267	0.304	0.346	0.392	0.443	0.495	0.551	0.609	0.670	0.733	0.862	0.993	1.13	1.27	1.42
1.8	0.215	0.242	0.276	0.315	0.358	0.404	0.454	0.506	0.561	0.618	0.676	0.799	0.924	1.05	1.19	1.33
2.0	0.196	0.221	0.252	0.288	0.329	0.372	0.418	0.467	0.518	0.572	0.628	0.744	0.863	0.984	1.11	1.25
2.2	0.180	0.203	0.232	0.266	0.304	0.344	0.387	0.433	0.482	0.532	0.585	0.695	0.808	0.924	1.05	1.17
2.4	0.166	0.188	0.215	0.246	0.282	0.320	0.361	0.404	0.449	0.497	0.547	0.651	0.760	0.870	0.986	1.11
2.6	0.154	0.174	0.200	0.230	0.263	0.299	0.337	0.378	0.421	0.466	0.512	0.612	0.716	0.822	0.933	1.05
2.8	0.144	0.163	0.187	0.215	0.246	0.280	0.316	0.355	0.396	0.438	0.483	0.577	0.676	0.778	0.884	0.996
3.0	0.135	0.153	0.176	0.202	0.231	0.264	0.298	0.334	0.373	0.414	0.456	0.546	0.641	0.738	0.840	0.947

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 75°

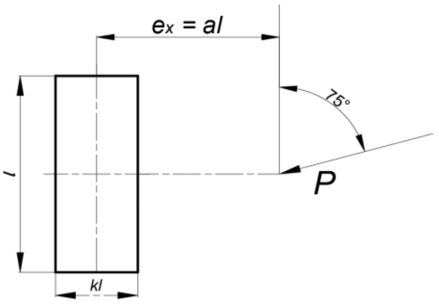
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2
(1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.



a	*k*															
	0.0	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.0	0.867	0.924	0.985	1.05	1.11	1.17	1.23	1.29	1.35	1.41	1.47	1.59	1.72	1.84	1.96	2.08
0.10	0.820	0.880	0.947	1.02	1.08	1.15	1.22	1.28	1.34	1.40	1.47	1.59	1.71	1.83	1.96	2.08
0.15	0.794	0.853	0.920	0.991	1.06	1.13	1.20	1.27	1.33	1.39	1.46	1.58	1.71	1.83	1.95	2.07
0.20	0.769	0.828	0.895	0.967	1.04	1.11	1.18	1.25	1.32	1.38	1.45	1.57	1.70	1.82	1.95	2.07
0.25	0.747	0.805	0.870	0.942	1.02	1.09	1.16	1.23	1.30	1.37	1.43	1.56	1.69	1.82	1.94	2.06
0.30	0.725	0.783	0.847	0.919	0.993	1.07	1.14	1.21	1.28	1.35	1.42	1.55	1.68	1.81	1.93	2.06
0.40	0.685	0.743	0.805	0.875	0.951	1.03	1.10	1.18	1.25	1.32	1.39	1.53	1.66	1.79	1.91	2.04
0.50	0.650	0.706	0.768	0.836	0.911	0.988	1.07	1.14	1.22	1.29	1.36	1.50	1.63	1.76	1.89	2.02
0.60	0.616	0.672	0.734	0.801	0.874	0.951	1.03	1.11	1.18	1.26	1.33	1.47	1.61	1.74	1.87	2.00
0.70	0.586	0.639	0.701	0.769	0.839	0.916	0.994	1.07	1.15	1.23	1.30	1.45	1.58	1.72	1.85	1.98
0.80	0.557	0.609	0.669	0.737	0.807	0.882	0.960	1.04	1.12	1.20	1.27	1.42	1.56	1.70	1.83	1.96
0.90	0.530	0.581	0.640	0.707	0.777	0.850	0.927	1.01	1.09	1.16	1.24	1.39	1.54	1.68	1.81	1.94
1.0	0.505	0.554	0.613	0.679	0.749	0.820	0.896	0.974	1.05	1.13	1.21	1.36	1.51	1.66	1.79	1.93
1.2	0.460	0.507	0.563	0.627	0.695	0.765	0.838	0.914	0.992	1.07	1.15	1.31	1.46	1.61	1.75	1.89
1.4	0.422	0.466	0.519	0.580	0.646	0.715	0.786	0.859	0.935	1.01	1.09	1.25	1.41	1.56	1.70	1.85
1.6	0.388	0.430	0.481	0.539	0.603	0.670	0.739	0.809	0.883	0.959	1.04	1.19	1.35	1.50	1.66	1.80
1.8	0.358	0.398	0.447	0.503	0.564	0.628	0.696	0.764	0.836	0.909	0.985	1.14	1.30	1.45	1.61	1.76
2.0	0.333	0.371	0.418	0.470	0.528	0.591	0.656	0.723	0.792	0.863	0.937	1.09	1.24	1.40	1.55	1.71
2.2	0.310	0.346	0.391	0.441	0.497	0.557	0.620	0.685	0.752	0.821	0.892	1.04	1.19	1.35	1.50	1.66
2.4	0.290	0.324	0.367	0.416	0.469	0.526	0.587	0.650	0.714	0.782	0.851	0.996	1.15	1.30	1.45	1.60
2.6	0.272	0.305	0.346	0.392	0.443	0.498	0.556	0.617	0.681	0.746	0.813	0.953	1.10	1.25	1.40	1.56
2.8	0.256	0.287	0.327	0.371	0.420	0.473	0.529	0.588	0.649	0.712	0.778	0.914	1.06	1.20	1.36	1.51
3.0	0.242	0.272	0.309	0.352	0.399	0.449	0.504	0.561	0.620	0.681	0.745	0.877	1.02	1.16	1.31	1.46

Table H.3 Continued.

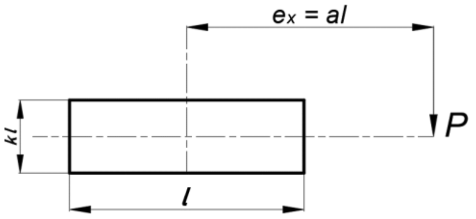
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 0°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.882	0.932	0.982	1.03	1.08	1.13	1.18	1.23	1.28	1.33	1.38	1.48	1.58	1.68	1.78	1.88
0.10	0.685	0.742	0.807	0.879	0.955	1.03	1.10	1.17	1.24	1.30	1.37	1.49	1.60	1.71	1.82	1.92
0.15	0.619	0.673	0.739	0.807	0.881	0.958	1.04	1.11	1.19	1.26	1.33	1.46	1.58	1.70	1.81	1.93
0.20	0.561	0.613	0.677	0.745	0.815	0.891	0.969	1.05	1.12	1.20	1.27	1.41	1.55	1.67	1.80	1.91
0.25	0.511	0.561	0.621	0.688	0.758	0.830	0.906	0.984	1.06	1.14	1.22	1.37	1.51	1.64	1.77	1.89
0.30	0.466	0.514	0.572	0.637	0.706	0.776	0.849	0.926	1.00	1.08	1.16	1.31	1.46	1.60	1.74	1.87
0.40	0.394	0.438	0.491	0.550	0.614	0.682	0.751	0.822	0.897	0.973	1.05	1.21	1.36	1.51	1.65	1.80
0.50	0.340	0.379	0.427	0.481	0.540	0.603	0.669	0.736	0.806	0.878	0.952	1.10	1.26	1.41	1.56	1.71
0.60	0.297	0.332	0.376	0.426	0.480	0.538	0.600	0.664	0.729	0.797	0.867	1.01	1.16	1.32	1.47	1.62
0.70	0.263	0.295	0.336	0.381	0.430	0.484	0.542	0.602	0.664	0.728	0.793	0.932	1.08	1.23	1.38	1.53
0.80	0.236	0.265	0.302	0.344	0.390	0.440	0.493	0.549	0.607	0.668	0.730	0.860	0.999	1.14	1.29	1.44
0.90	0.213	0.240	0.274	0.313	0.356	0.402	0.451	0.504	0.559	0.616	0.674	0.798	0.930	1.07	1.21	1.36
1.0	0.194	0.219	0.251	0.287	0.327	0.370	0.416	0.465	0.516	0.570	0.626	0.743	0.868	1.00	1.14	1.28
1.2	0.165	0.187	0.214	0.246	0.280	0.318	0.359	0.402	0.447	0.495	0.545	0.651	0.764	0.884	1.01	1.14
1.4	0.143	0.162	0.187	0.214	0.245	0.279	0.315	0.353	0.394	0.436	0.482	0.577	0.680	0.789	0.905	1.03
1.6	0.126	0.143	0.165	0.190	0.218	0.248	0.280	0.314	0.351	0.390	0.430	0.518	0.611	0.711	0.817	0.928
1.8	0.113	0.128	0.148	0.171	0.196	0.223	0.252	0.284	0.317	0.352	0.389	0.469	0.554	0.646	0.744	0.846
2.0	0.102	0.116	0.134	0.155	0.178	0.202	0.229	0.258	0.288	0.321	0.354	0.427	0.507	0.592	0.682	0.776
2.2	0.0932	0.106	0.122	0.141	0.162	0.185	0.210	0.236	0.264	0.294	0.326	0.393	0.466	0.545	0.629	0.716
2.4	0.0857	0.0976	0.113	0.130	0.150	0.171	0.194	0.218	0.244	0.272	0.301	0.363	0.431	0.505	0.583	0.664
2.6	0.0793	0.0904	0.104	0.121	0.139	0.159	0.180	0.203	0.227	0.252	0.279	0.338	0.402	0.470	0.543	0.619
2.8	0.0738	0.0841	0.0972	0.112	0.129	0.148	0.168	0.189	0.212	0.236	0.261	0.316	0.375	0.440	0.508	0.579
3.0	0.0690	0.0786	0.0909	0.105	0.121	0.138	0.157	0.177	0.198	0.221	0.245	0.296	0.352	0.413	0.477	0.544

Table H.3 Continued.

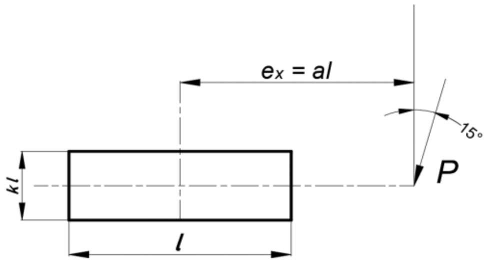
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 15°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			**ASD**		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	***k***															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.867	0.924	0.985	1.05	1.11	1.17	1.23	1.29	1.35	1.41	1.47	1.59	1.72	1.84	1.96	2.08
0.10	0.695	0.754	0.816	0.887	0.962	1.04	1.11	1.19	1.26	1.33	1.40	1.53	1.66	1.79	1.92	2.04
0.15	0.630	0.685	0.747	0.815	0.889	0.966	1.04	1.12	1.20	1.27	1.34	1.48	1.62	1.75	1.88	2.01
0.20	0.572	0.625	0.686	0.754	0.824	0.900	0.978	1.06	1.14	1.21	1.29	1.43	1.57	1.71	1.84	1.97
0.25	0.522	0.572	0.631	0.698	0.768	0.840	0.917	0.995	1.07	1.15	1.23	1.38	1.53	1.67	1.81	1.94
0.30	0.477	0.526	0.582	0.647	0.716	0.786	0.861	0.938	1.02	1.10	1.17	1.33	1.48	1.63	1.77	1.90
0.40	0.405	0.449	0.501	0.561	0.626	0.694	0.764	0.836	0.911	0.988	1.07	1.22	1.38	1.53	1.68	1.83
0.50	0.350	0.389	0.437	0.491	0.552	0.616	0.682	0.750	0.821	0.894	0.969	1.12	1.28	1.43	1.59	1.74
0.60	0.306	0.341	0.386	0.436	0.491	0.550	0.613	0.678	0.744	0.813	0.884	1.03	1.18	1.34	1.49	1.65
0.70	0.271	0.303	0.345	0.391	0.441	0.496	0.554	0.616	0.679	0.744	0.811	0.951	1.10	1.25	1.40	1.55
0.80	0.243	0.273	0.311	0.354	0.400	0.451	0.505	0.563	0.622	0.684	0.747	0.879	1.02	1.16	1.31	1.46
0.90	0.220	0.247	0.282	0.322	0.366	0.413	0.463	0.517	0.573	0.631	0.691	0.817	0.949	1.09	1.23	1.38
1.0	0.201	0.226	0.259	0.296	0.336	0.380	0.427	0.477	0.530	0.585	0.642	0.761	0.887	1.02	1.16	1.30
1.2	0.171	0.193	0.221	0.253	0.289	0.328	0.369	0.413	0.460	0.509	0.561	0.668	0.783	0.904	1.03	1.16
1.4	0.148	0.168	0.192	0.221	0.253	0.287	0.324	0.364	0.405	0.449	0.496	0.593	0.698	0.808	0.921	1.04
1.6	0.131	0.148	0.170	0.196	0.225	0.256	0.289	0.324	0.362	0.402	0.443	0.532	0.628	0.729	0.833	0.942
1.8	0.117	0.133	0.153	0.176	0.202	0.230	0.260	0.293	0.327	0.363	0.401	0.483	0.570	0.663	0.759	0.859
2.0	0.106	0.120	0.138	0.160	0.183	0.209	0.237	0.266	0.298	0.331	0.366	0.440	0.522	0.608	0.696	0.790
2.2	0.0964	0.110	0.126	0.146	0.168	0.191	0.217	0.244	0.273	0.304	0.336	0.405	0.480	0.560	0.643	0.730
2.4	0.0887	0.101	0.116	0.134	0.155	0.177	0.200	0.226	0.252	0.281	0.310	0.375	0.445	0.519	0.596	0.678
2.6	0.0821	0.0934	0.108	0.125	0.143	0.164	0.186	0.209	0.234	0.261	0.289	0.349	0.414	0.483	0.556	0.633
2.8	0.0764	0.0870	0.100	0.116	0.133	0.153	0.173	0.195	0.219	0.243	0.270	0.326	0.387	0.452	0.520	0.592
3.0	0.0714	0.0813	0.0940	0.109	0.125	0.143	0.162	0.183	0.205	0.228	0.253	0.306	0.363	0.424	0.489	0.557

Table H.3 Continued.

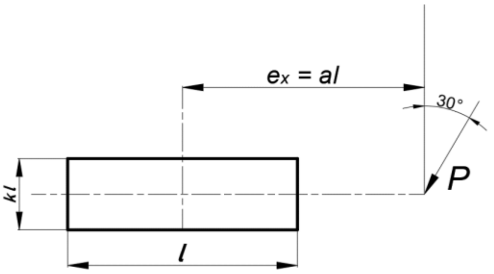
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 30°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2
(1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.825	0.884	0.953	1.02	1.09	1.16	1.23	1.30	1.37	1.44	1.51	1.65	1.78	1.92	2.06	2.20
0.10	0.713	0.782	0.851	0.922	0.996	1.07	1.15	1.23	1.31	1.38	1.46	1.61	1.75	1.90	2.04	2.18
0.15	0.650	0.717	0.785	0.854	0.926	1.00	1.08	1.16	1.24	1.32	1.40	1.56	1.71	1.86	2.01	2.15
0.20	0.598	0.659	0.724	0.792	0.862	0.936	1.02	1.10	1.18	1.26	1.34	1.50	1.66	1.81	1.96	2.11
0.25	0.551	0.608	0.670	0.736	0.805	0.877	0.954	1.03	1.12	1.20	1.28	1.44	1.60	1.76	1.91	2.07
0.30	0.509	0.563	0.622	0.686	0.753	0.825	0.900	0.978	1.06	1.14	1.22	1.38	1.55	1.70	1.86	2.02
0.40	0.437	0.486	0.540	0.600	0.665	0.734	0.806	0.881	0.957	1.04	1.12	1.28	1.44	1.60	1.76	1.92
0.50	0.381	0.424	0.474	0.530	0.591	0.657	0.725	0.797	0.870	0.945	1.02	1.18	1.34	1.50	1.66	1.81
0.60	0.335	0.374	0.420	0.473	0.531	0.592	0.657	0.724	0.794	0.865	0.939	1.09	1.24	1.40	1.55	1.71
0.70	0.298	0.334	0.377	0.425	0.480	0.537	0.599	0.662	0.728	0.796	0.866	1.01	1.16	1.31	1.46	1.61
0.80	0.268	0.301	0.340	0.386	0.437	0.491	0.548	0.608	0.671	0.735	0.802	0.939	1.08	1.22	1.37	1.52
0.90	0.243	0.273	0.310	0.353	0.400	0.451	0.505	0.561	0.620	0.682	0.745	0.876	1.01	1.15	1.29	1.44
1.0	0.222	0.250	0.285	0.325	0.369	0.417	0.467	0.520	0.577	0.635	0.695	0.819	0.946	1.08	1.21	1.36
1.2	0.189	0.213	0.244	0.279	0.318	0.360	0.406	0.453	0.503	0.556	0.610	0.724	0.840	0.960	1.09	1.22
1.4	0.164	0.186	0.213	0.244	0.279	0.317	0.358	0.401	0.445	0.493	0.542	0.646	0.754	0.864	0.979	1.10
1.6	0.145	0.164	0.189	0.217	0.249	0.283	0.319	0.358	0.399	0.442	0.487	0.582	0.682	0.784	0.891	1.00
1.8	0.130	0.147	0.170	0.195	0.223	0.255	0.288	0.324	0.361	0.400	0.441	0.529	0.621	0.716	0.816	0.921
2.0	0.118	0.133	0.154	0.177	0.203	0.232	0.263	0.295	0.329	0.365	0.403	0.484	0.570	0.658	0.752	0.850
2.2	0.107	0.122	0.141	0.162	0.186	0.212	0.241	0.271	0.303	0.336	0.371	0.446	0.526	0.609	0.696	0.788
2.4	0.0988	0.112	0.129	0.149	0.172	0.196	0.222	0.250	0.280	0.311	0.343	0.413	0.488	0.565	0.647	0.734
2.6	0.0914	0.104	0.120	0.139	0.159	0.182	0.206	0.233	0.260	0.289	0.319	0.385	0.455	0.527	0.605	0.687
2.8	0.0851	0.0967	0.112	0.129	0.149	0.170	0.192	0.217	0.243	0.270	0.299	0.360	0.425	0.494	0.567	0.645
3.0	0.0795	0.0905	0.104	0.121	0.139	0.159	0.181	0.203	0.228	0.253	0.280	0.338	0.400	0.465	0.534	0.607

Table H.3 Continued.

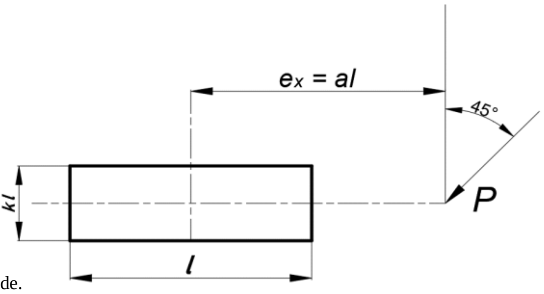
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 45°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.763	0.814	0.889	0.963	1.04	1.11	1.18	1.26	1.33	1.41	1.48	1.63	1.78	1.93	2.07	2.22
0.10	0.711	0.790	0.868	0.945	1.02	1.10	1.18	1.25	1.33	1.41	1.49	1.64	1.80	1.95	2.11	2.26
0.15	0.663	0.744	0.823	0.900	0.977	1.05	1.13	1.21	1.29	1.37	1.45	1.61	1.76	1.92	2.08	2.24
0.20	0.622	0.697	0.773	0.850	0.927	1.00	1.08	1.16	1.24	1.32	1.40	1.56	1.72	1.88	2.04	2.20
0.25	0.587	0.656	0.728	0.801	0.876	0.953	1.03	1.11	1.19	1.27	1.35	1.51	1.67	1.83	2.00	2.16
0.30	0.554	0.617	0.685	0.756	0.829	0.904	0.980	1.06	1.14	1.22	1.30	1.46	1.62	1.78	1.95	2.11
0.40	0.492	0.548	0.609	0.675	0.744	0.815	0.888	0.964	1.04	1.12	1.20	1.36	1.52	1.68	1.84	2.01
0.50	0.438	0.488	0.544	0.605	0.670	0.739	0.809	0.882	0.957	1.03	1.11	1.26	1.42	1.58	1.74	1.91
0.60	0.391	0.437	0.489	0.546	0.608	0.673	0.741	0.812	0.885	0.959	1.03	1.18	1.33	1.49	1.64	1.81
0.70	0.352	0.394	0.442	0.496	0.554	0.616	0.682	0.751	0.820	0.892	0.965	1.10	1.25	1.40	1.56	1.71
0.80	0.319	0.358	0.402	0.453	0.508	0.568	0.631	0.696	0.764	0.832	0.902	1.04	1.18	1.32	1.47	1.63
0.90	0.291	0.327	0.369	0.416	0.469	0.526	0.585	0.648	0.713	0.778	0.846	0.977	1.11	1.25	1.40	1.55
1.0	0.267	0.300	0.340	0.384	0.435	0.488	0.546	0.606	0.667	0.730	0.794	0.921	1.05	1.19	1.33	1.48
1.2	0.229	0.258	0.292	0.333	0.378	0.427	0.479	0.533	0.590	0.648	0.707	0.825	0.948	1.07	1.21	1.34
1.4	0.199	0.225	0.257	0.293	0.334	0.378	0.426	0.475	0.527	0.580	0.635	0.745	0.859	0.978	1.10	1.23
1.6	0.177	0.200	0.228	0.262	0.299	0.339	0.382	0.427	0.475	0.524	0.574	0.677	0.784	0.896	1.01	1.13
1.8	0.158	0.179	0.205	0.236	0.269	0.307	0.346	0.388	0.431	0.477	0.524	0.619	0.720	0.825	0.935	1.05
2.0	0.143	0.162	0.186	0.215	0.246	0.280	0.316	0.355	0.395	0.437	0.481	0.570	0.664	0.763	0.867	0.976
2.2	0.131	0.148	0.171	0.196	0.226	0.257	0.291	0.326	0.364	0.403	0.443	0.527	0.616	0.709	0.807	0.910
2.4	0.121	0.137	0.158	0.181	0.208	0.238	0.269	0.303	0.337	0.374	0.412	0.491	0.574	0.662	0.755	0.853
2.6	0.112	0.127	0.146	0.168	0.194	0.221	0.250	0.282	0.314	0.348	0.384	0.458	0.537	0.620	0.709	0.801
2.8	0.104	0.118	0.136	0.157	0.180	0.206	0.234	0.263	0.294	0.326	0.360	0.429	0.504	0.583	0.667	0.755
3.0	0.0972	0.110	0.128	0.147	0.169	0.193	0.219	0.247	0.276	0.306	0.338	0.404	0.475	0.550	0.630	0.714

Table H.3 Continued.

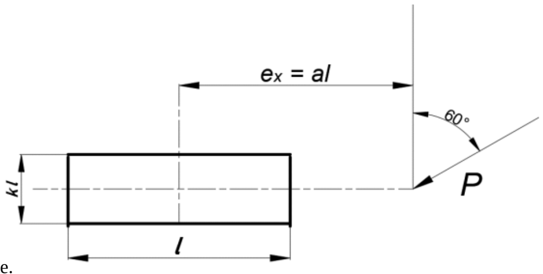
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 60°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			**ASD**		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	***k***															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.692	0.774	0.855	0.937	1.02	1.10	1.18	1.26	1.34	1.43	1.51	1.67	1.83	2.00	2.16	2.32
0.10	0.674	0.758	0.841	0.922	1.00	1.09	1.17	1.25	1.33	1.41	1.49	1.66	1.82	1.99	2.15	2.32
0.15	0.654	0.740	0.823	0.905	0.986	1.07	1.15	1.23	1.31	1.39	1.47	1.63	1.80	1.96	2.13	2.29
0.20	0.630	0.715	0.799	0.882	0.963	1.04	1.12	1.20	1.28	1.36	1.44	1.60	1.77	1.93	2.09	2.26
0.25	0.612	0.691	0.773	0.854	0.935	1.01	1.09	1.17	1.25	1.33	1.41	1.57	1.73	1.89	2.06	2.22
0.30	0.594	0.670	0.748	0.828	0.907	0.984	1.06	1.14	1.22	1.30	1.37	1.53	1.69	1.85	2.02	2.18
0.40	0.557	0.626	0.699	0.773	0.850	0.926	1.00	1.08	1.15	1.23	1.30	1.46	1.62	1.78	1.94	2.10
0.50	0.518	0.582	0.649	0.720	0.793	0.867	0.942	1.02	1.09	1.16	1.23	1.38	1.54	1.70	1.86	2.02
0.60	0.481	0.539	0.602	0.669	0.739	0.811	0.884	0.957	1.03	1.10	1.17	1.32	1.47	1.62	1.78	1.94
0.70	0.445	0.499	0.558	0.621	0.688	0.758	0.829	0.901	0.971	1.04	1.11	1.26	1.40	1.55	1.71	1.87
0.80	0.411	0.462	0.517	0.578	0.642	0.709	0.778	0.849	0.918	0.987	1.06	1.20	1.34	1.49	1.64	1.79
0.90	0.381	0.429	0.481	0.538	0.600	0.665	0.732	0.800	0.869	0.936	1.00	1.14	1.28	1.43	1.58	1.73
1.0	0.355	0.399	0.449	0.503	0.562	0.625	0.690	0.757	0.824	0.890	0.956	1.09	1.23	1.37	1.52	1.67
1.2	0.309	0.349	0.393	0.443	0.497	0.556	0.617	0.680	0.745	0.808	0.871	1.00	1.13	1.27	1.41	1.56
1.4	0.273	0.308	0.349	0.394	0.445	0.499	0.556	0.616	0.677	0.736	0.797	0.921	1.05	1.18	1.32	1.46
1.6	0.243	0.275	0.312	0.354	0.401	0.452	0.506	0.562	0.619	0.675	0.733	0.850	0.973	1.10	1.23	1.37
1.8	0.219	0.248	0.282	0.322	0.365	0.413	0.464	0.516	0.569	0.622	0.676	0.788	0.906	1.03	1.15	1.29
2.0	0.200	0.226	0.257	0.294	0.335	0.379	0.427	0.476	0.526	0.576	0.628	0.734	0.846	0.962	1.08	1.21
2.2	0.183	0.207	0.236	0.270	0.309	0.351	0.395	0.442	0.489	0.536	0.585	0.686	0.792	0.904	1.02	1.14
2.4	0.169	0.191	0.218	0.251	0.287	0.326	0.367	0.411	0.456	0.500	0.547	0.643	0.745	0.852	0.964	1.08
2.6	0.156	0.177	0.203	0.233	0.267	0.304	0.343	0.385	0.427	0.469	0.512	0.605	0.702	0.804	0.912	1.02
2.8	0.146	0.165	0.189	0.218	0.250	0.285	0.322	0.361	0.401	0.441	0.483	0.571	0.663	0.762	0.865	0.973
3.0	0.136	0.155	0.178	0.205	0.235	0.268	0.303	0.340	0.378	0.416	0.456	0.540	0.628	0.723	0.822	0.926

Table H.3 Continued.

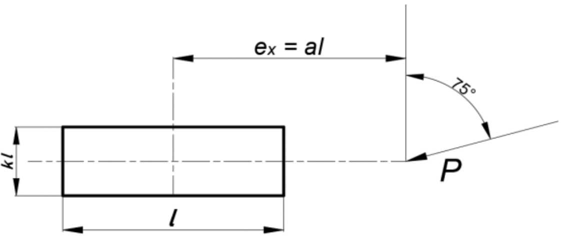
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 75°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			**ASD**		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	***k***															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.627	0.696	0.782	0.869	0.955	1.04	1.13	1.21	1.30	1.39	1.47	1.65	1.82	1.99	2.16	2.34
0.10	0.604	0.690	0.776	0.863	0.949	1.03	1.12	1.21	1.29	1.38	1.47	1.64	1.81	1.98	2.16	2.33
0.15	0.609	0.684	0.771	0.857	0.943	1.03	1.11	1.20	1.29	1.37	1.46	1.63	1.80	1.97	2.14	2.32
0.20	0.607	0.676	0.763	0.849	0.935	1.02	1.11	1.19	1.28	1.36	1.45	1.62	1.79	1.96	2.13	2.30
0.25	0.606	0.671	0.754	0.840	0.926	1.01	1.10	1.18	1.27	1.35	1.43	1.60	1.77	1.94	2.11	2.28
0.30	0.604	0.670	0.750	0.831	0.915	0.999	1.08	1.17	1.25	1.34	1.42	1.59	1.76	1.93	2.09	2.26
0.40	0.599	0.669	0.744	0.821	0.900	0.981	1.06	1.14	1.22	1.31	1.39	1.56	1.72	1.89	2.05	2.22
0.50	0.590	0.662	0.735	0.810	0.887	0.964	1.04	1.12	1.20	1.28	1.36	1.52	1.68	1.85	2.01	2.18
0.60	0.579	0.650	0.723	0.796	0.871	0.945	1.02	1.10	1.18	1.25	1.33	1.49	1.65	1.81	1.97	2.13
0.70	0.564	0.635	0.706	0.779	0.851	0.925	0.999	1.07	1.15	1.23	1.30	1.46	1.61	1.77	1.93	2.09
0.80	0.549	0.617	0.688	0.758	0.831	0.902	0.975	1.05	1.12	1.20	1.27	1.42	1.58	1.74	1.89	2.05
0.90	0.532	0.597	0.667	0.738	0.807	0.879	0.950	1.02	1.09	1.17	1.24	1.39	1.54	1.70	1.86	2.01
1.0	0.514	0.578	0.645	0.715	0.784	0.853	0.924	0.994	1.07	1.14	1.21	1.36	1.51	1.66	1.82	1.98
1.2	0.477	0.537	0.601	0.667	0.736	0.803	0.871	0.940	1.01	1.08	1.15	1.30	1.44	1.59	1.75	1.90
1.4	0.441	0.498	0.558	0.622	0.688	0.754	0.820	0.887	0.954	1.02	1.09	1.23	1.38	1.53	1.68	1.83
1.6	0.408	0.460	0.518	0.579	0.643	0.708	0.772	0.837	0.902	0.969	1.04	1.18	1.32	1.46	1.61	1.76
1.8	0.378	0.427	0.481	0.539	0.601	0.664	0.726	0.790	0.854	0.919	0.985	1.12	1.26	1.40	1.55	1.70
2.0	0.351	0.397	0.447	0.503	0.562	0.624	0.685	0.746	0.809	0.873	0.937	1.07	1.21	1.35	1.49	1.64
2.2	0.327	0.370	0.418	0.470	0.527	0.587	0.647	0.706	0.767	0.829	0.892	1.02	1.16	1.30	1.44	1.58
2.4	0.305	0.346	0.391	0.441	0.496	0.553	0.612	0.670	0.729	0.790	0.851	0.978	1.11	1.25	1.39	1.53
2.6	0.286	0.324	0.367	0.415	0.467	0.523	0.580	0.636	0.694	0.753	0.813	0.937	1.07	1.20	1.34	1.48
2.8	0.268	0.304	0.345	0.391	0.441	0.495	0.551	0.606	0.662	0.719	0.778	0.899	1.02	1.16	1.29	1.43
3.0	0.253	0.287	0.326	0.370	0.418	0.470	0.524	0.578	0.632	0.688	0.745	0.863	0.986	1.11	1.25	1.38

Table H.3 Continued.

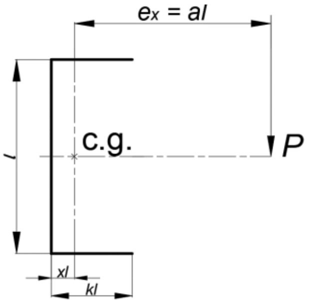
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 0°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	***k***															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.294	0.353	0.426	0.515	0.603	0.691	0.779	0.867	0.956	1.04	1.13	1.31	1.48	1.66	1.84	2.01
0.10	0.294	0.362	0.441	0.524	0.608	0.693	0.779	0.866	0.952	1.04	1.13	1.30	1.48	1.65	1.83	2.00
0.15	0.290	0.358	0.433	0.513	0.594	0.677	0.761	0.845	0.930	1.02	1.10	1.27	1.44	1.62	1.79	1.96
0.20	0.279	0.346	0.418	0.494	0.572	0.651	0.732	0.813	0.894	0.976	1.06	1.22	1.39	1.56	1.73	1.89
0.25	0.263	0.328	0.397	0.469	0.543	0.619	0.695	0.773	0.851	0.930	1.01	1.17	1.33	1.49	1.66	1.82
0.30	0.246	0.309	0.374	0.442	0.512	0.584	0.656	0.730	0.805	0.881	0.957	1.11	1.27	1.43	1.59	1.75
0.40	0.212	0.268	0.327	0.388	0.450	0.514	0.579	0.646	0.715	0.784	0.855	0.999	1.15	1.30	1.45	1.61
0.50	0.183	0.232	0.285	0.339	0.395	0.452	0.511	0.572	0.634	0.698	0.764	0.900	1.04	1.18	1.33	1.48
0.60	0.159	0.202	0.249	0.298	0.348	0.399	0.453	0.508	0.566	0.625	0.686	0.813	0.946	1.08	1.23	1.37
0.70	0.140	0.178	0.219	0.264	0.309	0.356	0.405	0.455	0.508	0.563	0.620	0.740	0.866	0.998	1.13	1.27
0.80	0.124	0.158	0.196	0.235	0.277	0.320	0.365	0.411	0.460	0.511	0.565	0.677	0.797	0.922	1.05	1.19
0.90	0.112	0.142	0.176	0.212	0.250	0.290	0.331	0.374	0.420	0.467	0.517	0.623	0.737	0.856	0.981	1.11
1.0	0.102	0.129	0.160	0.193	0.228	0.265	0.303	0.343	0.385	0.430	0.477	0.577	0.684	0.797	0.916	1.04
1.2	0.0855	0.109	0.134	0.163	0.193	0.225	0.258	0.293	0.331	0.370	0.411	0.500	0.595	0.697	0.805	0.918
1.4	0.0738	0.0938	0.116	0.140	0.167	0.195	0.225	0.256	0.289	0.324	0.361	0.439	0.525	0.617	0.714	0.818
1.6	0.0648	0.0823	0.102	0.123	0.147	0.172	0.199	0.226	0.256	0.287	0.320	0.391	0.468	0.552	0.641	0.735
1.8	0.0578	0.0733	0.0907	0.110	0.131	0.154	0.178	0.203	0.230	0.258	0.288	0.352	0.422	0.498	0.580	0.667
2.0	0.0521	0.0661	0.0817	0.0991	0.118	0.139	0.161	0.184	0.208	0.234	0.261	0.320	0.384	0.454	0.529	0.610
2.2	0.0474	0.0601	0.0744	0.0903	0.108	0.127	0.147	0.168	0.190	0.214	0.239	0.292	0.352	0.417	0.486	0.562
2.4	0.0435	0.0552	0.0682	0.0828	0.0990	0.117	0.135	0.155	0.175	0.197	0.220	0.270	0.325	0.385	0.450	0.520
2.6	0.0402	0.0509	0.0630	0.0765	0.0915	0.108	0.125	0.143	0.162	0.182	0.204	0.250	0.301	0.357	0.418	0.484
2.8	0.0373	0.0473	0.0586	0.0711	0.0851	0.100	0.116	0.133	0.151	0.170	0.190	0.233	0.281	0.333	0.391	0.453
3.0	0.0349	0.0442	0.0547	0.0664	0.0795	0.0938	0.109	0.124	0.141	0.159	0.177	0.218	0.263	0.312	0.366	0.425
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 15°

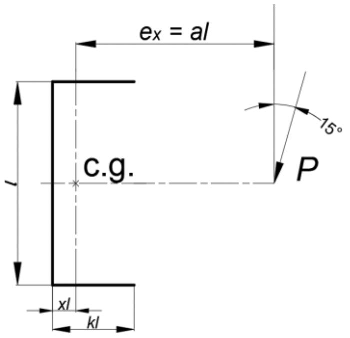
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.



a	*k*															
	0.0	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.0	0.313	0.391	0.478	0.564	0.650	0.736	0.823	0.909	0.995	1.08	1.17	1.34	1.51	1.69	1.86	2.03
0.00	0.300	0.373	0.455	0.540	0.627	0.714	0.801	0.887	0.974	1.06	1.15	1.32	1.49	1.67	1.84	2.01
0.15	0.292	0.365	0.443	0.523	0.604	0.687	0.770	0.854	0.938	1.02	1.11	1.28	1.45	1.62	1.79	1.96
0.20	0.279	0.350	0.425	0.501	0.579	0.658	0.738	0.818	0.899	0.980	1.06	1.22	1.39	1.55	1.72	1.89
0.25	0.263	0.331	0.403	0.476	0.550	0.625	0.701	0.778	0.856	0.934	1.01	1.17	1.33	1.49	1.65	1.82
0.30	0.246	0.310	0.378	0.448	0.518	0.590	0.663	0.736	0.810	0.885	0.961	1.11	1.27	1.43	1.59	1.75
0.40	0.213	0.269	0.329	0.392	0.456	0.521	0.587	0.654	0.722	0.791	0.862	1.01	1.15	1.30	1.46	1.61
0.50	0.185	0.233	0.286	0.343	0.400	0.459	0.518	0.580	0.643	0.707	0.773	0.909	1.05	1.19	1.34	1.49
0.60	0.161	0.204	0.251	0.301	0.353	0.406	0.461	0.517	0.575	0.635	0.697	0.824	0.958	1.10	1.24	1.38
0.70	0.142	0.180	0.222	0.266	0.314	0.363	0.413	0.464	0.518	0.574	0.632	0.752	0.879	1.01	1.15	1.29
0.80	0.127	0.161	0.198	0.239	0.281	0.327	0.373	0.420	0.470	0.522	0.576	0.690	0.811	0.938	1.07	1.21
0.90	0.114	0.145	0.179	0.215	0.255	0.296	0.339	0.383	0.430	0.478	0.529	0.637	0.751	0.872	0.998	1.13
1.0	0.104	0.132	0.163	0.196	0.232	0.271	0.310	0.352	0.395	0.441	0.489	0.590	0.698	0.813	0.933	1.06
1.2	0.0877	0.111	0.137	0.166	0.197	0.230	0.265	0.301	0.340	0.380	0.422	0.513	0.609	0.713	0.822	0.936
1.4	0.0758	0.0961	0.119	0.143	0.171	0.200	0.231	0.263	0.297	0.333	0.371	0.451	0.538	0.632	0.731	0.836
1.6	0.0667	0.0845	0.104	0.126	0.150	0.177	0.205	0.233	0.264	0.296	0.330	0.402	0.481	0.566	0.657	0.754
1.8	0.0595	0.0754	0.0931	0.113	0.134	0.158	0.183	0.209	0.237	0.266	0.296	0.362	0.434	0.512	0.596	0.685
2.0	0.0537	0.0680	0.0840	0.102	0.121	0.143	0.166	0.190	0.215	0.241	0.269	0.329	0.395	0.467	0.544	0.627
2.2	0.0489	0.0619	0.0765	0.0927	0.111	0.131	0.152	0.173	0.196	0.221	0.246	0.302	0.363	0.429	0.501	0.578
2.4	0.0449	0.0568	0.0702	0.0852	0.102	0.120	0.139	0.160	0.181	0.203	0.227	0.278	0.335	0.396	0.463	0.535
2.6	0.0415	0.0525	0.0649	0.0787	0.0942	0.111	0.129	0.148	0.167	0.188	0.210	0.258	0.311	0.368	0.431	0.499
2.8	0.0385	0.0488	0.0603	0.0731	0.0876	0.103	0.120	0.138	0.156	0.175	0.196	0.241	0.290	0.344	0.403	0.466
3.0	0.0360	0.0456	0.0563	0.0683	0.0819	0.0966	0.112	0.129	0.146	0.164	0.183	0.225	0.272	0.322	0.378	0.438
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 30°

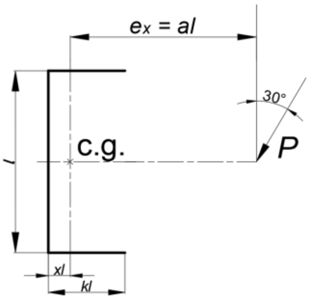
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with

$$R_n = C \cdot C_1 \cdot t_e \cdot l \ \ (\phi = 0.75, \Omega = 2.00)$$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.346	0.428	0.509	0.591	0.672	0.753	0.835	0.916	0.998	1.08	1.16	1.32	1.49	1.65	1.81	1.97
0.10	0.321	0.407	0.491	0.574	0.657	0.739	0.822	0.905	0.987	1.07	1.15	1.32	1.48	1.65	1.82	1.98
0.15	0.304	0.385	0.467	0.550	0.631	0.712	0.793	0.874	0.955	1.04	1.12	1.28	1.45	1.61	1.78	1.94
0.20	0.289	0.363	0.442	0.521	0.600	0.678	0.757	0.835	0.915	0.994	1.07	1.23	1.40	1.56	1.72	1.89
0.25	0.272	0.342	0.416	0.492	0.567	0.643	0.719	0.794	0.870	0.947	1.02	1.18	1.34	1.50	1.66	1.83
0.30	0.255	0.320	0.389	0.462	0.534	0.608	0.680	0.754	0.827	0.901	0.976	1.13	1.28	1.44	1.60	1.77
0.40	0.224	0.280	0.341	0.405	0.471	0.539	0.607	0.675	0.744	0.814	0.884	1.03	1.18	1.33	1.48	1.64
0.50	0.196	0.245	0.299	0.356	0.416	0.478	0.541	0.605	0.669	0.735	0.802	0.939	1.08	1.23	1.38	1.53
0.60	0.172	0.216	0.264	0.315	0.370	0.426	0.485	0.544	0.605	0.666	0.729	0.860	0.996	1.14	1.28	1.43
0.70	0.153	0.193	0.236	0.282	0.331	0.383	0.437	0.493	0.549	0.607	0.667	0.791	0.922	1.06	1.20	1.34
0.80	0.137	0.173	0.212	0.254	0.299	0.347	0.397	0.449	0.502	0.557	0.613	0.732	0.857	0.987	1.12	1.26
0.90	0.124	0.157	0.192	0.231	0.272	0.316	0.363	0.412	0.461	0.513	0.567	0.679	0.798	0.922	1.05	1.19
1.0	0.114	0.143	0.176	0.211	0.249	0.290	0.334	0.380	0.426	0.475	0.526	0.632	0.745	0.864	0.988	1.12
1.2	0.0963	0.122	0.149	0.180	0.213	0.249	0.287	0.328	0.369	0.413	0.458	0.553	0.656	0.764	0.878	0.997
1.4	0.0835	0.105	0.130	0.156	0.185	0.217	0.251	0.288	0.325	0.364	0.404	0.490	0.583	0.682	0.787	0.898
1.6	0.0736	0.0930	0.114	0.138	0.164	0.193	0.224	0.256	0.289	0.324	0.361	0.439	0.524	0.615	0.712	0.815
1.8	0.0658	0.0831	0.102	0.124	0.147	0.173	0.201	0.230	0.260	0.292	0.326	0.397	0.475	0.558	0.648	0.744
2.0	0.0594	0.0751	0.0925	0.112	0.133	0.157	0.183	0.209	0.237	0.266	0.296	0.362	0.433	0.511	0.595	0.684
2.2	0.0542	0.0684	0.0844	0.102	0.122	0.144	0.167	0.191	0.217	0.243	0.272	0.332	0.399	0.471	0.549	0.632
2.4	0.0497	0.0629	0.0775	0.0939	0.112	0.132	0.154	0.176	0.200	0.225	0.251	0.307	0.369	0.436	0.509	0.587
2.6	0.0460	0.0581	0.0717	0.0869	0.104	0.123	0.143	0.164	0.185	0.208	0.233	0.285	0.343	0.406	0.474	0.548
2.8	0.0428	0.0541	0.0667	0.0809	0.0967	0.114	0.133	0.152	0.173	0.194	0.217	0.266	0.320	0.379	0.444	0.513
3.0	0.0400	0.0505	0.0624	0.0757	0.0905	0.107	0.125	0.143	0.162	0.182	0.203	0.249	0.300	0.356	0.417	0.483
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

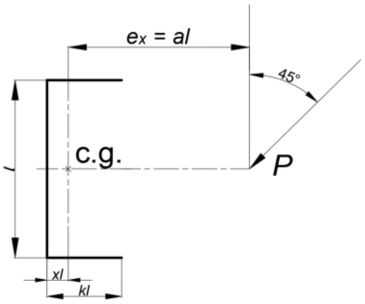
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 45°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min}=\frac{P_u}{\phi C_1 t_e l}$	$t_{min}=\frac{P_u}{\phi C C_1 l}$	$l_{min}=\frac{P_u}{\phi C C_1 t_e}$	$C_{min}=\frac{\Omega P_a}{C_1 t_e l}$	$t_{min}=\frac{\Omega P_a}{C C_1 l}$	$l_{min}=\frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2
(1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.381	0.444	0.518	0.592	0.666	0.740	0.814	0.889	0.963	1.04	1.11	1.26	1.41	1.55	1.70	1.85
0.10	0.356	0.435	0.513	0.592	0.671	0.749	0.828	0.906	0.984	1.06	1.14	1.30	1.45	1.61	1.76	1.91
0.15	0.331	0.412	0.490	0.567	0.645	0.724	0.802	0.881	0.960	1.04	1.12	1.27	1.43	1.59	1.74	1.90
0.20	0.311	0.387	0.463	0.539	0.615	0.693	0.770	0.849	0.928	1.01	1.08	1.24	1.40	1.56	1.71	1.87
0.25	0.294	0.364	0.436	0.509	0.584	0.659	0.736	0.813	0.891	0.968	1.05	1.20	1.36	1.52	1.68	1.84
0.30	0.277	0.342	0.411	0.481	0.553	0.626	0.701	0.776	0.853	0.929	1.01	1.16	1.32	1.48	1.64	1.80
0.40	0.246	0.303	0.365	0.429	0.495	0.563	0.633	0.705	0.778	0.851	0.924	1.07	1.23	1.39	1.55	1.71
0.50	0.219	0.270	0.326	0.384	0.445	0.508	0.574	0.642	0.711	0.782	0.852	0.994	1.14	1.30	1.46	1.62
0.60	0.196	0.242	0.293	0.346	0.402	0.461	0.523	0.587	0.653	0.721	0.787	0.925	1.07	1.22	1.37	1.53
0.70	0.176	0.219	0.265	0.314	0.366	0.421	0.479	0.539	0.602	0.667	0.731	0.862	0.999	1.14	1.29	1.45
0.80	0.159	0.198	0.241	0.286	0.334	0.386	0.440	0.497	0.557	0.619	0.681	0.806	0.937	1.08	1.22	1.37
0.90	0.145	0.181	0.220	0.262	0.308	0.356	0.407	0.461	0.518	0.577	0.635	0.756	0.882	1.01	1.15	1.30
1.0	0.133	0.167	0.203	0.242	0.284	0.330	0.378	0.429	0.484	0.540	0.595	0.710	0.831	0.959	1.09	1.23
1.2	0.114	0.143	0.175	0.209	0.246	0.287	0.330	0.377	0.426	0.476	0.526	0.631	0.743	0.862	0.986	1.12
1.4	0.0997	0.125	0.153	0.183	0.217	0.253	0.293	0.335	0.379	0.424	0.469	0.566	0.669	0.780	0.896	1.02
1.6	0.0883	0.111	0.136	0.163	0.193	0.226	0.262	0.300	0.341	0.381	0.423	0.512	0.608	0.710	0.819	0.933
1.8	0.0792	0.0995	0.122	0.147	0.174	0.205	0.237	0.272	0.309	0.346	0.385	0.466	0.555	0.651	0.753	0.860
2.0	0.0717	0.0902	0.111	0.133	0.159	0.187	0.216	0.249	0.282	0.316	0.352	0.428	0.511	0.600	0.695	0.797
2.2	0.0655	0.0824	0.101	0.122	0.145	0.171	0.199	0.229	0.259	0.291	0.324	0.395	0.472	0.556	0.646	0.741
2.4	0.0603	0.0759	0.0933	0.113	0.134	0.158	0.184	0.212	0.240	0.269	0.300	0.366	0.439	0.517	0.602	0.692
2.6	0.0558	0.0703	0.0865	0.105	0.125	0.147	0.171	0.197	0.223	0.250	0.279	0.341	0.409	0.483	0.563	0.649
2.8	0.0520	0.0654	0.0805	0.0974	0.116	0.137	0.160	0.184	0.208	0.234	0.261	0.319	0.384	0.454	0.529	0.610
3.0	0.0486	0.0612	0.0754	0.0912	0.109	0.128	0.150	0.172	0.195	0.219	0.245	0.300	0.361	0.427	0.499	0.575
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

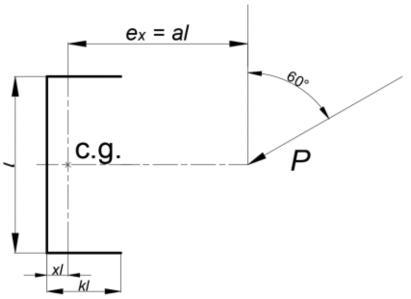
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 60°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.412	0.476	0.546	0.615	0.684	0.753	0.823	0.892	0.961	1.03	1.10	1.24	1.38	1.52	1.65	1.79
0.10	0.386	0.454	0.524	0.595	0.668	0.742	0.816	0.889	0.963	1.04	1.11	1.25	1.39	1.53	1.67	1.81
0.15	0.366	0.434	0.503	0.574	0.646	0.720	0.795	0.871	0.946	1.02	1.09	1.24	1.38	1.53	1.67	1.81
0.20	0.346	0.414	0.482	0.551	0.623	0.697	0.772	0.848	0.924	1.00	1.08	1.23	1.37	1.52	1.66	1.80
0.25	0.328	0.395	0.462	0.529	0.599	0.672	0.746	0.823	0.900	0.977	1.05	1.21	1.36	1.50	1.65	1.79
0.30	0.312	0.377	0.441	0.508	0.576	0.647	0.721	0.796	0.874	0.951	1.03	1.18	1.34	1.48	1.63	1.78
0.40	0.284	0.343	0.404	0.467	0.532	0.599	0.670	0.744	0.821	0.898	0.976	1.13	1.29	1.44	1.59	1.74
0.50	0.259	0.314	0.371	0.430	0.492	0.556	0.624	0.695	0.769	0.846	0.923	1.08	1.24	1.39	1.54	1.69
0.60	0.237	0.288	0.342	0.398	0.456	0.518	0.583	0.651	0.723	0.797	0.873	1.03	1.18	1.34	1.49	1.64
0.70	0.217	0.265	0.316	0.369	0.425	0.484	0.546	0.612	0.681	0.753	0.827	0.977	1.13	1.28	1.43	1.58
0.80	0.201	0.245	0.293	0.343	0.396	0.453	0.513	0.577	0.643	0.712	0.783	0.929	1.08	1.23	1.38	1.53
0.90	0.186	0.227	0.272	0.320	0.371	0.425	0.483	0.544	0.608	0.674	0.743	0.883	1.03	1.17	1.32	1.48
1.0	0.172	0.212	0.254	0.300	0.348	0.400	0.456	0.515	0.576	0.640	0.706	0.840	0.980	1.12	1.27	1.42
1.2	0.150	0.186	0.224	0.265	0.310	0.357	0.409	0.463	0.521	0.579	0.641	0.765	0.896	1.03	1.18	1.32
1.4	0.133	0.165	0.199	0.237	0.278	0.322	0.370	0.420	0.473	0.528	0.584	0.701	0.823	0.954	1.09	1.23
1.6	0.119	0.148	0.179	0.214	0.251	0.293	0.337	0.384	0.433	0.484	0.537	0.646	0.761	0.883	1.01	1.15
1.8	0.107	0.134	0.163	0.194	0.229	0.268	0.308	0.352	0.398	0.446	0.495	0.597	0.706	0.821	0.944	1.07
2.0	0.0979	0.122	0.149	0.178	0.211	0.246	0.284	0.325	0.368	0.413	0.460	0.555	0.657	0.767	0.883	1.01
2.2	0.0899	0.112	0.137	0.164	0.195	0.228	0.264	0.302	0.342	0.384	0.427	0.517	0.615	0.718	0.828	0.946
2.4	0.0830	0.104	0.127	0.152	0.181	0.212	0.246	0.281	0.319	0.358	0.399	0.484	0.576	0.675	0.780	0.891
2.6	0.0771	0.0965	0.118	0.142	0.169	0.198	0.230	0.263	0.299	0.336	0.374	0.455	0.542	0.636	0.736	0.843
2.8	0.0719	0.0901	0.110	0.133	0.158	0.185	0.216	0.247	0.281	0.316	0.351	0.428	0.512	0.601	0.697	0.799
3.0	0.0674	0.0845	0.104	0.125	0.149	0.175	0.203	0.233	0.265	0.298	0.332	0.405	0.484	0.570	0.661	0.759
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

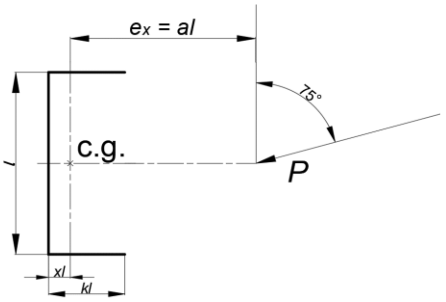
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 75°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			**ASD**		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.434	0.492	0.553	0.614	0.675	0.736	0.797	0.858	0.919	0.980	1.04	1.16	1.29	1.41	1.53	1.65
0.10	0.410	0.469	0.530	0.595	0.661	0.726	0.792	0.856	0.920	0.983	1.04	1.17	1.29	1.41	1.54	1.66
0.15	0.397	0.455	0.517	0.582	0.649	0.716	0.783	0.849	0.914	0.978	1.04	1.17	1.29	1.41	1.53	1.66
0.20	0.385	0.443	0.504	0.569	0.636	0.704	0.772	0.840	0.906	0.971	1.04	1.16	1.29	1.41	1.53	1.66
0.25	0.373	0.431	0.492	0.556	0.624	0.692	0.761	0.830	0.897	0.964	1.03	1.16	1.28	1.41	1.53	1.65
0.30	0.362	0.420	0.480	0.544	0.611	0.680	0.749	0.819	0.887	0.954	1.02	1.15	1.28	1.40	1.53	1.65
0.40	0.343	0.400	0.458	0.520	0.586	0.655	0.725	0.795	0.865	0.933	1.00	1.13	1.26	1.39	1.52	1.64
0.50	0.325	0.381	0.437	0.497	0.562	0.630	0.700	0.771	0.842	0.912	0.981	1.12	1.25	1.38	1.50	1.63
0.60	0.308	0.362	0.418	0.476	0.539	0.606	0.676	0.748	0.819	0.890	0.961	1.10	1.23	1.36	1.49	1.61
0.70	0.293	0.346	0.400	0.457	0.518	0.584	0.653	0.724	0.796	0.868	0.940	1.08	1.22	1.35	1.48	1.60
0.80	0.278	0.330	0.383	0.439	0.499	0.563	0.631	0.701	0.773	0.846	0.918	1.06	1.20	1.33	1.47	1.59
0.90	0.265	0.315	0.367	0.422	0.480	0.543	0.610	0.679	0.751	0.823	0.896	1.04	1.18	1.32	1.45	1.58
1.0	0.253	0.301	0.352	0.405	0.463	0.524	0.589	0.658	0.729	0.800	0.874	1.02	1.16	1.30	1.44	1.57
1.2	0.230	0.276	0.324	0.376	0.431	0.489	0.551	0.617	0.686	0.757	0.829	0.975	1.12	1.26	1.40	1.54
1.4	0.211	0.254	0.300	0.349	0.402	0.458	0.517	0.581	0.646	0.716	0.786	0.931	1.08	1.22	1.37	1.51
1.6	0.194	0.235	0.278	0.325	0.376	0.430	0.486	0.547	0.611	0.677	0.746	0.889	1.03	1.18	1.33	1.47
1.8	0.179	0.218	0.259	0.304	0.352	0.404	0.458	0.516	0.578	0.642	0.709	0.848	0.991	1.14	1.28	1.43
2.0	0.166	0.203	0.242	0.285	0.331	0.381	0.433	0.489	0.547	0.609	0.674	0.809	0.950	1.09	1.24	1.38
2.2	0.155	0.190	0.227	0.268	0.312	0.360	0.410	0.463	0.520	0.579	0.641	0.772	0.910	1.05	1.19	1.34
2.4	0.145	0.178	0.214	0.252	0.295	0.341	0.389	0.440	0.494	0.551	0.611	0.738	0.872	1.01	1.15	1.29
2.6	0.136	0.167	0.201	0.239	0.280	0.324	0.370	0.419	0.471	0.526	0.584	0.707	0.835	0.968	1.11	1.25
2.8	0.128	0.158	0.190	0.226	0.265	0.308	0.352	0.400	0.450	0.503	0.558	0.677	0.801	0.930	1.07	1.21
3.0	0.121	0.149	0.181	0.215	0.252	0.293	0.336	0.382	0.430	0.481	0.534	0.649	0.768	0.895	1.03	1.16
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 0°

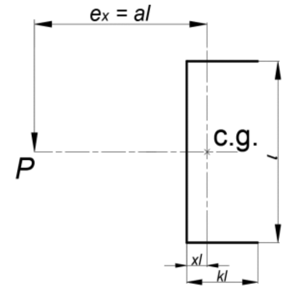
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with

$$R_n = C \cdot C_1 \cdot t_e \cdot l \ \ (\phi = 0.75, \Omega = 2.00)$$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2
(1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.294	0.353	0.426	0.515	0.603	0.691	0.779	0.867	0.956	1.04	1.13	1.31	1.48	1.66	1.84	2.01
0.10	0.294	0.365	0.444	0.524	0.605	0.686	0.766	0.846	0.926	1.01	1.08	1.24	1.40	1.56	1.72	1.88
0.15	0.290	0.359	0.433	0.509	0.586	0.663	0.739	0.816	0.892	0.968	1.04	1.20	1.35	1.50	1.66	1.81
0.20	0.279	0.345	0.415	0.487	0.560	0.633	0.706	0.779	0.852	0.925	0.999	1.15	1.29	1.44	1.60	1.75
0.25	0.263	0.327	0.393	0.462	0.531	0.601	0.670	0.740	0.810	0.881	0.952	1.09	1.24	1.39	1.53	1.68
0.30	0.246	0.307	0.369	0.434	0.500	0.566	0.633	0.700	0.768	0.836	0.904	1.04	1.18	1.33	1.47	1.62
0.40	0.212	0.266	0.321	0.379	0.438	0.499	0.561	0.623	0.685	0.749	0.813	0.943	1.08	1.21	1.35	1.50
0.50	0.183	0.230	0.278	0.329	0.383	0.438	0.494	0.551	0.609	0.668	0.728	0.852	0.979	1.11	1.25	1.38
0.60	0.159	0.200	0.242	0.287	0.336	0.386	0.438	0.492	0.546	0.601	0.658	0.775	0.896	1.02	1.15	1.29
0.70	0.140	0.176	0.213	0.254	0.299	0.345	0.394	0.444	0.494	0.546	0.600	0.710	0.826	0.946	1.07	1.20
0.80	0.124	0.156	0.190	0.228	0.269	0.311	0.357	0.404	0.451	0.500	0.550	0.654	0.764	0.879	0.998	1.12
0.90	0.112	0.140	0.171	0.206	0.244	0.284	0.326	0.370	0.415	0.460	0.508	0.606	0.710	0.820	0.934	1.05
1.0	0.102	0.127	0.156	0.188	0.223	0.260	0.299	0.340	0.383	0.426	0.471	0.564	0.663	0.767	0.876	0.991
1.2	0.0855	0.107	0.132	0.159	0.190	0.222	0.257	0.293	0.331	0.370	0.410	0.494	0.583	0.678	0.778	0.883
1.4	0.0738	0.0926	0.114	0.138	0.165	0.194	0.224	0.256	0.290	0.325	0.362	0.438	0.519	0.606	0.698	0.795
1.6	0.0648	0.0814	0.100	0.122	0.145	0.171	0.198	0.227	0.258	0.290	0.323	0.393	0.468	0.547	0.632	0.722
1.8	0.0578	0.0725	0.0897	0.109	0.130	0.153	0.178	0.204	0.232	0.261	0.291	0.356	0.425	0.498	0.577	0.660
2.0	0.0521	0.0653	0.0810	0.0982	0.118	0.139	0.161	0.185	0.210	0.237	0.265	0.324	0.388	0.457	0.530	0.607
2.2	0.0474	0.0595	0.0738	0.0896	0.107	0.127	0.147	0.169	0.192	0.217	0.242	0.298	0.358	0.421	0.489	0.562
2.4	0.0435	0.0545	0.0677	0.0824	0.0988	0.116	0.135	0.156	0.177	0.199	0.223	0.275	0.331	0.390	0.454	0.522
2.6	0.0402	0.0504	0.0626	0.0762	0.0913	0.108	0.125	0.144	0.164	0.185	0.207	0.255	0.308	0.364	0.424	0.488
2.8	0.0373	0.0469	0.0581	0.0709	0.0849	0.100	0.117	0.134	0.152	0.172	0.192	0.238	0.288	0.341	0.397	0.457
3.0	0.0349	0.0438	0.0543	0.0662	0.0793	0.0937	0.109	0.125	0.142	0.161	0.180	0.222	0.269	0.320	0.373	0.431
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

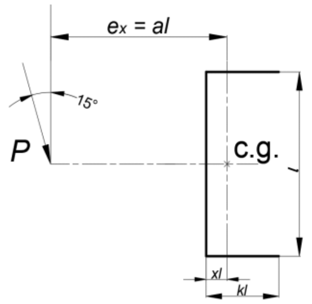
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 15°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.313	0.391	0.478	0.564	0.650	0.736	0.823	0.909	0.995	1.08	1.17	1.34	1.51	1.69	1.86	2.03
0.10	0.300	0.375	0.455	0.536	0.616	0.695	0.774	0.853	0.931	1.01	1.09	1.24	1.40	1.56	1.72	1.88
0.15	0.292	0.365	0.441	0.517	0.593	0.668	0.744	0.818	0.893	0.968	1.04	1.19	1.34	1.50	1.65	1.81
0.20	0.279	0.348	0.420	0.492	0.565	0.637	0.709	0.780	0.851	0.923	0.995	1.14	1.29	1.43	1.58	1.74
0.25	0.263	0.328	0.395	0.464	0.533	0.602	0.671	0.740	0.808	0.877	0.946	1.09	1.23	1.37	1.52	1.67
0.30	0.246	0.307	0.370	0.435	0.500	0.567	0.633	0.699	0.765	0.832	0.898	1.03	1.17	1.31	1.46	1.60
0.40	0.213	0.266	0.321	0.378	0.437	0.497	0.559	0.621	0.683	0.746	0.809	0.936	1.07	1.20	1.34	1.49
0.50	0.185	0.231	0.278	0.328	0.380	0.435	0.491	0.550	0.610	0.669	0.730	0.853	0.980	1.11	1.25	1.38
0.60	0.161	0.202	0.243	0.287	0.334	0.384	0.437	0.492	0.548	0.607	0.664	0.781	0.903	1.03	1.16	1.29
0.70	0.142	0.178	0.215	0.255	0.298	0.344	0.394	0.444	0.498	0.552	0.607	0.720	0.835	0.956	1.08	1.21
0.80	0.127	0.159	0.192	0.229	0.270	0.312	0.357	0.405	0.454	0.506	0.559	0.665	0.776	0.891	1.01	1.13
0.90	0.114	0.143	0.174	0.208	0.245	0.285	0.326	0.371	0.417	0.466	0.516	0.618	0.723	0.833	0.948	1.07
1.0	0.104	0.130	0.159	0.191	0.225	0.262	0.301	0.342	0.386	0.431	0.479	0.575	0.676	0.781	0.891	1.01
1.2	0.0877	0.110	0.134	0.162	0.192	0.224	0.259	0.295	0.334	0.375	0.417	0.505	0.597	0.693	0.794	0.901
1.4	0.0758	0.0949	0.116	0.141	0.168	0.197	0.227	0.260	0.294	0.330	0.369	0.449	0.533	0.621	0.715	0.813
1.6	0.0667	0.0835	0.103	0.125	0.148	0.174	0.202	0.231	0.262	0.295	0.330	0.403	0.480	0.562	0.648	0.739
1.8	0.0595	0.0745	0.0919	0.111	0.133	0.156	0.181	0.208	0.236	0.266	0.298	0.365	0.437	0.512	0.592	0.677
2.0	0.0537	0.0672	0.0831	0.101	0.121	0.142	0.165	0.189	0.215	0.242	0.271	0.334	0.399	0.470	0.545	0.624
2.2	0.0489	0.0612	0.0758	0.0919	0.110	0.130	0.151	0.173	0.197	0.222	0.249	0.307	0.368	0.434	0.504	0.578
2.4	0.0449	0.0562	0.0696	0.0845	0.101	0.119	0.139	0.160	0.182	0.205	0.230	0.283	0.341	0.402	0.468	0.538
2.6	0.0415	0.0519	0.0644	0.0783	0.0937	0.110	0.129	0.148	0.169	0.190	0.213	0.263	0.317	0.375	0.437	0.502
2.8	0.0385	0.0483	0.0599	0.0729	0.0872	0.103	0.120	0.138	0.157	0.177	0.198	0.245	0.297	0.351	0.409	0.471
3.0	0.0360	0.0452	0.0559	0.0681	0.0815	0.0962	0.112	0.129	0.147	0.166	0.186	0.229	0.278	0.330	0.385	0.444
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

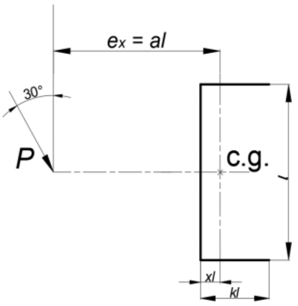
C Coefficients for Eccentrically Loaded Weld Groups Angle = 30°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.346	0.428	0.509	0.591	0.672	0.753	0.835	0.916	0.998	1.08	1.16	1.32	1.49	1.65	1.81	1.97
0.10	0.321	0.405	0.484	0.561	0.637	0.713	0.789	0.865	0.942	1.02	1.10	1.25	1.41	1.57	1.73	1.89
0.15	0.304	0.383	0.459	0.534	0.606	0.678	0.750	0.822	0.895	0.969	1.04	1.19	1.35	1.51	1.66	1.83
0.20	0.289	0.360	0.432	0.502	0.570	0.638	0.707	0.776	0.845	0.916	0.988	1.13	1.29	1.44	1.60	1.76
0.25	0.272	0.338	0.405	0.470	0.535	0.599	0.664	0.729	0.796	0.865	0.935	1.08	1.22	1.38	1.53	1.69
0.30	0.255	0.316	0.378	0.440	0.502	0.563	0.625	0.688	0.753	0.821	0.890	1.03	1.17	1.32	1.47	1.62
0.40	0.224	0.276	0.330	0.385	0.441	0.498	0.556	0.617	0.680	0.745	0.812	0.945	1.08	1.22	1.36	1.51
0.50	0.196	0.242	0.289	0.338	0.388	0.442	0.499	0.557	0.617	0.679	0.743	0.872	1.00	1.14	1.28	1.42
0.60	0.172	0.214	0.255	0.299	0.346	0.397	0.450	0.505	0.563	0.622	0.682	0.808	0.932	1.06	1.19	1.33
0.70	0.153	0.190	0.228	0.268	0.312	0.359	0.408	0.461	0.515	0.572	0.630	0.750	0.870	0.994	1.12	1.26
0.80	0.137	0.171	0.205	0.243	0.284	0.327	0.374	0.423	0.474	0.528	0.583	0.698	0.814	0.933	1.06	1.19
0.90	0.124	0.154	0.187	0.222	0.260	0.301	0.344	0.390	0.438	0.489	0.542	0.652	0.764	0.878	0.997	1.12
1.0	0.114	0.140	0.171	0.204	0.240	0.278	0.318	0.362	0.407	0.455	0.505	0.610	0.718	0.828	0.943	1.06
1.2	0.0963	0.120	0.146	0.175	0.207	0.241	0.277	0.315	0.356	0.398	0.444	0.540	0.640	0.742	0.848	0.959
1.4	0.0835	0.104	0.127	0.153	0.182	0.212	0.244	0.278	0.315	0.354	0.395	0.482	0.575	0.670	0.768	0.872
1.6	0.0736	0.0919	0.113	0.136	0.161	0.189	0.218	0.249	0.282	0.318	0.355	0.435	0.521	0.609	0.701	0.798
1.8	0.0658	0.0821	0.101	0.122	0.145	0.170	0.197	0.226	0.256	0.288	0.322	0.396	0.475	0.557	0.643	0.734
2.0	0.0594	0.0742	0.0915	0.111	0.132	0.155	0.180	0.205	0.234	0.263	0.295	0.362	0.436	0.513	0.594	0.679
2.2	0.0542	0.0676	0.0836	0.101	0.121	0.142	0.165	0.189	0.214	0.242	0.271	0.334	0.403	0.475	0.551	0.631
2.4	0.0497	0.0621	0.0769	0.0932	0.111	0.131	0.152	0.175	0.198	0.224	0.251	0.310	0.374	0.442	0.513	0.589
2.6	0.0460	0.0575	0.0711	0.0864	0.103	0.122	0.141	0.162	0.185	0.208	0.234	0.288	0.349	0.413	0.480	0.551
2.8	0.0428	0.0535	0.0662	0.0805	0.0962	0.113	0.132	0.151	0.172	0.195	0.218	0.270	0.327	0.387	0.451	0.518
3.0	0.0400	0.0500	0.0619	0.0753	0.0900	0.106	0.123	0.142	0.162	0.183	0.205	0.253	0.306	0.364	0.425	0.489
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

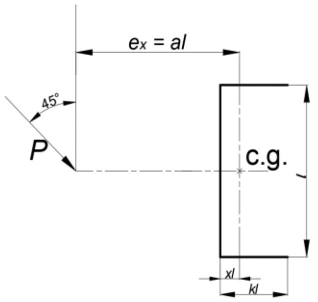
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 45°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2
(1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	***k***															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.381	0.444	0.518	0.592	0.666	0.740	0.814	0.889	0.963	1.04	1.11	1.26	1.41	1.55	1.70	1.85
0.10	0.356	0.431	0.503	0.572	0.641	0.712	0.784	0.857	0.931	1.01	1.08	1.23	1.38	1.54	1.69	1.85
0.15	0.331	0.408	0.476	0.541	0.605	0.672	0.741	0.813	0.886	0.961	1.04	1.19	1.34	1.50	1.66	1.81
0.20	0.311	0.383	0.448	0.509	0.570	0.632	0.699	0.768	0.841	0.914	0.990	1.14	1.30	1.45	1.61	1.77
0.25	0.294	0.360	0.422	0.480	0.536	0.596	0.661	0.728	0.798	0.870	0.944	1.09	1.25	1.41	1.56	1.72
0.30	0.277	0.338	0.398	0.454	0.508	0.567	0.629	0.694	0.763	0.833	0.904	1.05	1.20	1.36	1.51	1.67
0.40	0.246	0.300	0.353	0.405	0.459	0.515	0.574	0.636	0.701	0.769	0.838	0.980	1.13	1.27	1.42	1.58
0.50	0.219	0.267	0.314	0.363	0.415	0.469	0.526	0.586	0.648	0.712	0.779	0.917	1.06	1.20	1.35	1.50
0.60	0.196	0.239	0.281	0.327	0.377	0.430	0.484	0.541	0.600	0.662	0.726	0.859	0.999	1.14	1.28	1.43
0.70	0.176	0.215	0.255	0.299	0.345	0.394	0.447	0.501	0.558	0.617	0.678	0.807	0.942	1.08	1.22	1.36
0.80	0.159	0.195	0.232	0.273	0.317	0.364	0.414	0.466	0.520	0.577	0.636	0.759	0.889	1.02	1.16	1.29
0.90	0.145	0.178	0.214	0.252	0.293	0.337	0.385	0.434	0.486	0.541	0.597	0.716	0.841	0.968	1.10	1.23
1.0	0.133	0.164	0.198	0.234	0.273	0.314	0.359	0.406	0.456	0.508	0.562	0.676	0.797	0.920	1.05	1.18
1.2	0.114	0.141	0.171	0.203	0.238	0.276	0.316	0.358	0.404	0.452	0.501	0.607	0.719	0.835	0.953	1.08
1.4	0.0997	0.123	0.150	0.180	0.211	0.245	0.281	0.320	0.362	0.405	0.451	0.549	0.654	0.762	0.873	0.989
1.6	0.0883	0.110	0.134	0.160	0.189	0.220	0.254	0.289	0.327	0.367	0.409	0.500	0.598	0.700	0.804	0.913
1.8	0.0792	0.0983	0.120	0.145	0.171	0.200	0.231	0.263	0.298	0.335	0.374	0.459	0.550	0.646	0.744	0.847
2.0	0.0717	0.0891	0.109	0.132	0.156	0.183	0.211	0.241	0.274	0.308	0.344	0.423	0.508	0.599	0.691	0.789
2.2	0.0655	0.0815	0.100	0.121	0.144	0.169	0.195	0.223	0.253	0.285	0.318	0.392	0.472	0.558	0.645	0.737
2.4	0.0603	0.0750	0.0924	0.112	0.133	0.156	0.181	0.207	0.235	0.264	0.296	0.365	0.440	0.521	0.604	0.691
2.6	0.0558	0.0695	0.0857	0.104	0.124	0.145	0.168	0.193	0.219	0.247	0.277	0.341	0.412	0.489	0.567	0.650
2.8	0.0520	0.0648	0.0799	0.0968	0.115	0.136	0.157	0.181	0.205	0.231	0.259	0.320	0.387	0.460	0.535	0.614
3.0	0.0486	0.0607	0.0748	0.0908	0.108	0.127	0.148	0.170	0.193	0.218	0.244	0.302	0.365	0.434	0.505	0.581
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

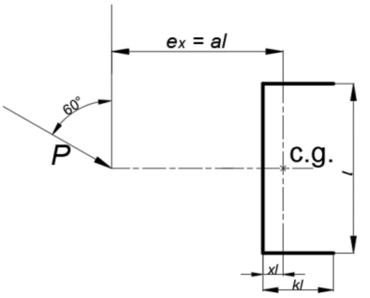
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 60°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min}= \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min}= \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.412	0.476	0.546	0.615	0.684	0.753	0.823	0.892	0.961	1.03	1.10	1.24	1.38	1.52	1.65	1.79
0.10	0.386	0.450	0.512	0.574	0.640	0.708	0.778	0.849	0.921	0.992	1.06	1.21	1.35	1.49	1.63	1.77
0.15	0.366	0.429	0.487	0.546	0.609	0.675	0.744	0.815	0.887	0.959	1.03	1.18	1.32	1.47	1.61	1.75
0.20	0.346	0.409	0.464	0.519	0.579	0.643	0.710	0.780	0.852	0.925	0.998	1.15	1.29	1.44	1.58	1.73
0.25	0.328	0.390	0.443	0.496	0.554	0.617	0.683	0.751	0.821	0.891	0.963	1.11	1.26	1.41	1.56	1.70
0.30	0.312	0.372	0.424	0.476	0.533	0.594	0.660	0.726	0.795	0.864	0.935	1.08	1.23	1.38	1.52	1.67
0.40	0.284	0.339	0.389	0.440	0.495	0.555	0.617	0.682	0.750	0.819	0.888	1.03	1.17	1.32	1.46	1.61
0.50	0.259	0.310	0.357	0.409	0.462	0.518	0.579	0.643	0.708	0.776	0.845	0.986	1.13	1.27	1.41	1.56
0.60	0.237	0.284	0.330	0.380	0.432	0.487	0.544	0.606	0.670	0.736	0.805	0.944	1.09	1.23	1.37	1.51
0.70	0.217	0.261	0.305	0.353	0.404	0.457	0.513	0.572	0.634	0.699	0.766	0.903	1.04	1.19	1.33	1.47
0.80	0.201	0.241	0.284	0.329	0.378	0.430	0.484	0.542	0.602	0.664	0.730	0.865	1.00	1.15	1.29	1.43
0.90	0.186	0.223	0.265	0.308	0.356	0.405	0.458	0.513	0.571	0.632	0.695	0.828	0.966	1.11	1.25	1.39
1.0	0.172	0.209	0.248	0.290	0.335	0.383	0.434	0.487	0.543	0.602	0.663	0.793	0.928	1.07	1.21	1.35
1.2	0.150	0.183	0.219	0.258	0.299	0.343	0.391	0.441	0.493	0.549	0.607	0.729	0.858	0.994	1.13	1.27
1.4	0.133	0.163	0.196	0.232	0.270	0.311	0.354	0.402	0.451	0.503	0.557	0.672	0.796	0.926	1.06	1.20
1.6	0.119	0.146	0.176	0.210	0.245	0.283	0.324	0.368	0.414	0.463	0.514	0.623	0.739	0.864	0.994	1.13
1.8	0.107	0.132	0.161	0.191	0.224	0.260	0.298	0.339	0.382	0.428	0.476	0.578	0.690	0.808	0.932	1.06
2.0	0.0979	0.121	0.147	0.175	0.207	0.240	0.275	0.314	0.355	0.398	0.443	0.540	0.645	0.758	0.876	0.997
2.2	0.0899	0.111	0.136	0.162	0.192	0.223	0.256	0.292	0.330	0.371	0.414	0.506	0.605	0.713	0.825	0.941
2.4	0.0830	0.103	0.126	0.151	0.178	0.208	0.239	0.273	0.309	0.347	0.388	0.475	0.570	0.672	0.779	0.890
2.6	0.0771	0.0955	0.117	0.141	0.167	0.195	0.224	0.256	0.290	0.326	0.365	0.447	0.538	0.635	0.738	0.843
2.8	0.0719	0.0892	0.109	0.132	0.156	0.183	0.211	0.241	0.273	0.307	0.344	0.423	0.509	0.602	0.700	0.801
3.0	0.0674	0.0837	0.103	0.124	0.147	0.172	0.199	0.228	0.258	0.291	0.325	0.400	0.483	0.571	0.666	0.763
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

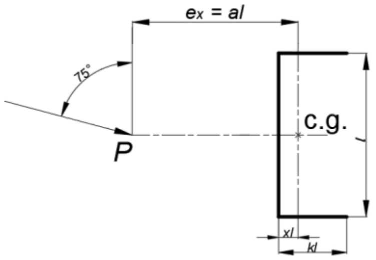
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 75°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

0.00	k															
	0.0	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.0	0.434	0.492	0.553	0.614	0.675	0.736	0.797	0.858	0.919	0.980	1.04	1.16	1.29	1.41	1.53	1.65
0.10	0.410	0.466	0.523	0.583	0.646	0.709	0.774	0.838	0.901	0.965	1.03	1.15	1.27	1.40	1.52	1.64
0.15	0.397	0.451	0.506	0.564	0.625	0.688	0.753	0.819	0.884	0.948	1.01	1.14	1.27	1.39	1.51	1.64
0.20	0.385	0.437	0.491	0.548	0.610	0.672	0.735	0.799	0.864	0.930	0.996	1.12	1.25	1.38	1.50	1.63
0.25	0.373	0.425	0.477	0.535	0.596	0.658	0.721	0.785	0.848	0.912	0.976	1.11	1.24	1.37	1.49	1.62
0.30	0.362	0.414	0.465	0.523	0.584	0.646	0.710	0.773	0.837	0.900	0.963	1.09	1.22	1.35	1.48	1.61
0.40	0.343	0.394	0.444	0.500	0.561	0.623	0.688	0.752	0.817	0.880	0.944	1.07	1.19	1.32	1.45	1.58
0.50	0.325	0.375	0.425	0.480	0.540	0.602	0.666	0.731	0.797	0.862	0.927	1.05	1.18	1.30	1.43	1.55
0.60	0.308	0.357	0.408	0.461	0.519	0.581	0.645	0.711	0.777	0.843	0.909	1.04	1.17	1.29	1.41	1.54
0.70	0.293	0.340	0.391	0.443	0.500	0.561	0.624	0.690	0.757	0.823	0.890	1.02	1.15	1.28	1.40	1.53
0.80	0.278	0.325	0.375	0.427	0.482	0.541	0.604	0.670	0.736	0.803	0.870	1.00	1.14	1.27	1.39	1.52
0.90	0.265	0.311	0.359	0.410	0.464	0.523	0.585	0.649	0.716	0.783	0.851	0.987	1.12	1.25	1.38	1.51
1.0	0.253	0.297	0.344	0.395	0.448	0.506	0.567	0.630	0.696	0.763	0.831	0.968	1.10	1.24	1.37	1.50
1.2	0.230	0.273	0.318	0.367	0.419	0.474	0.532	0.594	0.658	0.724	0.792	0.929	1.07	1.20	1.34	1.47
1.4	0.211	0.251	0.295	0.342	0.392	0.445	0.501	0.560	0.622	0.687	0.753	0.890	1.03	1.17	1.30	1.44
1.6	0.194	0.232	0.274	0.319	0.367	0.418	0.472	0.529	0.589	0.652	0.717	0.852	0.991	1.13	1.27	1.41
1.8	0.179	0.215	0.256	0.299	0.344	0.394	0.446	0.501	0.559	0.620	0.683	0.815	0.953	1.09	1.23	1.37
2.0	0.166	0.201	0.239	0.280	0.324	0.371	0.422	0.475	0.531	0.590	0.651	0.780	0.915	1.05	1.19	1.34
2.2	0.155	0.188	0.225	0.264	0.306	0.351	0.400	0.451	0.505	0.562	0.621	0.747	0.880	1.02	1.16	1.30
2.4	0.145	0.176	0.211	0.249	0.290	0.333	0.380	0.429	0.481	0.536	0.594	0.716	0.846	0.981	1.12	1.26
2.6	0.136	0.166	0.200	0.236	0.275	0.317	0.361	0.409	0.459	0.512	0.568	0.686	0.813	0.946	1.08	1.22
2.8	0.128	0.156	0.189	0.224	0.262	0.302	0.344	0.390	0.439	0.490	0.544	0.659	0.783	0.912	1.05	1.19
3.0	0.121	0.148	0.179	0.213	0.249	0.288	0.329	0.373	0.420	0.470	0.522	0.633	0.753	0.881	1.01	1.15
x	0.00	0.00833	0.0286	0.0563	0.0889	0.125	0.164	0.204	0.246	0.289	0.333	0.424	0.516	0.610	0.704	0.800

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 0°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with

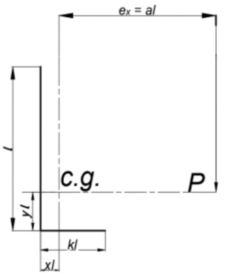
$$R_n = C \cdot C_1 \cdot t_e \cdot l \;\; (\phi = 0.75, \Omega = 2.00)$$

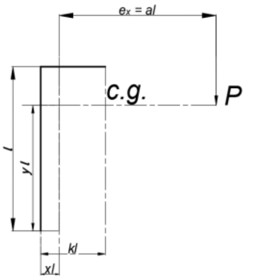
LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.





a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.294	0.323	0.353	0.382	0.426	0.470	0.515	0.559	0.603	0.647	0.691	0.779	0.867	0.956	1.04	1.13
0.10	0.294	0.325	0.362	0.401	0.442	0.483	0.525	0.567	0.609	0.651	0.694	0.781	0.868	0.953	1.04	1.13
0.15	0.290	0.322	0.358	0.395	0.434	0.474	0.514	0.555	0.596	0.637	0.678	0.762	0.847	0.933	1.02	1.11
0.20	0.279	0.312	0.346	0.382	0.419	0.456	0.494	0.533	0.572	0.612	0.652	0.732	0.815	0.898	0.982	1.07
0.25	0.263	0.295	0.329	0.363	0.398	0.433	0.469	0.506	0.543	0.581	0.619	0.698	0.778	0.859	0.942	1.03
0.30	0.246	0.276	0.308	0.342	0.374	0.408	0.441	0.476	0.512	0.548	0.585	0.662	0.740	0.820	0.901	0.984
0.40	0.212	0.238	0.265	0.295	0.325	0.356	0.387	0.418	0.451	0.484	0.519	0.591	0.666	0.744	0.823	0.903
0.50	0.183	0.205	0.228	0.254	0.281	0.310	0.338	0.367	0.397	0.428	0.460	0.528	0.600	0.675	0.751	0.830
0.60	0.159	0.178	0.199	0.220	0.244	0.270	0.297	0.324	0.351	0.380	0.411	0.475	0.543	0.615	0.689	0.765
0.70	0.140	0.157	0.175	0.194	0.215	0.238	0.263	0.288	0.314	0.341	0.369	0.429	0.494	0.563	0.634	0.708
0.80	0.124	0.140	0.155	0.173	0.191	0.212	0.235	0.259	0.283	0.308	0.334	0.391	0.453	0.518	0.587	0.658
0.90	0.112	0.126	0.140	0.155	0.172	0.191	0.212	0.235	0.257	0.280	0.305	0.358	0.417	0.479	0.544	0.613
1.0	0.102	0.114	0.127	0.141	0.156	0.174	0.193	0.214	0.235	0.257	0.280	0.330	0.385	0.444	0.507	0.572
1.2	0.0855	0.0960	0.107	0.119	0.132	0.147	0.163	0.181	0.201	0.220	0.240	0.285	0.334	0.387	0.444	0.504
1.4	0.0738	0.0827	0.0921	0.102	0.114	0.127	0.141	0.157	0.175	0.192	0.210	0.250	0.294	0.342	0.394	0.448
1.6	0.0648	0.0727	0.0809	0.0898	0.0999	0.111	0.124	0.139	0.154	0.170	0.186	0.222	0.262	0.306	0.353	0.403
1.8	0.0578	0.0647	0.0720	0.0800	0.0891	0.0994	0.111	0.124	0.138	0.152	0.167	0.199	0.236	0.276	0.319	0.366
2.0	0.0521	0.0584	0.0649	0.0722	0.0803	0.0898	0.100	0.112	0.125	0.138	0.151	0.181	0.214	0.251	0.291	0.334
2.2	0.0474	0.0531	0.0591	0.0657	0.0731	0.0818	0.0915	0.102	0.114	0.126	0.138	0.165	0.196	0.230	0.268	0.308
2.4	0.0435	0.0487	0.0542	0.0603	0.0671	0.0751	0.0840	0.0940	0.105	0.116	0.127	0.152	0.181	0.213	0.247	0.285
2.6	0.0402	0.0450	0.0501	0.0557	0.0620	0.0694	0.0777	0.0870	0.0971	0.107	0.118	0.141	0.168	0.198	0.230	0.265
2.8	0.0373	0.0418	0.0465	0.0518	0.0576	0.0645	0.0722	0.0809	0.0903	0.0996	0.110	0.132	0.157	0.184	0.215	0.247
3.0	0.0349	0.0391	0.0434	0.0483	0.0539	0.0603	0.0675	0.0756	0.0843	0.0932	0.102	0.123	0.147	0.173	0.201	0.232
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 15°

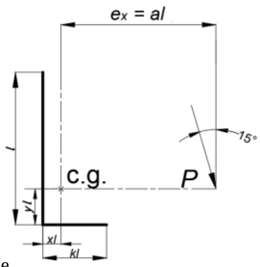
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

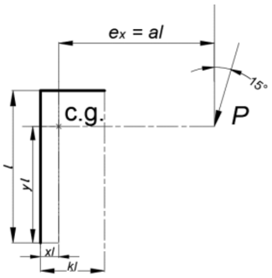
LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.





a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.313	0.348	0.391	0.434	0.478	0.521	0.564	0.607	0.650	0.693	0.736	0.823	0.909	0.995	1.08	1.17
0.10	0.300	0.339	0.382	0.426	0.471	0.516	0.561	0.605	0.648	0.692	0.735	0.822	0.908	0.995	1.08	1.17
0.15	0.292	0.332	0.374	0.416	0.458	0.500	0.542	0.585	0.628	0.671	0.714	0.799	0.885	0.970	1.06	1.14
0.20	0.279	0.316	0.358	0.399	0.440	0.480	0.520	0.561	0.602	0.643	0.684	0.768	0.852	0.936	1.02	1.11
0.25	0.263	0.297	0.336	0.376	0.417	0.455	0.494	0.533	0.572	0.611	0.651	0.732	0.814	0.898	0.982	1.07
0.30	0.246	0.278	0.313	0.350	0.389	0.428	0.465	0.502	0.539	0.577	0.616	0.695	0.776	0.858	0.941	1.02
0.40	0.213	0.240	0.269	0.301	0.334	0.369	0.406	0.440	0.474	0.510	0.546	0.621	0.699	0.779	0.860	0.943
0.50	0.185	0.208	0.232	0.259	0.288	0.319	0.351	0.385	0.417	0.450	0.484	0.555	0.629	0.707	0.786	0.866
0.60	0.161	0.181	0.202	0.225	0.251	0.278	0.307	0.338	0.369	0.399	0.431	0.498	0.569	0.643	0.720	0.799
0.70	0.142	0.160	0.178	0.199	0.221	0.245	0.271	0.300	0.329	0.357	0.387	0.450	0.518	0.589	0.663	0.739
0.80	0.127	0.143	0.159	0.177	0.197	0.219	0.242	0.268	0.296	0.322	0.350	0.410	0.474	0.542	0.613	0.686
0.90	0.114	0.129	0.143	0.159	0.177	0.197	0.219	0.243	0.268	0.293	0.319	0.375	0.436	0.500	0.568	0.638
1.0	0.104	0.117	0.130	0.145	0.161	0.179	0.199	0.221	0.245	0.269	0.293	0.345	0.403	0.464	0.529	0.596
1.2	0.0877	0.0986	0.110	0.122	0.136	0.151	0.169	0.188	0.209	0.229	0.251	0.297	0.349	0.404	0.463	0.525
1.4	0.0758	0.0851	0.0948	0.105	0.117	0.131	0.146	0.163	0.181	0.200	0.219	0.260	0.306	0.356	0.410	0.467
1.6	0.0667	0.0749	0.0833	0.0926	0.103	0.115	0.129	0.144	0.160	0.177	0.194	0.231	0.273	0.318	0.367	0.420
1.8	0.0595	0.0667	0.0743	0.0826	0.0920	0.103	0.115	0.128	0.143	0.158	0.174	0.208	0.246	0.287	0.332	0.380
2.0	0.0537	0.0602	0.0670	0.0745	0.0830	0.0927	0.104	0.116	0.130	0.143	0.157	0.188	0.223	0.261	0.303	0.347
2.2	0.0489	0.0548	0.0610	0.0678	0.0756	0.0845	0.0946	0.106	0.118	0.131	0.144	0.172	0.204	0.240	0.278	0.319
2.4	0.0449	0.0503	0.0560	0.0622	0.0694	0.0776	0.0869	0.0973	0.109	0.120	0.132	0.159	0.188	0.221	0.257	0.296
2.6	0.0415	0.0465	0.0517	0.0575	0.0642	0.0718	0.0803	0.0900	0.100	0.111	0.122	0.147	0.175	0.205	0.239	0.275
2.8	0.0385	0.0432	0.0481	0.0534	0.0597	0.0667	0.0747	0.0837	0.0934	0.104	0.114	0.137	0.163	0.192	0.223	0.257
3.0	0.0360	0.0404	0.0449	0.0499	0.0557	0.0623	0.0698	0.0782	0.0872	0.0968	0.106	0.128	0.152	0.179	0.209	0.241
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 30°

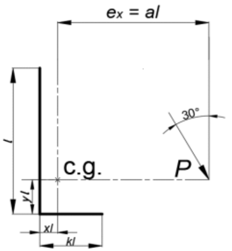
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

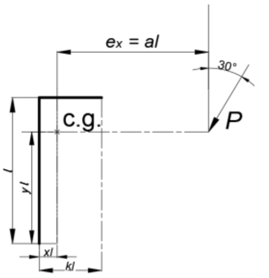
LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.





a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.346	0.387	0.428	0.468	0.509	0.550	0.591	0.631	0.672	0.713	0.753	0.835	0.916	0.998	1.08	1.16
0.10	0.321	0.373	0.422	0.468	0.514	0.558	0.601	0.644	0.686	0.728	0.770	0.853	0.936	1.02	1.10	1.18
0.15	0.304	0.352	0.401	0.450	0.497	0.542	0.585	0.628	0.671	0.713	0.755	0.838	0.921	1.00	1.09	1.17
0.20	0.289	0.331	0.377	0.424	0.470	0.517	0.560	0.603	0.645	0.687	0.729	0.813	0.896	0.980	1.06	1.15
0.25	0.272	0.310	0.353	0.396	0.440	0.486	0.530	0.572	0.614	0.656	0.697	0.781	0.865	0.949	1.03	1.12
0.30	0.255	0.290	0.329	0.369	0.411	0.453	0.497	0.540	0.580	0.621	0.662	0.745	0.829	0.914	0.998	1.08
0.40	0.224	0.253	0.285	0.319	0.355	0.393	0.432	0.473	0.514	0.552	0.591	0.671	0.754	0.838	0.924	1.01
0.50	0.196	0.221	0.248	0.277	0.308	0.341	0.377	0.414	0.453	0.490	0.527	0.603	0.683	0.766	0.850	0.936
0.60	0.172	0.194	0.218	0.243	0.270	0.300	0.332	0.365	0.401	0.437	0.472	0.545	0.621	0.700	0.783	0.867
0.70	0.153	0.173	0.193	0.215	0.239	0.266	0.295	0.326	0.359	0.393	0.426	0.494	0.567	0.644	0.723	0.805
0.80	0.137	0.155	0.173	0.193	0.214	0.238	0.264	0.293	0.323	0.356	0.386	0.451	0.521	0.594	0.670	0.749
0.90	0.124	0.140	0.156	0.174	0.194	0.215	0.240	0.266	0.294	0.325	0.353	0.414	0.480	0.550	0.623	0.698
1.0	0.114	0.128	0.142	0.158	0.176	0.196	0.219	0.243	0.270	0.298	0.325	0.382	0.445	0.511	0.581	0.654
1.2	0.0963	0.108	0.121	0.134	0.149	0.167	0.186	0.207	0.230	0.255	0.279	0.330	0.386	0.447	0.510	0.577
1.4	0.0835	0.0938	0.104	0.116	0.129	0.144	0.161	0.180	0.201	0.222	0.244	0.290	0.340	0.395	0.453	0.515
1.6	0.0736	0.0826	0.0920	0.102	0.114	0.127	0.142	0.159	0.177	0.197	0.216	0.258	0.304	0.354	0.407	0.464
1.8	0.0658	0.0738	0.0822	0.0914	0.102	0.114	0.127	0.142	0.159	0.177	0.194	0.232	0.274	0.319	0.369	0.421
2.0	0.0594	0.0667	0.0742	0.0825	0.0920	0.103	0.115	0.129	0.144	0.160	0.176	0.210	0.249	0.291	0.336	0.385
2.2	0.0542	0.0608	0.0676	0.0752	0.0838	0.0939	0.105	0.118	0.131	0.146	0.160	0.192	0.228	0.267	0.309	0.355
2.4	0.0497	0.0558	0.0621	0.0691	0.0770	0.0863	0.0965	0.108	0.121	0.134	0.148	0.177	0.210	0.246	0.286	0.328
2.6	0.0460	0.0516	0.0574	0.0639	0.0712	0.0798	0.0893	0.100	0.112	0.124	0.137	0.164	0.195	0.229	0.266	0.305
2.8	0.0428	0.0480	0.0534	0.0594	0.0663	0.0742	0.0831	0.0931	0.104	0.115	0.127	0.153	0.182	0.214	0.248	0.285
3.0	0.0400	0.0448	0.0499	0.0555	0.0619	0.0693	0.0777	0.0870	0.0970	0.108	0.119	0.143	0.170	0.200	0.233	0.268
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

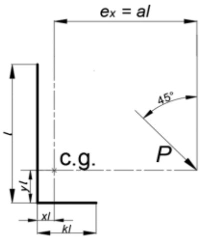
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 45°

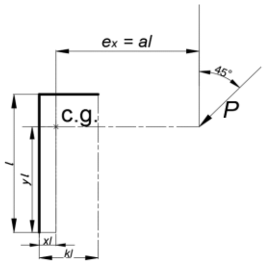
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2
(1.0 for E49 electrodes)





Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.381	0.407	0.444	0.481	0.518	0.555	0.592	0.629	0.666	0.703	0.740	0.814	0.889	0.963	1.04	1.11
0.10	0.356	0.403	0.449	0.494	0.538	0.582	0.624	0.665	0.706	0.745	0.785	0.862	0.939	1.01	1.09	1.17
0.15	0.331	0.382	0.429	0.475	0.521	0.566	0.611	0.655	0.698	0.740	0.781	0.860	0.938	1.02	1.09	1.17
0.20	0.311	0.359	0.406	0.452	0.497	0.543	0.589	0.634	0.679	0.723	0.767	0.848	0.928	1.01	1.09	1.16
0.25	0.294	0.337	0.381	0.426	0.470	0.515	0.561	0.607	0.654	0.699	0.745	0.828	0.910	0.991	1.07	1.15
0.30	0.277	0.316	0.357	0.399	0.443	0.487	0.532	0.578	0.624	0.671	0.717	0.803	0.886	0.969	1.05	1.13
0.40	0.246	0.279	0.314	0.351	0.390	0.430	0.473	0.517	0.562	0.608	0.655	0.743	0.830	0.916	1.00	1.08
0.50	0.219	0.247	0.278	0.310	0.345	0.381	0.420	0.461	0.504	0.548	0.594	0.680	0.768	0.856	0.943	1.03
0.60	0.196	0.221	0.247	0.276	0.307	0.340	0.375	0.413	0.453	0.495	0.539	0.622	0.709	0.797	0.885	0.972
0.70	0.176	0.198	0.222	0.248	0.275	0.305	0.338	0.373	0.410	0.450	0.491	0.570	0.653	0.739	0.827	0.915
0.80	0.159	0.180	0.201	0.224	0.249	0.277	0.307	0.339	0.375	0.412	0.450	0.524	0.604	0.687	0.773	0.860
0.90	0.145	0.164	0.183	0.204	0.227	0.252	0.280	0.311	0.344	0.378	0.415	0.485	0.560	0.640	0.724	0.808
1.0	0.133	0.150	0.168	0.187	0.208	0.231	0.257	0.286	0.317	0.350	0.384	0.451	0.522	0.598	0.679	0.761
1.2	0.114	0.129	0.143	0.160	0.178	0.198	0.221	0.246	0.273	0.302	0.333	0.393	0.458	0.527	0.601	0.679
1.4	0.0997	0.112	0.125	0.139	0.155	0.173	0.193	0.215	0.240	0.265	0.293	0.347	0.406	0.470	0.538	0.610
1.6	0.0883	0.0992	0.111	0.123	0.137	0.153	0.171	0.191	0.213	0.236	0.261	0.310	0.364	0.422	0.485	0.552
1.8	0.0792	0.0889	0.0990	0.110	0.123	0.137	0.154	0.172	0.191	0.212	0.235	0.280	0.330	0.383	0.441	0.503
2.0	0.0717	0.0805	0.0897	0.0998	0.111	0.125	0.139	0.156	0.174	0.193	0.213	0.255	0.301	0.350	0.404	0.462
2.2	0.0655	0.0735	0.0819	0.0911	0.102	0.114	0.127	0.142	0.159	0.176	0.195	0.234	0.276	0.322	0.372	0.426
2.4	0.0603	0.0676	0.0753	0.0838	0.0936	0.105	0.117	0.131	0.146	0.162	0.180	0.216	0.255	0.298	0.345	0.396
2.6	0.0558	0.0626	0.0697	0.0776	0.0866	0.0969	0.109	0.121	0.135	0.150	0.167	0.200	0.237	0.278	0.321	0.369
2.8	0.0520	0.0582	0.0649	0.0722	0.0806	0.0902	0.101	0.113	0.126	0.140	0.155	0.187	0.221	0.259	0.301	0.345
3.0	0.0486	0.0545	0.0606	0.0675	0.0754	0.0844	0.0945	0.106	0.118	0.131	0.145	0.175	0.207	0.243	0.282	0.324
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

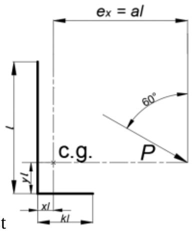
C Coefficients for Eccentrically Loaded Weld Groups Angle = 60°

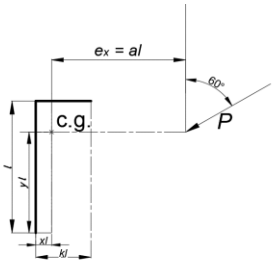
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min}=\frac{P_u}{\phi C_1 t_e l}$	$t_{min}=\frac{P_u}{\phi C C_1 l}$	$l_{min}=\frac{P_u}{\phi C C_1 t_e}$	$C_{min}=\frac{\Omega P_a}{C_1 t_e l}$	$t_{min}=\frac{\Omega P_a}{C C_1 l}$	$l_{min}=\frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)





Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.412	0.442	0.476	0.511	0.546	0.580	0.615	0.650	0.684	0.719	0.753	0.823	0.892	0.961	1.03	1.10
0.10	0.386	0.429	0.471	0.512	0.552	0.590	0.628	0.664	0.700	0.736	0.771	0.841	0.910	0.979	1.05	1.12
0.15	0.366	0.411	0.454	0.497	0.539	0.581	0.621	0.660	0.698	0.735	0.771	0.843	0.913	0.983	1.05	1.12
0.20	0.346	0.392	0.435	0.478	0.522	0.565	0.608	0.649	0.689	0.728	0.766	0.841	0.913	0.984	1.05	1.12
0.25	0.328	0.373	0.416	0.458	0.502	0.546	0.590	0.634	0.676	0.717	0.757	0.834	0.908	0.981	1.05	1.12
0.30	0.312	0.355	0.397	0.438	0.481	0.526	0.571	0.615	0.659	0.702	0.744	0.824	0.901	0.975	1.05	1.12
0.40	0.284	0.322	0.360	0.399	0.440	0.483	0.527	0.574	0.620	0.665	0.710	0.796	0.878	0.957	1.03	1.11
0.50	0.259	0.293	0.328	0.364	0.401	0.442	0.485	0.530	0.577	0.624	0.670	0.761	0.847	0.930	1.01	1.09
0.60	0.237	0.267	0.299	0.332	0.367	0.405	0.446	0.489	0.535	0.581	0.628	0.721	0.811	0.898	0.981	1.06
0.70	0.217	0.245	0.274	0.305	0.337	0.373	0.411	0.452	0.496	0.542	0.588	0.682	0.773	0.862	0.947	1.03
0.80	0.201	0.226	0.252	0.281	0.311	0.344	0.380	0.419	0.461	0.505	0.550	0.643	0.736	0.825	0.911	0.995
0.90	0.186	0.209	0.233	0.260	0.288	0.319	0.353	0.390	0.430	0.472	0.515	0.606	0.697	0.785	0.872	0.958
1.0	0.172	0.194	0.217	0.241	0.268	0.297	0.329	0.364	0.402	0.442	0.484	0.572	0.659	0.747	0.834	0.920
1.2	0.150	0.169	0.189	0.210	0.234	0.260	0.289	0.321	0.354	0.391	0.429	0.509	0.591	0.675	0.761	0.847
1.4	0.133	0.150	0.167	0.186	0.207	0.230	0.256	0.285	0.316	0.349	0.384	0.457	0.533	0.613	0.696	0.780
1.6	0.119	0.134	0.149	0.166	0.185	0.206	0.230	0.256	0.284	0.314	0.346	0.413	0.483	0.559	0.638	0.719
1.8	0.107	0.121	0.135	0.150	0.167	0.187	0.208	0.232	0.258	0.285	0.315	0.376	0.441	0.512	0.586	0.664
2.0	0.0979	0.110	0.123	0.136	0.152	0.170	0.190	0.212	0.235	0.261	0.288	0.345	0.406	0.471	0.542	0.616
2.2	0.0899	0.101	0.113	0.125	0.140	0.156	0.175	0.195	0.217	0.240	0.266	0.319	0.375	0.436	0.503	0.573
2.4	0.0830	0.0932	0.104	0.116	0.129	0.144	0.161	0.180	0.200	0.222	0.246	0.296	0.348	0.406	0.469	0.535
2.6	0.0771	0.0866	0.0964	0.107	0.120	0.134	0.150	0.167	0.186	0.207	0.229	0.276	0.325	0.379	0.438	0.502
2.8	0.0719	0.0808	0.0900	0.100	0.112	0.125	0.140	0.156	0.174	0.193	0.214	0.258	0.305	0.356	0.411	0.472
3.0	0.0674	0.0757	0.0843	0.0939	0.105	0.117	0.131	0.147	0.163	0.181	0.201	0.242	0.286	0.335	0.388	0.445
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

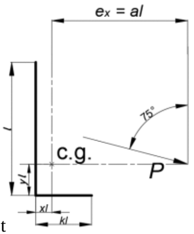
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 75°

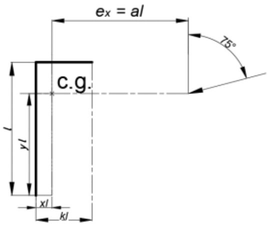
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2
(1.0 for E49 electrodes)





Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.0	1.2	1.4	1.6	1.8	2.0
0.00	0.434	0.462	0.492	0.523	0.553	0.584	0.614	0.645	0.675	0.706	0.736	0.797	0.858	0.919	0.980	1.04
0.10	0.410	0.454	0.493	0.525	0.555	0.585	0.615	0.646	0.676	0.707	0.738	0.799	0.860	0.921	0.983	1.04
0.15	0.397	0.440	0.482	0.520	0.555	0.586	0.617	0.648	0.678	0.709	0.740	0.801	0.862	0.923	0.985	1.05
0.20	0.385	0.427	0.469	0.510	0.548	0.583	0.616	0.648	0.679	0.710	0.741	0.803	0.864	0.925	0.986	1.05
0.25	0.373	0.415	0.457	0.498	0.539	0.576	0.612	0.645	0.678	0.710	0.741	0.803	0.865	0.926	0.987	1.05
0.30	0.362	0.404	0.445	0.487	0.528	0.568	0.605	0.641	0.675	0.707	0.740	0.803	0.865	0.926	0.988	1.05
0.40	0.343	0.383	0.422	0.464	0.506	0.548	0.588	0.627	0.664	0.699	0.733	0.798	0.862	0.925	0.987	1.05
0.50	0.325	0.364	0.401	0.441	0.483	0.526	0.569	0.609	0.648	0.686	0.722	0.791	0.857	0.921	0.983	1.05
0.60	0.308	0.345	0.382	0.420	0.461	0.504	0.547	0.590	0.631	0.670	0.708	0.780	0.848	0.914	0.978	1.04
0.70	0.293	0.328	0.363	0.400	0.439	0.482	0.525	0.569	0.611	0.652	0.692	0.767	0.837	0.905	0.971	1.04
0.80	0.278	0.312	0.346	0.381	0.419	0.460	0.504	0.548	0.592	0.634	0.675	0.752	0.825	0.894	0.962	1.03
0.90	0.265	0.297	0.330	0.363	0.400	0.440	0.483	0.527	0.571	0.615	0.657	0.737	0.813	0.884	0.952	1.02
1.0	0.253	0.283	0.314	0.347	0.382	0.421	0.463	0.507	0.551	0.595	0.639	0.722	0.799	0.873	0.942	1.01
1.2	0.230	0.258	0.287	0.317	0.350	0.387	0.426	0.468	0.512	0.556	0.601	0.688	0.770	0.847	0.921	0.991
1.4	0.211	0.237	0.263	0.292	0.322	0.356	0.393	0.432	0.475	0.518	0.563	0.652	0.738	0.819	0.896	0.970
1.6	0.194	0.218	0.242	0.268	0.298	0.329	0.364	0.401	0.441	0.484	0.527	0.616	0.704	0.788	0.869	0.945
1.8	0.179	0.201	0.224	0.249	0.276	0.306	0.338	0.374	0.411	0.452	0.494	0.582	0.670	0.756	0.839	0.919
2.0	0.166	0.187	0.208	0.231	0.257	0.285	0.315	0.349	0.385	0.423	0.464	0.549	0.636	0.723	0.808	0.890
2.2	0.155	0.174	0.194	0.215	0.240	0.266	0.295	0.327	0.361	0.397	0.436	0.519	0.605	0.691	0.777	0.860
2.4	0.145	0.163	0.181	0.202	0.224	0.250	0.277	0.307	0.339	0.374	0.411	0.491	0.575	0.661	0.746	0.830
2.6	0.136	0.153	0.170	0.189	0.211	0.235	0.261	0.289	0.320	0.353	0.388	0.465	0.546	0.630	0.714	0.797
2.8	0.128	0.144	0.160	0.178	0.199	0.221	0.246	0.273	0.302	0.334	0.368	0.441	0.520	0.601	0.683	0.766
3.0	0.121	0.136	0.151	0.169	0.188	0.209	0.233	0.259	0.287	0.317	0.349	0.419	0.495	0.573	0.653	0.735
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

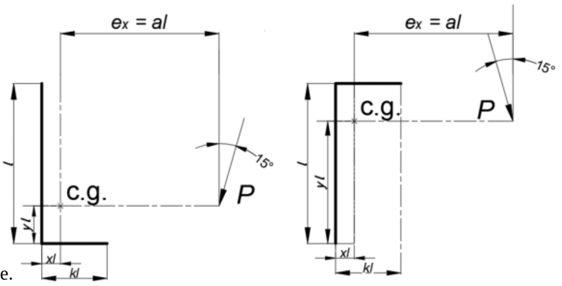
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 15°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.313	0.348	0.391	0.434	0.478	0.521	0.564	0.607	0.650	0.693	0.736	0.823	0.909	0.995	1.08	1.17
0.10	0.300	0.330	0.365	0.403	0.442	0.482	0.523	0.565	0.608	0.653	0.698	0.790	0.881	0.973	1.06	1.15
0.15	0.292	0.324	0.357	0.392	0.429	0.466	0.505	0.544	0.584	0.624	0.665	0.749	0.834	0.922	1.01	1.10
0.20	0.279	0.313	0.344	0.378	0.411	0.447	0.483	0.520	0.558	0.596	0.635	0.714	0.796	0.879	0.964	1.05
0.25	0.263	0.295	0.328	0.359	0.391	0.424	0.458	0.493	0.529	0.566	0.603	0.680	0.759	0.840	0.922	1.01
0.30	0.246	0.277	0.309	0.339	0.369	0.400	0.432	0.465	0.500	0.535	0.571	0.645	0.723	0.802	0.883	0.965
0.40	0.213	0.241	0.269	0.297	0.324	0.352	0.381	0.411	0.443	0.475	0.509	0.580	0.654	0.731	0.809	0.890
0.50	0.185	0.209	0.234	0.258	0.285	0.310	0.336	0.364	0.393	0.423	0.455	0.522	0.593	0.667	0.743	0.821
0.60	0.161	0.182	0.204	0.226	0.249	0.274	0.298	0.323	0.350	0.378	0.408	0.471	0.539	0.610	0.684	0.760
0.70	0.142	0.161	0.180	0.200	0.220	0.243	0.266	0.289	0.314	0.341	0.369	0.429	0.493	0.561	0.633	0.707
0.80	0.127	0.144	0.161	0.178	0.197	0.217	0.240	0.261	0.285	0.309	0.336	0.392	0.454	0.519	0.588	0.659
0.90	0.114	0.130	0.144	0.160	0.177	0.196	0.217	0.238	0.259	0.283	0.307	0.361	0.419	0.481	0.547	0.616
1.0	0.104	0.118	0.131	0.145	0.161	0.179	0.198	0.218	0.238	0.260	0.283	0.334	0.389	0.448	0.511	0.577
1.2	0.0877	0.0995	0.111	0.123	0.136	0.151	0.168	0.186	0.204	0.223	0.244	0.289	0.339	0.392	0.450	0.510
1.4	0.0758	0.0858	0.0954	0.106	0.117	0.131	0.146	0.162	0.178	0.195	0.214	0.254	0.299	0.348	0.400	0.456
1.6	0.0667	0.0754	0.0838	0.0930	0.103	0.115	0.128	0.143	0.158	0.173	0.190	0.226	0.267	0.311	0.360	0.411
1.8	0.0595	0.0671	0.0747	0.0829	0.0922	0.103	0.115	0.128	0.142	0.156	0.171	0.204	0.241	0.282	0.326	0.373
2.0	0.0537	0.0605	0.0673	0.0747	0.0832	0.0927	0.104	0.116	0.128	0.141	0.155	0.185	0.219	0.257	0.298	0.342
2.2	0.0489	0.0551	0.0613	0.0680	0.0757	0.0846	0.0946	0.106	0.117	0.129	0.142	0.170	0.201	0.236	0.274	0.315
2.4	0.0449	0.0505	0.0562	0.0624	0.0695	0.0777	0.0869	0.0971	0.108	0.119	0.131	0.156	0.186	0.218	0.254	0.292
2.6	0.0415	0.0467	0.0519	0.0577	0.0642	0.0718	0.0804	0.0899	0.100	0.110	0.121	0.145	0.172	0.203	0.236	0.272
2.8	0.0385	0.0434	0.0482	0.0536	0.0597	0.0668	0.0747	0.0836	0.0931	0.103	0.113	0.135	0.161	0.189	0.220	0.254
3.0	0.0360	0.0405	0.0450	0.0500	0.0558	0.0624	0.0698	0.0781	0.0871	0.0960	0.105	0.127	0.151	0.177	0.207	0.239
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

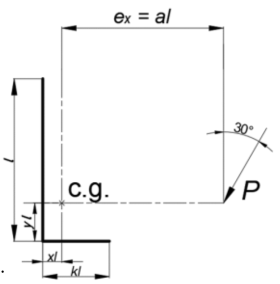
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 30°

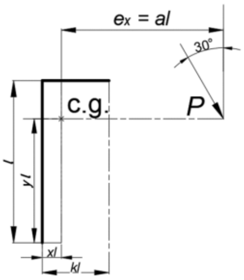
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)





Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.346	0.387	0.428	0.468	0.509	0.550	0.591	0.631	0.672	0.713	0.753	0.835	0.916	0.998	1.08	1.16
0.10	0.321	0.355	0.391	0.428	0.466	0.505	0.544	0.585	0.626	0.667	0.709	0.794	0.881	0.967	1.05	1.14
0.15	0.304	0.337	0.371	0.405	0.439	0.475	0.512	0.550	0.588	0.628	0.668	0.750	0.836	0.922	1.01	1.10
0.20	0.289	0.320	0.354	0.386	0.418	0.452	0.487	0.522	0.558	0.596	0.634	0.713	0.795	0.879	0.965	1.05
0.25	0.272	0.302	0.334	0.366	0.397	0.429	0.462	0.495	0.530	0.566	0.603	0.679	0.759	0.840	0.924	1.01
0.30	0.255	0.284	0.315	0.346	0.376	0.406	0.437	0.469	0.502	0.537	0.573	0.647	0.725	0.805	0.888	0.972
0.40	0.223	0.249	0.277	0.305	0.334	0.361	0.390	0.419	0.451	0.483	0.517	0.588	0.663	0.740	0.821	0.903
0.50	0.196	0.219	0.244	0.270	0.296	0.321	0.348	0.375	0.405	0.435	0.467	0.535	0.607	0.682	0.761	0.841
0.60	0.172	0.193	0.216	0.240	0.264	0.287	0.312	0.337	0.365	0.394	0.424	0.489	0.558	0.631	0.707	0.785
0.70	0.153	0.172	0.193	0.214	0.237	0.259	0.281	0.305	0.331	0.358	0.387	0.448	0.515	0.585	0.659	0.735
0.80	0.137	0.155	0.173	0.193	0.213	0.234	0.255	0.278	0.302	0.327	0.355	0.413	0.477	0.545	0.616	0.690
0.90	0.124	0.140	0.157	0.175	0.193	0.213	0.233	0.254	0.277	0.301	0.327	0.383	0.444	0.509	0.577	0.649
1.0	0.114	0.128	0.144	0.160	0.177	0.195	0.214	0.234	0.256	0.278	0.303	0.356	0.414	0.476	0.543	0.612
1.2	0.0963	0.109	0.122	0.135	0.150	0.166	0.184	0.202	0.221	0.241	0.263	0.311	0.364	0.421	0.482	0.546
1.4	0.0835	0.0943	0.106	0.117	0.130	0.144	0.160	0.177	0.194	0.212	0.232	0.275	0.323	0.375	0.431	0.491
1.6	0.0736	0.0832	0.0931	0.103	0.115	0.127	0.142	0.157	0.173	0.189	0.207	0.246	0.290	0.338	0.390	0.444
1.8	0.0657	0.0744	0.0831	0.0921	0.102	0.114	0.127	0.141	0.155	0.171	0.187	0.223	0.263	0.307	0.354	0.405
2.0	0.0594	0.0672	0.0749	0.0832	0.0924	0.103	0.115	0.128	0.141	0.155	0.170	0.203	0.240	0.281	0.325	0.373
2.2	0.0541	0.0613	0.0682	0.0758	0.0842	0.0940	0.105	0.117	0.129	0.142	0.156	0.186	0.221	0.258	0.300	0.344
2.4	0.0497	0.0563	0.0626	0.0695	0.0774	0.0864	0.0965	0.108	0.119	0.131	0.144	0.172	0.204	0.239	0.278	0.320
2.6	0.0460	0.0521	0.0579	0.0643	0.0716	0.0799	0.0893	0.0998	0.111	0.122	0.133	0.160	0.190	0.223	0.259	0.298
2.8	0.0428	0.0484	0.0538	0.0597	0.0666	0.0743	0.0831	0.0929	0.103	0.113	0.125	0.149	0.177	0.208	0.243	0.279
3.0	0.0400	0.0452	0.0502	0.0558	0.0622	0.0695	0.0777	0.0869	0.0964	0.106	0.117	0.140	0.166	0.196	0.228	0.263
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 45°

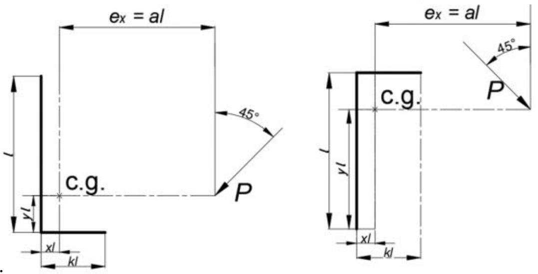
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.



a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.381	0.407	0.444	0.481	0.518	0.555	0.592	0.629	0.666	0.703	0.740	0.814	0.889	0.963	1.04	1.11
0.10	0.356	0.387	0.419	0.453	0.486	0.522	0.558	0.595	0.633	0.672	0.712	0.793	0.876	0.961	1.04	1.13
0.15	0.331	0.361	0.393	0.425	0.458	0.492	0.527	0.563	0.600	0.639	0.678	0.759	0.842	0.928	1.01	1.10
0.20	0.311	0.340	0.370	0.402	0.435	0.468	0.502	0.536	0.572	0.609	0.647	0.726	0.809	0.894	0.981	1.07
0.25	0.294	0.321	0.350	0.381	0.413	0.445	0.478	0.511	0.546	0.582	0.619	0.696	0.777	0.861	0.948	1.04
0.30	0.277	0.303	0.331	0.361	0.392	0.424	0.455	0.487	0.521	0.556	0.592	0.668	0.748	0.831	0.916	1.00
0.40	0.246	0.270	0.296	0.324	0.354	0.383	0.413	0.443	0.475	0.509	0.543	0.617	0.694	0.775	0.858	0.944
0.50	0.219	0.241	0.266	0.292	0.319	0.347	0.375	0.404	0.434	0.466	0.500	0.570	0.646	0.725	0.806	0.890
0.60	0.196	0.216	0.239	0.263	0.289	0.316	0.342	0.369	0.398	0.429	0.461	0.529	0.602	0.679	0.759	0.842
0.70	0.176	0.195	0.216	0.239	0.263	0.288	0.313	0.339	0.366	0.395	0.426	0.492	0.563	0.638	0.716	0.797
0.80	0.159	0.177	0.197	0.218	0.241	0.265	0.288	0.312	0.338	0.366	0.395	0.459	0.527	0.601	0.677	0.756
0.90	0.145	0.162	0.180	0.200	0.222	0.244	0.266	0.289	0.314	0.340	0.368	0.429	0.496	0.566	0.640	0.718
1.0	0.133	0.149	0.166	0.185	0.205	0.226	0.246	0.268	0.292	0.317	0.344	0.403	0.467	0.535	0.607	0.682
1.2	0.114	0.128	0.143	0.159	0.177	0.196	0.215	0.234	0.256	0.279	0.304	0.357	0.416	0.480	0.547	0.618
1.4	0.0996	0.112	0.125	0.140	0.156	0.172	0.189	0.207	0.227	0.248	0.270	0.320	0.374	0.433	0.496	0.562
1.6	0.0882	0.0993	0.111	0.125	0.138	0.153	0.169	0.186	0.204	0.223	0.243	0.289	0.339	0.393	0.452	0.514
1.8	0.0791	0.0891	0.100	0.112	0.124	0.137	0.153	0.168	0.184	0.202	0.221	0.263	0.309	0.360	0.414	0.472
2.0	0.0717	0.0808	0.0908	0.101	0.112	0.125	0.139	0.153	0.168	0.185	0.202	0.241	0.284	0.331	0.382	0.436
2.2	0.0655	0.0738	0.0830	0.0921	0.102	0.114	0.127	0.141	0.155	0.170	0.186	0.222	0.262	0.306	0.354	0.405
2.4	0.0603	0.0680	0.0763	0.0847	0.0941	0.105	0.117	0.130	0.143	0.157	0.172	0.206	0.243	0.285	0.330	0.378
2.6	0.0558	0.0630	0.0706	0.0784	0.0871	0.0972	0.108	0.121	0.133	0.146	0.160	0.192	0.227	0.266	0.308	0.354
2.8	0.0519	0.0587	0.0656	0.0729	0.0810	0.0905	0.101	0.113	0.124	0.136	0.150	0.179	0.212	0.249	0.289	0.333
3.0	0.0486	0.0549	0.0613	0.0682	0.0757	0.0847	0.0945	0.106	0.116	0.128	0.141	0.168	0.199	0.234	0.272	0.314
x	0.00	0.00455	0.0167	0.0346	0.0571	0.0833	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

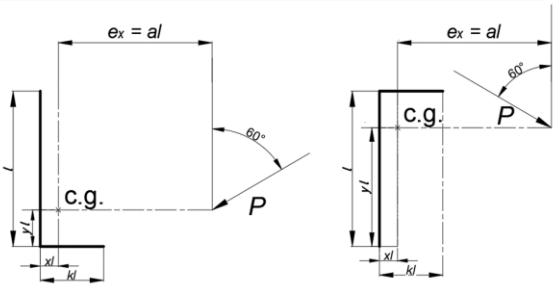
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 60°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

$P =$ required force, P_u or P_a, kN
$t_e =$ effective throat dimension, mm
$\mathrm{a} = e_x/l$
$e_x =$ horizantal component of eccentricity of P with respect to centroid of weld group, mm
$C =$ coefficient tabulated below
$C_1 =$ electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.412	0.442	0.476	0.511	0.546	0.580	0.615	0.650	0.684	0.719	0.753	0.823	0.892	0.961	1.03	1.10
0.10	0.386	0.410	0.437	0.466	0.497	0.531	0.565	0.602	0.639	0.677	0.717	0.798	0.881	0.962	1.04	1.11
0.15	0.366	0.389	0.415	0.444	0.475	0.508	0.543	0.579	0.616	0.654	0.694	0.775	0.860	0.944	1.03	1.10
0.20	0.346	0.369	0.395	0.424	0.455	0.488	0.522	0.558	0.595	0.632	0.671	0.752	0.837	0.924	1.01	1.09
0.25	0.328	0.351	0.377	0.406	0.436	0.469	0.503	0.539	0.574	0.611	0.650	0.730	0.814	0.902	0.989	1.07
0.30	0.312	0.335	0.361	0.389	0.419	0.451	0.485	0.520	0.555	0.592	0.629	0.709	0.792	0.880	0.968	1.06
0.40	0.284	0.306	0.331	0.358	0.387	0.418	0.451	0.485	0.519	0.554	0.591	0.669	0.751	0.837	0.926	1.02
0.50	0.259	0.280	0.304	0.330	0.358	0.388	0.420	0.453	0.486	0.520	0.556	0.632	0.713	0.798	0.885	0.975
0.60	0.237	0.257	0.280	0.305	0.332	0.362	0.392	0.424	0.455	0.489	0.524	0.599	0.678	0.762	0.848	0.937
0.70	0.217	0.237	0.259	0.283	0.309	0.337	0.367	0.397	0.428	0.460	0.494	0.567	0.645	0.728	0.813	0.900
0.80	0.201	0.219	0.240	0.263	0.288	0.315	0.344	0.373	0.402	0.434	0.467	0.538	0.615	0.696	0.779	0.866
0.90	0.185	0.203	0.224	0.246	0.270	0.296	0.323	0.351	0.379	0.410	0.442	0.512	0.586	0.665	0.748	0.833
1.0	0.172	0.190	0.209	0.230	0.253	0.278	0.305	0.331	0.358	0.388	0.419	0.487	0.559	0.637	0.718	0.801
1.2	0.150	0.166	0.184	0.203	0.225	0.248	0.272	0.296	0.322	0.350	0.379	0.442	0.511	0.585	0.662	0.742
1.4	0.133	0.148	0.164	0.182	0.201	0.223	0.245	0.267	0.291	0.317	0.344	0.404	0.469	0.539	0.612	0.689
1.6	0.119	0.132	0.147	0.164	0.182	0.202	0.222	0.243	0.265	0.289	0.314	0.370	0.432	0.498	0.568	0.641
1.8	0.107	0.120	0.134	0.149	0.166	0.184	0.203	0.222	0.243	0.265	0.289	0.341	0.399	0.462	0.528	0.598
2.0	0.0979	0.109	0.122	0.136	0.152	0.169	0.186	0.204	0.223	0.245	0.267	0.316	0.371	0.430	0.493	0.559
2.2	0.0899	0.101	0.112	0.126	0.140	0.156	0.172	0.189	0.207	0.227	0.248	0.294	0.346	0.401	0.461	0.525
2.4	0.0830	0.0930	0.104	0.116	0.130	0.144	0.160	0.176	0.193	0.211	0.231	0.275	0.323	0.376	0.433	0.493
2.6	0.0770	0.0865	0.0969	0.108	0.121	0.134	0.149	0.164	0.180	0.198	0.216	0.257	0.303	0.353	0.408	0.466
2.8	0.0719	0.0808	0.0906	0.102	0.113	0.126	0.140	0.154	0.169	0.185	0.203	0.242	0.285	0.333	0.385	0.440
3.0	0.0674	0.0758	0.0850	0.0951	0.106	0.118	0.131	0.145	0.159	0.175	0.191	0.228	0.270	0.315	0.364	0.418
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

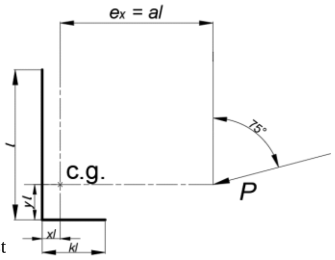
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 75°

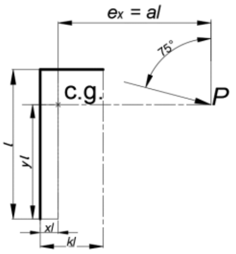
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)





Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.434	0.462	0.492	0.523	0.553	0.584	0.614	0.645	0.675	0.706	0.736	0.797	0.858	0.919	0.980	1.04
0.10	0.410	0.425	0.446	0.472	0.501	0.533	0.568	0.606	0.646	0.686	0.726	0.802	0.872	0.936	0.999	1.06
0.15	0.397	0.413	0.434	0.460	0.489	0.522	0.557	0.595	0.634	0.675	0.717	0.796	0.869	0.935	0.999	1.06
0.20	0.385	0.401	0.423	0.449	0.478	0.511	0.546	0.584	0.623	0.664	0.707	0.789	0.864	0.933	0.998	1.06
0.25	0.373	0.390	0.412	0.438	0.467	0.500	0.535	0.573	0.612	0.653	0.696	0.781	0.859	0.929	0.996	1.06
0.30	0.362	0.380	0.402	0.428	0.457	0.490	0.525	0.562	0.602	0.643	0.685	0.771	0.852	0.925	0.993	1.06
0.40	0.343	0.360	0.383	0.409	0.438	0.470	0.505	0.542	0.581	0.622	0.664	0.749	0.834	0.914	0.985	1.05
0.50	0.325	0.343	0.365	0.391	0.420	0.452	0.486	0.523	0.562	0.602	0.643	0.727	0.814	0.898	0.975	1.04
0.60	0.308	0.326	0.348	0.374	0.403	0.434	0.468	0.505	0.543	0.583	0.623	0.707	0.793	0.879	0.960	1.04
0.70	0.293	0.311	0.333	0.358	0.386	0.418	0.451	0.487	0.525	0.565	0.604	0.686	0.773	0.859	0.943	1.02
0.80	0.278	0.296	0.318	0.343	0.371	0.402	0.435	0.471	0.508	0.547	0.586	0.667	0.753	0.840	0.925	1.01
0.90	0.265	0.283	0.304	0.329	0.357	0.387	0.420	0.455	0.492	0.530	0.568	0.648	0.733	0.820	0.907	0.990
1.0	0.253	0.270	0.292	0.316	0.343	0.373	0.405	0.440	0.476	0.513	0.551	0.630	0.714	0.801	0.888	0.972
1.2	0.230	0.248	0.268	0.292	0.318	0.347	0.378	0.412	0.447	0.482	0.518	0.596	0.678	0.763	0.851	0.937
1.4	0.211	0.228	0.248	0.270	0.296	0.324	0.354	0.386	0.419	0.453	0.488	0.564	0.644	0.727	0.814	0.901
1.6	0.194	0.210	0.230	0.252	0.276	0.303	0.332	0.363	0.394	0.427	0.461	0.534	0.612	0.694	0.778	0.866
1.8	0.179	0.195	0.214	0.235	0.258	0.284	0.312	0.342	0.371	0.403	0.436	0.506	0.582	0.662	0.745	0.831
2.0	0.166	0.182	0.200	0.220	0.242	0.267	0.294	0.322	0.351	0.381	0.413	0.481	0.554	0.632	0.713	0.798
2.2	0.155	0.170	0.187	0.206	0.228	0.252	0.278	0.305	0.331	0.360	0.391	0.457	0.529	0.604	0.683	0.766
2.4	0.145	0.159	0.176	0.194	0.215	0.238	0.263	0.288	0.314	0.342	0.372	0.436	0.505	0.578	0.655	0.736
2.6	0.136	0.150	0.166	0.184	0.204	0.226	0.250	0.273	0.298	0.325	0.354	0.415	0.482	0.554	0.629	0.707
2.8	0.128	0.141	0.157	0.174	0.193	0.214	0.237	0.260	0.284	0.310	0.337	0.396	0.461	0.531	0.604	0.681
3.0	0.121	0.134	0.149	0.165	0.183	0.204	0.226	0.247	0.270	0.295	0.321	0.379	0.442	0.509	0.581	0.655
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 0°

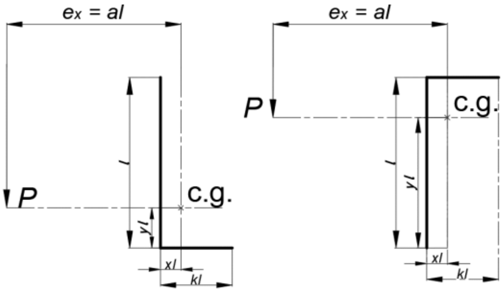
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			**ASD**		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.



a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.294	0.323	0.353	0.382	0.426	0.470	0.515	0.559	0.603	0.647	0.691	0.779	0.867	0.956	1.04	1.13
0.10	0.294	0.328	0.368	0.409	0.449	0.489	0.527	0.564	0.599	0.632	0.665	0.730	0.796	0.865	0.935	1.01
0.15	0.290	0.324	0.361	0.398	0.435	0.471	0.504	0.537	0.569	0.600	0.630	0.694	0.760	0.828	0.898	0.970
0.20	0.279	0.311	0.344	0.378	0.410	0.442	0.472	0.502	0.533	0.565	0.596	0.659	0.725	0.793	0.862	0.934
0.25	0.263	0.293	0.323	0.352	0.382	0.410	0.438	0.467	0.498	0.530	0.563	0.627	0.692	0.759	0.828	0.900
0.30	0.246	0.274	0.301	0.327	0.353	0.379	0.406	0.436	0.466	0.498	0.531	0.596	0.660	0.727	0.796	0.867
0.40	0.212	0.236	0.258	0.280	0.302	0.326	0.352	0.381	0.410	0.442	0.474	0.540	0.603	0.669	0.736	0.805
0.50	0.183	0.204	0.222	0.242	0.262	0.285	0.309	0.336	0.364	0.394	0.424	0.489	0.552	0.616	0.682	0.750
0.60	0.159	0.177	0.194	0.212	0.231	0.251	0.274	0.298	0.325	0.354	0.383	0.445	0.508	0.570	0.634	0.700
0.70	0.140	0.156	0.171	0.188	0.205	0.224	0.245	0.268	0.293	0.320	0.348	0.407	0.469	0.529	0.591	0.654
0.80	0.124	0.138	0.153	0.168	0.184	0.202	0.221	0.243	0.266	0.291	0.317	0.374	0.433	0.492	0.552	0.614
0.90	0.112	0.124	0.138	0.152	0.167	0.184	0.201	0.221	0.243	0.266	0.292	0.345	0.402	0.459	0.517	0.577
1.0	0.102	0.113	0.125	0.138	0.152	0.168	0.185	0.203	0.223	0.245	0.269	0.320	0.374	0.430	0.486	0.544
1.2	0.0855	0.0953	0.106	0.117	0.129	0.143	0.158	0.174	0.192	0.211	0.232	0.278	0.328	0.380	0.432	0.486
1.4	0.0738	0.0822	0.0913	0.101	0.112	0.124	0.138	0.152	0.168	0.185	0.204	0.245	0.291	0.339	0.388	0.438
1.6	0.0648	0.0722	0.0803	0.0891	0.0989	0.110	0.122	0.135	0.149	0.165	0.182	0.219	0.260	0.305	0.351	0.398
1.8	0.0578	0.0643	0.0716	0.0796	0.0883	0.0983	0.109	0.121	0.134	0.148	0.163	0.197	0.236	0.277	0.320	0.364
2.0	0.0521	0.0580	0.0646	0.0718	0.0798	0.0890	0.0988	0.110	0.121	0.134	0.148	0.180	0.215	0.253	0.294	0.335
2.2	0.0474	0.0528	0.0588	0.0655	0.0728	0.0812	0.0902	0.100	0.111	0.123	0.136	0.165	0.197	0.233	0.271	0.310
2.4	0.0435	0.0485	0.0540	0.0601	0.0669	0.0746	0.0830	0.0921	0.102	0.113	0.125	0.152	0.182	0.216	0.251	0.288
2.6	0.0402	0.0448	0.0499	0.0555	0.0618	0.0690	0.0768	0.0853	0.0947	0.105	0.116	0.141	0.169	0.200	0.233	0.268
2.8	0.0373	0.0416	0.0463	0.0516	0.0575	0.0642	0.0714	0.0795	0.0882	0.0978	0.108	0.132	0.158	0.187	0.217	0.251
3.0	0.0349	0.0389	0.0433	0.0482	0.0537	0.0600	0.0668	0.0744	0.0826	0.0914	0.101	0.123	0.148	0.175	0.204	0.235
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 15°

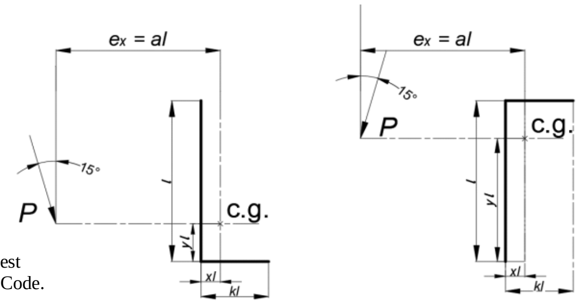
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.



a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.313	0.348	0.391	0.434	0.478	0.521	0.564	0.607	0.650	0.693	0.736	0.823	0.909	0.995	1.08	1.17
0.10	0.300	0.332	0.368	0.405	0.442	0.480	0.517	0.553	0.589	0.625	0.660	0.730	0.800	0.871	0.944	1.02
0.15	0.292	0.325	0.359	0.393	0.428	0.463	0.497	0.531	0.565	0.598	0.631	0.698	0.766	0.836	0.908	0.981
0.20	0.279	0.312	0.344	0.376	0.409	0.442	0.474	0.506	0.537	0.569	0.601	0.665	0.732	0.801	0.871	0.944
0.25	0.263	0.294	0.325	0.356	0.386	0.417	0.447	0.477	0.508	0.538	0.569	0.633	0.700	0.768	0.838	0.910
0.30	0.246	0.276	0.305	0.334	0.361	0.389	0.418	0.448	0.478	0.509	0.540	0.604	0.670	0.738	0.808	0.879
0.40	0.213	0.239	0.265	0.289	0.313	0.338	0.364	0.393	0.423	0.455	0.488	0.551	0.615	0.681	0.750	0.820
0.50	0.185	0.208	0.230	0.250	0.273	0.296	0.321	0.347	0.377	0.407	0.439	0.503	0.566	0.631	0.697	0.766
0.60	0.161	0.181	0.201	0.220	0.240	0.262	0.285	0.310	0.337	0.366	0.397	0.461	0.522	0.585	0.650	0.716
0.70	0.142	0.160	0.177	0.195	0.214	0.234	0.255	0.278	0.304	0.331	0.360	0.422	0.483	0.544	0.607	0.671
0.80	0.127	0.143	0.158	0.174	0.192	0.211	0.231	0.252	0.276	0.302	0.329	0.388	0.448	0.507	0.568	0.631
0.90	0.114	0.129	0.143	0.158	0.174	0.191	0.210	0.230	0.252	0.277	0.302	0.358	0.417	0.474	0.533	0.594
1.0	0.104	0.117	0.130	0.144	0.158	0.175	0.192	0.211	0.232	0.255	0.279	0.332	0.389	0.445	0.501	0.560
1.2	0.0877	0.0989	0.110	0.121	0.135	0.149	0.164	0.181	0.199	0.220	0.241	0.289	0.341	0.394	0.446	0.501
1.4	0.0758	0.0853	0.0947	0.105	0.117	0.129	0.143	0.158	0.174	0.192	0.212	0.254	0.302	0.352	0.401	0.452
1.6	0.0667	0.0749	0.0833	0.0925	0.103	0.114	0.127	0.140	0.155	0.171	0.188	0.227	0.270	0.317	0.363	0.411
1.8	0.0595	0.0668	0.0743	0.0825	0.0917	0.102	0.113	0.126	0.139	0.154	0.170	0.205	0.245	0.287	0.332	0.377
2.0	0.0537	0.0602	0.0670	0.0745	0.0828	0.0923	0.103	0.114	0.126	0.139	0.154	0.187	0.223	0.263	0.305	0.347
2.2	0.0489	0.0548	0.0610	0.0678	0.0755	0.0842	0.0937	0.104	0.115	0.128	0.141	0.171	0.205	0.242	0.281	0.321
2.4	0.0449	0.0503	0.0560	0.0623	0.0694	0.0773	0.0861	0.0957	0.106	0.118	0.130	0.158	0.189	0.223	0.260	0.299
2.6	0.0415	0.0465	0.0517	0.0575	0.0642	0.0715	0.0797	0.0886	0.0983	0.109	0.120	0.146	0.176	0.207	0.241	0.278
2.8	0.0385	0.0432	0.0480	0.0535	0.0597	0.0665	0.0742	0.0825	0.0915	0.101	0.112	0.137	0.164	0.193	0.225	0.260
3.0	0.0360	0.0403	0.0449	0.0500	0.0557	0.0621	0.0693	0.0772	0.0857	0.0950	0.105	0.128	0.154	0.181	0.211	0.243
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

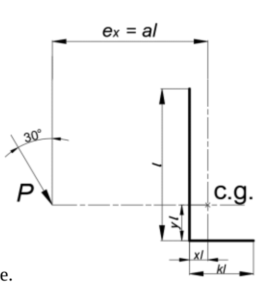
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 30°

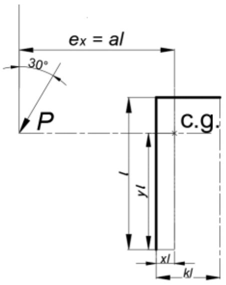
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2
(1.0 for E49 electrodes)





Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.346	0.387	0.428	0.468	0.509	0.550	0.591	0.631	0.672	0.713	0.753	0.835	0.916	0.998	1.08	1.16
0.10	0.321	0.355	0.391	0.428	0.465	0.501	0.539	0.576	0.613	0.650	0.688	0.764	0.841	0.920	0.999	1.08
0.15	0.304	0.337	0.370	0.403	0.437	0.472	0.506	0.541	0.577	0.612	0.648	0.721	0.796	0.873	0.953	1.03
0.20	0.289	0.319	0.350	0.382	0.415	0.448	0.481	0.514	0.548	0.582	0.617	0.687	0.759	0.834	0.910	0.989
0.25	0.272	0.301	0.331	0.361	0.392	0.424	0.456	0.488	0.520	0.553	0.586	0.654	0.725	0.798	0.873	0.950
0.30	0.255	0.283	0.311	0.339	0.369	0.399	0.430	0.461	0.493	0.525	0.557	0.624	0.694	0.765	0.839	0.914
0.40	0.224	0.248	0.273	0.298	0.326	0.355	0.386	0.416	0.447	0.478	0.509	0.574	0.641	0.710	0.782	0.854
0.50	0.196	0.218	0.239	0.264	0.290	0.318	0.347	0.376	0.406	0.437	0.468	0.531	0.596	0.663	0.733	0.803
0.60	0.172	0.192	0.212	0.235	0.260	0.286	0.311	0.339	0.367	0.398	0.430	0.492	0.555	0.621	0.688	0.757
0.70	0.153	0.171	0.190	0.211	0.234	0.257	0.281	0.307	0.334	0.363	0.393	0.456	0.518	0.582	0.647	0.715
0.80	0.137	0.153	0.171	0.191	0.212	0.233	0.255	0.279	0.305	0.332	0.361	0.424	0.484	0.546	0.609	0.675
0.90	0.124	0.139	0.155	0.174	0.192	0.212	0.233	0.255	0.279	0.305	0.333	0.393	0.453	0.513	0.575	0.639
1.0	0.114	0.127	0.142	0.159	0.175	0.194	0.214	0.235	0.257	0.282	0.308	0.365	0.425	0.483	0.543	0.605
1.2	0.0963	0.108	0.121	0.135	0.149	0.165	0.183	0.202	0.222	0.243	0.267	0.319	0.375	0.431	0.487	0.546
1.4	0.0835	0.0937	0.105	0.117	0.130	0.144	0.159	0.176	0.194	0.214	0.235	0.282	0.334	0.387	0.440	0.495
1.6	0.0736	0.0827	0.0927	0.103	0.114	0.127	0.141	0.156	0.173	0.190	0.209	0.252	0.300	0.351	0.400	0.452
1.8	0.0658	0.0739	0.0827	0.0919	0.102	0.114	0.126	0.140	0.155	0.171	0.189	0.228	0.272	0.319	0.366	0.415
2.0	0.0594	0.0668	0.0746	0.0830	0.0922	0.103	0.114	0.127	0.141	0.155	0.171	0.207	0.248	0.291	0.337	0.383
2.2	0.0542	0.0609	0.0679	0.0757	0.0842	0.0939	0.104	0.116	0.128	0.142	0.157	0.190	0.228	0.268	0.311	0.355
2.4	0.0497	0.0560	0.0624	0.0695	0.0773	0.0863	0.0960	0.107	0.118	0.131	0.145	0.176	0.210	0.247	0.287	0.331
2.6	0.0460	0.0518	0.0576	0.0642	0.0715	0.0798	0.0889	0.0990	0.110	0.121	0.134	0.163	0.195	0.230	0.267	0.308
2.8	0.0428	0.0482	0.0535	0.0597	0.0665	0.0742	0.0828	0.0921	0.102	0.113	0.125	0.152	0.182	0.214	0.250	0.288
3.0	0.0400	0.0450	0.0500	0.0557	0.0622	0.0693	0.0774	0.0862	0.0957	0.106	0.117	0.143	0.170	0.201	0.234	0.270
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

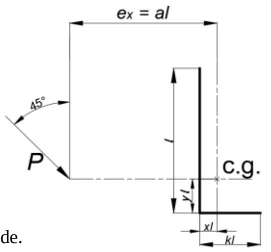
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 45°

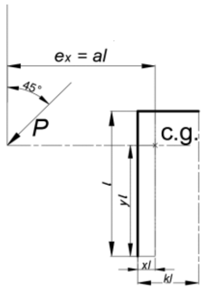
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)





Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.381	0.407	0.444	0.481	0.518	0.555	0.592	0.629	0.666	0.703	0.740	0.814	0.889	0.963	1.04	1.11
0.10	0.356	0.387	0.420	0.455	0.490	0.527	0.563	0.600	0.638	0.675	0.712	0.789	0.867	0.944	1.02	1.10
0.15	0.331	0.361	0.393	0.426	0.461	0.498	0.535	0.573	0.610	0.648	0.686	0.765	0.843	0.922	1.00	1.08
0.20	0.311	0.339	0.368	0.399	0.431	0.466	0.503	0.541	0.580	0.618	0.657	0.736	0.815	0.895	0.974	1.05
0.25	0.294	0.320	0.347	0.376	0.406	0.438	0.473	0.509	0.547	0.586	0.625	0.705	0.785	0.865	0.945	1.03
0.30	0.277	0.302	0.328	0.354	0.383	0.414	0.447	0.482	0.518	0.554	0.592	0.671	0.752	0.833	0.914	0.996
0.40	0.246	0.269	0.292	0.317	0.345	0.375	0.407	0.441	0.475	0.510	0.545	0.616	0.691	0.770	0.851	0.932
0.50	0.219	0.240	0.261	0.286	0.313	0.342	0.374	0.406	0.440	0.473	0.508	0.576	0.646	0.719	0.796	0.876
0.60	0.196	0.215	0.235	0.259	0.285	0.314	0.344	0.375	0.408	0.441	0.475	0.540	0.609	0.679	0.751	0.826
0.70	0.176	0.194	0.213	0.235	0.261	0.288	0.317	0.347	0.379	0.411	0.444	0.508	0.575	0.643	0.713	0.786
0.80	0.159	0.176	0.194	0.216	0.240	0.265	0.293	0.322	0.352	0.383	0.415	0.478	0.543	0.610	0.679	0.749
0.90	0.145	0.161	0.178	0.198	0.221	0.246	0.272	0.299	0.328	0.357	0.387	0.450	0.514	0.579	0.646	0.715
1.0	0.133	0.148	0.164	0.183	0.205	0.228	0.253	0.278	0.305	0.332	0.362	0.425	0.487	0.550	0.616	0.684
1.2	0.114	0.127	0.142	0.158	0.178	0.198	0.219	0.242	0.265	0.291	0.318	0.377	0.438	0.499	0.561	0.626
1.4	0.0997	0.111	0.124	0.140	0.156	0.173	0.192	0.213	0.234	0.257	0.282	0.336	0.394	0.453	0.513	0.575
1.6	0.0883	0.0986	0.111	0.124	0.138	0.154	0.171	0.189	0.209	0.230	0.252	0.302	0.356	0.414	0.471	0.530
1.8	0.0792	0.0885	0.0995	0.112	0.124	0.138	0.153	0.170	0.188	0.207	0.228	0.273	0.324	0.378	0.434	0.490
2.0	0.0717	0.0802	0.0903	0.101	0.112	0.125	0.139	0.155	0.171	0.189	0.208	0.249	0.296	0.347	0.401	0.455
2.2	0.0655	0.0733	0.0827	0.0921	0.103	0.114	0.127	0.141	0.157	0.173	0.191	0.229	0.273	0.320	0.371	0.424
2.4	0.0603	0.0676	0.0761	0.0847	0.0944	0.105	0.117	0.130	0.144	0.160	0.176	0.212	0.252	0.296	0.344	0.395
2.6	0.0558	0.0627	0.0704	0.0783	0.0873	0.0973	0.109	0.121	0.134	0.148	0.164	0.197	0.235	0.276	0.321	0.369
2.8	0.0520	0.0584	0.0654	0.0729	0.0812	0.0905	0.101	0.112	0.125	0.138	0.153	0.184	0.219	0.258	0.300	0.346
3.0	0.0486	0.0546	0.0612	0.0681	0.0759	0.0847	0.0946	0.105	0.117	0.129	0.143	0.172	0.206	0.242	0.282	0.325
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups Angle = 60°

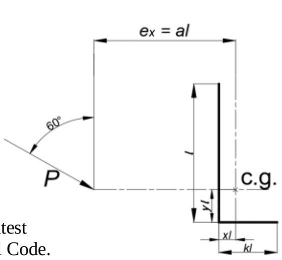
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

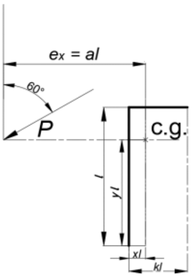
LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.





a	***k***															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.412	0.442	0.476	0.511	0.546	0.580	0.615	0.650	0.684	0.719	0.753	0.823	0.892	0.961	1.03	1.10
0.10	0.386	0.410	0.437	0.467	0.499	0.533	0.570	0.607	0.645	0.682	0.719	0.793	0.866	0.938	1.01	1.08
0.15	0.366	0.389	0.415	0.443	0.474	0.507	0.543	0.582	0.621	0.660	0.699	0.775	0.849	0.923	0.996	1.07
0.20	0.346	0.368	0.393	0.419	0.449	0.483	0.519	0.557	0.595	0.634	0.675	0.754	0.831	0.906	0.980	1.05
0.25	0.328	0.350	0.373	0.399	0.428	0.462	0.498	0.536	0.574	0.613	0.652	0.730	0.810	0.888	0.963	1.04
0.30	0.312	0.334	0.356	0.381	0.410	0.443	0.478	0.516	0.555	0.594	0.633	0.710	0.788	0.867	0.944	1.02
0.40	0.284	0.305	0.326	0.351	0.380	0.412	0.446	0.481	0.519	0.558	0.598	0.676	0.753	0.829	0.905	0.982
0.50	0.259	0.278	0.299	0.325	0.353	0.384	0.417	0.452	0.488	0.525	0.563	0.644	0.722	0.799	0.874	0.949
0.60	0.237	0.255	0.276	0.301	0.329	0.360	0.392	0.426	0.461	0.497	0.534	0.611	0.691	0.769	0.846	0.921
0.70	0.217	0.235	0.256	0.280	0.307	0.337	0.369	0.402	0.436	0.472	0.507	0.582	0.660	0.740	0.817	0.893
0.80	0.201	0.217	0.237	0.261	0.287	0.316	0.347	0.379	0.413	0.448	0.483	0.556	0.632	0.710	0.789	0.866
0.90	0.186	0.202	0.221	0.244	0.269	0.297	0.327	0.359	0.392	0.425	0.460	0.532	0.606	0.682	0.760	0.838
1.0	0.172	0.188	0.207	0.228	0.253	0.280	0.309	0.340	0.371	0.404	0.438	0.509	0.582	0.655	0.731	0.809
1.2	0.150	0.165	0.182	0.202	0.225	0.250	0.277	0.305	0.335	0.365	0.396	0.463	0.535	0.607	0.680	0.754
1.4	0.133	0.146	0.163	0.181	0.202	0.225	0.250	0.276	0.302	0.329	0.359	0.422	0.491	0.563	0.634	0.706
1.6	0.119	0.131	0.146	0.163	0.183	0.204	0.227	0.250	0.274	0.300	0.326	0.386	0.451	0.521	0.593	0.662
1.8	0.107	0.119	0.133	0.149	0.166	0.186	0.207	0.229	0.251	0.274	0.299	0.355	0.417	0.483	0.553	0.622
2.0	0.0979	0.109	0.122	0.136	0.153	0.171	0.190	0.210	0.230	0.252	0.276	0.328	0.386	0.449	0.516	0.586
2.2	0.0899	0.0999	0.112	0.126	0.141	0.157	0.175	0.194	0.213	0.233	0.255	0.304	0.359	0.419	0.483	0.550
2.4	0.0830	0.0925	0.104	0.117	0.131	0.145	0.162	0.180	0.197	0.216	0.237	0.283	0.335	0.392	0.453	0.517
2.6	0.0771	0.0861	0.0965	0.109	0.121	0.135	0.151	0.167	0.184	0.202	0.221	0.265	0.314	0.368	0.426	0.487
2.8	0.0719	0.0804	0.0902	0.102	0.113	0.126	0.141	0.156	0.172	0.189	0.208	0.249	0.295	0.346	0.402	0.460
3.0	0.0674	0.0755	0.0847	0.0952	0.106	0.118	0.132	0.147	0.162	0.178	0.195	0.234	0.278	0.327	0.380	0.436
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

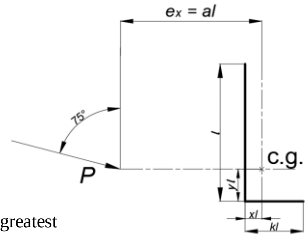
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 75°

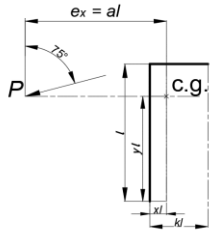
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)





Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	*k*															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.434	0.462	0.492	0.523	0.553	0.584	0.614	0.645	0.675	0.706	0.736	0.797	0.858	0.919	0.980	1.04
0.10	0.410	0.424	0.441	0.465	0.495	0.527	0.561	0.595	0.629	0.661	0.694	0.758	0.827	0.895	0.960	1.02
0.15	0.397	0.411	0.429	0.454	0.484	0.517	0.552	0.587	0.621	0.655	0.688	0.752	0.816	0.885	0.952	1.02
0.20	0.385	0.399	0.417	0.443	0.474	0.507	0.542	0.578	0.614	0.649	0.682	0.747	0.811	0.875	0.943	1.01
0.25	0.373	0.388	0.407	0.432	0.463	0.497	0.533	0.569	0.606	0.641	0.676	0.742	0.806	0.869	0.933	1.00
0.30	0.362	0.377	0.397	0.423	0.453	0.487	0.523	0.561	0.598	0.634	0.670	0.737	0.802	0.865	0.927	0.992
0.40	0.343	0.357	0.378	0.405	0.434	0.468	0.504	0.542	0.581	0.619	0.656	0.726	0.793	0.857	0.919	0.982
0.50	0.325	0.340	0.361	0.387	0.417	0.450	0.485	0.523	0.563	0.602	0.641	0.714	0.783	0.849	0.912	0.975
0.60	0.308	0.324	0.345	0.371	0.401	0.433	0.469	0.506	0.545	0.585	0.625	0.701	0.773	0.840	0.905	0.968
0.70	0.293	0.309	0.330	0.355	0.385	0.418	0.453	0.489	0.528	0.568	0.608	0.687	0.761	0.831	0.897	0.962
0.80	0.278	0.294	0.316	0.341	0.370	0.403	0.437	0.474	0.511	0.550	0.591	0.672	0.748	0.820	0.888	0.954
0.90	0.265	0.281	0.302	0.327	0.356	0.388	0.422	0.458	0.496	0.535	0.574	0.656	0.734	0.808	0.879	0.946
1.0	0.253	0.269	0.290	0.315	0.343	0.375	0.408	0.444	0.481	0.519	0.558	0.640	0.720	0.796	0.868	0.937
1.2	0.230	0.246	0.267	0.291	0.318	0.349	0.382	0.417	0.453	0.490	0.528	0.608	0.690	0.769	0.844	0.917
1.4	0.211	0.226	0.246	0.270	0.297	0.326	0.358	0.392	0.427	0.463	0.500	0.577	0.659	0.741	0.819	0.894
1.6	0.194	0.209	0.229	0.251	0.277	0.305	0.336	0.368	0.403	0.438	0.473	0.548	0.628	0.711	0.791	0.869
1.8	0.179	0.194	0.213	0.235	0.259	0.286	0.316	0.347	0.380	0.413	0.447	0.519	0.597	0.679	0.763	0.842
2.0	0.166	0.181	0.199	0.220	0.243	0.269	0.298	0.328	0.360	0.391	0.423	0.493	0.568	0.648	0.731	0.814
2.2	0.155	0.169	0.186	0.206	0.229	0.254	0.281	0.310	0.340	0.369	0.401	0.468	0.541	0.619	0.700	0.784
2.4	0.145	0.159	0.175	0.194	0.216	0.240	0.266	0.294	0.322	0.350	0.380	0.446	0.516	0.592	0.671	0.754
2.6	0.136	0.149	0.165	0.184	0.205	0.228	0.253	0.279	0.305	0.332	0.362	0.424	0.493	0.567	0.644	0.725
2.8	0.128	0.141	0.156	0.174	0.194	0.216	0.240	0.265	0.290	0.316	0.344	0.405	0.472	0.543	0.619	0.698
3.0	0.121	0.133	0.148	0.165	0.184	0.206	0.228	0.252	0.276	0.301	0.328	0.387	0.452	0.521	0.595	0.672
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

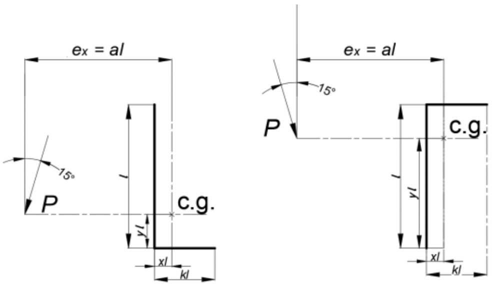
C Coefficients for Eccentrically Loaded Weld Groups
Angle = 15°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

$P =$ required force, P_u or P_a, kN
$t_e =$ effective throat dimension, mm
a $= e_x/l$
$e_x =$ horizantal component of eccentricity of P with respect to centroid of weld group, mm
$C =$ coefficient tabulated below
$C_1 =$ electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)



Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.

a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.313	0.348	0.391	0.434	0.478	0.521	0.564	0.607	0.650	0.693	0.736	0.823	0.909	0.995	1.08	1.17
0.10	0.300	0.342	0.386	0.430	0.471	0.508	0.542	0.574	0.605	0.637	0.669	0.735	0.804	0.876	0.950	1.03
0.15	0.292	0.331	0.371	0.409	0.444	0.476	0.506	0.536	0.566	0.599	0.631	0.698	0.766	0.838	0.911	0.987
0.20	0.279	0.314	0.349	0.383	0.414	0.443	0.471	0.500	0.531	0.563	0.596	0.663	0.731	0.802	0.875	0.950
0.25	0.263	0.295	0.326	0.356	0.384	0.410	0.438	0.467	0.497	0.529	0.562	0.630	0.698	0.768	0.840	0.914
0.30	0.246	0.275	0.303	0.329	0.355	0.381	0.408	0.437	0.467	0.498	0.531	0.599	0.666	0.736	0.808	0.881
0.40	0.213	0.238	0.260	0.282	0.304	0.329	0.356	0.384	0.413	0.444	0.475	0.542	0.609	0.677	0.747	0.819
0.50	0.185	0.206	0.225	0.244	0.265	0.288	0.313	0.340	0.368	0.397	0.428	0.492	0.559	0.625	0.693	0.764
0.60	0.161	0.180	0.197	0.215	0.234	0.255	0.278	0.303	0.330	0.358	0.387	0.449	0.515	0.579	0.645	0.713
0.70	0.142	0.159	0.174	0.191	0.209	0.228	0.249	0.273	0.298	0.325	0.353	0.412	0.475	0.537	0.601	0.668
0.80	0.127	0.141	0.156	0.171	0.188	0.205	0.225	0.247	0.271	0.296	0.323	0.379	0.440	0.501	0.563	0.627
0.90	0.114	0.127	0.141	0.155	0.170	0.187	0.205	0.226	0.248	0.272	0.297	0.351	0.408	0.468	0.528	0.589
1.0	0.104	0.116	0.128	0.142	0.156	0.171	0.188	0.207	0.228	0.251	0.275	0.326	0.381	0.439	0.496	0.556
1.2	0.0877	0.0979	0.108	0.120	0.133	0.147	0.161	0.178	0.197	0.217	0.238	0.284	0.334	0.388	0.442	0.497
1.4	0.0758	0.0846	0.0939	0.104	0.115	0.128	0.141	0.156	0.172	0.190	0.209	0.251	0.297	0.347	0.398	0.449
1.6	0.0667	0.0744	0.0827	0.0917	0.102	0.113	0.125	0.138	0.153	0.169	0.186	0.225	0.267	0.312	0.360	0.409
1.8	0.0595	0.0663	0.0738	0.0820	0.0911	0.101	0.112	0.124	0.138	0.152	0.168	0.203	0.242	0.284	0.329	0.374
2.0	0.0537	0.0598	0.0666	0.0741	0.0823	0.0915	0.102	0.113	0.125	0.138	0.153	0.185	0.221	0.260	0.302	0.345
2.2	0.0489	0.0545	0.0607	0.0675	0.0751	0.0836	0.0929	0.103	0.114	0.126	0.140	0.170	0.203	0.239	0.279	0.319
2.4	0.0449	0.0500	0.0557	0.0620	0.0690	0.0768	0.0855	0.0950	0.105	0.117	0.129	0.157	0.188	0.222	0.258	0.297
2.6	0.0415	0.0463	0.0514	0.0573	0.0639	0.0711	0.0792	0.0880	0.0976	0.108	0.120	0.146	0.174	0.206	0.240	0.276
2.8	0.0385	0.0430	0.0478	0.0533	0.0594	0.0662	0.0737	0.0819	0.0909	0.101	0.112	0.136	0.163	0.193	0.224	0.258
3.0	0.0360	0.0402	0.0447	0.0498	0.0555	0.0619	0.0690	0.0767	0.0851	0.0945	0.105	0.127	0.153	0.181	0.210	0.243
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 30°

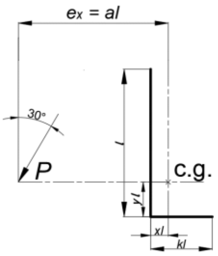
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

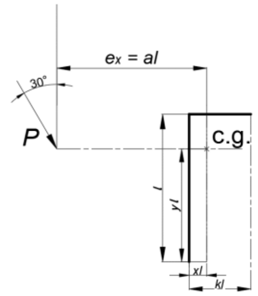
LRFD			ASD		
$C_{min}=\frac{P_u}{\phi C_1 t_e l}$	$t_{min}=\frac{P_u}{\phi C C_1 l}$	$l_{min}=\frac{P_u}{\phi C C_1 t_e}$	$C_{min}=\frac{\Omega P_a}{C_1 t_e l}$	$t_{min}=\frac{\Omega P_a}{C C_1 l}$	$l_{min}=\frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.





a	*k*															
	0	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.346	0.387	0.428	0.468	0.509	0.550	0.591	0.631	0.672	0.713	0.753	0.835	0.916	0.998	1.08	1.16
0.10	0.321	0.371	0.415	0.453	0.488	0.519	0.549	0.580	0.613	0.647	0.683	0.758	0.835	0.913	0.992	1.07
0.15	0.304	0.349	0.390	0.426	0.457	0.484	0.512	0.543	0.575	0.610	0.646	0.720	0.797	0.875	0.954	1.03
0.20	0.289	0.328	0.365	0.397	0.425	0.452	0.479	0.509	0.541	0.576	0.611	0.686	0.763	0.840	0.917	0.997
0.25	0.272	0.307	0.341	0.370	0.396	0.422	0.450	0.479	0.510	0.544	0.579	0.653	0.730	0.807	0.884	0.962
0.30	0.255	0.287	0.316	0.343	0.368	0.395	0.422	0.451	0.482	0.515	0.550	0.623	0.699	0.776	0.852	0.930
0.40	0.224	0.250	0.274	0.297	0.321	0.346	0.373	0.401	0.431	0.463	0.497	0.568	0.643	0.718	0.794	0.870
0.50	0.196	0.219	0.239	0.259	0.282	0.306	0.332	0.359	0.388	0.419	0.451	0.519	0.592	0.666	0.740	0.816
0.60	0.172	0.193	0.211	0.230	0.250	0.273	0.298	0.324	0.351	0.380	0.411	0.476	0.547	0.619	0.692	0.765
0.70	0.153	0.171	0.188	0.205	0.224	0.245	0.268	0.293	0.320	0.347	0.377	0.439	0.507	0.577	0.647	0.719
0.80	0.137	0.153	0.169	0.185	0.203	0.222	0.244	0.267	0.292	0.319	0.346	0.406	0.471	0.539	0.607	0.677
0.90	0.124	0.139	0.153	0.169	0.185	0.203	0.223	0.245	0.269	0.294	0.320	0.377	0.439	0.505	0.571	0.639
1.0	0.114	0.127	0.140	0.154	0.170	0.186	0.205	0.226	0.248	0.272	0.297	0.352	0.411	0.474	0.538	0.604
1.2	0.0963	0.107	0.119	0.132	0.145	0.160	0.177	0.195	0.215	0.236	0.259	0.309	0.363	0.421	0.482	0.543
1.4	0.0835	0.0931	0.103	0.114	0.127	0.140	0.155	0.171	0.189	0.209	0.229	0.274	0.324	0.378	0.434	0.491
1.6	0.0736	0.0821	0.0913	0.101	0.112	0.124	0.137	0.152	0.168	0.186	0.205	0.246	0.292	0.342	0.395	0.448
1.8	0.0658	0.0733	0.0816	0.0906	0.101	0.112	0.124	0.137	0.152	0.168	0.185	0.223	0.265	0.311	0.361	0.411
2.0	0.0594	0.0663	0.0738	0.0820	0.0910	0.101	0.112	0.124	0.138	0.153	0.169	0.204	0.243	0.286	0.332	0.379
2.2	0.0542	0.0604	0.0673	0.0748	0.0831	0.0926	0.103	0.114	0.126	0.140	0.155	0.187	0.224	0.263	0.307	0.351
2.4	0.0497	0.0555	0.0618	0.0688	0.0765	0.0852	0.0947	0.105	0.117	0.129	0.143	0.173	0.207	0.244	0.285	0.327
2.6	0.0460	0.0513	0.0571	0.0636	0.0708	0.0789	0.0877	0.0974	0.108	0.120	0.133	0.161	0.193	0.228	0.265	0.305
2.8	0.0428	0.0478	0.0531	0.0591	0.0659	0.0735	0.0817	0.0908	0.101	0.112	0.124	0.150	0.180	0.213	0.248	0.286
3.0	0.0400	0.0446	0.0496	0.0553	0.0617	0.0687	0.0764	0.0850	0.0944	0.105	0.116	0.141	0.169	0.200	0.233	0.268
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 45°

Available strength of a weld group, ϕR_n or R_n/Ω, is determined with

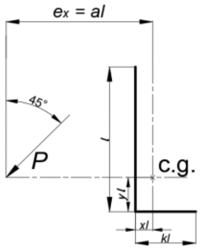
$$R_n = C \cdot C_1 \cdot t_e \cdot l \;\; (\phi = 0.75, \Omega = 2.00)$$

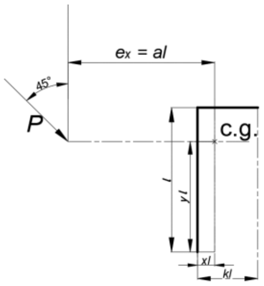
LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a = e_x/l
e_x = horizantal component of eccentricity of P
with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2
(1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.





a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.356	0.400	0.438	0.471	0.503	0.534	0.567	0.602	0.638	0.674	0.712	0.789	0.866	0.944	1.02	1.10
0.10	0.331	0.378	0.414	0.444	0.472	0.502	0.534	0.568	0.604	0.640	0.678	0.755	0.834	0.914	0.994	1.07
0.15	0.311	0.355	0.390	0.417	0.443	0.472	0.504	0.538	0.573	0.609	0.647	0.724	0.802	0.882	0.963	1.04
0.20	0.294	0.333	0.366	0.393	0.418	0.446	0.477	0.510	0.545	0.581	0.619	0.695	0.773	0.852	0.932	1.01
0.25	0.277	0.312	0.343	0.369	0.394	0.421	0.451	0.484	0.519	0.555	0.592	0.669	0.747	0.826	0.905	0.985
0.30	0.246	0.276	0.302	0.327	0.352	0.379	0.407	0.438	0.471	0.507	0.544	0.620	0.698	0.777	0.857	0.936
0.40	0.219	0.245	0.267	0.291	0.316	0.341	0.369	0.398	0.430	0.464	0.500	0.575	0.653	0.732	0.811	0.891
0.50	0.196	0.218	0.239	0.261	0.284	0.309	0.335	0.364	0.394	0.426	0.461	0.534	0.610	0.689	0.768	0.847
0.60	0.176	0.197	0.216	0.236	0.257	0.281	0.307	0.333	0.362	0.393	0.426	0.497	0.571	0.648	0.727	0.806
0.70	0.159	0.178	0.196	0.214	0.235	0.257	0.282	0.307	0.335	0.364	0.395	0.463	0.536	0.611	0.688	0.767
0.80	0.145	0.162	0.179	0.197	0.215	0.236	0.259	0.284	0.310	0.339	0.368	0.433	0.503	0.577	0.653	0.729
0.90	0.133	0.149	0.165	0.181	0.199	0.219	0.240	0.264	0.289	0.316	0.344	0.406	0.474	0.545	0.619	0.695
1.0	0.114	0.128	0.141	0.156	0.172	0.189	0.209	0.230	0.253	0.277	0.304	0.360	0.423	0.489	0.559	0.631
1.2	0.0997	0.111	0.124	0.137	0.151	0.167	0.184	0.203	0.224	0.247	0.270	0.323	0.380	0.442	0.508	0.577
1.4	0.0883	0.0986	0.110	0.121	0.134	0.149	0.164	0.182	0.201	0.222	0.243	0.292	0.345	0.403	0.464	0.529
1.6	0.0792	0.0884	0.0983	0.109	0.121	0.134	0.148	0.164	0.182	0.201	0.221	0.265	0.315	0.369	0.427	0.488
1.8	0.0717	0.0800	0.0890	0.0989	0.110	0.122	0.135	0.150	0.166	0.183	0.202	0.243	0.289	0.340	0.394	0.451
2.0	0.0655	0.0730	0.0813	0.0905	0.100	0.112	0.124	0.137	0.152	0.169	0.186	0.224	0.267	0.314	0.365	0.420
2.2	0.0603	0.0672	0.0749	0.0833	0.0926	0.103	0.114	0.127	0.141	0.156	0.172	0.208	0.248	0.293	0.341	0.392
2.4	0.0558	0.0623	0.0693	0.0772	0.0859	0.0955	0.106	0.118	0.131	0.145	0.160	0.194	0.232	0.273	0.318	0.366
2.6	0.0520	0.0580	0.0645	0.0719	0.0800	0.0891	0.0991	0.110	0.122	0.135	0.150	0.182	0.217	0.257	0.298	0.344
2.8	0.0486	0.0542	0.0604	0.0673	0.0749	0.0834	0.0928	0.103	0.114	0.127	0.141	0.171	0.204	0.241	0.281	0.323
3.0	0.0486	0.0542	0.0604	0.0673	0.0749	0.0834	0.0928	0.103	0.114	0.127	0.141	0.171	0.204	0.241	0.281	0.323
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 60°

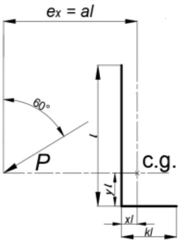
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ $(\phi = 0.75, \Omega = 2.00)$

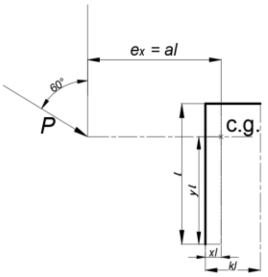
LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
a $= e_x/l$
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H.2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.





a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.386	0.425	0.461	0.495	0.529	0.564	0.600	0.636	0.672	0.707	0.743	0.813	0.883	0.954	1.02	1.09
0.10	0.366	0.406	0.439	0.471	0.504	0.539	0.574	0.610	0.647	0.684	0.721	0.794	0.867	0.938	1.01	1.08
0.15	0.346	0.387	0.417	0.447	0.479	0.513	0.549	0.585	0.621	0.658	0.696	0.771	0.846	0.920	0.993	1.07
0.20	0.328	0.368	0.397	0.426	0.457	0.490	0.526	0.561	0.598	0.635	0.672	0.747	0.823	0.899	0.974	1.05
0.25	0.312	0.351	0.379	0.407	0.437	0.470	0.505	0.541	0.577	0.615	0.652	0.726	0.801	0.876	0.953	1.03
0.30	0.284	0.318	0.347	0.373	0.401	0.432	0.466	0.502	0.539	0.577	0.615	0.690	0.765	0.839	0.913	0.987
0.40	0.259	0.289	0.316	0.343	0.369	0.399	0.432	0.467	0.504	0.541	0.580	0.657	0.733	0.808	0.882	0.956
0.50	0.237	0.265	0.289	0.316	0.342	0.370	0.401	0.435	0.470	0.508	0.546	0.624	0.702	0.779	0.854	0.928
0.60	0.217	0.243	0.266	0.291	0.317	0.344	0.373	0.405	0.440	0.477	0.515	0.593	0.671	0.749	0.826	0.902
0.70	0.201	0.224	0.246	0.269	0.294	0.320	0.349	0.379	0.413	0.448	0.485	0.563	0.641	0.720	0.798	0.875
0.80	0.186	0.207	0.228	0.250	0.273	0.299	0.326	0.356	0.388	0.422	0.458	0.534	0.612	0.692	0.770	0.848
0.90	0.172	0.192	0.212	0.233	0.256	0.280	0.306	0.335	0.365	0.398	0.433	0.507	0.585	0.664	0.743	0.821
1.0	0.150	0.168	0.186	0.205	0.225	0.247	0.272	0.298	0.326	0.357	0.389	0.459	0.534	0.611	0.690	0.768
1.2	0.133	0.149	0.165	0.182	0.200	0.221	0.243	0.268	0.294	0.322	0.352	0.418	0.489	0.563	0.640	0.718
1.4	0.119	0.133	0.148	0.163	0.180	0.199	0.220	0.242	0.267	0.293	0.321	0.382	0.449	0.521	0.595	0.671
1.6	0.107	0.120	0.134	0.148	0.164	0.181	0.200	0.221	0.244	0.268	0.294	0.352	0.415	0.483	0.554	0.628
1.8	0.0979	0.109	0.122	0.135	0.150	0.165	0.183	0.203	0.224	0.247	0.271	0.325	0.385	0.449	0.517	0.589
2.0	0.0899	0.100	0.112	0.124	0.138	0.152	0.169	0.187	0.207	0.229	0.251	0.302	0.358	0.419	0.485	0.553
2.2	0.0830	0.0927	0.103	0.115	0.127	0.141	0.157	0.174	0.192	0.212	0.234	0.282	0.335	0.393	0.455	0.520
2.4	0.0771	0.0862	0.0959	0.107	0.118	0.131	0.146	0.162	0.179	0.198	0.219	0.264	0.314	0.369	0.428	0.491
2.6	0.0719	0.0804	0.0895	0.0996	0.111	0.123	0.137	0.152	0.168	0.186	0.205	0.248	0.295	0.348	0.404	0.464
2.8	0.0674	0.0754	0.0839	0.0934	0.104	0.116	0.128	0.142	0.158	0.175	0.193	0.234	0.279	0.328	0.383	0.440
3.0	0.0674	0.0754	0.0839	0.0934	0.104	0.116	0.128	0.142	0.158	0.175	0.193	0.234	0.279	0.328	0.383	0.440
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

Table H.3 Continued.

C Coefficients for Eccentrically Loaded Weld Groups
Angle = 75°

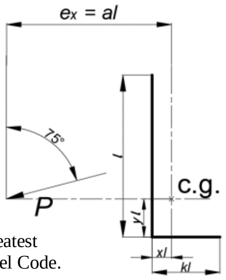
Available strength of a weld group, ϕR_n or R_n/Ω, is determined with
$R_n = C \cdot C_1 \cdot t_e \cdot l$ ($\phi = 0.75, \Omega = 2.00$)

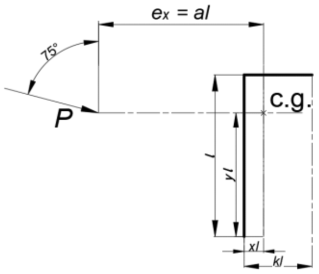
LRFD			ASD		
$C_{min} = \frac{P_u}{\phi C_1 t_e l}$	$t_{min} = \frac{P_u}{\phi C C_1 l}$	$l_{min} = \frac{P_u}{\phi C C_1 t_e}$	$C_{min} = \frac{\Omega P_a}{C_1 t_e l}$	$t_{min} = \frac{\Omega P_a}{C C_1 l}$	$l_{min} = \frac{\Omega P_a}{C C_1 t_e}$

where

P = required force, P_u or P_a, kN
t_e = effective throat dimension, mm
$a = e_x/l$
e_x = horizantal component of eccentricity of P with respect to centroid of weld group, mm
C = coefficient tabulated below
C_1 = electrode strength coefficient from Table H. 2 (1.0 for E49 electrodes)

Note: Shaded values indicate the value is based on the greatest available strength permitted by the Turkish Structural Steel Code.





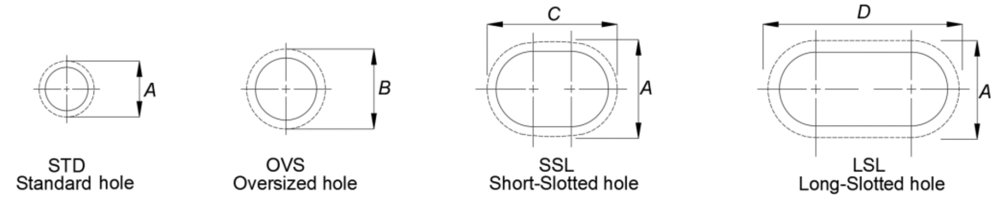
a	k															
	0.00	**0.10**	**0.20**	**0.30**	**0.40**	**0.50**	**0.60**	**0.70**	**0.80**	**0.90**	**1.0**	**1.2**	**1.4**	**1.6**	**1.8**	**2.0**
0.00	0.434	0.462	0.492	0.523	0.553	0.584	0.614	0.645	0.675	0.706	0.736	0.797	0.858	0.919	0.980	1.04
0.10	0.410	0.453	0.492	0.523	0.553	0.584	0.614	0.645	0.675	0.706	0.736	0.797	0.858	0.919	0.980	1.04
0.15	0.397	0.438	0.479	0.517	0.551	0.583	0.614	0.644	0.675	0.705	0.736	0.797	0.858	0.919	0.979	1.04
0.20	0.385	0.424	0.463	0.502	0.539	0.574	0.608	0.640	0.672	0.703	0.734	0.795	0.857	0.918	0.979	1.04
0.25	0.373	0.411	0.449	0.486	0.524	0.560	0.595	0.629	0.662	0.695	0.727	0.790	0.852	0.914	0.975	1.04
0.30	0.362	0.399	0.435	0.471	0.509	0.545	0.581	0.615	0.650	0.683	0.716	0.781	0.844	0.907	0.969	1.03
0.40	0.343	0.378	0.411	0.446	0.482	0.519	0.556	0.591	0.626	0.659	0.692	0.758	0.825	0.889	0.953	1.02
0.50	0.325	0.360	0.390	0.423	0.459	0.496	0.533	0.570	0.606	0.641	0.674	0.739	0.803	0.868	0.934	0.999
0.60	0.308	0.342	0.372	0.403	0.438	0.475	0.512	0.550	0.587	0.624	0.659	0.726	0.790	0.853	0.916	0.979
0.70	0.293	0.325	0.355	0.385	0.418	0.454	0.492	0.530	0.569	0.606	0.643	0.713	0.779	0.843	0.905	0.968
0.80	0.278	0.310	0.339	0.368	0.400	0.435	0.472	0.511	0.550	0.588	0.626	0.699	0.767	0.833	0.897	0.959
0.90	0.265	0.295	0.324	0.352	0.383	0.417	0.454	0.492	0.531	0.570	0.609	0.684	0.755	0.822	0.887	0.951
1.0	0.253	0.281	0.309	0.337	0.367	0.400	0.436	0.474	0.513	0.552	0.592	0.668	0.741	0.811	0.878	0.943
1.2	0.230	0.257	0.283	0.310	0.338	0.369	0.403	0.439	0.478	0.517	0.557	0.636	0.713	0.786	0.857	0.924
1.4	0.211	0.235	0.260	0.285	0.312	0.341	0.373	0.408	0.446	0.484	0.524	0.604	0.683	0.759	0.833	0.903
1.6	0.194	0.217	0.240	0.263	0.289	0.317	0.347	0.380	0.416	0.454	0.493	0.573	0.653	0.731	0.807	0.880
1.8	0.179	0.200	0.222	0.244	0.269	0.296	0.324	0.356	0.390	0.426	0.464	0.543	0.623	0.703	0.780	0.856
2.0	0.166	0.186	0.206	0.228	0.251	0.276	0.304	0.333	0.366	0.400	0.437	0.514	0.594	0.674	0.753	0.830
2.2	0.155	0.173	0.192	0.213	0.235	0.259	0.285	0.314	0.344	0.377	0.413	0.488	0.567	0.647	0.726	0.804
2.4	0.145	0.162	0.180	0.199	0.220	0.243	0.268	0.295	0.325	0.356	0.390	0.463	0.540	0.620	0.699	0.778
2.6	0.136	0.152	0.169	0.188	0.207	0.229	0.253	0.279	0.307	0.338	0.370	0.441	0.516	0.594	0.673	0.752
2.8	0.128	0.143	0.159	0.177	0.196	0.216	0.239	0.264	0.291	0.320	0.351	0.419	0.493	0.569	0.648	0.727
3.0	0.121	0.135	0.151	0.167	0.185	0.205	0.227	0.251	0.277	0.305	0.334	0.400	0.471	0.546	0.624	0.702
x	0.000	0.005	0.017	0.035	0.057	0.083	0.113	0.144	0.178	0.213	0.250	0.327	0.408	0.492	0.579	0.667
y	0.500	0.455	0.417	0.385	0.357	0.333	0.312	0.294	0.278	0.263	0.250	0.227	0.208	0.192	0.179	0.167

APPENDIX I

DESIGN TABLES FOR CONNECTING ELEMENTS

Table I.1 Reduction in area for holes.

Reduction in Area for Holes, mm^2

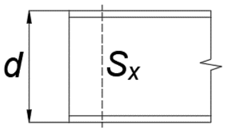


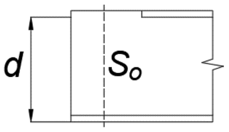
Thickness, t, mm	**$A \times t$**							**$B \times t$**						
	Bolt Diameter, d, mm							**Bolt Diameter, d, mm**						
	16	**20**	**22**	**24**	**27**	**30**	**36**	**16**	**20**	**22**	**24**	**27**	**30**	**36**
2	40.0	48.0	52.0	56.0	64.0	70.0	82.0	44.0	52.0	60.0	64.0	74.0	80.0	92.0
4	80.0	96.0	104	112	128	140	164	88.0	104	120	128	148	160	184
6	120	144	156	168	192	210	246	132	156	180	192	222	240	276
8	160	192	208	224	256	280	328	176	208	240	256	296	320	368
10	200	240	260	280	320	350	410	220	260	300	320	370	400	460
12	240	288	312	336	384	420	492	264	312	360	384	444	480	552
14	280	336	364	392	448	490	574	308	364	420	448	518	560	644
16	320	384	416	448	512	560	656	352	416	480	512	592	640	736
18	360	432	468	504	576	630	738	396	468	540	576	666	720	828
20	400	480	520	560	640	700	820	440	520	600	640	740	800	920
22	440	528	572	616	704	770	902	484	572	660	704	814	880	1010
24	480	576	624	672	768	840	984	528	624	720	768	888	960	1100
26	520	624	676	728	832	910	1070	572	676	780	832	962	1040	1200
28	560	672	728	784	896	980	1150	616	728	840	896	1040	1120	1290
30	600	720	780	840	960	1050	1230	660	780	900	960	1110	1200	1380

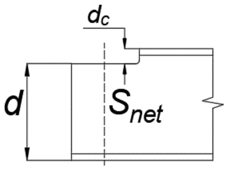
Thickness, t, mm	**$C \times t$**							**$D \times t$**						
	Bolt Diameter, d, mm							**Bolt Diameter, d, mm**						
	16	**20**	**22**	**24**	**27**	**30**	**36**	**16**	**20**	**22**	**24**	**27**	**30**	**36**
2	48.0	56.0	64.0	68.0	78.0	84.0	96.0	84.0	104	114	124	138	154	184
4	96.0	112	128	136	156	168	192	168	208	228	248	276	308	368
6	144	168	192	204	234	252	288	252	312	342	372	414	462	552
8	192	224	256	272	312	336	384	336	416	456	496	552	616	736
10	240	280	320	340	390	420	480	420	520	570	620	690	770	920
12	288	336	384	408	468	504	576	504	624	684	744	828	924	1100
14	336	392	448	476	546	588	672	588	728	798	868	966	1080	1290
16	384	448	512	544	624	672	768	672	832	912	992	1100	1230	1470
18	432	504	576	612	702	756	864	756	936	1030	1120	1240	1390	1660
20	480	560	640	680	780	840	960	840	1040	1140	1240	1380	1540	1840
22	528	616	704	748	858	924	1060	924	1140	1250	1360	1520	1690	2020
24	576	672	768	816	936	1010	1150	1010	1250	1370	1490	1660	1850	2210
26	624	728	832	884	1010	1090	1250	1090	1350	1480	1610	1790	2000	2390
28	672	784	896	952	1090	1180	1340	1180	1460	1600	1740	1930	2160	2580
30	720	840	960	1020	1170	1260	1440	1260	1560	1710	1860	2070	2310	2760

Table I.2 Elastic section modulus for coped I-shapes.

Elastic Section Modulus for Coped HD Shapes





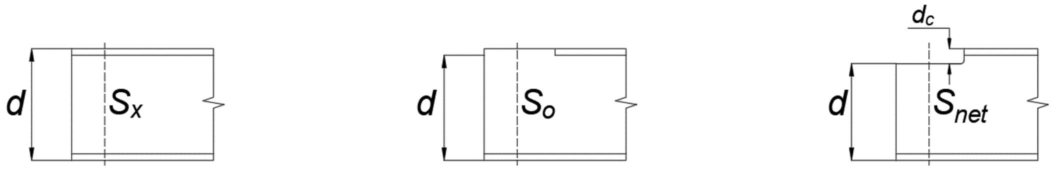


Shape	d, mm	t_f, mm	S_x, ×10^3 mm^3	S_o, ×10^3 mm^3	S_{net}, ×10^3 mm^3									
					d_c, mm									
					25	50	75	100	125	150	175	200	225	250
HD 400 × 1086	569	125	20940	5980	–	–	–	–	3620	3220	2850	2510	2190	1900
× 990	550	115	18870	5210	–	–	–	–	3100	2740	2410	2110	1830	1580
× 900	531	106	16960	4490	–	–	–	–	2620	2300	2010	1740	1500	1280
× 818	514	97.0	15260	3910	–	–	–	2530	2230	1950	1690	1460	1240	1050
× 744	498	88.9	13740	3400	–	–	–	2160	1900	1650	1420	1210	1020	
× 677	483	81.5	12400	2980	–	–	–	1870	1630	1410	1200	1020	852	
× 634	474	77.1	11570	2690	–	–	–	1670	1450	1250	1060	894	743	
× 592	465	72.3	10760	2460	–	–	1730	1510	1310	1120	951	796	657	
× 551	455	67.6	9939	2210	–	–	1540	1340	1160	989	833	692	566	
× 509	446	62.7	9172	2000	–	–	1380	1200	1030	874	731	603		
× 463	435	57.4	8283	1760	–	–	1200	1040	889	751	625	511		
× 421	425	52.6	7510	1550	–	–	1050	904	769	646	533	432		
× 382	416	48.0	6794	1360	–	1050	913	783	663	553	453	364		
× 347	407	43.7	6140	1200	–	922	797	681	573	475	386	307		
× 314	399	39.6	5525	1060	–	813	700	596	500	412	332			
× 287	393	36.6	5074	943	–	720	619	525	439	360	289			
× 262	387	33.3	4620	858	–	652	560	474	394	322	258			
× 237	380	30.2	4146	747	–	565	483	408	338	275	218			
× 216	375	27.7	3794	670	–	505	431	362	299	242	191			
× 187	368	24.0	3271	564	492	424	360	302	248	200	156			
HD 360 × 196	372	26.2	3421	624	–	470	400	336	277	224	176			
× 179	368	23.9	3122	561	489	421	358	300	247	198	155			
× 162	364	21.8	2832	491	427	368	312	261	214	172	134			
× 147	360	19.8	2572	446	387	333	282	235	192	153	119			
× 134	356	18.0	2332	399	346	297	251	209	170	136	105			
HD 320 × 300	375	48.0	4635	984	–	739	629	528	435	352	278			
× 245	359	40.0	3796	719	–	533	450	374	305	243	189			
× 198	343	32.0	3026	570	–	417	349	287	231	181				
× 158	330	25.5	2403	432	–	312	259	211	168	129				
× 127	320	20.5	1926	327	279	234	193	156	123	93.2				
× 97.6	310	15.5	1479	244	207	172	141	113	87.7	65.5				
× 74.2	301	11.0	1093	203	172	143	116	92.4	71.1	52.5				
HD 260 × 172	290	32.5	2159	403	–	276	221	173	130					
× 142	278	26.5	1750	322	–	217	172	132	97.3					
× 114	268	21.5	1411	246	203	163	128	97.0	70.2					
× 93.0	260	17.5	1148	188	154	124	96.1	71.9	51.3					
× 68.2	250	12.5	836.4	132	108	85.3	65.5	48.1	33.3					
× 54.1	244	9.50	654.1	110	88.8	70.0	53.4	38.9						

– Indicates that cope depth is less than flange thickness.
Note: Values are omitted when cope depth exceeds d/2.

Table I.2 Continued.

Elastic Section Modulus for Coped HEA Shapes

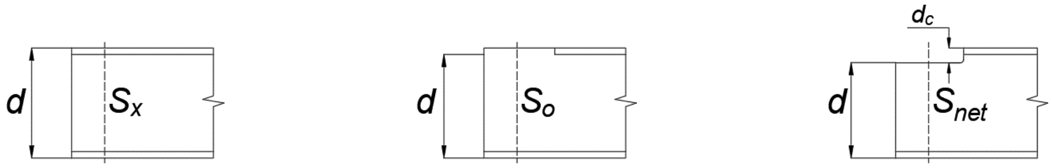


Shape	d, mm	t_f, mm	S_x, $\times10^3$ mm^3	S_o, $\times10^3$ mm^3	S_{net}, $\times10^3$ mm^3									
					d_c, mm									
					25	**50**	**75**	**100**	**125**	**150**	**175**	**200**	**225**	**250**
HE 1000 A	990	31.0	11190	4020	–	3650	3470	3290	3120	2950	2790	2630	2480	2330
HE 900 A	890	30.0	9485	3200	–	2870	2710	2550	2400	2260	2120	1980	1840	1710
HE 800 A	790	28.0	7682	2400	–	2120	1990	1860	1730	1610	1490	1380	1270	1160
HE 700 A	690	27.0	6241	1800	–	1560	1440	1330	1230	1130	1030	934	844	759
HE 650 A	640	26.0	5474	1460	–	1250	1150	1060	964	876	792	712	635	563
HE 600 A	590	25.0	4787	1210	1110	1020	929	844	763	686	612	542	476	414
HE 550 A	540	24.0	4146	981	895	813	735	661	590	522	459	399	343	291
HE 500 A	490	23.0	3550	783	708	636	568	503	442	385	331	282	236	
HE 450 A	440	21.0	2896	609	544	482	424	369	318	270	226	186		
HE 400 A	390	19.0	2311	461	405	353	304	258	216	178	143			
HE 360 A	350	17.5	1891	341	295	252	213	176	143	113	86.3			
HE 340 A	330	16.5	1678	290	248	210	175	142	113	87.2				
HE 320 A	310	15.5	1479	244	207	172	141	113	87.6	65.5				
HE 300 A	290	14.0	1260	202	170	140	112	88.0	66.5					
HE 280 A	270	13.0	1013	165	136	110	86.9	66.2	48.2					
HE 260 A	250	12.5	836.4	133	108	85.5	65.6	48.3	33.5					
HE 240 A	230	12.0	675.1	112	89	68.9	51.2	36.0						
HE 220 A	210	11.0	515.2	86.6	67.6	50.8	36.2	24.1						
HE 200 A	190	10.0	388.6	65.7	49.9	36.1	24.4							
HE 180 A	171	9.50	293.6	49.2	36.0	24.9	15.7							
HE 160 A	152	9.00	220.1	38.5	27.0	17.5	9.99							
HE 140 A	133	8.50	155.4	27.0	17.9	10.6								
HE 120 A	114	8.00	106.3	18.0	11.0	5.68								
HE 100 A	96.0	8.00	72.76	12.6	6.89									

– Indicates that cope depth is less than flange thickness.
Note: Values are omitted when cope depth exceeds d/2.

Table I.2 Continued.

Elastic Section Modulus for Coped HEB Shapes

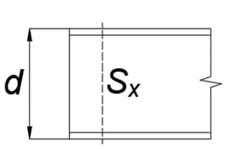


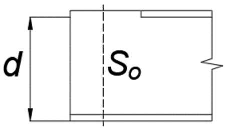
Shape	d, mm	t_f, mm	S_x, $\times10^3$ mm^3	S_o, $\times10^3$ mm^3	S_{net}, $\times10^3$ mm^3									
					d_c, mm									
					25	50	75	100	125	150	175	200	225	250
HE 1000 B	1000	36.0	12890	4690	–	4260	4060	3850	3650	3460	3270	3090	2910	2730
HE 900 B	900	35.0	10980	3750	–	3370	3190	3010	2830	2660	2490	2330	2180	2030
HE 800 B	800	33.0	8977	2850	–	2520	2370	2210	2070	1920	1780	1650	1520	1400
HE 700 B	700	32.0	7340	2150	–	1870	1730	1600	1480	1360	1240	1130	1020	920
HE 650 B	650	31.0	6480	1770	–	1520	1400	1290	1180	1070	968	872	780	693
HE 600 B	600	30.0	5701	1470	–	1250	1140	1040	939	845	756	671	591	516
HE 550 B	550	29.0	4971	1210	–	1010	911	820	733	651	574	501	432	369
HE 500 B	500	28.0	4287	974	–	795	711	632	557	486	420	359	302	249
HE 450 B	450	26.0	3551	767	–	610	538	470	406	346	291	241	195	
HE 400 B	400	24.0	2884											
				588	519	453	392	335	282	233	189	149		
HE 360 B	360	22.5	2400	446	387	333	282	235	192	154	119			
HE 340 B	340	21.5	2156	384	330	281	235	193	155	121				
HE 320 B	320	20.5	1926	327	279	234	193	156	123	93.4				
HE 300 B	300	19.0	1678	276	233	193	156	123	94.5	69.3				
HE 280 B	280	18.0	1376	229	191	155	124	95.2	70.4					
HE 260 B	260	17.5	1148	188	154	124	96	71.9	51.3					
HE 240 B	240	17.0	938.3	159	128	100	75.6	54.4						
HE 220 B	220	16.0	735.5	127	100	76.1	55.4	37.9						
HE 200 B	200	15.0	569.6	99.0	76.0	56.0	38.8	24.8						
HE 180 B	180	14.0	425.7	75.4	56.1	39.5	25.8							
HE 160 B	160	13.0	311.5	55.9	39.9	26.5	15.8							
HE 140 B	140	12.0	215.6	37.5	25.3	15.5								
HE 120 B	120	11.0	144.1	25.4	15.9	8.62								
HE 100 B	100	10.0	89.91	16.1	9.07	4.04								

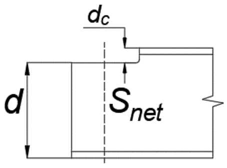
– Indicates that cope depth is less than flange thickness.
Note: Values are omitted when cope depth exceeds d/2.

Table I.2 Continued.

Elastic Section Modulus for Coped HEM Shapes





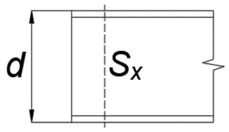


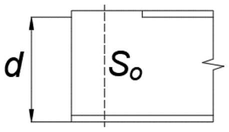
Shape	d, mm	t_f, mm	S_x, ×10^3 mm^3	S_o, ×10^3 mm^3	S_{net}, ×10^3 mm^3									
					d_c, mm									
					25	**50**	**75**	**100**	**125**	**150**	**175**	**200**	**225**	**250**
HE 1000 M	1010	40.0	14330	5250	–	4770	4540	4310	4090	3880	3670	3460	3260	3070
HE 900 M	910	40.0	12540	4330	–	3890	3680	3480	3280	3080	2890	2710	2530	2360
HE 800 M	814	40.0	10870	3510	–	3110	2920	2740	2560	2380	2210	2050	1890	1740
HE 700 M	716	40.0	9198	2750	–	2400	2230	2060	1910	1750	1610	1470	1330	1200
HE 650 M	668	40.0	8433	2410	–	2080	1920	1770	1620	1480	1340	1210	1090	971
HE 600 M	620	40.0	7660	2090	–	1780	1630	1490	1350	1220	1100	979	867	762
HE 550 M	572	40.0	6923	1790	–	1500	1360	1230	1110	989	877	771	671	578
HE 500 M	524	40.0	6180	1510	–	1240	1120	999	886	779	679	585	498	418
HE 450 M	478	40.0	5501	1260	–	1020	904	797	695	601	513	431	357	
HE 400 M	432	40.0	4820	1040	–	813	711	615	526	443	368	299		
HE 360 M	395	40.0	4297	869	–	664	572	486	406	334	269			
HE 340 M	377	40.0	4052	793	–	597	509	428	354	287	227			
HE 320 M	359	40.0	3796	719	–	533	450	374	305	243	189			
HE 300 M	340	39.0	3482	645	–	469	392	321	257	201				
HE 280 M	310	33.0	2551	475	–	334	273	217	168	126				
HE 260 M	290	32.5	2159	403	–	276	221	173	130					
HE 240 M	270	32.0	1799	346	–	230	180	137	99.5					
HE 220 M	240	26.0	1217	237	–	149	112	80.6						
HE 200 M	220	25.0	967.4	191	150	114	82.9	56.7						
HE 180 M	200	24.0	748.3	152	116	85.2	58.9	37.6						
HE 160 M	180	23.0	566.5	118	87.4	61.3	39.9							
HE 140 M	160	22.0	411.4	85.9	61.1	40.4	24.2							
HE 120 M	140	21.0	288.2	62.5	42.0	25.7								
HE 100 M	120	20.0	190.4	43.3	27.1	14.8								

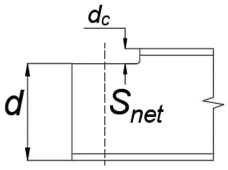
– Indicates that cope depth is less than flange thickness.
Note: Values are omitted when cope depth exceeds d/2.

Table I.2 Continued.

Elastic Section Modulus for Coped IPE Shapes





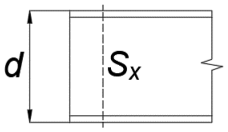


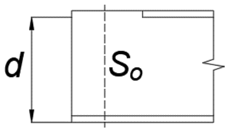
Shape	d, mm	t_f, mm	S_x, $\times 10^3$ mm^3	S_o, $\times 10^3$ mm^3	S_{net}, $\times 10^3$ mm^3									
					d_c, mm									
					25	50	75	100	125	150	175	200	225	250
IPE 600	600	19.0	3069	1070	991	912	837	764	694	627	563	502	444	389
IPE 550	550	17.2	2441	838	769	702	638	577	518	462	409	359	312	267
IPE 500	500	16.0	1928	642	583	527	474	423	375	329	286	245	207	172
IPE 450	450	14.6	1500	483	434	388	344	302	262	225	190	158	129	
IPE 400	400	13.5	1156	354	313	275	239	206	174	145	118	93.1		
IPE 360	360	12.7	903.6	268	234	202	173	145	119	95.7	74.4			
IPE 330	330	11.5	713.1	211	182	155	130	107	85.2	65.9				
IPE 300	300	10.7	557.1	165	140	117	95.9	76.5	59.0	43.4				
IPE 270	270	10.2	428.9	125	104	84.7	67.2	51.5	37.5					
IPE 240	240	9.80	324.3	92.8	75.4	59.5	45.2	32.6						
IPE 220	220	9.20	252	73.8	58.8	45.2	33.2	22.8						
IPE 200	200	8.50	194.3	57.7	44.9	33.4	23.4	14.8						
IPE 180	180	8.00	146.3	44.1	33.2	23.7	15.6							
IPE 160	160	7.40	108.7	32.8	23.8	16.0	9.55							
IPE 140	140	6.90	77.32	23.5	16.2	10.1								
IPE 120	120	6.30	53.0	16.2	10.3	5.64								
IPE 100	100	5.70	34.2	10.4	5.99	2.55								
IPE 80	80.0	5.20	20.0	6.15	2.98									

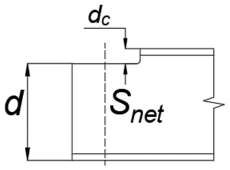
– Indicates that cope depth is less than flange thickness.
Note: Values are omitted when cope depth exceeds d/2.

Table I.2 Continued.

Elastic Section Modulus for Coped IPEA Shapes





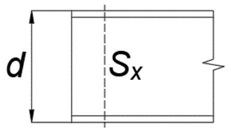


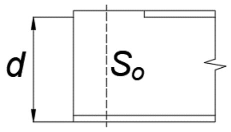
Shape	d, mm	t_f, mm	S_x, $\times 10^3$ mm^3	S_o, $\times 10^3$ mm^3	S_{net}, $\times 10^3$ mm^3									
					d_c, mm									
					25	**50**	**75**	**100**	**125**	**150**	**175**	**200**	**225**	**250**
IPE A 600	597	17.5	2778	893	824	757	694	632	573	517	464	413	364	319
IPE A 550	547	15.7	2193	691	633	577	524	472	423	377	333	291	252	216
IPE A 500	497	14.5	1728	535	485	438	393	350	309	271	235	201	169	
IPE A 450	447	13.1	1331	395	354	316	279	244	212	182	153	127		
IPE A 400	397	12.0	1022	289	256	224	195	167	141	117	95			
IPE A 360	358	11.5	811.8	223	194	167	142	119	97.9	78.5	61.1			
IPE A 330	327	10.0	625.7	181	156	132	111	90.5	72.3	55.9				
IPE A 300	297	9.20	483.1	140	119	99.0	80.8	64.2	49.4					
IPE A 270	267	8.70	368.3	103	85.5	69.4	54.9	41.9	30.6					
IPE A 240	237	8.30	277.7	76.7	62.1	48.8	37	26.7						
IPE A 220	217	7.70	213.5	61.4	48.6	37.3	27.3	18.7						
IPE A 200	197	7.00	161.6	45.7	35.3	26.1	18.2							
IPE A 180	177	6.50	120.1	35.0	26.2	18.6	12.1							
IPE A 160	157	5.90	87.81	25.6	18.4	12.3	7.32							
IPE A 140	137	5.60	63.3	18.6	12.7	7.81								
IPE A 120	118	5.10	43.77	13.4	8.52	4.63								
IPE A 100	98.0	4.70	28.81	8.82	5.02									
IPE A 80	78.0	4.20	16.51	5.09	2.41									

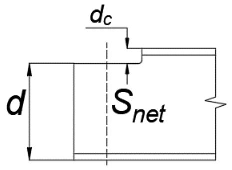
– Indicates that cope depth is less than flange thickness.
Note: Values are omitted when cope depth exceeds d/2.

Table I.2 Continued.

Elastic Section Modulus for Coped IPEO Shapes







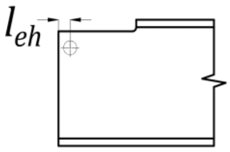
Shape	d, mm	t_f, mm	S_x, $\times 10^3$ mm^3	S_o, $\times 10^3$ mm^3	S_{net}, $\times 10^3$ mm^3									
					d_c, mm									
					25	50	75	100	125	150	175	200	225	250
IPE O 600	330	16.5	3879	1380	1280	1180	1080	986	897	811	729	651	577	507
IPE O 550	310	15.5	2847	982	901	822	747	675	607	542	480	421	366	314
IPE O 500	290	14.0	2284	772	702	635	570	509	451	397	345	296	251	210
IPE O 450	270	13.0	1795	580	521	466	413	363	315	271	230	192	157	
IPE O 400	250	12.5	1324	406	360	316	275	237	201	167	137	109		
IPE O 360	230	12.0	1047	314	274	237	202	170	140	113	88.9			
IPE O 330	210	11.0	833	245	212	180	151	124	99.7	77.8				
IPE O 300	190	10.0	657.5	192	163	136	112	89.2	69.1	51.5				
IPE O 270	171	9.50	507.1	146	122	99.3	79.0	60.9	44.9					
IPE O 240	152	9.00	361.1	106	86.0	68.0	51.9	37.9						
IPE O 220	133	8.50	282.3	83.7	66.7	51.4	37.9	26.3						
IPE O 200	114	8.00	218.9	65.0	50.6	37.7	26.6	17.3						
IPE O 180	96.0	8.00	165.4	50.7	38.2	27.4	18.2							

– Indicates that cope depth is less than flange thickness.
Note: Values are omitted when cope depth exceeds d/2.

Table I.3 Block shear: tension rupture component.

Block Shear
Tension Rupture Component
per mm of thickness, kN/mm

$U_{bs} = 1.0$

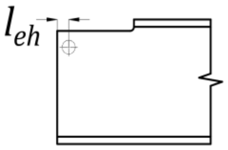


F_u	360 MPa													
l_{eh}, mm	Bolt diameter, d, mm[a]													
	16		20		22		24		27		30		36	
	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
25	4.05	2.70	3.51	2.34	3.24	2.16	2.97	1.98	2.43	1.62	2.02	1.35	1.22	0.810
30	5.40	3.60	4.86	3.24	4.59	3.06	4.32	2.88	3.78	2.52	3.37	2.25	2.56	1.71
35	6.75	4.50	6.21	4.14	5.94	3.96	5.67	3.78	5.13	3.42	4.73	3.15	3.92	2.61
40	8.10	5.40	7.56	5.04	7.29	4.86	7.02	4.68	6.48	4.32	6.08	4.05	5.27	3.51
45	9.45	6.30	8.91	5.94	8.64	5.76	8.37	5.58	7.83	5.22	7.42	4.95	6.61	4.41
50	10.8	7.20	10.3	6.84	9.99	6.66	9.72	6.48	9.18	6.12	8.78	5.85	7.97	5.31
55	12.2	8.10	11.6	7.74	11.3	7.56	11.1	7.38	10.5	7.02	10.1	6.75	9.32	6.21
60	13.5	9.00	13.0	8.64	12.7	8.46	12.4	8.28	11.9	7.92	11.5	7.65	10.7	7.11
65	14.9	9.90	14.3	9.54	14.0	9.36	13.8	9.18	13.2	8.82	12.8	8.55	12.0	8.01
70	16.2	10.8	15.7	10.4	15.4	10.3	15.1	10.1	14.6	9.72	14.2	9.45	13.4	8.91
75	17.6	11.7	17.0	11.3	16.7	11.2	16.5	11.0	15.9	10.6	15.5	10.4	14.7	9.81
LRFD	**ASD**	[a] Values are for standard hole types.												
$\phi = 0.75$	$\Omega = 2.00$													

Table I.3 Continued.

$U_{bs} = 1.0$

Block Shear
Tension Rupture Component
per mm of thickness, kN/mm

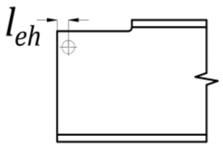


F_u	430 MPa													
l_{eh}, mm	Bolt diameter, d, mm[a]													
	16		20		22		24		27		30		36	
	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
25	4.84	3.23	4.19	2.80	3.87	2.58	3.55	2.37	2.90	1.94	2.42	1.61	1.45	0.968
30	6.45	4.30	5.80	3.87	5.48	3.66	5.16	3.44	4.52	3.01	4.03	2.69	3.06	2.04
35	8.06	5.38	7.42	4.95	7.10	4.73	6.77	4.52	6.13	4.09	5.64	3.76	4.68	3.12
40	9.68	6.45	9.03	6.02	8.71	5.81	8.39	5.59	7.74	5.16	7.26	4.84	6.29	4.19
45	11.3	7.52	10.6	7.10	10.3	6.88	10.0	6.67	9.35	6.23	8.87	5.91	7.90	5.27
50	12.9	8.60	12.3	8.17	11.9	7.96	11.6	7.74	11.0	7.31	10.5	6.99	9.51	6.34
55	14.5	9.67	13.9	9.25	13.5	9.03	13.2	8.82	12.6	8.39	12.1	8.06	11.1	7.42
60	16.1	10.7	15.5	10.3	15.2	10.1	14.8	9.89	14.2	9.46	13.7	9.14	12.7	8.49
65	17.7	11.8	17.1	11.4	16.8	11.2	16.4	11.0	15.8	10.5	15.3	10.2	14.4	9.57
70	19.4	12.9	18.7	12.5	18.4	12.3	18.1	12.0	17.4	11.6	16.9	11.3	16.0	10.6
75	21.0	14.0	20.3	13.5	20.0	13.3	19.7	13.1	19.0	12.7	18.5	12.4	17.6	11.7
LRFD	**ASD**	[a] Values are for standard hole types.												
$\phi = 0.75$	$\Omega = 2.00$													

Table I.3 Continued.

Block Shear
Tension Rupture Component
per mm of thickness, kN/mm

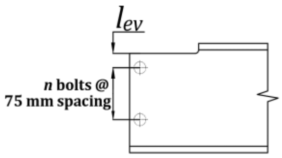
$U_{bs} = 1.0$



F_u	510 MPa														
l_{eh}, mm	Bolt diameter, d, mm[a]														
	16		20		22		24		27		30		36	
	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$	$\frac{\phi F_u A_{nt}}{t}$	$\frac{F_u A_{nt}}{\Omega t}$
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
25	5.74	3.83	4.97	3.32	4.59	3.06	4.21	2.81	3.44	2.30	2.87	1.91	1.72	1.15
30	7.65	5.10	6.89	4.59	6.50	4.34	6.12	4.08	5.36	3.57	4.78	3.19	3.63	2.42
35	9.56	6.38	8.80	5.87	8.42	5.61	8.03	5.36	7.27	4.85	6.69	4.46	5.55	3.70
40	11.5	7.65	10.7	7.14	10.3	6.89	9.95	6.63	9.18	6.12	8.61	5.74	7.46	4.97
45	13.4	8.92	12.6	8.42	12.2	8.16	11.9	7.91	11.1	7.40	10.5	7.01	9.37	6.25
50	15.3	10.2	14.5	9.69	14.2	9.44	13.8	9.18	13.0	8.67	12.4	8.29	11.3	7.52
55	17.2	11.5	16.4	11.0	16.1	10.7	15.7	10.5	14.9	9.95	14.3	9.56	13.2	8.80
60	19.1	12.7	18.4	12.2	18.0	12.0	17.6	11.7	16.8	11.2	16.3	10.8	15.1	10.1
65	21.0	14.0	20.3	13.5	19.9	13.3	19.5	13.0	18.7	12.5	18.2	12.1	17.0	11.3
70	23.0	15.3	22.2	14.8	21.8	14.5	21.4	14.3	20.7	13.8	20.1	13.4	18.9	12.6
75	24.9	16.6	24.1	16.1	23.7	15.8	23.3	15.6	22.6	15.0	22.0	14.7	20.8	13.9
LRFD	**ASD**	[a] Values are for standard hole types.													
$\phi = 0.75$	$\Omega = 2.00$														

Table I.4 Block shear: shear yielding component.

Block Shear
Shear Yielding Component
per mm of thickness, kN/mm

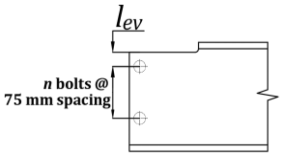


l_{ev}, mm	n	F_y, MPa						l_{ev}, mm	n	F_y, MPa					
		235		275		355				235		275		355	
		$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$			$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$
		LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD
25	12	89.9	59.9	105	70.1	136	90.5	25	9	66.1	44.1	77.3	51.6	99.8	66.6
30		90.4	60.3	106	70.5	137	91.1	30		66.6	44.4	78.0	52.0	101	67.1
35		90.9	60.6	106	71.0	137	91.6	35		67.2	44.8	78.6	52.4	101	67.6
40		91.5	61.0	107	71.4	138	92.1	40		67.7	45.1	79.2	52.8	102	68.2
45		92.0	61.3	108	71.8	139	92.7	45		68.2	45.5	79.8	53.2	103	68.7
50		92.5	61.7	108	72.2	140	93.2	50		68.7	45.8	80.4	53.6	104	69.2
55		93.1	62.0	109	72.6	141	93.7	55		69.3	46.2	81.1	54.0	105	69.8
60		93.6	62.4	110	73.0	141	94.3	60		69.8	46.5	81.7	54.4	105	70.3
65		94.1	62.7	110	73.4	142	94.8	65		70.3	46.9	82.3	54.9	106	70.8
70		94.6	63.1	111	73.8	143	95.3	70		70.9	47.2	82.9	55.3	107	71.4
75		95.2	63.4	111	74.2	144	95.8	75		71.4	47.6	83.5	55.7	108	71.9
25	11	82.0	54.6	95.9	63.9	124	82.5	25	8	58.2	38.8	68.1	45.4	87.9	58.6
30		82.5	55.0	96.5	64.4	125	83.1	30		58.7	39.1	68.7	45.8	88.7	59.1
35		83.0	55.3	97.1	64.8	125	83.6	35		59.2	39.5	69.3	46.2	89.5	59.6
40		83.5	55.7	97.8	65.2	126	84.1	40		59.7	39.8	69.9	46.6	90.3	60.2
45		84.1	56.0	98.4	65.6	127	84.7	45		60.3	40.2	70.5	47.0	91.1	60.7
50		84.6	56.4	99.0	66.0	128	85.2	50		60.8	40.5	71.2	47.4	91.9	61.2
55		85.1	56.8	99.6	66.4	129	85.7	55		61.3	40.9	71.8	47.9	92.7	61.8
60		85.7	57.1	100	66.8	129	86.3	60		61.9	41.2	72.4	48.3	93.5	62.3
65		86.2	57.5	101	67.2	130	86.8	65		62.4	41.6	73.0	48.7	94.3	62.8
70		86.7	57.8	101	67.7	131	87.3	70		62.9	41.9	73.6	49.1	95.1	63.4
75		87.2	58.2	102	68.1	132	87.9	75		63.5	42.3	74.3	49.5	95.9	63.9
25	10	74.0	49.4	86.6	57.8	112	74.5	25	7	50.2	33.5	58.8	39.2	75.9	50.6
30		74.6	49.7	87.2	58.2	113	75.1	30		50.8	33.8	59.4	39.6	76.7	51.1
35		75.1	50.1	87.9	58.6	113	75.6	35		51.3	34.2	60.0	40.0	77.5	51.7
40		75.6	50.4	88.5	59.0	114	76.1	40		51.8	34.5	60.6	40.4	78.3	52.2
45		76.1	50.8	89.1	59.4	115	76.7	45		52.3	34.9	61.3	40.8	79.1	52.7
50		76.7	51.1	89.7	59.8	116	77.2	50		52.9	35.2	61.9	41.2	79.9	53.2
55		77.2	51.5	90.3	60.2	117	77.7	55		53.4	35.6	62.5	41.7	80.7	53.8
60		77.7	51.8	91.0	60.6	117	78.3	60		53.9	36.0	63.1	42.1	81.5	54.3
65		78.3	52.2	91.6	61.1	118	78.8	65		54.5	36.3	63.7	42.5	82.3	54.8
70		78.8	52.5	92.2	61.5	119	79.3	70		55.0	36.7	64.4	42.9	83.1	55.4
75		79.3	52.9	92.8	61.9	120	79.9	75		55.5	37.0	65.0	43.3	83.9	55.9

LRFD	ASD
$\phi = 0.75$	$\Omega = 2.00$

Table I.4 Continued.

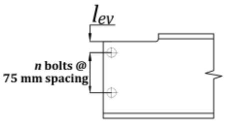
Block Shear
Shear Yielding Component
per mm of thickness, kN/mm



l_{ev}, mm	n	F_y, MPa						l_{ev}, mm	n	F_y, MPa					
		235		275		355				235		275		355	
		$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$			$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$	$\frac{\phi 0.6F_yA_{gv}}{t}$	$\frac{0.6F_yA_{gv}}{\Omega t}$
		LRFD	ASD	LRFD	ASD	LRFD	ASD			LRFD	ASD	LRFD	ASD	LRFD	ASD
25	**6**	42.3	28.2	49.5	33.0	63.9	42.6	**25**	**3**	18.5	12.3	21.7	14.4	28.0	18.6
30		42.8	28.6	50.1	33.4	64.7	43.1	**30**		19.0	12.7	22.3	14.9	28.8	19.2
35		43.4	28.9	50.7	33.8	65.5	43.7	**35**		19.6	13.0	22.9	15.3	29.6	19.7
40		43.9	29.3	51.4	34.2	66.3	44.2	**40**		20.1	13.4	23.5	15.7	30.4	20.2
45		44.4	29.6	52.0	34.7	67.1	44.7	**45**		20.6	13.7	24.1	16.1	31.2	20.8
50		44.9	30.0	52.6	35.1	67.9	45.3	**50**		21.2	14.1	24.8	16.5	32.0	21.3
55		45.5	30.3	53.2	35.5	68.7	45.8	**55**		21.7	14.5	25.4	16.9	32.7	21.8
60		46.0	30.7	53.8	35.9	69.5	46.3	**60**		22.2	14.8	26.0	17.3	33.5	22.4
65		46.5	31.0	54.5	36.3	70.3	46.9	**65**		22.7	15.2	26.6	17.7	34.3	22.9
70		47.1	31.4	55.1	36.7	71.1	47.4	**70**		23.3	15.5	27.2	18.2	35.1	23.4
75		47.6	31.7	55.7	37.1	71.9	47.9	**75**		23.8	15.9	27.8	18.6	35.9	24.0
25	**5**	34.4	22.9	40.2	26.8	51.9	34.6	**25**	**2**	10.6	7.05	12.4	8.25	16.0	10.7
30		34.9	23.3	40.8	27.2	52.7	35.1	**30**		11.1	7.40	13.0	8.66	16.8	11.2
35		35.4	23.6	41.5	27.6	53.5	35.7	**35**		11.6	7.76	13.6	9.08	17.6	11.7
40		36.0	24.0	42.1	28.0	54.3	36.2	**40**		12.2	8.11	14.2	9.49	18.4	12.2
45		36.5	24.3	42.7	28.5	55.1	36.7	**45**		12.7	8.46	14.9	9.90	19.2	12.8
50		37.0	24.7	43.3	28.9	55.9	37.3	**50**		13.2	8.81	15.5	10.3	20.0	13.3
55		37.5	25.0	43.9	29.3	56.7	37.8	**55**		13.7	9.17	16.1	10.7	20.8	13.8
60		38.1	25.4	44.6	29.7	57.5	38.3	**60**		14.3	9.52	16.7	11.1	21.6	14.4
65		38.6	25.7	45.2	30.1	58.3	38.9	**65**		14.8	9.87	17.3	11.6	22.4	14.9
70		39.1	26.1	45.8	30.5	59.1	39.4	**70**		15.3	10.2	17.9	12.0	23.2	15.4
75		39.7	26.4	46.4	30.9	59.9	39.9	**75**		15.9	10.6	18.6	12.4	24.0	16.0
25	**4**	26.4	17.6	30.9	20.6	39.9	26.6								
30		27.0	18.0	31.6	21.0	40.7	27.2								
35		27.5	18.3	32.2	21.5	41.5	27.7								
40		28.0	18.7	32.8	21.9	42.3	28.2								
45		28.6	19.0	33.4	22.3	43.1	28.8								
50		29.1	19.4	34.0	22.7	43.9	29.3								
55		29.6	19.7	34.6	23.1	44.7	29.8								
60		30.1	20.1	35.3	23.5	45.5	30.4								
65		30.7	20.4	35.9	23.9	46.3	30.9								
70		31.2	20.8	36.5	24.3	47.1	31.4								
75		31.7	21.2	37.1	24.8	47.9	32.0								
LRFD	**ASD**														
$\phi = 0.75$	$\Omega = 2.00$														

Table I.5 Block shear: shear rupture component.

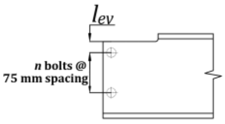
Block Shear
Shear Rupture Component
per mm of thickness, kN/mm



F_u, MPa		360													
n	l_{ev}, mm	Bolt diameter, d, mm[a]													
		16		20		22		24		27		30		36	
		$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
12	25	100	67.0	93.0	62.0	89.3	59.5	85.5	57.0	78.1	52.1	72.5	48.3	61.3	40.9
	30	101	67.5	93.8	62.5	90.1	60.0	86.3	57.6	78.9	52.6	73.3	48.9	62.1	41.4
	35	102	68.0	94.6	63.1	90.9	60.6	87.2	58.1	79.7	53.1	74.1	49.4	62.9	42.0
	40	103	68.6	95.4	63.6	91.7	61.1	88.0	58.6	80.5	53.7	74.9	50.0	63.7	42.5
	45	104	69.1	96.2	64.2	92.5	61.7	88.8	59.2	81.3	54.2	75.7	50.5	64.6	43.0
	50	104	69.7	97.0	64.7	93.3	62.2	89.6	59.7	82.1	54.8	76.5	51.0	65.4	43.6
	55	105	70.2	97.8	65.2	94.1	62.7	90.4	60.3	82.9	55.3	77.4	51.6	66.2	44.1
	60	106	70.7	98.7	65.8	94.9	63.3	91.2	60.8	83.8	55.8	78.2	52.1	67.0	44.7
	65	107	71.3	99.5	66.3	95.7	63.8	92.0	61.3	84.6	56.4	79.0	52.6	67.8	45.2
	70	108	71.8	100	66.9	96.6	64.4	92.8	61.9	85.4	56.9	79.8	53.2	68.6	45.7
	75	109	72.4	101	67.4	97.4	64.9	93.6	62.4	86.2	57.5	80.6	53.7	69.4	46.3
11	25	91.5	61.0	84.7	56.5	81.3	54.2	77.9	51.9	71.1	47.4	66.0	44.0	55.8	37.2
	30	92.3	61.6	85.5	57.0	82.1	54.8	78.7	52.5	71.9	48.0	66.8	44.6	56.6	37.7
	35	93.2	62.1	86.3	57.6	82.9	55.3	79.5	53.0	72.7	48.5	67.6	45.1	57.4	38.3
	40	94.0	62.6	87.2	58.1	83.8	55.8	80.4	53.6	73.5	49.0	68.4	45.6	58.2	38.8
	45	94.8	63.2	88.0	58.6	84.6	56.4	81.2	54.1	74.4	49.6	69.3	46.2	59.0	39.4
	50	95.6	63.7	88.8	59.2	85.4	56.9	82.0	54.6	75.2	50.1	70.1	46.7	59.9	39.9
	55	96.4	64.3	89.6	59.7	86.2	57.5	82.8	55.2	76.0	50.7	70.9	47.3	60.7	40.4
	60	97.2	64.8	90.4	60.3	87.0	58.0	83.6	55.7	76.8	51.2	71.7	47.8	61.5	41.0
	65	98.0	65.3	91.2	60.8	87.8	58.5	84.4	56.3	77.6	51.7	72.5	48.3	62.3	41.5
	70	98.8	65.9	92.0	61.3	88.6	59.1	85.2	56.8	78.4	52.3	73.3	48.9	63.1	42.1
	75	99.6	66.4	92.8	61.9	89.4	59.6	86.0	57.3	79.2	52.8	74.1	49.4	63.9	42.6
10	25	82.6	55.1	76.5	51.0	73.4	48.9	70.3	46.9	64.2	42.8	59.5	39.7	50.3	33.5
	30	83.4	55.6	77.3	51.5	74.2	49.5	71.1	47.4	65.0	43.3	60.3	40.2	51.1	34.1
	35	84.2	56.2	78.1	52.1	75.0	50.0	71.9	48.0	65.8	43.8	61.2	40.8	51.9	34.6
	40	85.0	56.7	78.9	52.6	75.8	50.5	72.7	48.5	66.6	44.4	62.0	41.3	52.7	35.2
	45	85.9	57.2	79.7	53.1	76.6	51.1	73.5	49.0	67.4	44.9	62.8	41.8	53.5	35.7
	50	86.7	57.8	80.5	53.7	77.4	51.6	74.4	49.6	68.2	45.5	63.6	42.4	54.4	36.2
	55	87.5	58.3	81.3	54.2	78.2	52.2	75.2	50.1	69.0	46.0	64.4	42.9	55.2	36.8
	60	88.3	58.9	82.1	54.8	79.1	52.7	76.0	50.7	69.8	46.5	65.2	43.5	56.0	37.3
	65	89.1	59.4	82.9	55.3	79.9	53.2	76.8	51.2	70.6	47.1	66.0	44.0	56.8	37.9
	70	89.9	59.9	83.8	55.8	80.7	53.8	77.6	51.7	71.4	47.6	66.8	44.5	57.6	38.4
	75	90.7	60.5	84.6	56.4	81.5	54.3	78.4	52.3	72.3	48.2	67.6	45.1	58.4	38.9
9	25	73.7	49.1	68.2	45.5	65.4	43.6	62.7	41.8	57.2	38.1	53.1	35.4	44.8	29.9
	30	74.5	49.7	69.0	46.0	66.3	44.2	63.5	42.3	58.0	38.7	53.9	35.9	45.6	30.4
	35	75.3	50.2	69.8	46.5	67.1	44.7	64.3	42.9	58.8	39.2	54.7	36.4	46.4	30.9
	40	76.1	50.8	70.6	47.1	67.9	45.3	65.1	43.4	59.6	39.7	55.5	37.0	47.2	31.5
	45	77.0	51.3	71.4	47.6	68.7	45.8	65.9	44.0	60.4	40.3	56.3	37.5	48.0	32.0
	50	77.8	51.8	72.3	48.2	69.5	46.3	66.7	44.5	61.2	40.8	57.1	38.1	48.8	32.6
	55	78.6	52.4	73.1	48.7	70.3	46.9	67.6	45.0	62.0	41.4	57.9	38.6	49.7	33.1
	60	79.4	52.9	73.9	49.2	71.1	47.4	68.4	45.6	62.9	41.9	58.7	39.1	50.5	33.6
	65	80.2	53.5	74.7	49.8	71.9	48.0	69.2	46.1	63.7	42.4	59.5	39.7	51.3	34.2
	70	81.0	54.0	75.5	50.3	72.7	48.5	70.0	46.7	64.5	43.0	60.3	40.2	52.1	34.7
	75	81.8	54.5	76.3	50.9	73.5	49.0	70.8	47.2	65.3	43.5	61.2	40.8	52.9	35.3
8	25	64.8	43.2	59.9	40.0	57.5	38.3	55.1	36.7	50.2	33.5	46.6	31.1	39.3	26.2
	30	65.6	43.7	60.8	40.5	58.3	38.9	55.9	37.3	51.0	34.0	47.4	31.6	40.1	26.7
	35	66.4	44.3	61.6	41.0	59.1	39.4	56.7	37.8	51.8	34.6	48.2	32.1	40.9	27.3
	40	67.2	44.8	62.4	41.6	59.9	40.0	57.5	38.3	52.7	35.1	49.0	32.7	41.7	27.8
	45	68.0	45.4	63.2	42.1	60.8	40.5	58.3	38.9	53.5	35.6	49.8	33.2	42.5	28.4
	50	68.9	45.9	64.0	42.7	61.6	41.0	59.1	39.4	54.3	36.2	50.6	33.8	43.3	28.9
	55	69.7	46.4	64.8	43.2	62.4	41.6	59.9	40.0	55.1	36.7	51.4	34.3	44.1	29.4
	60	70.5	47.0	65.6	43.7	63.2	42.1	60.8	40.5	55.9	37.3	52.2	34.8	45.0	30.0
	65	71.3	47.5	66.4	44.3	64.0	42.7	61.6	41.0	56.7	37.8	53.1	35.4	45.8	30.5
	70	72.1	48.1	67.2	44.8	64.8	43.2	62.4	41.6	57.5	38.3	53.9	35.9	46.6	31.0
	75	72.9	48.6	68.0	45.4	65.6	43.7	63.2	42.1	58.3	38.9	54.7	36.4	47.4	31.6
7	25	55.9	37.3	51.7	34.5	49.6	33.0	47.5	31.6	43.3	28.8	40.1	26.7	33.8	22.5
	30	56.7	37.8	52.5	35.0	50.4	33.6	48.3	32.2	44.1	29.4	40.9	27.3	34.6	23.1
	35	57.5	38.3	53.3	35.5	51.2	34.1	49.1	32.7	44.9	29.9	41.7	27.8	35.4	23.6
	40	58.3	38.9	54.1	36.1	52.0	34.7	49.9	33.3	45.7	30.5	42.5	28.3	36.2	24.1
	45	59.1	39.4	54.9	36.6	52.8	35.2	50.7	33.8	46.5	31.0	43.3	28.9	37.0	24.7
	50	59.9	40.0	55.7	37.2	53.6	35.7	51.5	34.3	47.3	31.5	44.1	29.4	37.8	25.2
	55	60.8	40.5	56.5	37.7	54.4	36.3	52.3	34.9	48.1	32.1	45.0	30.0	38.6	25.8
	60	61.6	41.0	57.3	38.2	55.2	36.8	53.1	35.4	48.9	32.6	45.8	30.5	39.4	26.3
	65	62.4	41.6	58.2	38.8	56.1	37.4	53.9	36.0	49.7	33.2	46.6	31.0	40.3	26.8
	70	63.2	42.1	59.0	39.3	56.9	37.9	54.8	36.5	50.5	33.7	47.4	31.6	41.1	27.4
	75	64.0	42.7	59.8	39.9	57.7	38.4	55.6	37.0	51.4	34.2	48.2	32.1	41.9	27.9
LRFD	ASD	[a] Values are for standard hole types.													
$\phi = 0.75$	$\Omega = 2.00$														

Table I.5 Continued.

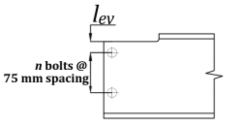
Block Shear
Shear Rupture Component
per mm of thickness, kN/mm



F_u, MPa		360													
n	l_{ev}, mm	Bolt diameter, d, mm[a]													
		16		20		22		24		27		30		36	
		$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
6	25	47.0	31.3	43.4	28.9	41.6	27.8	39.9	26.6	36.3	24.2	33.6	22.4	28.3	18.8
	30	47.8	31.9	44.2	29.5	42.4	28.3	40.7	27.1	37.1	24.7	34.4	23.0	29.1	19.4
	35	48.6	32.4	45.0	30.0	43.3	28.8	41.5	27.6	37.9	25.3	35.2	23.5	29.9	19.9
	40	49.4	32.9	45.8	30.6	44.1	29.4	42.3	28.2	38.7	25.8	36.0	24.0	30.7	20.5
	45	50.2	33.5	46.7	31.1	44.9	29.9	43.1	28.7	39.5	26.4	36.9	24.6	31.5	21.0
	50	51.0	34.0	47.5	31.6	45.7	30.5	43.9	29.3	40.3	26.9	37.7	25.1	32.3	21.5
	55	51.8	34.6	48.3	32.2	46.5	31.0	44.7	29.8	41.1	27.4	38.5	25.7	33.1	22.1
	60	52.7	35.1	49.1	32.7	47.3	31.5	45.5	30.3	42.0	28.0	39.3	26.2	33.9	22.6
	65	53.5	35.6	49.9	33.3	48.1	32.1	46.3	30.9	42.8	28.5	40.1	26.7	34.7	23.2
	70	54.3	36.2	50.7	33.8	48.9	32.6	47.1	31.4	43.6	29.1	40.9	27.3	35.6	23.7
	75	55.1	36.7	51.5	34.3	49.7	33.2	48.0	32.0	44.4	29.6	41.7	27.8	36.4	24.2
5	25	38.1	25.4	35.2	23.4	33.7	22.5	32.2	21.5	29.3	19.5	27.1	18.1	22.8	15.2
	30	38.9	25.9	36.0	24.0	34.5	23.0	33.0	22.0	30.1	20.1	27.9	18.6	23.6	15.7
	35	39.7	26.5	36.8	24.5	35.3	23.5	33.9	22.6	30.9	20.6	28.8	19.2	24.4	16.3
	40	40.5	27.0	37.6	25.1	36.1	24.1	34.7	23.1	31.8	21.2	29.6	19.7	25.2	16.8
	45	41.3	27.5	38.4	25.6	36.9	24.6	35.5	23.7	32.6	21.7	30.4	20.2	26.0	17.3
	50	42.1	28.1	39.2	26.1	37.7	25.2	36.3	24.2	33.4	22.2	31.2	20.8	26.8	17.9
	55	42.9	28.6	40.0	26.7	38.6	25.7	37.1	24.7	34.2	22.8	32.0	21.3	27.6	18.4
	60	43.7	29.2	40.8	27.2	39.4	26.2	37.9	25.3	35.0	23.3	32.8	21.9	28.4	19.0
	65	44.6	29.7	41.6	27.8	40.2	26.8	38.7	25.8	35.8	23.9	33.6	22.4	29.2	19.5
	70	45.4	30.2	42.4	28.3	41.0	27.3	39.5	26.4	36.6	24.4	34.4	22.9	30.1	20.0
	75	46.2	30.8	43.3	28.8	41.8	27.9	40.3	26.9	37.4	24.9	35.2	23.5	30.9	20.6
4	25	29.2	19.4	26.9	17.9	25.8	17.2	24.6	16.4	22.4	14.9	20.7	13.8	17.3	11.5
	30	30.0	20.0	27.7	18.5	26.6	17.7	25.4	17.0	23.2	15.4	21.5	14.3	18.1	12.0
	35	30.8	20.5	28.5	19.0	27.4	18.3	26.2	17.5	24.0	16.0	22.3	14.9	18.9	12.6
	40	31.6	21.1	29.3	19.5	28.2	18.8	27.1	18.0	24.8	16.5	23.1	15.4	19.7	13.1
	45	32.4	21.6	30.1	20.1	29.0	19.3	27.9	18.6	25.6	17.1	23.9	15.9	20.5	13.7
	50	33.2	22.1	30.9	20.6	29.8	19.9	28.7	19.1	26.4	17.6	24.7	16.5	21.3	14.2
	55	34.0	22.7	31.8	21.2	30.6	20.4	29.5	19.7	27.2	18.1	25.5	17.0	22.1	14.7
	60	34.8	23.2	32.6	21.7	31.4	21.0	30.3	20.2	28.0	18.7	26.3	17.5	22.9	15.3
	65	35.6	23.8	33.4	22.2	32.2	21.5	31.1	20.7	28.8	19.2	27.1	18.1	23.7	15.8
	70	36.4	24.3	34.2	22.8	33.0	22.0	31.9	21.3	29.6	19.8	27.9	18.6	24.5	16.4
	75	37.3	24.8	35.0	23.3	33.9	22.6	32.7	21.8	30.5	20.3	28.8	19.2	25.4	16.9
3	25	20.2	13.5	18.6	12.4	17.8	11.9	17.0	11.3	15.4	10.3	14.2	9.45	11.7	7.83
	30	21.1	14.0	19.4	13.0	18.6	12.4	17.8	11.9	16.2	10.8	15.0	9.99	12.6	8.37
	35	21.9	14.6	20.3	13.5	19.4	13.0	18.6	12.4	17.0	11.3	15.8	10.5	13.4	8.91
	40	22.7	15.1	21.1	14.0	20.3	13.5	19.4	13.0	17.8	11.9	16.6	11.1	14.2	9.45
	45	23.5	15.7	21.9	14.6	21.1	14.0	20.3	13.5	18.6	12.4	17.4	11.6	15.0	9.99
	50	24.3	16.2	22.7	15.1	21.9	14.6	21.1	14.0	19.4	13.0	18.2	12.2	15.8	10.5
	55	25.1	16.7	23.5	15.7	22.7	15.1	21.9	14.6	20.2	13.5	19.0	12.7	16.6	11.1
	60	25.9	17.3	24.3	16.2	23.5	15.7	22.7	15.1	21.1	14.0	19.8	13.2	17.4	11.6
	65	26.7	17.8	25.1	16.7	24.3	16.2	23.5	15.7	21.9	14.6	20.7	13.8	18.2	12.1
	70	27.5	18.4	25.9	17.3	25.1	16.7	24.3	16.2	22.7	15.1	21.5	14.3	19.0	12.7
	75	28.3	18.9	26.7	17.8	25.9	17.3	25.1	16.7	23.5	15.7	22.3	14.8	19.8	13.2
2	25	11.3	7.56	10.4	6.91	9.88	6.59	9.40	6.26	8.42	5.62	7.70	5.13	6.24	4.16
	30	12.2	8.10	11.2	7.45	10.7	7.13	10.2	6.80	9.23	6.16	8.50	5.67	7.05	4.70
	35	13.0	8.64	12.0	7.99	11.5	7.67	11.0	7.34	10.0	6.70	9.32	6.21	7.86	5.24
	40	13.8	9.18	12.8	8.53	12.3	8.21	11.8	7.88	10.9	7.24	10.1	6.75	8.67	5.78
	45	14.6	9.72	13.6	9.07	13.1	8.75	12.6	8.42	11.7	7.78	10.9	7.29	9.48	6.32
	50	15.4	10.3	14.4	9.61	13.9	9.29	13.4	8.96	12.5	8.32	11.7	7.83	10.3	6.86
	55	16.2	10.8	15.2	10.2	14.7	9.83	14.3	9.50	13.3	8.86	12.6	8.37	11.1	7.40
	60	17.0	11.3	16.0	10.7	15.6	10.4	15.1	10.0	14.1	9.40	13.4	8.91	11.9	7.94
	65	17.8	11.9	16.8	11.2	16.4	10.9	15.9	10.6	14.9	9.94	14.2	9.45	12.7	8.48
	70	18.6	12.4	17.7	11.8	17.2	11.4	16.7	11.1	15.7	10.5	15.0	9.99	13.5	9.02
	75	19.4	13.0	18.5	12.3	18.0	12.0	17.5	11.7	16.5	11.0	15.8	10.5	14.3	9.56
LRFD	ASD	[a] Values are for standard hole types.													
$\phi = 0.75$	$\Omega = 2.00$														

Table I.5 Continued.

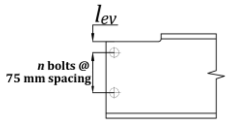
Block Shear
Shear Rupture Component
per mm of thickness, kN/mm



F_u, MPa		430													
n	l_{ev}, mm	Bolt diameter, d, mm[a]													
		16		20		22		24		27		30		36	
		$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
12	25	120	80.0	111	74.0	107	71.1	102	68.1	93.3	62.2	86.6	57.7	73.2	48.8
	30	121	80.6	112	74.7	108	71.7	103	68.8	94.2	62.8	87.6	58.4	74.2	49.5
	35	122	81.3	113	75.3	109	72.4	104	69.4	95.2	63.5	88.5	59.0	75.2	50.1
	40	123	81.9	114	76.0	110	73.0	105	70.0	96.2	64.1	89.5	59.7	76.1	50.8
	45	124	82.6	115	76.6	110	73.7	106	70.7	97.1	64.8	90.5	60.3	77.1	51.4
	50	125	83.2	116	77.3	111	74.3	107	71.3	98.1	65.4	91.4	61.0	78.1	52.1
	55	126	83.9	117	77.9	112	74.9	108	72.0	99.1	66.0	92.4	61.6	79.0	52.7
	60	127	84.5	118	78.6	113	75.6	109	72.6	100	66.7	93.4	62.2	80.0	53.3
	65	128	85.1	119	79.2	114	76.2	110	73.3	101	67.3	94.3	62.9	81.0	54.0
	70	129	85.8	120	79.9	115	76.9	111	73.9	102	68.0	95.3	63.5	81.9	54.6
	75	130	86.4	121	80.5	116	77.5	112	74.6	103	68.6	96.3	64.2	82.9	55.3
11	25	109	72.9	101	67.5	97.1	64.8	93.1	62.0	84.9	56.6	78.9	52.6	66.7	44.4
	30	110	73.5	102	68.1	98.1	65.4	94.0	62.7	85.9	57.3	79.8	53.2	67.6	45.1
	35	111	74.2	103	68.8	99.1	66.0	95.0	63.3	86.9	57.9	80.8	53.9	68.6	45.7
	40	112	74.8	104	69.4	100	66.7	96.0	64.0	87.8	58.6	81.8	54.5	69.6	46.4
	45	113	75.5	105	70.0	101	67.3	96.9	64.6	88.8	59.2	82.7	55.1	70.5	47.0
	50	114	76.1	106	70.7	102	68.0	97.9	65.3	89.8	59.9	83.7	55.8	71.5	47.7
	55	115	76.8	107	71.3	103	68.6	98.9	65.9	90.8	60.5	84.7	56.4	72.5	48.3
	60	116	77.4	108	72.0	104	69.3	99.8	66.6	91.7	61.1	85.6	57.1	73.4	49.0
	65	117	78.0	109	72.6	105	69.9	101	67.2	92.7	61.8	86.6	57.7	74.4	49.6
	70	118	78.7	110	73.3	106	70.6	102	67.9	93.7	62.4	87.6	58.4	75.4	50.2
	75	119	79.3	111	73.9	107	71.2	103	68.5	94.6	63.1	88.5	59.0	76.3	50.9
10	25	98.7	65.8	91.3	60.9	87.7	58.4	84.0	56.0	76.6	51.1	71.1	47.4	60.1	40.1
	30	99.7	66.4	92.3	61.5	88.6	59.1	84.9	56.6	77.6	51.7	72.1	48.1	61.0	40.7
	35	101	67.1	93.3	62.2	89.6	59.7	85.9	57.3	78.6	52.4	73.0	48.7	62.0	41.3
	40	102	67.7	94.2	62.8	90.6	60.4	86.9	57.9	79.5	53.0	74.0	49.3	63.0	42.0
	45	103	68.4	95.2	63.5	91.5	61.0	87.8	58.6	80.5	53.7	75.0	50.0	64.0	42.6
	50	104	69.0	96.2	64.1	92.5	61.7	88.8	59.2	81.5	54.3	75.9	50.6	64.9	43.3
	55	104	69.7	97.1	64.8	93.5	62.3	89.8	59.9	82.4	55.0	76.9	51.3	65.9	43.9
	60	105	70.3	98.1	65.4	94.4	63.0	90.8	60.5	83.4	55.6	77.9	51.9	66.9	44.6
	65	106	71.0	99.1	66.0	95.4	63.6	91.7	61.1	84.4	56.2	78.9	52.6	67.8	45.2
	70	107	71.6	100	66.7	96.4	64.2	92.7	61.8	85.3	56.9	79.8	53.2	68.8	45.9
	75	108	72.2	101	67.3	97.3	64.9	93.7	62.4	86.3	57.5	80.8	53.9	69.8	46.5
9	25	88.0	58.7	81.5	54.3	78.2	52.1	74.9	49.9	68.3	45.5	63.4	42.2	53.5	35.7
	30	89.0	59.3	82.4	55.0	79.1	52.8	75.9	50.6	69.3	46.2	64.3	42.9	54.5	36.3
	35	90.0	60.0	83.4	55.6	80.1	53.4	76.8	51.2	70.2	46.8	65.3	43.5	55.4	37.0
	40	90.9	60.6	84.4	56.2	81.1	54.1	77.8	51.9	71.2	47.5	66.3	44.2	56.4	37.6
	45	91.9	61.3	85.3	56.9	82.0	54.7	78.8	52.5	72.2	48.1	67.2	44.8	57.4	38.2
	50	92.9	61.9	86.3	57.5	83.0	55.3	79.7	53.1	73.1	48.8	68.2	45.5	58.3	38.9
	55	93.8	62.6	87.3	58.2	84.0	56.0	80.7	53.8	74.1	49.4	69.2	46.1	59.3	39.5
	60	94.8	63.2	88.2	58.8	84.9	56.6	81.7	54.4	75.1	50.1	70.1	46.8	60.3	40.2
	65	95.8	63.9	89.2	59.5	85.9	57.3	82.6	55.1	76.0	50.7	71.1	47.4	61.2	40.8
	70	96.7	64.5	90.2	60.1	86.9	57.9	83.6	55.7	77.0	51.3	72.1	48.1	62.2	41.5
	75	97.7	65.1	91.1	60.8	87.8	58.6	84.6	56.4	78.0	52.0	73.0	48.7	63.2	42.1
8	25	77.4	51.6	71.6	47.7	68.7	45.8	65.8	43.9	60.0	40.0	55.6	37.1	46.9	31.3
	30	78.4	52.2	72.6	48.4	69.7	46.4	66.8	44.5	61.0	40.6	56.6	37.7	47.9	31.9
	35	79.3	52.9	73.5	49.0	70.6	47.1	67.7	45.2	61.9	41.3	57.6	38.4	48.9	32.6
	40	80.3	53.5	74.5	49.7	71.6	47.7	68.7	45.8	62.9	41.9	58.5	39.0	49.8	33.2
	45	81.3	54.2	75.5	50.3	72.6	48.4	69.7	46.4	63.9	42.6	59.5	39.7	50.8	33.9
	50	82.2	54.8	76.4	51.0	73.5	49.0	70.6	47.1	64.8	43.2	60.5	40.3	51.8	34.5
	55	83.2	55.5	77.4	51.6	74.5	49.7	71.6	47.7	65.8	43.9	61.4	41.0	52.7	35.2
	60	84.2	56.1	78.4	52.2	75.5	50.3	72.6	48.4	66.8	44.5	62.4	41.6	53.7	35.8
	65	85.1	56.8	79.3	52.9	76.4	51.0	73.5	49.0	67.7	45.2	63.4	42.2	54.7	36.4
	70	86.1	57.4	80.3	53.5	77.4	51.6	74.5	49.7	68.7	45.8	64.3	42.9	55.6	37.1
	75	87.1	58.0	81.3	54.2	78.4	52.2	75.5	50.3	69.7	46.4	65.3	43.5	56.6	37.7
7	25	66.8	44.5	61.7	41.2	59.2	39.5	56.7	37.8	51.7	34.4	47.9	31.9	40.3	26.9
	30	67.7	45.2	62.7	41.8	60.2	40.1	57.7	38.4	52.6	35.1	48.9	32.6	41.3	27.5
	35	68.7	45.8	63.7	42.4	61.1	40.8	58.6	39.1	53.6	35.7	49.8	33.2	42.3	28.2
	40	69.7	46.4	64.6	43.1	62.1	41.4	59.6	39.7	54.6	36.4	50.8	33.9	43.2	28.8
	45	70.6	47.1	65.6	43.7	63.1	42.1	60.6	40.4	55.5	37.0	51.8	34.5	44.2	29.5
	50	71.6	47.7	66.6	44.4	64.0	42.7	61.5	41.0	56.5	37.7	52.7	35.2	45.2	30.1
	55	72.6	48.4	67.5	45.0	65.0	43.3	62.5	41.7	57.5	38.3	53.7	35.8	46.1	30.8
	60	73.5	49.0	68.5	45.7	66.0	44.0	63.5	42.3	58.4	39.0	54.7	36.4	47.1	31.4
	65	74.5	49.7	69.5	46.3	67.0	44.6	64.4	43.0	59.4	39.6	55.6	37.1	48.1	32.1
	70	75.5	50.3	70.4	47.0	67.9	45.3	65.4	43.6	60.4	40.2	56.6	37.7	49.1	32.7
	75	76.4	51.0	71.4	47.6	68.9	45.9	66.4	44.2	61.3	40.9	57.6	38.4	50.0	33.3
LRFD	ASD	[a] Values are for standard hole types.													
$\phi = 0.75$	$\Omega = 2.00$														

Table I.5 Continued.

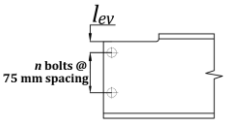
Block Shear
Shear Rupture Component
per mm of thickness, kN/mm



F_u , MPa		430													
n	l_{ev}, mm	Bolt diameter, d , mm[a]													
		16		20		22		24		27		30		36	
		$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
6	25	56.1	37.4	51.9	34.6	49.7	33.2	47.6	31.7	43.3	28.9	40.2	26.8	33.8	22.5
	30	57.1	38.1	52.8	35.2	50.7	33.8	48.6	32.4	44.3	29.5	41.1	27.4	34.7	23.2
	35	58.1	38.7	53.8	35.9	51.7	34.4	49.5	33.0	45.3	30.2	42.1	28.1	35.7	23.8
	40	59.0	39.3	54.8	36.5	52.6	35.1	50.5	33.7	46.2	30.8	43.1	28.7	36.7	24.4
	45	60.0	40.0	55.7	37.2	53.6	35.7	51.5	34.3	47.2	31.5	44.0	29.3	37.6	25.1
	50	61.0	40.6	56.7	37.8	54.6	36.4	52.4	35.0	48.2	32.1	45.0	30.0	38.6	25.7
	55	61.9	41.3	57.7	38.4	55.5	37.0	53.4	35.6	49.1	32.8	46.0	30.6	39.6	26.4
	60	62.9	41.9	58.6	39.1	56.5	37.7	54.4	36.2	50.1	33.4	46.9	31.3	40.5	27.0
	65	63.9	42.6	59.6	39.7	57.5	38.3	55.3	36.9	51.1	34.1	47.9	31.9	41.5	27.7
	70	64.8	43.2	60.6	40.4	58.4	39.0	56.3	37.5	52.1	34.7	48.9	32.6	42.5	28.3
	75	65.8	43.9	61.5	41.0	59.4	39.6	57.3	38.2	53.0	35.3	49.8	33.2	43.4	29.0
5	25	45.5	30.3	42.0	28.0	40.2	26.8	38.5	25.7	35.0	23.3	32.4	21.6	27.2	18.1
	30	46.4	31.0	43.0	28.6	41.2	27.5	39.5	26.3	36.0	24.0	33.4	22.3	28.2	18.8
	35	47.4	31.6	43.9	29.3	42.2	28.1	40.4	27.0	37.0	24.6	34.3	22.9	29.1	19.4
	40	48.4	32.2	44.9	29.9	43.2	28.8	41.4	27.6	37.9	25.3	35.3	23.5	30.1	20.1
	45	49.3	32.9	45.9	30.6	44.1	29.4	42.4	28.3	38.9	25.9	36.3	24.2	31.1	20.7
	50	50.3	33.5	46.8	31.2	45.1	30.1	43.3	28.9	39.9	26.6	37.2	24.8	32.0	21.3
	55	51.3	34.2	47.8	31.9	46.1	30.7	44.3	29.5	40.8	27.2	38.2	25.5	33.0	22.0
	60	52.2	34.8	48.8	32.5	47.0	31.3	45.3	30.2	41.8	27.9	39.2	26.1	34.0	22.6
	65	53.2	35.5	49.7	33.2	48.0	32.0	46.2	30.8	42.8	28.5	40.2	26.8	34.9	23.3
	70	54.2	36.1	50.7	33.8	49.0	32.6	47.2	31.5	43.7	29.2	41.1	27.4	35.9	23.9
	75	55.1	36.8	51.7	34.4	49.9	33.3	48.2	32.1	44.7	29.8	42.1	28.1	36.9	24.6
4	25	34.8	23.2	32.1	21.4	30.8	20.5	29.4	19.6	26.7	17.8	24.7	16.4	20.6	13.7
	30	35.8	23.9	33.1	22.1	31.7	21.2	30.4	20.3	27.7	18.4	25.6	17.1	21.6	14.4
	35	36.8	24.5	34.1	22.7	32.7	21.8	31.3	20.9	28.6	19.1	26.6	17.7	22.5	15.0
	40	37.7	25.2	35.0	23.3	33.7	22.4	32.3	21.5	29.6	19.7	27.6	18.4	23.5	15.7
	45	38.7	25.8	36.0	24.0	34.6	23.1	33.3	22.2	30.6	20.4	28.5	19.0	24.5	16.3
	50	39.7	26.4	37.0	24.6	35.6	23.7	34.2	22.8	31.5	21.0	29.5	19.7	25.4	17.0
	55	40.6	27.1	37.9	25.3	36.6	24.4	35.2	23.5	32.5	21.7	30.5	20.3	26.4	17.6
	60	41.6	27.7	38.9	25.9	37.5	25.0	36.2	24.1	33.5	22.3	31.4	21.0	27.4	18.3
	65	42.6	28.4	39.9	26.6	38.5	25.7	37.2	24.8	34.4	23.0	32.4	21.6	28.3	18.9
	70	43.5	29.0	40.8	27.2	39.5	26.3	38.1	25.4	35.4	23.6	33.4	22.3	29.3	19.5
	75	44.5	29.7	41.8	27.9	40.4	27.0	39.1	26.1	36.4	24.3	34.3	22.9	30.3	20.2
3	25	24.2	16.1	22.3	14.8	21.3	14.2	20.3	13.5	18.4	12.3	16.9	11.3	14.0	9.35
	30	25.2	16.8	23.2	15.5	22.3	14.8	21.3	14.2	19.4	12.9	17.9	11.9	15.0	10.0
	35	26.1	17.4	24.2	16.1	23.2	15.5	22.3	14.8	20.3	13.5	18.9	12.6	16.0	10.6
	40	27.1	18.1	25.2	16.8	24.2	16.1	23.2	15.5	21.3	14.2	19.8	13.2	16.9	11.3
	45	28.1	18.7	26.1	17.4	25.2	16.8	24.2	16.1	22.3	14.8	20.8	13.9	17.9	11.9
	50	29.0	19.4	27.1	18.1	26.1	17.4	25.2	16.8	23.2	15.5	21.8	14.5	18.9	12.6
	55	30.0	20.0	28.1	18.7	27.1	18.1	26.1	17.4	24.2	16.1	22.7	15.2	19.8	13.2
	60	31.0	20.6	29.0	19.4	28.1	18.7	27.1	18.1	25.2	16.8	23.7	15.8	20.8	13.9
	65	31.9	21.3	30.0	20.0	29.0	19.4	28.1	18.7	26.1	17.4	24.7	16.4	21.8	14.5
	70	32.9	21.9	31.0	20.6	30.0	20.0	29.0	19.4	27.1	18.1	25.6	17.1	22.7	15.2
	75	33.9	22.6	31.9	21.3	31.0	20.6	30.0	20.0	28.1	18.7	26.6	17.7	23.7	15.8
2	25	13.5	9.03	12.4	8.26	11.8	7.87	11.2	7.48	10.1	6.71	9.19	6.13	7.45	4.97
	30	14.5	9.68	13.4	8.90	12.8	8.51	12.2	8.13	11.0	7.35	10.2	6.77	8.42	5.61
	35	15.5	10.3	14.3	9.55	13.7	9.16	13.2	8.77	12.0	8.00	11.1	7.42	9.38	6.26
	40	16.4	11.0	15.3	10.2	14.7	9.80	14.1	9.42	13.0	8.64	12.1	8.06	10.4	6.90
	45	17.4	11.6	16.3	10.8	15.7	10.4	15.1	10.1	13.9	9.29	13.1	8.71	11.3	7.55
	50	18.4	12.3	17.2	11.5	16.6	11.1	16.1	10.7	14.9	9.93	14.0	9.35	12.3	8.19
	55	19.4	12.9	18.2	12.1	17.6	11.7	17.0	11.4	15.9	10.6	15.0	10.0	13.3	8.84
	60	20.3	13.5	19.2	12.8	18.6	12.4	18.0	12.0	16.8	11.2	16.0	10.6	14.2	9.48
	65	21.3	14.2	20.1	13.4	19.5	13.0	19.0	12.6	17.8	11.9	16.9	11.3	15.2	10.1
	70	22.3	14.8	21.1	14.1	20.5	13.7	19.9	13.3	18.8	12.5	17.9	11.9	16.2	10.8
	75	23.2	15.5	22.1	14.7	21.5	14.3	20.9	13.9	19.7	13.2	18.9	12.6	17.1	11.4
LRFD	ASD	[a] Values are for standard hole types.													
$\phi = 0.75$	$\Omega = 2.00$														

Table I.5 Continued.

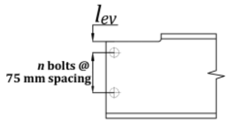
Block Shear
Shear Rupture Component
per mm of thickness, kN/mm



F_u, MPa		510													
n	l_{ev}, mm	Bolt diameter, d, mm[a]													
		16		20		22		24		27		30		36	
		$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
12	25	142	94.9	132	87.8	126	84.3	121	80.8	111	73.7	103	68.5	86.9	57.9
	30	143	95.6	133	88.6	128	85.1	122	81.5	112	74.5	104	69.2	88.0	58.7
	35	145	96.4	134	89.4	129	85.8	123	82.3	113	75.3	105	70.0	89.2	59.4
	40	146	97.2	135	90.1	130	86.6	125	83.1	114	76.0	106	70.8	90.3	60.2
	45	147	97.9	136	90.9	131	87.4	126	83.8	115	76.8	107	71.5	91.5	61.0
	50	148	98.7	137	91.6	132	88.1	127	84.6	116	77.6	108	72.3	92.6	61.7
	55	149	99.5	139	92.4	133	88.9	128	85.4	118	78.3	110	73.1	93.8	62.5
	60	150	100	140	93.2	134	89.7	129	86.1	119	79.1	111	73.8	94.9	63.3
	65	151	101	141	93.9	136	90.4	130	86.9	120	79.9	112	74.6	96.0	64.0
	70	153	102	142	94.7	137	91.2	132	87.7	121	80.6	113	75.4	97.2	64.8
	75	154	103	143	95.5	138	92.0	133	88.4	122	81.4	114	76.1	98.3	65.6
11	25	130	86.4	120	80.0	115	76.8	110	73.6	101	67.2	93.5	62.3	79.1	52.7
	30	131	87.2	121	80.8	116	77.6	112	74.4	102	67.9	94.7	63.1	80.2	53.5
	35	132	88.0	122	81.5	118	78.3	113	75.1	103	68.7	95.8	63.9	81.4	54.2
	40	133	88.7	123	82.3	119	79.1	114	75.9	104	69.5	97.0	64.6	82.5	55.0
	45	134	89.5	125	83.1	120	79.9	115	76.7	105	70.2	98.1	65.4	83.7	55.8
	50	135	90.3	126	83.8	121	80.6	116	77.4	106	71.0	99.3	66.2	84.8	56.5
	55	137	91.0	127	84.6	122	81.4	117	78.2	108	71.8	100	66.9	85.9	57.3
	60	138	91.8	128	85.4	123	82.2	118	78.9	109	72.5	102	67.7	87.1	58.1
	65	139	92.6	129	86.1	124	82.9	120	79.7	110	73.3	103	68.5	88.2	58.8
	70	140	93.3	130	86.9	126	83.7	121	80.5	111	74.1	104	69.2	89.4	59.6
	75	141	94.1	132	87.7	127	84.5	122	81.2	112	74.8	105	70.0	90.5	60.4
10	25	117	78.0	108	72.2	104	69.3	99.6	66.4	90.9	60.6	84.3	56.2	71.3	47.5
	30	118	78.8	109	73.0	105	70.1	101	67.2	92.0	61.4	85.5	57.0	72.4	48.3
	35	119	79.6	111	73.7	106	70.8	102	67.9	93.2	62.1	86.6	57.8	73.6	49.0
	40	120	80.3	112	74.5	107	71.6	103	68.7	94.3	62.9	87.8	58.5	74.7	49.8
	45	122	81.1	113	75.3	109	72.4	104	69.5	95.5	63.6	88.9	59.3	75.8	50.6
	50	123	81.9	114	76.0	110	73.1	105	70.2	96.6	64.4	90.1	60.1	77.0	51.3
	55	124	82.6	115	76.8	111	73.9	106	71.0	97.8	65.2	91.2	60.8	78.1	52.1
	60	125	83.4	116	77.6	112	74.7	108	71.8	98.9	65.9	92.4	61.6	79.3	52.9
	65	126	84.2	118	78.3	113	75.4	109	72.5	100	66.7	93.5	62.3	80.4	53.6
	70	127	84.9	119	79.1	114	76.2	110	73.3	101	67.5	94.7	63.1	81.6	54.4
	75	129	85.7	120	79.9	115	77.0	111	74.1	102	68.2	95.8	63.9	82.7	55.2
9	25	104	69.6	96.6	64.4	92.7	61.8	88.8	59.2	81.0	54.0	75.2	50.1	63.5	42.3
	30	106	70.4	97.8	65.2	93.9	62.6	90.0	60.0	82.2	54.8	76.3	50.9	64.6	43.1
	35	107	71.1	98.9	65.9	95.0	63.3	91.1	60.7	83.3	55.5	77.5	51.6	65.8	43.8
	40	108	71.9	100	66.7	96.2	64.1	92.3	61.5	84.5	56.3	78.6	52.4	66.9	44.6
	45	109	72.7	101	67.5	97.3	64.9	93.4	62.3	85.6	57.1	79.8	53.2	68.0	45.4
	50	110	73.4	102	68.2	98.5	65.6	94.6	63.0	86.8	57.8	80.9	53.9	69.2	46.1
	55	111	74.2	104	69.0	99.6	66.4	95.7	63.8	87.9	58.6	82.0	54.7	70.3	46.9
	60	112	75.0	105	69.8	101	67.2	96.8	64.6	89.0	59.4	83.2	55.5	71.5	47.7
	65	114	75.7	106	70.5	102	67.9	98.0	65.3	90.2	60.1	84.3	56.2	72.6	48.4
	70	115	76.5	107	71.3	103	68.7	99.1	66.1	91.3	60.9	85.5	57.0	73.8	49.2
	75	116	77.3	108	72.1	104	69.5	100	66.9	92.5	61.7	86.6	57.8	74.9	50.0
8	25	91.8	61.2	84.9	56.6	81.5	54.3	78.0	52.0	71.1	47.4	66.0	44.0	55.7	37.1
	30	92.9	62.0	86.1	57.4	82.6	55.1	79.2	52.8	72.3	48.2	67.1	44.8	56.8	37.9
	35	94.1	62.7	87.2	58.1	83.8	55.8	80.3	53.6	73.4	49.0	68.3	45.5	57.9	38.6
	40	95.2	63.5	88.4	58.9	84.9	56.6	81.5	54.3	74.6	49.7	69.4	46.3	59.1	39.4
	45	96.4	64.3	89.5	59.7	86.1	57.4	82.6	55.1	75.7	50.5	70.6	47.0	60.2	40.2
	50	97.5	65.0	90.7	60.4	87.2	58.1	83.8	55.8	76.9	51.3	71.7	47.8	61.4	40.9
	55	98.7	65.8	91.8	61.2	88.4	58.9	84.9	56.6	78.0	52.0	72.9	48.6	62.5	41.7
	60	99.8	66.6	92.9	62.0	89.5	59.7	86.1	57.4	79.2	52.8	74.0	49.3	63.7	42.5
	65	101	67.3	94.1	62.7	90.7	60.4	87.2	58.1	80.3	53.6	75.2	50.1	64.8	43.2
	70	102	68.1	95.2	63.5	91.8	61.2	88.4	58.9	81.5	54.3	76.3	50.9	66.0	44.0
	75	103	68.8	96.4	64.3	92.9	62.0	89.5	59.7	82.6	55.1	77.5	51.6	67.1	44.8
7	25	79.2	52.8	73.2	48.8	70.2	46.8	67.2	44.8	61.3	40.9	56.8	37.9	47.9	31.9
	30	80.3	53.6	74.4	49.6	71.4	47.6	68.4	45.6	62.4	41.6	57.9	38.6	49.0	32.7
	35	81.5	54.3	75.5	50.3	72.5	48.3	69.5	46.4	63.6	42.4	59.1	39.4	50.1	33.4
	40	82.6	55.1	76.7	51.1	73.7	49.1	70.7	47.1	64.7	43.1	60.2	40.2	51.3	34.2
	45	83.8	55.8	77.8	51.9	74.8	49.9	71.8	47.9	65.9	43.9	61.4	40.9	52.4	35.0
	50	84.9	56.6	78.9	52.6	76.0	50.6	73.0	48.7	67.0	44.7	62.5	41.7	53.6	35.7
	55	86.1	57.4	80.1	53.4	77.1	51.4	74.1	49.4	68.2	45.4	63.7	42.5	54.7	36.5
	60	87.2	58.1	81.2	54.2	78.3	52.2	75.3	50.2	69.3	46.2	64.8	43.2	55.9	37.3
	65	88.4	58.9	82.4	54.9	79.4	52.9	76.4	50.9	70.5	47.0	66.0	44.0	57.0	38.0
	70	89.5	59.7	83.5	55.7	80.6	53.7	77.6	51.7	71.6	47.7	67.1	44.8	58.2	38.8
	75	90.7	60.4	84.7	56.5	81.7	54.5	78.7	52.5	72.8	48.5	68.3	45.5	59.3	39.6
LRFD	ASD	[a] Values are for standard hole types.													
$\phi = 0.75$	$\Omega = 2.00$														

Table I.5 Continued.

Block Shear
Shear Rupture Component
per mm of thickness, kN/mm



F_u, MPa		510													
n	l_{ev}, mm	Bolt diameter, d, mm[a]													
		16		20		22		24		27		30		36	
		$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$	$\frac{\phi 0.6F_uA_{nv}}{t}$	$\frac{0.6F_uA_{nv}}{\Omega t}$
		LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
6	25	66.6	44.4	61.5	41.0	59.0	39.3	56.5	37.6	51.4	34.3	47.6	31.7	40.0	26.7
	30	67.7	45.1	62.7	41.8	60.1	40.1	57.6	38.4	52.6	35.0	48.8	32.5	41.2	27.5
	35	68.9	45.9	63.8	42.5	61.3	40.9	58.8	39.2	53.7	35.8	49.9	33.3	42.3	28.2
	40	70.0	46.7	64.9	43.3	62.4	41.6	59.9	39.9	54.9	36.6	51.1	34.0	43.5	29.0
	45	71.1	47.4	66.1	44.1	63.6	42.4	61.0	40.7	56.0	37.3	52.2	34.8	44.6	29.8
	50	72.3	48.2	67.2	44.8	64.7	43.1	62.2	41.5	57.1	38.1	53.4	35.6	45.8	30.5
	55	73.4	49.0	68.4	45.6	65.9	43.9	63.3	42.2	58.3	38.9	54.5	36.3	46.9	31.3
	60	74.6	49.7	69.5	46.4	67.0	44.7	64.5	43.0	59.4	39.6	55.7	37.1	48.1	32.1
	65	75.7	50.5	70.7	47.1	68.2	45.4	65.6	43.8	60.6	40.4	56.8	37.9	49.2	32.8
	70	76.9	51.3	71.8	47.9	69.3	46.2	66.8	44.5	61.7	41.2	57.9	38.6	50.4	33.6
	75	78.0	52.0	73.0	48.7	70.5	47.0	67.9	45.3	62.9	41.9	59.1	39.4	51.5	34.3
5	25	53.9	36.0	49.8	33.2	47.7	31.8	45.7	30.4	41.5	27.7	38.4	25.6	32.2	21.5
	30	55.1	36.7	50.9	34.0	48.9	32.6	46.8	31.2	42.7	28.5	39.6	26.4	33.4	22.3
	35	56.2	37.5	52.1	34.7	50.0	33.4	48.0	32.0	43.8	29.2	40.7	27.2	34.5	23.0
	40	57.4	38.2	53.2	35.5	51.2	34.1	49.1	32.7	45.0	30.0	41.9	27.9	35.7	23.8
	45	58.5	39.0	54.4	36.3	52.3	34.9	50.3	33.5	46.1	30.8	43.0	28.7	36.8	24.6
	50	59.7	39.8	55.5	37.0	53.5	35.6	51.4	34.3	47.3	31.5	44.2	29.5	38.0	25.3
	55	60.8	40.5	56.7	37.8	54.6	36.4	52.6	35.0	48.4	32.3	45.3	30.2	39.1	26.1
	60	62.0	41.3	57.8	38.6	55.8	37.2	53.7	35.8	49.6	33.0	46.5	31.0	40.3	26.9
	65	63.1	42.1	59.0	39.3	56.9	37.9	54.9	36.6	50.7	33.8	47.6	31.7	41.4	27.6
	70	64.3	42.8	60.1	40.1	58.1	38.7	56.0	37.3	51.9	34.6	48.8	32.5	42.6	28.4
	75	65.4	43.6	61.3	40.9	59.2	39.5	57.1	38.1	53.0	35.3	49.9	33.3	43.7	29.1
4	25	41.3	27.5	38.1	25.4	36.5	24.3	34.9	23.3	31.7	21.1	29.3	19.5	24.4	16.3
	30	42.5	28.3	39.2	26.2	37.6	25.1	36.0	24.0	32.8	21.9	30.4	20.3	25.6	17.1
	35	43.6	29.1	40.4	26.9	38.8	25.9	37.2	24.8	34.0	22.6	31.6	21.0	26.7	17.8
	40	44.8	29.8	41.5	27.7	39.9	26.6	38.3	25.6	35.1	23.4	32.7	21.8	27.9	18.6
	45	45.9	30.6	42.7	28.5	41.1	27.4	39.5	26.3	36.3	24.2	33.9	22.6	29.0	19.4
	50	47.0	31.4	43.8	29.2	42.2	28.2	40.6	27.1	37.4	24.9	35.0	23.3	30.2	20.1
	55	48.2	32.1	45.0	30.0	43.4	28.9	41.8	27.8	38.6	25.7	36.1	24.1	31.3	20.9
	60	49.3	32.9	46.1	30.8	44.5	29.7	42.9	28.6	39.7	26.5	37.3	24.9	32.5	21.6
	65	50.5	33.7	47.3	31.5	45.7	30.4	44.1	29.4	40.9	27.2	38.4	25.6	33.6	22.4
	70	51.6	34.4	48.4	32.3	46.8	31.2	45.2	30.1	42.0	28.0	39.6	26.4	34.8	23.2
	75	52.8	35.2	49.6	33.0	48.0	32.0	46.4	30.9	43.1	28.8	40.7	27.2	35.9	23.9
3	25	28.7	19.1	26.4	17.6	25.2	16.8	24.1	16.1	21.8	14.5	20.1	13.4	16.6	11.1
	30	29.8	19.9	27.5	18.4	26.4	17.6	25.2	16.8	22.9	15.3	21.2	14.2	17.8	11.9
	35	31.0	20.7	28.7	19.1	27.5	18.4	26.4	17.6	24.1	16.1	22.4	14.9	18.9	12.6
	40	32.1	21.4	29.8	19.9	28.7	19.1	27.5	18.4	25.2	16.8	23.5	15.7	20.1	13.4
	45	33.3	22.2	31.0	20.7	29.8	19.9	28.7	19.1	26.4	17.6	24.7	16.4	21.2	14.2
	50	34.4	23.0	32.1	21.4	31.0	20.7	29.8	19.9	27.5	18.4	25.8	17.2	22.4	14.9
	55	35.6	23.7	33.3	22.2	32.1	21.4	31.0	20.7	28.7	19.1	27.0	18.0	23.5	15.7
	60	36.7	24.5	34.4	23.0	33.3	22.2	32.1	21.4	29.8	19.9	28.1	18.7	24.7	16.4
	65	37.9	25.2	35.6	23.7	34.4	23.0	33.3	22.2	31.0	20.7	29.3	19.5	25.8	17.2
	70	39.0	26.0	36.7	24.5	35.6	23.7	34.4	23.0	32.1	21.4	30.4	20.3	27.0	18.0
	75	40.2	26.8	37.9	25.2	36.7	24.5	35.6	23.7	33.3	22.2	31.6	21.0	28.1	18.7
2	25	16.1	10.7	14.7	9.79	14.0	9.33	13.3	8.87	11.9	7.96	10.9	7.27	8.84	5.89
	30	17.2	11.5	15.8	10.6	15.1	10.1	14.5	9.64	13.1	8.72	12.0	8.03	9.98	6.66
	35	18.4	12.2	17.0	11.3	16.3	10.9	15.6	10.4	14.2	9.49	13.2	8.80	11.1	7.42
	40	19.5	13.0	18.1	12.1	17.4	11.6	16.8	11.2	15.4	10.3	14.3	9.56	12.3	8.19
	45	20.7	13.8	19.3	12.9	18.6	12.4	17.9	11.9	16.5	11.0	15.5	10.3	13.4	8.95
	50	21.8	14.5	20.4	13.6	19.7	13.2	19.0	12.7	17.7	11.8	16.6	11.1	14.6	9.72
	55	23.0	15.3	21.6	14.4	20.9	13.9	20.2	13.5	18.8	12.5	17.8	11.9	15.7	10.5
	60	24.1	16.1	22.7	15.1	22.0	14.7	21.3	14.2	20.0	13.3	18.9	12.6	16.9	11.2
	65	25.2	16.8	23.9	15.9	23.2	15.5	22.5	15.0	21.1	14.1	20.1	13.4	18.0	12.0
	70	26.4	17.6	25.0	16.7	24.3	16.2	23.6	15.8	22.3	14.8	21.2	14.2	19.2	12.8
	75	27.5	18.4	26.2	17.4	25.5	17.0	24.8	16.5	23.4	15.6	22.4	14.9	20.3	13.5
LRFD	ASD	[a] Values are for standard hole types.													
$\phi = 0.75$	$\Omega = 2.00$														

Table I.6 Beam bearing constants.

Beam Bearing Constants
HD Shapes

F_y = 235 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	kN	kN/m	kN/m	kN	kN	kN/m	kN/m	kN	kN	kN/m	kN/m
	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400 × 1086	6420	4280	18300	12200	15800	10600	41200	27400	14300	9520	54900	36600
× 990	5490	3660	16900	11300	13400	8960	36300	24200	12100	8080	48300	32200
× 900	4680	3120	15500	10300	11300	7550	31400	20900	10200	6810	41800	27900
× 818	3980	2650	14200	9480	9530	6350	27400	18300	8590	5730	36500	24400
× 744	3390	2260	13100	8710	8040	5360	24000	16000	7240	4830	31900	21300
× 677	2900	1940	12000	8020	6800	4530	21000	14000	6120	4080	28100	18700
× 634	2580	1720	11200	7460	5930	3950	18200	12100	5360	3570	24300	16200
× 592	2310	1540	10600	7050	5280	3520	16700	11100	4760	3170	22300	14900
× 551	2040	1360	9870	6580	4600	3070	14900	9910	4150	2770	19800	13200
× 509	1780	1190	9190	6130	3980	2650	13200	8790	3590	2390	17600	11700
× 463	1520	1020	8410	5610	3340	2230	11300	7560	3010	2010	15100	10100
× 421	1300	868	7710	5140	2800	1870	9740	6490	2530	1680	13000	8660
× 382	1100	735	7000	4670	2320	1550	8180	5450	2090	1390	10900	7270
× 347	938	625	6390	4260	1930	1290	6980	4650	1740	1160	9310	6210
× 314	799	532	5850	3900	1610	1070	6030	4020	1450	965	8040	5360
× 287	685	457	5310	3540	1340	891	4950	3300	1210	805	6600	4400
× 262	599	399	4960	3310	1150	767	4500	3000	1030	690	6000	4000
× 237	502	335	4440	2960	929	619	3630	2420	837	558	4840	3230
× 216	434	289	4070	2710	779	519	3080	2050	702	468	4100	2730
× 187	344	229	3530	2350	585	390	2360	1570	528	352	3140	2100
HD 360 × 196	397	265	3850	2570	699	466	2790	1860	630	420	3720	2480
× 179	343	229	3530	2350	584	389	2370	1580	526	351	3160	2100
× 162	288	192	3130	2080	466	311	1830	1220	421	281	2440	1630
× 147	251	168	2890	1930	395	263	1610	1070	356	237	2150	1430
× 134	217	145	2630	1750	327	218	1350	902	295	197	1800	1200
HD 320 × 300	1190	793	6350	4230	2000	1330	6750	4500	1830	1220	9000	6000
× 245	827	551	4940	3290	1250	835	3980	2650	1160	771	5310	3540
× 198	624	416	4230	2820	888	592	3280	2190	814	542	4370	2910
× 158	447	298	3410	2270	573	382	2240	1490	524	350	2980	1990
× 127	321	214	2700	1800	363	242	1430	954	333	222	1910	1270
× 97.6	225	150	2120	1410	219	146	936	624	199	133	1250	832
× 74.2	179	119	1880	1250	154	103	954	636	135	90.1	1270	848
HD 260 × 172	597	398	4230	2820	895	597	3820	2550	822	548	5090	3390
× 142	460	307	3640	2430	646	431	3120	2080	588	392	4160	2770
× 114	334	223	2940	1960	421	281	2090	1390	384	256	2790	1860
× 93.0	244	163	2350	1570	272	181	1360	904	249	166	1810	1210
× 68.2	161	107	1760	1180	149	99.6	833	555	135	90.3	1110	740
× 54.1	128	85.3	1530	1020	105	70.0	731	487	93.2	62.1	975	650

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	ASD	LRFD	ASD
$\phi = 1.00$	$\Omega = 1.50$	$\phi = 0.75$	$\Omega = 2.00$

Table I.6 Continued.

F_y = 235 MPa

Beam Bearing Constants
HD Shapes

Shape	Nominal Weight	$l_b =$ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400 × 1086	1090	–	–	–	–	14300	9530	6260	4170
× 990	990	–	–	–	–	12300	8220	5580	3720
× 900	900	–	–	–	–	10600	7070	4930	3290
× 818	818	–	–	–	–	9100	6070	4380	2920
× 744	744	–	–	–	–	7830	5220	3900	2600
× 677	677	–	–	–	–	6770	4510	3490	2320
× 634	634	–	–	–	–	6050	4030	3180	2120
× 592	592	–	–	–	–	5460	3640	2950	1970
× 551	551	–	–	–	–	4870	3240	2690	1800
× 509	509	2520	1680	2520	1680	4300	2870	2460	1640
× 463	463	2200	1460	2200	1460	3720	2480	2200	1460
× 421	421	1920	1280	1920	1280	3220	2150	1970	1310
× 382	382	1660	1110	1660	1110	2770	1840	1750	1170
× 347	347	1450	966	1450	966	2390	1590	1560	1040
× 314	314	1270	845	1270	845	2070	1380	1400	934
× 287	287	1110	740	1110	740	1800	1200	1250	835
× 262	262	995	664	995	664	1590	1060	1150	768
× 237	237	857	571	857	571	1360	906	1010	675
× 216	216	759	506	759	506	1190	795	915	610
× 187	187	626	417	626	417	969	646	778	519
HD 360 × 196	196	705	470	705	470	1100	735	860	573
× 179	179	625	417	625	417	968	645	778	519
× 162	162	538	358	538	358	825	550	683	455
× 147	147	483	322	483	322	734	489	624	416
× 134	134	428	285	428	285	645	430	562	375
HD 320 × 300	300	1700	1130	1700	1130	2890	1920	1430	952
× 245	245	1220	814	1220	814	2050	1370	1060	709
× 198	198	962	642	962	642	1590	1060	871	580
× 158	158	720	480	720	480	1170	778	675	450
× 127	127	485	323	537	358	858	572	519	346
× 97.6	97.6	299	199	394	263	587	391	393	262
× 74.2	74.2	237	158	329	219	461	308	340	226
HD 260 × 172	172	936	624	936	624	1530	1020	736	491
× 142	142	751	501	751	501	1210	807	608	405
× 114	114	569	379	569	379	903	602	472	315
× 93.0	93.0	393	262	432	288	676	450	367	244
× 68.2	68.2	224	150	302	201	432	288	264	176
× 54.1	54.1	171	114	250	167	327	218	224	149

For V_{nx}	
LRFD	ASD
ϕ_v = 1.00	Ω_v = 1.50

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.
l_b = length of bearing, mm
x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HD Shapes

F_y = 275 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HD 400 × 1086	7510	5010	21500	14300	17100	11400	44500	29700	15400	10300	59400	39600
× 990	6430	4280	19800	13200	14500	9700	39200	26100	13100	8740	52300	34900
× 900	5480	3650	18100	12100	12300	8170	33900	22600	11100	7370	45200	30200
× 818	4660	3110	16600	11100	10300	6870	29600	19800	9300	6200	39500	26400
× 744	3970	2650	15300	10200	8700	5800	25900	17300	7840	5220	34600	23000
× 677	3400	2260	14100	9390	7360	4910	22800	15200	6630	4420	30300	20200
× 634	3010	2010	13100	8730	6420	4280	19700	13100	5790	3860	26300	17500
× 592	2700	1800	12400	8250	5710	3810	18100	12100	5150	3430	24100	16100
× 551	2390	1590	11600	7700	4980	3320	16100	10700	4490	2990	21400	14300
× 509	2090	1390	10800	7170	4310	2870	14300	9510	3880	2590	19000	12700
× 463	1780	1190	9850	6560	3610	2410	12300	8180	3250	2170	16400	10900
× 421	1520	1020	9020	6010	3030	2020	10500	7020	2730	1820	14000	9370
× 382	1290	860	8200	5460	2510	1670	8850	5900	2260	1510	11800	7860
× 347	1100	732	7480	4990	2090	1390	7550	5030	1880	1250	10100	6710
× 314	935	623	6850	4570	1740	1160	6520	4350	1570	1040	8700	5800
× 287	802	534	6220	4140	1450	964	5360	3570	1310	871	7140	4760
× 262	701	467	5800	3870	1240	830	4870	3240	1120	746	6490	4320
× 237	587	392	5200	3470	1000	670	3930	2620	905	603	5240	3490
× 216	508	339	4760	3170	843	562	3330	2220	759	506	4440	2960
× 187	402	268	4130	2750	633	422	2550	1700	571	380	3400	2270
HD 360 × 196	465	310	4510	3010	756	504	3020	2010	681	454	4030	2690
× 179	401	267	4130	2750	632	421	2560	1710	569	379	3410	2280
× 162	336	224	3660	2440	504	336	1980	1320	456	304	2640	1760
× 147	294	196	3380	2260	427	285	1740	1160	385	257	2320	1550
× 134	254	169	3080	2050	354	236	1460	976	319	213	1950	1300
HD 320 × 300	1390	928	7430	4950	2160	1440	7300	4870	1980	1320	9730	6490
× 245	967	645	5780	3850	1350	903	4300	2870	1250	834	5740	3830
× 198	730	487	4950	3300	961	641	3550	2360	880	587	4730	3150
× 158	523	349	3990	2660	620	414	2420	1610	567	378	3220	2150
× 127	376	250	3160	2110	393	262	1550	1030	360	240	2060	1380
× 97.6	263	175	2480	1650	237	158	1010	675	216	144	1350	900
× 74.2	209	139	2200	1470	167	111	1030	688	146	97.5	1380	917
HD 260 × 172	699	466	4950	3300	969	646	4130	2750	889	593	5510	3670
× 142	538	359	4260	2840	699	466	3370	2250	636	424	4500	3000
× 114	391	261	3440	2290	456	304	2260	1510	415	277	3020	2010
× 93.0	285	190	2750	1830	294	196	1470	978	269	179	1960	1300
× 68.2	188	125	2060	1380	162	108	901	601	147	97.7	1200	801
× 54.1	150	99.8	1790	1190	114	75.8	791	527	101	67.2	1050	703

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
$\phi = 1.00$	$\Omega = 1.50$	$\phi = 0.75$	$\Omega = 2.00$

Table I.6 Continued.

Beam Bearing Constants
HD Shapes

F_y = 275 MPa

Shape	Nominal Weight	l_b = 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400 × 1086	1090	–	–	–	–	16700	11200	7320	4880
× 990	990	–	–	–	–	14400	9620	6520	4350
× 900	900	–	–	–	–	12400	8280	5770	3850
× 818	818	–	–	–	–	10600	7100	5130	3420
× 744	744	–	–	–	–	9170	6110	4570	3050
× 677	677	–	–	–	–	7920	5280	4080	2720
× 634	634	–	–	–	–	7080	4720	3720	2480
× 592	592	–	–	–	–	6390	4260	3450	2300
× 551	551	–	–	–	–	5690	3800	3150	2100
× 509	509	2950	1970	2950	1970	5040	3360	2880	1920
× 463	463	2570	1710	2570	1710	4350	2900	2570	1710
× 421	421	2250	1500	2250	1500	3770	2510	2300	1530
× 382	382	1950	1300	1950	1300	3240	2160	2050	1360
× 347	347	1700	1130	1700	1130	2790	1860	1830	1220
× 314	314	1480	988	1480	988	2420	1610	1640	1090
× 287	287	1300	866	1300	866	2100	1400	1470	977
× 262	262	1160	777	1160	777	1870	1240	1350	898
× 237	237	1000	669	1000	669	1590	1060	1190	790
× 216	216	888	592	888	592	1400	931	1070	714
× 187	187	732	488	732	488	1130	756	911	607
HD 360 × 196	196	825	550	825	550	1290	860	1010	671
× 179	179	731	487	731	487	1130	755	911	607
× 162	162	629	419	629	419	966	644	799	533
× 147	147	565	377	565	377	859	573	731	487
× 134	134	475	317	501	334	755	503	658	439
HD 320 × 300	300	1990	1320	1990	1320	3380	2250	1670	1110
× 245	245	1430	953	1430	953	2400	1600	1240	829
× 198	198	1130	751	1130	751	1860	1240	1020	679
× 158	158	825	550	842	562	1370	910	790	526
× 127	127	525	350	629	419	1000	669	607	405
× 97.6	97.6	324	216	461	307	635	423	460	307
× 74.2	74.2	256	171	385	257	499	333	397	265
HD 260 × 172	172	1100	730	1100	730	1790	1200	861	574
× 142	142	879	586	879	586	1420	945	711	474
× 114	114	657	438	666	444	1060	705	553	369
× 93.0	93.0	425	284	505	337	791	527	429	286
× 68.2	68.2	243	162	353	235	467	312	309	206
× 54.1	54.1	185	123	293	195	354	236	262	174

For V_{nx}	
LRFD	**ASD**
ϕ_v = 1.00	Ω_v = 1.50

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HD Shapes

F_y = 355 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	kN	kN/m	kN/m	kN	kN	kN/m	kN/m	kN	kN	kN/m	kN/m
	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400 × 1086	9690	6460	27700	18500	19500	13000	50600	33700	17500	11700	67500	45000
× 990	8300	5530	25500	17000	16500	11000	44600	29700	14900	9930	59400	39600
× 900	7080	4720	23400	15600	13900	9280	38600	25700	12600	8370	51400	34300
× 818	6010	4010	21500	14300	11700	7810	33700	22500	10600	7040	44900	29900
× 744	5130	3420	19700	13200	9880	6590	29400	19600	8900	5940	39300	26200
× 677	4380	2920	18200	12100	8360	5570	25900	17200	7530	5020	34500	23000
× 634	3890	2590	16900	11300	7290	4860	22400	14900	6580	4390	29800	19900
× 592	3490	2320	16000	10700	6490	4330	20600	13700	5850	3900	27400	18300
× 551	3080	2050	14900	9940	5660	3770	18300	12200	5100	3400	24400	16200
× 509	2700	1800	13900	9250	4890	3260	16200	10800	4410	2940	21600	14400
× 463	2300	1530	12700	8470	4100	2730	13900	9290	3700	2470	18600	12400
× 421	1970	1310	11600	7760	3440	2300	12000	7980	3100	2070	16000	10600
× 382	1670	1110	10600	7050	2850	1900	10100	6700	2570	1710	13400	8930
× 347	1420	945	9660	6440	2370	1580	8580	5720	2140	1430	11400	7630
× 314	1210	804	8840	5890	1980	1320	7410	4940	1780	1190	9880	6590
× 287	1030	690	8020	5350	1640	1100	6090	4060	1480	989	8110	5410
× 262	904	603	7490	4990	1410	943	5530	3690	1270	847	7370	4910
× 237	758	505	6710	4470	1140	761	4460	2970	1030	686	5950	3970
× 216	656	437	6140	4090	957	638	3780	2520	863	575	5040	3360
× 187	519	346	5330	3550	719	480	2900	1930	648	432	3860	2580
HD 360 × 196	600	400	5820	3880	859	573	3430	2290	774	516	4580	3050
× 179	518	345	5330	3550	718	479	2910	1940	647	431	3880	2590
× 162	434	290	4720	3150	572	382	2250	1500	518	345	3000	2000
× 147	380	253	4370	2910	485	323	1980	1320	438	292	2640	1760
× 134	328	219	3980	2650	402	268	1660	1110	363	242	2220	1480
HD 320 × 300	1800	1200	9590	6390	2460	1640	8290	5530	2250	1500	11100	7370
× 245	1250	832	7460	4970	1540	1030	4890	3260	1420	948	6520	4350
× 198	943	628	6390	4260	1090	728	4030	2690	1000	667	5370	3580
× 158	676	450	5150	3430	705	470	2750	1830	644	430	3660	2440
× 127	485	323	4080	2720	446	298	1760	1170	409	273	2340	1560
× 97.6	339	226	3200	2130	269	179	1150	767	245	163	1530	1020
× 74.2	270	180	2840	1890	190	126	1170	782	166	111	1560	1040
HD 260 × 172	903	602	6390	4260	1100	734	4690	3130	1010	673	6260	4170
× 142	695	463	5500	3670	794	529	3830	2560	723	482	5110	3410
× 114	505	337	4440	2960	518	345	2570	1710	472	315	3430	2280
× 93.0	368	246	3550	2370	334	223	1670	1110	306	204	2220	1480
× 68.2	243	162	2660	1780	184	122	1020	683	167	111	1370	910
× 54.1	193	129	2310	1540	129	86.1	898	599	115	76.3	1200	799

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	ASD	LRFD	ASD
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants
HD Shapes

F_y = 355 MPa

Shape	Nominal Weight	$l_b =$ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HD 400 × 1086	1090	–	–	–	–	21600	14400	9450	6300
× 990	990	–	–	–	–	18600	12400	8420	5620
× 900	900	–	–	–	–	16000	10700	7450	4970
× 818	818	–	–	–	–	13700	9160	6620	4420
× 744	744	–	–	–	–	11800	7890	5900	3930
× 677	677	–	–	–	–	10200	6820	5270	3510
× 634	634	–	–	–	–	9130	6090	4810	3200
× 592	592	–	–	–	–	8250	5500	4460	2970
× 551	551	–	–	–	–	7350	4900	4070	2710
× 509	509	3810	2540	3810	2540	6500	4340	3710	2480
× 463	463	3320	2210	3320	2210	5620	3740	3320	2210
× 421	421	2900	1930	2900	1930	4870	3240	2970	1980
× 382	382	2510	1680	2510	1680	4180	2790	2640	1760
× 347	347	2190	1460	2190	1460	3610	2400	2360	1570
× 314	314	1910	1280	1910	1280	3120	2080	2120	1410
× 287	287	1680	1120	1680	1120	2710	1810	1890	1260
× 262	262	1500	1000	1500	1000	2410	1610	1740	1160
× 237	237	1290	863	1290	863	2050	1370	1530	1020
× 216	216	1150	765	1150	765	1800	1200	1380	921
× 187	187	945	630	945	630	1460	976	1180	784
HD 360 × 196	196	1070	710	1070	710	1670	1110	1300	866
× 179	179	944	629	944	629	1460	974	1180	784
× 162	162	758	505	812	541	1250	831	1030	687
× 147	147	649	433	729	486	1110	739	943	629
× 134	134	540	360	646	431	974	649	849	566
HD 320 × 300	300	2560	1710	2560	1710	4360	2910	2160	1440
× 245	245	1850	1230	1850	1230	3090	2060	1610	1070
× 198	198	1430	953	1450	969	2400	1600	1320	877
× 158	158	937	625	1090	725	1760	1180	1020	679
× 127	127	596	398	811	541	1170	783	784	523
× 97.6	97.6	368	245	595	397	722	481	594	396
× 74.2	74.2	291	194	497	331	567	378	513	342
HD 260 × 172	172	1410	943	1410	943	2320	1540	1110	741
× 142	142	1130	755	1130	757	1830	1220	918	612
× 114	114	746	498	860	573	1360	910	714	476
× 93.0	93.0	483	322	652	435	935	624	554	369
× 68.2	68.2	276	184	456	304	531	354	399	266
× 54.1	54.1	210	140	378	252	402	268	338	225

For V_{nx}	
LRFD	**ASD**
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HEA Shapes

F_y = 235 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 A	591	394	3880	2590	767	512	903	602	708	472	1200	803
HE 900 A	564	376	3760	2510	721	481	947	631	665	443	1260	841
HE 800 A	511	341	3530	2350	632	421	941	628	583	388	1260	837
HE 700 A	460	307	3410	2270	590	393	1010	673	544	362	1350	897
HE 650 A	420	280	3170	2120	520	347	912	608	481	321	1220	811
HE 600 A	397	265	3060	2040	482	321	919	613	446	297	1230	817
HE 550 A	375	250	2940	1960	445	297	930	620	412	275	1240	827
HE 500 A	353	235	2820	1880	410	273	946	631	379	253	1260	841
HE 450 A	324	216	2700	1800	368	245	1020	677	338	225	1350	903
HE 400 A	297	198	2590	1720	327	218	1110	739	298	199	1480	985
HE 360 A	261	174	2350	1570	272	181	1010	672	249	166	1340	895
HE 340 A	243	162	2230	1490	245	163	972	648	223	149	1300	864
HE 320 A	225	150	2120	1410	219	146	936	624	199	133	1250	832
HE 300 A	205	136	2000	1330	191	127	933	622	173	115	1240	830
HE 280 A	174	116	1880	1250	168	112	900	600	152	101	1200	800
HE 260 A	161	107	1760	1180	149	99.6	833	555	135	90.3	1110	740
HE 240 A	145	96.9	1760	1180	146	97.6	943	629	132	87.9	1260	838
HE 220 A	119	79.5	1650	1100	126	84.2	916	611	114	75.7	1220	814
HE 200 A	107	71.3	1530	1020	108	71.9	892	595	96.5	64.3	1190	793
HE 180 A	86.4	57.6	1410	940	93.2	62.1	820	547	83.8	55.9	1090	729
HE 160 A	84.6	56.4	1410	940	90.7	60.5	974	649	80.8	53.9	1300	866
HE 140 A	66.2	44.2	1290	862	77.3	51.6	908	605	69.3	46.2	1210	807
HE 120 A	58.8	39.2	1180	783	65.0	43.4	846	564	58.6	39.1	1130	752
HE 100 A	58.8	39.2	1180	783	65.0	43.4	1000	669	58.6	39.1	1340	893

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants
HEA Shapes

F_y = 235 MPa

Shape	Nominal Weight	$l_b = $ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HE 1000 A	272	840	560	902	601	1490	995	2300	1540
HE 900 A	252	797	531	865	577	1430	953	2010	1340
HE 800 A	224	708	472	793	529	1300	869	1670	1110
HE 700 A	204	671	447	733	488	1190	795	1410	940
HE 650 A	190	593	395	674	449	1090	730	1220	812
HE 600 A	178	556	370	642	428	1040	692	1080	721
HE 550 A	166	520	346	610	406	984	656	952	635
HE 500 A	155	486	324	578	385	931	620	829	553
HE 450 A	140	449	299	541	360	865	577	713	476
HE 400 A	125	416	278	504	336	801	534	605	403
HE 360 A	112	356	237	449	300	705	470	494	329
HE 340 A	105	327	218	421	281	645	430	442	295
HE 320 A	97.6	299	199	394	263	587	391	393	262
HE 300 A	88.3	272	181	365	243	531	354	348	232
HE 280 A	76.4	248	165	324	216	480	320	305	203
HE 260 A	68.2	224	150	302	201	432	288	264	176
HE 240 A	60.3	232	155	286	191	432	288	243	162
HE 220 A	50.5	211	141	251	167	370	247	207	138
HE 200 A	42.3	192	128	229	153	336	224	174	116
HE 180 A	35.5	171	114	199	133	286	190	145	96.4
HE 160 A	30.4	185	123	197	132	282	188	129	85.7
HE 140 A	24.7	166	111	170	113	236	157	103	68.8
HE 120 A	19.9	149	99.2	153	102	212	141	80.4	53.6
HE 100 A	16.7	153	102	153	102	212	141	67.7	45.1

For V_{nx}	
LRFD	ASD
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.
l_b = length of bearing, mm
x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HEA Shapes

F_y = 275 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 A	692	461	4540	3030	830	554	977	651	766	511	1300	868
HE 900 A	660	440	4400	2930	780	520	1020	683	719	479	1370	910
HE 800 A	598	399	4130	2750	684	456	1020	679	630	420	1360	905
HE 700 A	538	359	3990	2660	638	426	1090	728	588	392	1460	971
HE 650 A	492	328	3710	2480	563	375	987	658	521	347	1320	877
HE 600 A	465	310	3580	2380	521	348	994	663	482	322	1330	884
HE 550 A	438	292	3440	2290	482	321	1010	671	445	297	1340	894
HE 500 A	413	275	3300	2200	444	296	1020	682	410	273	1360	910
HE 450 A	380	253	3160	2110	398	265	1100	732	365	244	1460	977
HE 400 A	348	232	3030	2020	354	236	1200	799	323	215	1600	1070
HE 360 A	306	204	2750	1830	294	196	1090	726	269	179	1450	969
HE 340 A	284	189	2610	1740	265	176	1050	701	242	161	1400	934
HE 320 A	263	175	2480	1650	237	158	1010	675	216	144	1350	900
HE 300 A	240	160	2340	1560	206	138	1010	673	187	125	1350	897
HE 280 A	204	136	2200	1470	182	121	974	649	164	109	1300	865
HE 260 A	188	125	2060	1380	162	108	901	601	147	97.7	1200	801
HE 240 A	170	113	2060	1380	158	106	1020	680	143	95.1	1360	907
HE 220 A	140	93.0	1930	1280	137	91.1	991	661	123	81.9	1320	881
HE 200 A	125	83.4	1790	1190	117	77.7	965	643	104	69.6	1290	858
HE 180 A	101	67.4	1650	1100	101	67.2	887	592	90.7	60.4	1180	789
HE 160 A	99.0	66.0	1650	1100	98.1	65.4	1050	703	87.4	58.3	1410	937
HE 140 A	77.5	51.7	1510	1010	83.7	55.8	982	655	75.0	50.0	1310	873
HE 120 A	68.8	45.8	1380	917	70.4	46.9	915	610	63.4	42.3	1220	813
HE 100 A	68.8	45.8	1380	917	70.4	46.9	1090	724	63.4	42.3	1450	966

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

F_y = 275 MPa

Beam Bearing Constants
HEA Shapes

Shape	Nominal Weight	$l_b = $ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HE 1000 A	272	908	606	1050	703	1750	1160	2700	1800
HE 900 A	252	862	575	1010	675	1670	1110	2350	1570
HE 800 A	224	765	510	928	619	1530	1020	1960	1300
HE 700 A	204	726	484	857	572	1400	930	1650	1100
HE 650 A	190	642	428	789	526	1280	854	1430	950
HE 600 A	178	601	401	751	501	1200	801	1270	844
HE 550 A	166	562	375	713	476	1120	750	1110	743
HE 500 A	155	525	350	677	451	1050	701	970	647
HE 450 A	140	486	324	633	422	971	647	835	557
HE 400 A	125	451	300	590	393	899	600	708	472
HE 360 A	112	385	257	526	351	763	509	578	385
HE 340 A	105	354	236	493	329	697	465	517	345
HE 320 A	97.6	324	216	461	307	635	423	460	307
HE 300 A	88.3	294	196	427	284	574	383	407	271
HE 280 A	76.4	268	179	380	253	519	346	356	238
HE 260 A	68.2	243	162	353	235	467	312	309	206
HE 240 A	60.3	251	168	335	223	480	320	285	190
HE 220 A	50.5	229	152	294	196	432	288	243	162
HE 200 A	42.3	207	138	268	179	388	258	204	136
HE 180 A	35.5	185	124	233	155	334	223	169	113
HE 160 A	30.4	200	133	231	154	330	220	150	100
HE 140 A	24.7	180	120	199	132	276	184	121	80.5
HE 120 A	19.9	161	107	179	119	248	165	94.1	62.7
HE 100 A	16.7	179	119	179	119	248	165	79.2	52.8

For V_{nx}	
LRFD	ASD
ϕ_v = 1.00	Ω_v = 1.50

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.
l_b = length of bearing, mm
x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HEA Shapes

F_y = 355 MPa

Shape	ϕR_1 kN LRFD	R_1/Ω kN ASD	ϕR_2 kN/m LRFD	R_2/Ω kN/m ASD	ϕR_3 kN LRFD	R_3/Ω kN ASD	ϕR_4 kN/m LRFD	R_4/Ω kN/m ASD	ϕR_5 kN LRFD	R_5/Ω kN ASD	ϕR_6 kN/m LRFD	R_6/Ω kN/m ASD
HE 1000 A	893	596	5860	3910	943	629	1110	740	870	580	1480	987
HE 900 A	852	568	5680	3790	886	591	1160	776	817	545	1550	1030
HE 800 A	772	515	5330	3550	777	518	1160	771	716	477	1540	1030
HE 700 A	695	463	5150	3430	725	483	1240	827	668	445	1650	1100
HE 650 A	635	423	4790	3200	639	426	1120	748	592	394	1500	997
HE 600 A	600	400	4620	3080	592	395	1130	753	548	365	1510	1000
HE 550 A	566	377	4440	2960	547	365	1140	762	506	337	1520	1020
HE 500 A	533	355	4260	2840	504	336	1160	775	466	311	1550	1030
HE 450 A	490	327	4080	2720	452	301	1250	832	415	277	1660	1110
HE 400 A	449	299	3910	2600	402	268	1360	908	367	244	1820	1210
HE 360 A	395	263	3550	2370	334	223	1240	825	306	204	1650	1100
HE 340 A	367	245	3370	2250	301	200	1190	796	274	183	1590	1060
HE 320 A	339	226	3200	2130	269	179	1150	767	245	163	1530	1020
HE 300 A	309	206	3020	2010	234	156	1150	765	212	141	1530	1020
HE 280 A	263	175	2840	1890	206	137	1110	737	186	124	1470	983
HE 260 A	243	162	2660	1780	184	122	1020	683	167	111	1370	910
HE 240 A	220	146	2660	1780	180	120	1160	773	162	108	1550	1030
HE 220 A	180	120	2490	1660	155	104	1130	751	140	93.0	1500	1000
HE 200 A	162	108	2310	1540	132	88.3	1100	731	119	79.1	1460	974
HE 180 A	130	87.0	2130	1420	115	76.3	1010	672	103	68.7	1340	896
HE 160 A	128	85.2	2130	1420	111	74.3	1200	798	99.3	66.2	1600	1060
HE 140 A	100	66.7	1950	1300	95.1	63.4	1120	744	85.2	56.8	1490	992
HE 120 A	88.8	59.2	1780	1180	79.9	53.3	1040	693	72.0	48.0	1390	924
HE 100 A	88.8	59.2	1780	1180	79.9	53.3	1230	823	72.0	48.0	1650	1100

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants
HEA Shapes

F_y = 355 MPa

Shape	Nominal Weight	l_b = 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \leq x \leq d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**
	kg/m	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 A	272	1030	688	1360	908	2060	1380	3480	2320
HE 900 A	252	979	653	1310	871	1960	1310	3030	2020
HE 800 A	224	870	580	1200	799	1740	1160	2520	1680
HE 700 A	204	825	550	1110	738	1650	1100	2130	1420
HE 650 A	190	729	486	1020	679	1460	972	1840	1230
HE 600 A	178	683	455	969	646	1370	910	1630	1090
HE 550 A	166	639	426	921	614	1280	852	1440	959
HE 500 A	155	597	398	873	582	1190	796	1250	835
HE 450 A	140	552	368	817	544	1100	735	1080	719
HE 400 A	125	512	341	761	508	1020	681	914	609
HE 360 A	112	438	292	679	453	867	578	746	497
HE 340 A	105	402	268	637	424	792	528	668	445
HE 320 A	97.6	368	245	595	397	722	481	594	396
HE 300 A	88.3	335	223	551	367	652	435	525	350
HE 280 A	76.4	304	203	490	327	589	393	460	307
HE 260 A	68.2	276	184	456	304	531	354	399	266
HE 240 A	60.3	286	190	433	288	545	363	367	245
HE 220 A	50.5	260	173	379	253	491	327	313	209
HE 200 A	42.3	236	157	346	231	440	294	263	175
HE 180 A	35.5	211	140	301	201	390	260	219	146
HE 160 A	30.4	227	151	298	199	414	276	194	130
HE 140 A	24.7	204	136	256	171	356	238	156	104
HE 120 A	19.9	183	122	231	154	320	213	121	80.9
HE 100 A	16.7	204	136	231	154	320	213	102	68.2

For V_{nx}	
LRFD	**ASD**
ϕ_v = 1.00	Ω_v = 1.50

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HEB Shapes

F_y = 235 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 B	737	491	4470	2980	1020	681	1180	784	944	629	1570	1040
HE 900 B	706	471	4350	2900	968	645	1240	827	894	596	1650	1100
HE 800 B	648	432	4110	2740	865	577	1250	835	798	532	1670	1110
HE 700 B	589	393	4000	2660	815	544	1350	902	752	502	1800	1200
HE 650 B	545	363	3760	2510	733	489	1250	836	679	452	1670	1110
HE 600 B	519	346	3640	2430	687	458	1280	851	636	424	1700	1130
HE 550 B	494	329	3530	2350	643	429	1310	870	596	397	1740	1160
HE 500 B	469	312	3410	2270	601	401	1340	896	556	371	1790	1190
HE 450 B	436	291	3290	2190	549	366	1450	965	506	337	1930	1290
HE 400 B	404	270	3170	2120	500	333	1580	1050	458	305	2110	1410
HE 360 B	364	242	2940	1960	431	287	1490	992	395	264	1980	1320
HE 340 B	342	228	2820	1880	396	264	1460	972	363	242	1940	1300
HE 320 B	321	214	2700	1800	363	242	1430	954	333	222	1910	1270
HE 300 B	297	198	2590	1720	327	218	1440	961	298	199	1920	1280
HE 280 B	259	173	2470	1650	297	198	1420	945	270	180	1890	1260
HE 260 B	244	163	2350	1570	272	181	1360	904	249	166	1810	1210
HE 240 B	223	149	2350	1570	268	179	1510	1010	244	163	2020	1340
HE 220 B	190	127	2230	1490	241	161	1500	1000	219	146	2000	1340
HE 200 B	174	116	2120	1410	215	143	1500	1000	195	130	2000	1330
HE 180 B	145	96.5	2000	1330	191	127	1500	1000	173	115	2000	1340
HE 160 B	132	87.7	1880	1250	168	112	1520	1010	152	101	2030	1350
HE 140 B	98.7	65.8	1650	1100	132	88.0	1260	840	120	80.1	1680	1120
HE 120 B	87.8	58.6	1530	1020	113	75.4	1280	856	103	68.5	1710	1140
HE 100 B	77.6	51.7	1410	940	95.6	63.7	1330	888	86.7	57.8	1780	1180

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

F_y = 235 MPa

Beam Bearing Constants
HEB Shapes

Shape	Nominal Weight	$l_b = $ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HE 1000 B	314	1090	729	1090	729	1830	1220	2680	1790
HE 900 B	291	1050	703	1050	703	1760	1170	2350	1570
HE 800 B	262	965	643	977	651	1620	1080	1970	1320
HE 700 B	241	909	606	909	606	1500	999	1680	1120
HE 650 B	225	833	555	846	564	1390	927	1470	978
HE 600 B	212	790	526	810	540	1330	886	1310	874
HE 550 B	199	748	499	776	517	1270	846	1160	776
HE 500 B	187	708	472	741	494	1210	806	1020	682
HE 450 B	171	665	443	699	466	1140	757	888	592
HE 400 B	155	626	418	658	439	1060	709	761	508
HE 360 B	142	554	369	599	399	962	641	635	423
HE 340 B	134	519	346	568	378	909	606	575	384
HE 320 B	127	485	323	537	358	858	572	519	346
HE 300 B	117	452	301	504	336	801	534	465	310
HE 280 B	103	422	281	456	304	716	477	415	276
HE 260 B	93.0	393	262	432	288	676	450	367	244
HE 240 B	83.2	405	270	411	274	635	423	338	226
HE 220 B	71.5	368	246	368	246	558	372	295	196
HE 200 B	61.3	344	229	344	229	518	345	254	169
HE 180 B	51.2	305	203	305	203	449	300	216	144
HE 160 B	42.6	282	188	282	188	414	276	180	120
HE 140 B	33.7	230	154	230	154	329	219	138	92.1
HE 120 B	26.7	210	140	210	140	298	199	110	73.3
HE 100 B	20.4	190	127	190	127	268	179	84.6	56.4

For V_{nx}	
LRFD	**ASD**
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HEB Shapes

F_y = 275 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	kN	kN/m	kN/m	kN	kN	kN/m	kN/m	kN	kN	kN/m	kN/m
	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HE 1000 B	862	575	5230	3480	1110	737	1270	848	1020	681	1700	1130
HE 900 B	827	551	5090	3390	1050	698	1340	894	967	645	1790	1190
HE 800 B	758	505	4810	3210	936	624	1350	903	863	576	1810	1200
HE 700 B	690	460	4680	3120	882	588	1460	976	814	543	1950	1300
HE 650 B	638	425	4400	2930	793	529	1360	905	734	489	1810	1210
HE 600 B	607	405	4260	2840	744	496	1380	921	688	459	1840	1230
HE 550 B	578	385	4130	2750	696	464	1410	942	644	430	1880	1260
HE 500 B	548	366	3990	2660	650	433	1450	969	602	401	1940	1290
HE 450 B	510	340	3850	2570	594	396	1570	1040	547	365	2090	1390
HE 400 B	473	316	3710	2480	541	360	1710	1140	495	330	2280	1520
HE 360 B	425	284	3440	2290	466	311	1610	1070	428	285	2150	1430
HE 340 B	400	267	3300	2200	429	286	1580	1050	393	262	2100	1400
HE 320 B	376	250	3160	2110	393	262	1550	1030	360	240	2060	1380
HE 300 B	348	232	3030	2020	354	236	1560	1040	323	215	2080	1390
HE 280 B	303	202	2890	1930	321	214	1530	1020	293	195	2040	1360
HE 260 B	285	190	2750	1830	294	196	1470	978	269	179	1960	1300
HE 240 B	261	174	2750	1830	290	193	1640	1090	264	176	2180	1450
HE 220 B	222	148	2610	1740	261	174	1630	1080	237	158	2170	1450
HE 200 B	204	136	2480	1650	233	155	1620	1080	211	141	2160	1440
HE 180 B	169	113	2340	1560	206	138	1630	1080	187	125	2170	1450
HE 160 B	154	103	2200	1470	182	121	1640	1100	164	109	2190	1460
HE 140 B	116	77.0	1930	1280	143	95.2	1360	908	130	86.7	1820	1210
HE 120 B	103	68.5	1790	1190	122	81.5	1390	926	111	74.1	1850	1230
HE 100 B	90.8	60.5	1650	1100	103	68.9	1440	961	93.8	62.5	1920	1280

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	ASD	LRFD	ASD
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

F_y = 275 MPa

Beam Bearing Constants
HEB Shapes

Shape	Nominal Weight	l_b = 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**
	kg/m	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 B	314	1210	805	1280	853	2140	1430	3140	2090
HE 900 B	291	1150	770	1230	822	2060	1370	2750	1830
HE 800 B	262	1040	696	1140	762	1900	1270	2310	1540
HE 700 B	241	999	666	1060	709	1750	1170	1960	1310
HE 650 B	225	901	601	990	660	1630	1090	1720	1140
HE 600 B	212	854	569	948	632	1560	1040	1530	1020
HE 550 B	199	809	539	908	605	1490	990	1360	908
HE 500 B	187	766	511	867	578	1420	944	1200	798
HE 450 B	171	719	480	818	545	1330	886	1040	693
HE 400 B	155	677	452	770	514	1240	829	891	594
HE 360 B	142	599	400	700	467	1130	751	743	495
HE 340 B	134	561	374	664	443	1060	710	673	449
HE 320 B	127	525	350	629	419	1000	669	607	405
HE 300 B	117	489	326	590	393	938	625	545	363
HE 280 B	103	456	304	534	356	837	558	485	323
HE 260 B	93.0	425	284	505	337	791	527	429	286
HE 240 B	83.2	438	292	481	321	743	495	396	264
HE 220 B	71.5	410	273	431	287	653	435	345	230
HE 200 B	61.3	384	256	402	268	606	404	297	198
HE 180 B	51.2	356	238	356	238	526	351	252	168
HE 160 B	42.6	330	220	330	220	484	323	211	141
HE 140 B	33.7	270	180	270	180	385	257	162	108
HE 120 B	26.7	246	164	246	164	349	232	129	85.8
HE 100 B	20.4	223	149	223	149	314	209	99.0	66.0

For V_{nx}	
LRFD	**ASD**
ϕ_v = 1.00	Ω_v = 1.50

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HEB Shapes

F_y = 355 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 B	1110	742	6750	4500	1260	837	1440	963	1160	773	1930	1280
HE 900 B	1070	711	6570	4380	1190	793	1520	1020	1100	732	2030	1350
HE 800 B	978	652	6210	4140	1060	709	1540	1030	981	654	2050	1370
HE 700 B	890	593	6040	4020	1000	668	1660	1110	925	616	2220	1480
HE 650 B	824	549	5680	3790	901	601	1540	1030	834	556	2060	1370
HE 600 B	784	523	5500	3670	845	563	1570	1050	782	521	2090	1390
HE 550 B	746	497	5330	3550	791	527	1600	1070	732	488	2140	1430
HE 500 B	708	472	5150	3430	739	492	1650	1100	684	456	2200	1470
HE 450 B	659	439	4970	3310	675	450	1780	1190	622	415	2370	1580
HE 400 B	611	407	4790	3200	614	410	1940	1300	562	375	2590	1730
HE 360 B	549	366	4440	2960	530	353	1830	1220	486	324	2440	1630
HE 340 B	517	344	4260	2840	487	325	1790	1200	447	298	2390	1590
HE 320 B	485	323	4080	2720	446	298	1760	1170	409	273	2340	1560
HE 300 B	449	299	3910	2600	402	268	1770	1180	367	244	2360	1570
HE 280 B	391	261	3730	2490	365	243	1740	1160	332	222	2320	1550
HE 260 B	368	246	3550	2370	334	223	1670	1110	306	204	2220	1480
HE 240 B	337	225	3550	2370	330	220	1860	1240	300	200	2480	1650
HE 220 B	287	191	3370	2250	296	197	1850	1230	269	179	2460	1640
HE 200 B	264	176	3200	2130	264	176	1840	1230	240	160	2460	1640
HE 180 B	219	146	3020	2010	234	156	1850	1230	212	141	2460	1640
HE 160 B	199	133	2840	1890	206	137	1870	1240	186	124	2490	1660
HE 140 B	149	99.4	2490	1660	162	108	1550	1030	148	98.5	2060	1380
HE 120 B	133	88.5	2310	1540	139	92.6	1580	1050	126	84.2	2100	1400
HE 100 B	117	78.1	2130	1420	117	78.3	1640	1090	107	71.0	2180	1460

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
$\phi = 1.00$	$\Omega = 1.50$	$\phi = 0.75$	$\Omega = 2.00$

Table I.6 Continued.

Beam Bearing Constants
HEB Shapes

F_y = 355 MPa

Shape	**Nominal Weight**	**$l_b =$ 80 mm**						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**
	kg/m	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 B	314	1370	914	1650	1100	2740	1830	4050	2700
HE 900 B	291	1310	875	1590	1060	2620	1750	3550	2360
HE 800 B	262	1190	791	1480	984	2370	1580	2980	1990
HE 700 B	241	1140	757	1370	915	2260	1510	2530	1690
HE 650 B	225	1020	683	1280	852	2050	1370	2220	1480
HE 600 B	212	970	647	1220	816	1940	1290	1980	1320
HE 550 B	199	919	613	1170	781	1840	1230	1760	1170
HE 500 B	187	871	580	1120	746	1740	1160	1540	1030
HE 450 B	171	817	545	1060	704	1630	1090	1340	895
HE 400 B	155	770	513	994	663	1540	1030	1150	767
HE 360 B	142	681	454	904	603	1350	902	959	639
HE 340 B	134	638	425	857	572	1260	841	869	579
HE 320 B	127	596	398	811	541	1170	783	784	523
HE 300 B	117	555	370	761	508	1090	725	703	469
HE 280 B	103	518	345	690	460	1010	672	626	417
HE 260 B	93.0	483	322	652	435	935	624	554	369
HE 240 B	83.2	498	332	621	414	957	638	511	341
HE 220 B	71.5	466	311	556	371	843	562	445	297
HE 200 B	61.3	436	291	519	346	783	522	383	256
HE 180 B	51.2	409	273	460	307	679	453	326	217
HE 160 B	42.6	385	257	426	284	625	417	273	182
HE 140 B	33.7	313	209	348	232	497	331	209	139
HE 120 B	26.7	295	196	317	212	450	300	166	111
HE 100 B	20.4	281	188	288	192	405	270	128	85.2

For V_{nx}	
LRFD	**ASD**
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.
l_b = length of bearing, mm
x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HEM Shapes

F_y= 235 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 M	864	576	4940	3290	1250	835	1420	945	1160	771	1890	1260
HE 900 M	864	576	4940	3290	1250	835	1570	1050	1160	771	2090	1400
HE 800 M	864	576	4940	3290	1250	835	1750	1170	1160	771	2340	1560
HE 700 M	827	551	4940	3290	1250	835	2000	1330	1160	771	2660	1770
HE 650 M	827	551	4940	3290	1250	835	2140	1430	1160	771	2850	1900
HE 600 M	827	551	4940	3290	1250	835	2300	1540	1160	771	3070	2050
HE 550 M	827	551	4940	3290	1250	835	2500	1660	1160	771	3330	2220
HE 500 M	827	551	4940	3290	1250	835	2730	1820	1160	771	3630	2420
HE 450 M	827	551	4940	3290	1250	835	2990	1990	1160	771	3980	2660
HE 400 M	827	551	4940	3290	1250	835	3310	2200	1160	771	4410	2940
HE 360 M	827	551	4940	3290	1250	835	3620	2410	1160	771	4820	3210
HE 340 M	827	551	4940	3290	1250	835	3790	2530	1160	771	5050	3370
HE 320 M	827	551	4940	3290	1250	835	3980	2650	1160	771	5310	3540
HE 300 M	814	543	4940	3290	1240	824	4310	2870	1140	759	5750	3830
HE 280 M	620	413	4350	2900	940	627	3820	2550	861	574	5090	3390
HE 260 M	597	398	4230	2820	895	597	3820	2550	822	548	5090	3390
HE 240 M	560	374	4230	2820	888	592	4160	2780	814	542	5550	3700
HE 220 M	401	267	3640	2430	640	427	3680	2450	581	387	4910	3270
HE 200 M	379	253	3530	2350	597	398	3790	2520	542	361	5050	3370
HE 180 M	332	221	3410	2270	556	371	3920	2610	504	336	5230	3480
HE 160 M	313	208	3290	2190	517	344	4090	2730	468	312	5450	3640
HE 140 M	260	173	3060	2040	452	301	3850	2570	411	274	5130	3420
HE 120 M	242	162	2940	1960	417	278	4100	2730	378	252	5470	3640
HE 100 M	226	150	2820	1880	382	255	4440	2960	347	231	5920	3950

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants
HEM Shapes

F_y= 235 MPa

Shape	Nominal Weight	$l_b =$ 80 mm						ϕV_{nx}	V_{nx}/Ω
		$x < d/2$		$d/2 \leq x \leq d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HE 1000 M	349	1260	839	1260	839	2120	1410	2980	1990
HE 900 M	333	1260	839	1260	839	2120	1410	2690	1800
HE 800 M	317	1260	839	1260	839	2120	1410	2410	1610
HE 700 M	301	1220	814	1220	814	2050	1370	2120	1410
HE 650 M	293	1220	814	1220	814	2050	1370	1980	1320
HE 600 M	285	1220	814	1220	814	2050	1370	1840	1220
HE 550 M	278	1220	814	1220	814	2050	1370	1690	1130
HE 500 M	270	1220	814	1220	814	2050	1370	1550	1030
HE 450 M	263	1220	814	1220	814	2050	1370	1420	944
HE 400 M	256	1220	814	1220	814	2050	1370	1280	853
HE 360 M	250	1220	814	1220	814	2050	1370	1170	780
HE 340 M	248	1220	814	1220	814	2050	1370	1120	744
HE 320 M	245	1220	814	1220	814	2050	1370	1060	709
HE 300 M	238	1210	806	1210	806	2020	1350	1010	671
HE 280 M	189	967	645	967	645	1590	1060	809	539
HE 260 M	172	936	624	936	624	1530	1020	736	491
HE 240 M	157	899	599	899	599	1460	973	685	457
HE 220 M	117	692	461	692	461	1090	729	525	350
HE 200 M	103	661	441	661	441	1040	693	465	310
HE 180 M	88.9	605	403	605	403	937	625	409	273
HE 160 M	76.2	576	384	576	384	888	592	355	237
HE 140 M	63.2	504	336	504	336	764	509	293	196
HE 120 M	52.1	477	318	477	318	720	480	247	165
HE 100 M	41.8	451	301	451	301	677	451	203	135

For V_{nx}	
LRFD	ASD
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.
l_b = length of bearing, mm
x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HEM Shapes

F_y= 275 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 M	1010	674	5780	3850	1350	903	1530	1020	1250	834	2040	1360
HE 900 M	1010	674	5780	3850	1350	903	1700	1130	1250	834	2260	1510
HE 800 M	1010	674	5780	3850	1350	903	1900	1270	1250	834	2530	1690
HE 700 M	967	645	5780	3850	1350	903	2160	1440	1250	834	2880	1920
HE 650 M	967	645	5780	3850	1350	903	2310	1540	1250	834	3080	2060
HE 600 M	967	645	5780	3850	1350	903	2490	1660	1250	834	3320	2220
HE 550 M	967	645	5780	3850	1350	903	2700	1800	1250	834	3600	2400
HE 500 M	967	645	5780	3850	1350	903	2950	1970	1250	834	3930	2620
HE 450 M	967	645	5780	3850	1350	903	3230	2160	1250	834	4310	2870
HE 400 M	967	645	5780	3850	1350	903	3580	2380	1250	834	4770	3180
HE 360 M	967	645	5780	3850	1350	903	3910	2610	1250	834	5220	3480
HE 340 M	967	645	5780	3850	1350	903	4100	2730	1250	834	5470	3640
HE 320 M	967	645	5780	3850	1350	903	4300	2870	1250	834	5740	3830
HE 300 M	953	635	5780	3850	1340	891	4660	3110	1230	821	6220	4140
HE 280 M	725	483	5090	3390	1020	678	4130	2750	932	621	5510	3670
HE 260 M	699	466	4950	3300	969	646	4130	2750	889	593	5510	3670
HE 240 M	656	437	4950	3300	961	641	4510	3000	880	587	6010	4000
HE 220 M	469	313	4260	2840	692	462	3980	2660	629	419	5310	3540
HE 200 M	443	296	4130	2750	646	431	4100	2730	586	391	5460	3640
HE 180 M	389	259	3990	2660	602	401	4240	2830	545	364	5650	3770
HE 160 M	366	244	3850	2570	559	373	4420	2950	506	337	5900	3930
HE 140 M	304	203	3580	2380	489	326	4170	2780	445	296	5550	3700
HE 120 M	284	189	3440	2290	451	300	4430	2960	409	273	5910	3940
HE 100 M	264	176	3300	2200	414	276	4810	3200	375	250	6410	4270

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
$\phi = 1.00$	$\Omega = 1.50$	$\phi = 0.75$	$\Omega = 2.00$

Table I.6 Continued.

Beam Bearing Constants
HEM Shapes

F_y= 275 MPa

Shape	Nominal Weight	$l_b =$ 80 mm						ϕV_{nx}	V_{nx}/Ω
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HE 1000 M	349	1470	982	1470	982	2480	1660	3490	2330
HE 900 M	333	1470	982	1470	982	2480	1660	3150	2100
HE 800 M	317	1470	982	1470	982	2480	1660	2820	1880
HE 700 M	301	1430	953	1430	953	2400	1600	2480	1650
HE 650 M	293	1430	953	1430	953	2400	1600	2310	1540
HE 600 M	285	1430	953	1430	953	2400	1600	2150	1430
HE 550 M	278	1430	953	1430	953	2400	1600	1980	1320
HE 500 M	270	1430	953	1430	953	2400	1600	1820	1210
HE 450 M	263	1430	953	1430	953	2400	1600	1660	1100
HE 400 M	256	1430	953	1430	953	2400	1600	1500	998
HE 360 M	250	1430	953	1430	953	2400	1600	1370	912
HE 340 M	248	1430	953	1430	953	2400	1600	1310	871
HE 320 M	245	1430	953	1430	953	2400	1600	1240	829
HE 300 M	238	1410	943	1410	943	2370	1580	1180	785
HE 280 M	189	1130	755	1130	755	1860	1240	946	631
HE 260 M	172	1100	730	1100	730	1790	1200	861	574
HE 240 M	157	1050	701	1050	701	1710	1140	802	535
HE 220 M	117	810	540	810	540	1280	853	614	409
HE 200 M	103	773	516	773	516	1220	811	545	363
HE 180 M	88.9	708	472	708	472	1100	731	479	319
HE 160 M	76.2	674	449	674	449	1040	693	416	277
HE 140 M	63.2	590	393	590	393	894	596	343	229
HE 120 M	52.1	559	372	559	372	842	561	289	193
HE 100 M	41.8	528	352	528	352	792	528	238	158

For V_{nx}	
LRFD	ASD
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
HEM Shapes

F_y= 355 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
HE 1000 M	1300	870	7460	4970	1540	1030	1740	1160	1420	948	2320	1550
HE 900 M	1300	870	7460	4970	1540	1030	1930	1290	1420	948	2570	1720
HE 800 M	1300	870	7460	4970	1540	1030	2160	1440	1420	948	2880	1920
HE 700 M	1250	832	7460	4970	1540	1030	2450	1630	1420	948	3270	2180
HE 650 M	1250	832	7460	4970	1540	1030	2630	1750	1420	948	3500	2340
HE 600 M	1250	832	7460	4970	1540	1030	2830	1890	1420	948	3780	2520
HE 550 M	1250	832	7460	4970	1540	1030	3070	2050	1420	948	4090	2730
HE 500 M	1250	832	7460	4970	1540	1030	3350	2230	1420	948	4470	2980
HE 450 M	1250	832	7460	4970	1540	1030	3670	2450	1420	948	4900	3270
HE 400 M	1250	832	7460	4970	1540	1030	4060	2710	1420	948	5420	3610
HE 360 M	1250	832	7460	4970	1540	1030	4450	2960	1420	948	5930	3950
HE 340 M	1250	832	7460	4970	1540	1030	4660	3100	1420	948	6210	4140
HE 320 M	1250	832	7460	4970	1540	1030	4890	3260	1420	948	6520	4350
HE 300 M	1230	820	7460	4970	1520	1010	5300	3530	1400	933	7060	4710
HE 280 M	936	624	6570	4380	1160	770	4690	3130	1060	706	6260	4170
HE 260 M	903	602	6390	4260	1100	734	4690	3130	1010	673	6260	4170
HE 240 M	847	564	6390	4260	1090	728	5120	3410	1000	667	6830	4550
HE 220 M	605	404	5500	3670	787	524	4530	3020	714	476	6030	4020
HE 200 M	572	382	5330	3550	734	490	4650	3100	666	444	6200	4140
HE 180 M	502	335	5150	3430	684	456	4820	3210	620	413	6420	4280
HE 160 M	472	315	4970	3310	635	423	5030	3350	575	383	6700	4470
HE 140 M	392	262	4620	3080	556	370	4730	3160	505	337	6310	4210
HE 120 M	366	244	4440	2960	512	341	5040	3360	465	310	6720	4480
HE 100 M	341	227	4260	2840	470	313	5460	3640	426	284	7280	4850

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
$\phi = 1.00$	$\Omega = 1.50$	$\phi = 0.75$	$\Omega = 2.00$

Table I.6 Continued.

Beam Bearing Constants
HEM Shapes

F_y= 355 MPa

Shape	Nominal Weight	$l_b =$ 80 mm						ϕV_{nx}	V_{nx}/Ω
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
HE 1000 M	349	1680	1120	1900	1270	3210	2140	4510	3010
HE 900 M	333	1690	1130	1900	1270	3210	2140	4070	2710
HE 800 M	317	1710	1140	1900	1270	3210	2140	3640	2430
HE 700 M	301	1730	1160	1850	1230	3090	2060	3200	2140
HE 650 M	293	1750	1170	1850	1230	3090	2060	2990	1990
HE 600 M	285	1770	1180	1850	1230	3090	2060	2770	1850
HE 550 M	278	1780	1190	1850	1230	3090	2060	2560	1710
HE 500 M	270	1810	1200	1850	1230	3090	2060	2340	1560
HE 450 M	263	1830	1220	1850	1230	3090	2060	2140	1430
HE 400 M	256	1850	1230	1850	1230	3090	2060	1930	1290
HE 360 M	250	1850	1230	1850	1230	3090	2060	1770	1180
HE 340 M	248	1850	1230	1850	1230	3090	2060	1690	1120
HE 320 M	245	1850	1230	1850	1230	3090	2060	1610	1070
HE 300 M	238	1830	1220	1830	1220	3060	2040	1520	1010
HE 280 M	189	1460	974	1460	974	2400	1600	1220	814
HE 260 M	172	1410	943	1410	943	2320	1540	1110	741
HE 240 M	157	1360	905	1360	905	2200	1470	1040	690
HE 220 M	117	1050	697	1050	697	1650	1100	792	528
HE 200 M	103	998	666	998	666	1570	1050	703	469
HE 180 M	88.9	914	609	914	609	1420	944	618	412
HE 160 M	76.2	870	580	870	580	1340	895	537	358
HE 140 M	63.2	761	508	761	508	1150	769	443	295
HE 120 M	52.1	721	481	721	481	1090	725	373	249
HE 100 M	41.8	682	454	682	454	1020	682	307	204

For V_{nx}	
LRFD	ASD
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.
$l_b =$ length of bearing, mm
$x =$ location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
IPE Shapes

F_y = 235 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE 600	606	404	2820	1880	373	248	935	624	335	224	1250	831
IPE 550	537	358	2610	1740	315	210	892	595	283	188	1190	793
IPE 500	443	296	2400	1600	268	179	818	546	241	160	1090	728
IPE 450	393	262	2210	1470	226	151	780	520	203	135	1040	693
IPE 400	349	232	2020	1350	191	127	727	485	171	114	969	646
IPE 360	289	192	1880	1250	166	111	691	461	149	99.5	921	614
IPE 330	260	173	1760	1180	143	95.5	686	457	128	85.4	915	610
IPE 300	214	143	1670	1110	127	84.9	688	459	114	75.7	917	612
IPE 270	195	130	1550	1030	111	74.2	644	429	99.8	66.5	859	573
IPE 240	181	120	1460	971	99.4	66.3	625	417	89.4	59.6	834	556
IPE 220	147	98.0	1390	924	89.4	59.6	626	417	80.2	53.5	835	557
IPE 200	135	89.9	1320	877	79.5	53.0	637	425	71.0	47.3	850	567
IPE 180	106	70.6	1250	830	71.0	47.3	638	425	63.3	42.2	851	567
IPE 160	96.4	64.2	1180	783	62.6	41.7	651	434	55.6	37.1	869	579
IPE 140	76.8	51.2	1100	736	55.0	36.7	663	442	48.9	32.6	884	589
IPE 120	68.8	45.8	1030	689	47.6	31.8	695	463	42.1	28.1	927	618
IPE 100	61.2	40.8	963	642	40.8	27.2	746	497	35.8	23.9	995	663
IPE 80	22.8	15.2	893	595	34.7	23.2	814	543	30.4	20.3	1090	723

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants
IPE Shapes

F_y = 235 MPa

Shape	Nominal Weight	$l_b =$ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 600	122	–	–	–	–	895	597	1020	677
IPE 550	106	–	–	–	–	774	516	861	574
IPE 500	90.7	333	222	635	423	667	445	719	479
IPE 450	77.6	289	193	570	380	578	385	596	398
IPE 400	66.3	249	166	497	332	497	332	485	323
IPE 360	57.1	223	149	439	293	442	295	406	271
IPE 330	49.1	201	134	396	264	396	264	349	233
IPE 300	42.2	187	125	348	232	365	243	300	200
IPE 270	36.1							251	168
IPE 240	30.7	156	104	297	198	299	199	210	140
IPE 220	26.2	147	98	258	172	279	186	183	122
IPE 200	22.4	139	92.6	240	160	261	174	158	105
IPE 180	18.8	131	87.6	206	137	244	163	135	89.7
IPE 160	15.8	125	83.4	190	127	229	153	113	75.2
IPE 140	12.9	120	79.7	165	110	216	144	92.8	61.9
IPE 120	10.4	116	77.5	151	101	207	138	74.4	49.6
IPE 100	8.10	115	76.9	138	92.2	199	133	57.8	38.5
IPE 80	6.00	94.2	62.8	94.2	62.8	117	78	42.9	28.6

For V_{nx}	
LRFD	ASD
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
IPE Shapes

F_y = 275 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE 600	710	473	3300	2200	403	269	1010	674	363	242	1350	899
IPE 550	629	419	3050	2040	341	227	965	643	306	204	1290	858
IPE 500	519	346	2810	1870	290	193	885	590	260	174	1180	787
IPE 450	460	307	2590	1720	245	163	844	563	220	146	1130	750
IPE 400	408	272	2370	1580	206	137	786	524	185	123	1050	699
IPE 360	338	225	2200	1470	179	120	747	498	161	108	997	664
IPE 330	304	203	2060	1380	155	103	742	495	139	92.4	989	660
IPE 300	251	167	1950	1300	138	91.8	744	496	123	81.9	992	662
IPE 270	229	152	1820	1210	120	80.3	697	465	108	72.0	929	619
IPE 240	211	141	1710	1140	108	71.7	676	451	96.7	64.5	902	601
IPE 220	172	115	1620	1080	96.7	64.5	677	452	86.8	57.9	903	602
IPE 200	158	105	1540	1030	86.0	57.3	690	460	76.8	51.2	919	613
IPE 180	124	82.6	1460	972	76.8	51.2	690	460	68.5	45.7	920	613
IPE 160	113	75.2	1380	917	67.7	45.1	705	470	60.2	40.1	940	626
IPE 140	89.8	59.9	1290	862	59.5	39.7	717	478	52.9	35.2	956	638
IPE 120	80.5	53.6	1210	807	51.5	34.4	752	501	45.5	30.3	1000	669
IPE 100	71.6	47.7	1130	752	44.1	29.4	807	538	38.7	25.8	1080	717
IPE 80	26.6	17.8	1050	697	37.6	25.1	880	587	32.9	21.9	1170	783

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants
IPE Shapes

F_y = 275 MPa

Shape	Nominal Weight	$l_b =$ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE 600	122	–	–	–	–	968	645	1190	792
IPE 550	106	–	–	–	–	837	558	1010	672
IPE 500	90.7	361	240	721	481	721	481	841	561
IPE 450	77.6	313	208	625	417	625	417	698	465
IPE 400	66.3	269	179	538	359	538	359	568	378
IPE 360	57.1	241	161	478	319	478	319	475	317
IPE 330	49.1	218	145	429	286	429	286	408	272
IPE 300	42.2	202	135	394	263	394	263	351	234
IPE 270	36.1							294	196
IPE 240	30.7	169	113	323	216	323	216	246	164
IPE 220	26.2	159	106	302	201	302	201	214	143
IPE 200	22.4	150	100	281	187	282	188	185	123
IPE 180	18.8	142	94.7	240	160	264	176	157	105
IPE 160	15.8	135	90.2	223	149	248	165	132	88.0
IPE 140	12.9	129	86.2	193	129	234	156	109	72.4
IPE 120	10.4	126	83.8	177	118	223	149	87.1	58.1
IPE 100	8.10	125	83.2	162	108	217	145	67.6	45.1
IPE 80	6.00	110	73.5	110	73.5	137	91.3	50.2	33.4

For V_{nx}	
LRFD	**ASD**
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.
l_b = length of bearing, mm
x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
IPE Shapes

F_y = 355 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE 600	916	611	4260	2840	458	305	1150	766	412	275	1530	1020
IPE 550	812	541	3940	2630	388	258	1100	731	348	232	1460	975
IPE 500	670	447	3620	2410	329	220	1010	671	296	197	1340	894
IPE 450	594	396	3340	2220	278	186	959	639	250	166	1280	852
IPE 400	527	351	3050	2040	234	156	893	596	210	140	1190	794
IPE 360	436	291	2840	1890	204	136	849	566	183	122	1130	755
IPE 330	393	262	2660	1780	176	117	843	562	158	105	1120	749
IPE 300	324	216	2520	1680	156	104	846	564	140	93.0	1130	752
IPE 270	295	197	2340	1560	137	91.3	792	528	123	81.8	1060	704
IPE 240	273	182	2200	1470	122	81.4	768	512	110	73.2	1020	683
IPE 220	222	148	2090	1400	110	73.3	770	513	98.6	65.7	1030	684
IPE 200	204	136	1990	1330	97.7	65.1	783	522	87.2	58.1	1040	696
IPE 180	160	107	1880	1250	87.2	58.2	784	523	77.8	51.9	1050	697
IPE 160	146	97.0	1780	1180	76.9	51.3	801	534	68.3	45.6	1070	712
IPE 140	116	77.3	1670	1110	67.7	45.1	815	543	60.1	40.0	1090	724
IPE 120	104	69.2	1560	1040	58.6	39.0	854	570	51.7	34.5	1140	760
IPE 100	92.4	61.6	1460	970	50.1	33.4	917	611	44.0	29.3	1220	815
IPE 80	34.4	22.9	1350	899	42.7	28.5	1000	667	37.4	24.9	1330	889

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants
IPE Shapes

F_y = 355 MPa

Shape	**Nominal Weight**	$l_b =$ **80 mm**						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**
	kg/m	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE 600	122	–	–	–	–	1100	733	1530	1020
IPE 550	106	–	–	–	–	951	634	1300	867
IPE 500	90.7	410	273	820	546	820	546	1090	724
IPE 450	77.6	355	237	710	473	710	473	901	601
IPE 400	66.3	306	204	611	408	611	408	733	488
IPE 360	57.1	274	183	544	362	544	362	613	409
IPE 330	49.1	247	165	487	325	487	325	527	351
IPE 300	42.2	230	153	448	299	448	299	454	302
IPE 270	36.1							380	253
IPE 240	30.7	192	128	367	245	367	245	317	211
IPE 220	26.2	181	120	343	229	343	229	276	184
IPE 200	22.4	171	114	321	214	321	214	239	159
IPE 180	18.8	161	108	300	200	300	200	203	135
IPE 160	15.8	154	102	282	188	282	188	170	114
IPE 140	12.9	147	98	249	166	266	177	140	93.4
IPE 120	10.4	143	95.2	229	153	254	169	112	75.0
IPE 100	8.10	142	94.5	209	139	247	165	87.3	58.2
IPE 80	6.00	142	94.9	142	94.9	177	118	64.8	43.2

For V_{nx}	
LRFD	**ASD**
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

$l_b =$ length of bearing, mm

$x =$ location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
IPEA Shapes

F_y = 235 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE A 600	239	159	2300	1540	264	176	556	371	242	161	741	494
IPE A 550	210	140	2120	1410	220	147	524	349	201	134	698	466
IPE A 500	175	117	1970	1320	191	127	507	338	174	116	677	451
IPE A 450	152	102	1790	1190	156	104	463	308	142	94.8	617	411
IPE A 400	136	90.5	1650	1100	132	88.0	444	296	120	80.1	592	395
IPE A 360	114	76.3	1550	1030	118	78.8	431	288	108	72.0	575	383
IPE A 330	107	71.3	1530	1020	108	71.9	518	345	96.5	64.3	691	461
IPE A 300	86.7	57.8	1430	956	94.0	62.7	513	342	83.8	55.9	683	456
IPE A 270	76.6	51.1	1290	862	78.2	52.2	442	295	70.4	46.9	589	393
IPE A 240	71.2	47.5	1220	815	70.3	46.8	441	294	63.3	42.2	588	392
IPE A 220	57.9	38.6	1180	783	63.8	42.5	462	308	57.1	38.1	615	410
IPE A 200	50.2	33.5	1060	705	51.9	34.6	408	272	46.6	31.1	544	362
IPE A 180	39.2	26.1	1010	674	46.8	31.2	426	284	41.7	27.8	569	379
IPE A 160	35.0	23.3	940	627	40.0	26.6	426	284	35.5	23.7	568	379
IPE A 140	28.1	18.8	893	595	36.1	24.0	440	293	32.0	21.3	587	391
IPE A 120	27.0	18.0	893	595	34.4	22.9	565	376	30.0	20.0	753	502
IPE A 100	24.7	16.5	846	564	30.5	20.3	625	417	26.4	17.6	833	556
IPE A 80	17.8	11.9	776	517	25.3	16.8	677	451	21.7	14.5	902	602

For R_1 and R_2		For R_3, R_4, R_5, and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants
IPEA Shapes

F_y = 235 MPa

Shape	Nominal Weight	$l_b = $ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE A 600	108	308	206	423	282	617	411	825	550
IPE A 550	92.1	262	175	379	253	524	349	694	463
IPE A 500	79.4	231	154	333	222	463	308	589	392
IPE A 450	67.2	193	129	295	197	386	257	479	319
IPE A 400	57.4	168	112	267	178	335	223	392	261
IPE A 360	50.2	154	103	238	159	306	204	333	222
IPE A 330	43.0	152	101	229	153	298	199	300	200
IPE A 300	36.5	139	92.3	201	134	270	180	255	170
IPE A 270	30.7	118	78.3	180	120	227	151	207	138
IPE A 240	26.2	110	73.6	169	113	211	141	174	116
IPE A 220	22.2	106	70.9	152	101	201	134	153	102
IPE A 200	18.4	90.1	60.1	135	89.9	169	113	125	83.3
IPE A 180	15.4	87.2	58.1	120	80	159	106	107	71.5
IPE A 160	12.7	81	54	110	73.5	145	96.8	88.5	59.0
IPE A 140	10.5	79	52.6	99.6	66.4	128	85.1	73.6	49.1
IPE A 120	8.70	90.2	60.1	98.5	65.6	125	83.6	63.0	42.0
IPE A 100	6.90	92.4	61.6	92.4	61.6	117	78.1	49.7	33.2
IPE A 80	5.00	79.9	53.3	79.9	53.3	97.7	65.1	36.3	24.2

For V_{nx}	
LRFD	ASD
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
IPEA Shapes

F_y = 275 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE A 600	280	186	2700	1800	286	190	601	401	262	174	802	534
IPE A 550	246	164	2480	1650	238	159	567	378	217	145	755	504
IPE A 500	205	137	2310	1540	206	138	549	366	188	125	732	488
IPE A 450	178	119	2090	1390	169	112	500	334	154	103	667	445
IPE A 400	159	106	1930	1280	143	95.2	481	320	130	86.7	641	427
IPE A 360	134	89.2	1820	1210	128	85.3	467	311	117	77.9	622	415
IPE A 330	125	83.4	1790	1190	117	77.7	561	374	104	69.6	747	498
IPE A 300	101	67.7	1680	1120	102	67.8	554	370	90.7	60.5	739	493
IPE A 270	89.6	59.7	1510	1010	84.6	56.4	478	319	76.1	50.8	637	425
IPE A 240	83.3	55.5	1430	953	76.0	50.7	477	318	68.5	45.6	636	424
IPE A 220	67.7	45.1	1380	917	69.0	46.0	499	333	61.8	41.2	666	444
IPE A 200	58.8	39.2	1240	825	56.2	37.5	441	294	50.4	33.6	588	392
IPE A 180	45.8	30.5	1180	788	50.6	33.7	461	308	45.1	30.1	615	410
IPE A 160	41.0	27.3	1100	733	43.2	28.8	461	307	38.4	25.6	615	410
IPE A 140	32.9	21.9	1050	697	39.0	26.0	476	317	34.6	23.1	635	423
IPE A 120	31.6	21.1	1050	697	37.2	24.8	611	407	32.4	21.6	814	543
IPE A 100	29.0	19.3	990	660	32.9	22.0	676	451	28.5	19.0	901	601
IPE A 80	20.9	13.9	908	605	27.3	18.2	732	488	23.5	15.7	976	651

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
$\phi = 1.00$	$\Omega = 1.50$	$\phi = 0.75$	$\Omega = 2.00$

Table I.6 Continued.

Beam Bearing Constants
IPEA Shapes

F_y = 275 MPa

Shape	**Nominal Weight**	**$l_b =$ 80 mm**						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**
	kg/m	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE A 600	108	334	222	495	330	667	445	965	644
IPE A 550	92.1	283	189	444	296	567	378	812	542
IPE A 500	79.4	250	167	390	260	500	334	689	459
IPE A 450	67.2	209	139	345	230	417	278	561	374
IPE A 400	57.4	181	121	313	209	362	242	459	306
IPE A 360	50.2	167	111	279	186	331	220	389	260
IPE A 330	43.0	164	109	268	179	323	215	351	234
IPE A 300	36.5	150	99.9	236	157	292	195	299	199
IPE A 270	30.7	127	84.8	211	140	246	164	242	162
IPE A 240	26.2	119	79.6	198	132	228	152	203	136
IPE A 220	22.2	115	76.7	178	118	218	145	179	119
IPE A 200	18.4	97.4	65	158	105	183	122	146	97.5
IPE A 180	15.4	94.3	62.9	140	93.6	175	117	126	83.7
IPE A 160	12.7	87.6	58.4	129	86	160	107	104	69.1
IPE A 140	10.5	85.4	56.9	117	77.7	149	99.6	86.1	57.4
IPE A 120	8.70	97.6	65	115	76.8	147	97.9	73.7	49.2
IPE A 100	6.90	101	67.1	108	72.1	137	91.4	58.2	38.8
IPE A 80	5.00	93.5	62.3	93.5	62.3	114	76.2	42.5	28.3

For V_{nx}	
LRFD	**ASD**
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
IPEA Shapes

F_y = 355 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE A 600	361	241	3480	2320	324	216	683	455	297	198	911	607
IPE A 550	317	211	3200	2130	270	180	644	429	247	165	858	572
IPE A 500	265	176	2980	1990	234	156	624	416	214	142	832	554
IPE A 450	230	153	2700	1800	192	128	569	379	175	117	758	505
IPE A 400	205	137	2490	1660	162	108	546	364	148	98.5	728	485
IPE A 360	173	115	2340	1560	145	96.9	530	353	133	88.5	707	471
IPE A 330	162	108	2310	1540	132	88.3	637	425	119	79.1	849	566
IPE A 300	131	87.3	2170	1440	116	77.0	630	420	103	68.7	840	560
IPE A 270	116	77.1	1950	1300	96.2	64.1	543	362	86.5	57.7	724	483
IPE A 240	108	71.7	1850	1230	86.4	57.6	542	361	77.8	51.9	723	482
IPE A 220	87.4	58.3	1780	1180	78.4	52.3	567	378	70.2	46.8	756	504
IPE A 200	75.9	50.6	1600	1070	63.8	42.6	501	334	57.3	38.2	668	445
IPE A 180	59.2	39.4	1530	1020	57.5	38.3	524	349	51.3	34.2	699	466
IPE A 160	52.9	35.3	1420	947	49.1	32.7	524	349	43.6	29.1	699	466
IPE A 140	42.5	28.3	1350	899	44.3	29.5	541	361	39.4	26.2	721	481
IPE A 120	40.8	27.2	1350	899	42.3	28.2	694	463	36.8	24.6	925	617
IPE A 100	37.4	24.9	1280	852	37.4	25.0	768	512	32.4	21.6	1020	683
IPE A 80	26.9	18.0	1170	781	31.1	20.7	832	555	26.7	17.8	1110	739

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants
IPEA Shapes

F_y = 355 MPa

Shape	Nominal Weight	l_b = 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \leq x \leq d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE A 600	108	379	253	639	426	758	505	1250	831
IPE A 550	92.1	322	215	573	382	644	429	1050	699
IPE A 500	79.4	284	189	503	335	568	379	889	593
IPE A 450	67.2	237	158	446	297	474	316	724	482
IPE A 400	57.4	206	137	404	269	412	274	592	395
IPE A 360	50.2	189	126	360	240	376	250	503	335
IPE A 330	43.0	187	124	346	231	367	245	453	302
IPE A 300	36.5	170	113	304	203	332	221	386	257
IPE A 270	30.7	144	96.3	272	181	279	186	313	209
IPE A 240	26.2	136	90.4	255	170	259	173	263	175
IPE A 220	22.2	131	87.2	229	153	248	165	231	154
IPE A 200	18.4	111	73.8	204	136	208	139	189	126
IPE A 180	15.4	107	71.5	181	121	199	133	162	108
IPE A 160	12.7	99.5	66.4	166	111	182	121	134	89.2
IPE A 140	10.5	97	64.7	150	100	175	117	111	74.1
IPE A 120	8.70	111	73.9	149	99.2	190	126	95.2	63.5
IPE A 100	6.90	114	76.2	140	93.1	177	118	75.1	50.1
IPE A 80	5.00	115	77	121	80.4	148	98.4	54.8	36.6

For V_{nx}	
LRFD	ASD
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
IPEO Shapes

F_y = 235 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE O 600	423	282	3530	2350	585	390	1420	948	528	352	1900	1260
IPE O 550	330	220	2980	1990	418	279	1130	750	377	251	1500	1000
IPE O 500	282	188	2820	1880	373	248	1110	739	335	224	1480	986
IPE O 450	249	166	2590	1720	315	210	1020	682	284	189	1360	910
IPE O 400	208	139	2280	1520	245	163	899	600	220	147	1200	799
IPE O 360	177	118	2160	1440	220	147	898	599	198	132	1200	798
IPE O 330	157	105	2000	1330	187	125	840	560	169	112	1120	747
IPE O 300	130	86.8	1880	1250	166	111	818	545	149	99.5	1090	727
IPE O 270	120	79.9	1760	1180	148	98.4	779	519	133	88.9	1040	692
IPE O 240	106	70.7	1650	1100	125	83.5	810	540	112	74.7	1080	720
IPE O 220	86.1	57.4	1550	1030	111	74.2	783	522	99.8	66.5	1040	696
IPE O 200	78.3	52.2	1460	971	97.9	65.2	766	511	87.5	58.4	1020	681
IPE O 180	63.5	42.3	1410	940	90.7	60.5	814	542	80.8	53.9	1080	723

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
$\phi = 1.00$	$\Omega = 1.50$	$\phi = 0.75$	$\Omega = 2.00$

Table I.6 Continued.

Beam Bearing Constants
IPEO Shapes

F_y = 235 MPa

Shape	**Nominal Weight**	$l_b =$ **80 mm**						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**
	kg/m	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE O 600	154	699	466	705	470	1130	752	1290	860
IPE O 550	123	508	339	569	379	898	599	996	664
IPE O 500	107	461	308	508	338	790	526	856	571
IPE O 450	92.4	397	264	456	304	706	470	707	472
IPE O 400	75.7	317	211	390	260	598	399	553	368
IPE O 360	66.0	294	196	350	233	526	351	472	315
IPE O 330	57.0	258	172	317	211	474	316	400	267
IPE O 300	49.3	237	158	281	187	411	274	343	229
IPE O 270	42.3	216	144	261	174	381	254	290	193
IPE O 240	34.3	198	132	238	158	344	229	239	159
IPE O 220	29.4	183	122	210	140	296	197	207	138
IPE O 200	25.1	169	113	195	130	273	182	177	118
IPE O 180	21.3	168	112	176	118	240	160	154	103

For V_{nx}	
LRFD	**ASD**
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.
l_b = length of bearing, mm
x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
IPEO Shapes

F_y = 275 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	kN	kN/m	kN/m	kN	kN	kN/m	kN/m	kN	kN	kN/m	kN/m
	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE O 600	495	330	4130	2750	633	422	1540	1030	571	380	2050	1370
IPE O 550	386	257	3490	2330	453	302	1220	812	407	272	1620	1080
IPE O 500	330	220	3300	2200	403	269	1200	800	363	242	1600	1070
IPE O 450	292	195	3030	2020	341	227	1110	738	307	205	1480	984
IPE O 400	243	162	2670	1780	265	176	973	649	238	159	1300	865
IPE O 360	207	138	2530	1690	238	159	971	648	214	143	1300	863
IPE O 330	184	123	2340	1560	203	135	909	606	182	122	1210	808
IPE O 300	152	102	2200	1470	179	120	885	590	161	108	1180	787
IPE O 270	140	93.5	2060	1380	160	106	842	562	144	96.2	1120	749
IPE O 240	124	82.8	1930	1280	135	90.3	876	584	121	80.9	1170	779
IPE O 220	101	67.2	1820	1210	120	80.3	847	565	108	72.0	1130	753
IPE O 200	91.6	61.1	1710	1140	106	70.6	829	553	94.7	63.1	1110	737
IPE O 180	74.3	49.5	1650	1100	98.1	65.4	880	587	87.4	58.3	1170	782

For R_1 and R_2		For R_3, R_4, R_5, and R_6	
LRFD	ASD	LRFD	ASD
$\phi = 1.00$	$\Omega = 1.50$	$\phi = 0.75$	$\Omega = 2.00$

Table I.6 Continued.

$F_y = 275$ MPa	Beam Bearing Constants IPEO Shapes								
Shape	**Nominal Weight**	$l_b = $ **80 mm**						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**	**kN**
	kg/m	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE O 600	154	756	504	825	550	1320	880	1510	1010
IPE O 550	123	550	367	665	444	1050	701	1170	777
IPE O 500	107	499	333	594	396	924	616	1000	668
IPE O 450	92.4	429	286	534	356	826	551	828	552
IPE O 400	75.7	342	228	457	305	685	457	647	431
IPE O 360	66.0	318	212	409	273	616	411	553	368
IPE O 330	57.0	279	186	371	247	551	367	468	312
IPE O 300	49.3	256	171	328	219	481	320	401	268
IPE O 270	42.3	234	156	305	204	446	297	339	226
IPE O 240	34.3	215	143	278	185	402	268	280	186
IPE O 220	29.4	198	132	246	164	347	231	242	161
IPE O 200	25.1	183	122	228	152	320	213	207	138
IPE O 180	21.3	181	121	206	138	281	187	180	120

For V_{nx}	
LRFD	**ASD**
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.
l_b = length of bearing, mm
x = location of concentrated force from member end, mm

Table I.6 Continued.

F_y = 355 MPa

Beam Bearing Constants
IPEO Shapes

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPE O 600	639	426	5330	3550	719	480	1750	1170	648	432	2330	1550
IPE O 550	498	332	4510	3010	514	343	1380	922	463	309	1840	1230
IPE O 500	426	284	4260	2840	458	305	1360	909	412	275	1820	1210
IPE O 450	377	251	3910	2600	387	258	1260	838	349	232	1680	1120
IPE O 400	314	209	3440	2300	301	200	1110	737	271	181	1470	982
IPE O 360	267	178	3270	2180	270	180	1100	736	244	162	1470	981
IPE O 330	238	158	3020	2010	230	153	1030	689	207	138	1380	918
IPE O 300	197	131	2840	1890	204	136	1010	670	183	122	1340	894
IPE O 270	181	121	2660	1780	181	121	957	638	164	109	1280	851
IPE O 240	160	107	2490	1660	154	103	995	663	138	91.9	1330	885
IPE O 220	130	86.7	2340	1560	137	91.3	963	642	123	81.8	1280	856
IPE O 200	118	78.9	2200	1470	120	80.2	942	628	108	71.7	1260	837
IPE O 180	95.9	63.9	2130	1420	111	74.3	1000	667	99.3	66.2	1330	889

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

F_y = 355 MPa

Beam Bearing Constants
IPEO Shapes

Shape	Nominal Weight	$l_b =$ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPE O 600	154	859	573	1070	710	1700	1140	1950	1300
IPE O 550	123	625	417	859	573	1250	833	1500	1000
IPE O 500	107	567	378	767	511	1130	756	1290	862
IPE O 450	92.4	488	325	689	459	975	650	1070	712
IPE O 400	75.7	389	259	590	393	778	519	835	556
IPE O 360	66.0	361	241	528	352	717	478	713	476
IPE O 330	57.0	317	212	479	319	626	417	605	403
IPE O 300	49.3	291	194	424	283	569	379	518	345
IPE O 270	42.3	266	177	394	263	516	344	438	292
IPE O 240	34.3	244	163	359	239	467	311	361	241
IPE O 220	29.4	225	150	317	212	428	285	312	208
IPE O 200	25.1	208	139	294	196	391	261	267	178
IPE O 180	21.3	206	137	266	178	362	241	233	155

For V_{nx}	
LRFD	ASD
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

$l_b =$ length of bearing, mm

$x =$ location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants for IPN Shapes

F_y = 235 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPN 600	725	483	5080	3380	1180	783	3200	2130	1050	698	4260	2840
IPN 550	583	388	4470	2980	933	622	2560	1710	839	559	3420	2280
IPN 500	506	337	4230	2820	816	544	2670	1780	727	485	3550	2370
IPN 450	411	274	3810	2540	661	441	2400	1600	589	393	3200	2130
IPN 400	326	217	3380	2260	522	348	2130	1420	465	310	2840	1900
IPN 380	295	197	3220	2150	472	315	2040	1360	421	280	2720	1810
IPN 360	267	178	3060	2040	426	284	1930	1290	379	253	2570	1720
IPN 340	235	157	2870	1910	375	250	1800	1200	334	223	2400	1600
IPN 320	210	140	2700	1800	334	222	1700	1130	297	198	2260	1510
IPN 300	185	124	2540	1690	294	196	1600	1070	262	175	2130	1420
IPN 280	163	109	2370	1580	257	172	1490	996	229	153	1990	1330
IPN 260	141	94.1	2210	1470	223	148	1400	932	198	132	1860	1240
IPN 240	121	80.9	2040	1360	191	127	1290	862	170	114	1720	1150
IPN 220	105	70.1	1900	1270	166	110	1220	814	148	98.5	1630	1090
IPN 200	90.1	60.1	1760	1180	142	94.7	1150	768	127	84.4	1540	1020
IPN 180	76.2	50.8	1620	1080	120	80.1	1080	722	107	71.5	1440	962
IPN 160	63.3	42.2	1480	987	100	66.8	1020	677	89.4	59.6	1350	902
IPN 140	51.7	34.5	1340	893	82.1	54.7	949	633	73.2	48.8	1270	844
IPN 120	41.3	27.6	1200	799	65.7	43.8	886	591	58.6	39.1	1180	787
IPN 100	32.1	21.4	1060	705	51.2	34.1	827	551	45.7	30.5	1100	735
IPN 80	24.1	16.0	917	611	38.5	25.7	775	517	34.3	22.9	1030	689

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

F_y = 235 MPa

Beam Bearing Constants for IPN Shapes

Shape	Nominal Weight	$l_b = $ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPN 600	199	1130	754	1130	754	1860	1240	1830	1220
IPN 550	166	940	627	940	627	1520	1020	1470	982
IPN 500	141	844	563	844	563	1350	900	1270	846
IPN 450	115	716	477	716	477	1130	751	1030	685
IPN 400	92.4	597	398	597	398	923	615	812	541
IPN 380	84.0	553	368	553	368	848	565	734	489
IPN 360	76.1	511	341	511	341	777	518	660	440
IPN 340	68.0	465	310	465	310	700	467	585	390
IPN 320	61.0	426	284	426	284	636	424	519	346
IPN 300	54.2	388	259	388	259	574	382	457	305
IPN 280	47.9	353	235	353	235	516	344	399	266
IPN 260	41.9	318	212	318	212	459	306	345	230
IPN 240	36.2	285	190	285	190	406	271	294	196
IPN 220	31.1	257	172	257	172	363	242	251	168
IPN 200	26.2	231	154	231	154	321	214	212	141
IPN 180	21.9	206	137	206	137	282	188	175	117
IPN 160	17.9	182	121	182	121	245	163	142	94.8
IPN 140	14.3	159	106	159	106	211	140	113	75.0
IPN 120	11.1	137	91.5	137	91.5	179	119	86.3	57.5
IPN 100	8.30	117	77.8	117	77.8	149	99.2	63.5	42.3
IPN 80	5.90	97.4	64.9	97.4	64.9	121	81.0	44.0	29.3

For V_{nx}	
LRFD	ASD
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.
l_b = length of bearing, mm
x = location of concentrated force from member end, mm

Table I.6 Continued.

Beam Bearing Constants
for IPN Shapes

F_y = 275 MPa

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPN 600	848	565	5940	3960	1270	848	3460	2310	1130	755	4610	3080
IPN 550	682	455	5230	3480	1010	673	2770	1850	908	605	3700	2470
IPN 500	592	395	4950	3300	883	589	2880	1920	787	524	3840	2560
IPN 450	481	321	4460	2970	715	477	2600	1730	637	425	3460	2310
IPN 400	382	254	3960	2640	565	377	2310	1540	504	336	3080	2050
IPN 380	345	230	3770	2510	511	341	2200	1470	455	303	2940	1960
IPN 360	312	208	3580	2380	461	307	2090	1390	410	274	2790	1860
IPN 340	276	184	3360	2240	406	270	1950	1300	361	241	2600	1730
IPN 320	245	164	3160	2110	361	241	1830	1220	322	215	2440	1630
IPN 300	217	145	2970	1980	318	212	1730	1150	283	189	2310	1540
IPN 280	191	127	2780	1850	278	186	1620	1080	248	166	2150	1440
IPN 260	165	110	2590	1720	241	161	1510	1010	215	143	2020	1340
IPN 240	142	94.7	2390	1600	207	138	1400	932	184	123	1860	1240
IPN 220	123	82.0	2230	1490	179	119	1320	881	160	107	1760	1170
IPN 200	105	70.3	2060	1380	154	102	1250	831	137	91.3	1660	1110
IPN 180	89.2	59.5	1900	1270	130	86.7	1170	781	116	77.3	1560	1040
IPN 160	74.1	49.4	1730	1160	108	72.3	1100	732	96.7	64.5	1460	976
IPN 140	60.5	40.4	1570	1050	88.8	59.2	1030	684	79.2	52.8	1370	913
IPN 120	48.4	32.3	1400	935	71.1	47.4	958	639	63.4	42.3	1280	852
IPN 100	37.6	25.1	1240	825	55.4	36.9	894	596	49.4	32.9	1190	795
IPN 80	28.2	18.8	1070	715	41.6	27.7	839	559	37.1	24.8	1120	746

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants for IPN Shapes

F_y = 275 MPa

Shape	Nominal Weight	l_b = 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPN 600	199	1320	882	1320	882	2170	1450	2140	1430
IPN 550	166	1100	733	1100	733	1780	1190	1720	1150
IPN 500	141	988	659	988	659	1580	1050	1490	990
IPN 450	115	838	558	838	558	1320	879	1200	802
IPN 400	92.4	698	466	698	466	1080	720	950	634
IPN 380	84.0	647	431	647	431	992	661	859	573
IPN 360	76.1	598	399	598	399	910	607	772	515
IPN 340	68.0	544	363	544	363	819	546	684	456
IPN 320	61.0	498	332	498	332	744	496	607	405
IPN 300	54.2	454	303	454	303	671	447	535	356
IPN 280	47.9	413	275	413	275	603	402	467	311
IPN 260	41.9	372	248	372	248	537	358	403	269
IPN 240	36.2	333	222	333	222	476	317	345	230
IPN 220	31.1	301	200	301	201	424	283	294	196
IPN 200	26.2	270	180	270	180	376	251	248	165
IPN 180	21.9	241	161	241	161	330	220	205	137
IPN 160	17.9	213	142	213	142	287	191	166	111
IPN 140	14.3	186	124	186	124	246	164	132	87.8
IPN 120	11.1	161	107	161	107	209	139	101	67.3
IPN 100	8.30	137	91.1	137	91.1	174	116	74.3	49.5
IPN 80	5.90	114	76.0	114	76.0	142	94.7	51.5	34.3

For V_{nx}	
LRFD	ASD
ϕ_v = 1.00	Ω_v = 1.50

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm

Table I.6 Continued.

F_y = 355 MPa

Beam Bearing Constants for IPN Shapes

Shape	ϕR_1	R_1/Ω	ϕR_2	R_2/Ω	ϕR_3	R_3/Ω	ϕR_4	R_4/Ω	ϕR_5	R_5/Ω	ϕR_6	R_6/Ω
	kN	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**	**kN**	**kN**	**kN/m**	**kN/m**
	LRFD	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**	**LRFD**	**ASD**
IPN 600	1090	730	7670	5110	1440	963	3930	2620	1290	858	5240	3490
IPN 550	880	587	6750	4500	1150	764	3150	2100	1030	687	4200	2800
IPN 500	764	510	6390	4260	1000	669	3280	2180	894	596	4370	2910
IPN 450	621	414	5750	3830	813	542	2950	1970	724	483	3930	2620
IPN 400	493	328	5110	3410	642	428	2620	1750	572	381	3490	2330
IPN 380	446	297	4860	3240	580	387	2500	1670	517	345	3340	2230
IPN 360	403	268	4620	3080	523	349	2370	1580	466	311	3160	2110
IPN 340	356	237	4330	2890	461	307	2210	1480	411	274	2950	1970
IPN 320	317	211	4080	2720	410	273	2080	1390	366	244	2780	1850
IPN 300	280	187	3830	2560	361	241	1970	1310	322	215	2620	1750
IPN 280	246	164	3590	2390	316	211	1840	1220	282	188	2450	1630
IPN 260	213	142	3340	2220	274	182	1720	1150	244	163	2290	1530
IPN 240	183	122	3090	2060	235	157	1590	1060	209	140	2120	1410
IPN 220	159	106	2880	1920	204	136	1500	1000	182	121	2000	1330
IPN 200	136	90.7	2660	1780	175	116	1420	944	156	104	1890	1260
IPN 180	115	76.8	2450	1630	148	98.5	1330	887	132	87.9	1770	1180
IPN 160	95.6	63.7	2240	1490	123	82.1	1250	832	110	73.3	1660	1110
IPN 140	78.2	52.1	2020	1350	101	67.3	1170	778	90.0	60.0	1560	1040
IPN 120	62.5	41.6	1810	1210	80.8	53.9	1090	726	72.1	48.1	1450	968
IPN 100	48.5	32.3	1600	1070	62.9	42.0	1020	677	56.2	37.4	1350	903
IPN 80	36.2	24.2	1380	923	47.3	31.5	953	635	42.2	28.1	1270	847

For R_1 and R_2		For R_3, R_4, R_5 and R_6	
LRFD	**ASD**	**LRFD**	**ASD**
ϕ = 1.00	Ω = 1.50	ϕ = 0.75	Ω = 2.00

Table I.6 Continued.

Beam Bearing Constants for IPN Shapes

F_y = 355 MPa

Shape	Nominal Weight	$l_b = $ 80 mm						$\phi_v V_{nx}$	V_{nx}/Ω_v
		$x < d/2$		$d/2 \le x \le d$		$x > d$			
		ϕR_n	R_n/Ω	ϕR_n	R_n/Ω	ϕR_n	R_n/Ω		
		kN	kN	kN	kN	kN	kN	kN	kN
	kg/m	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD
IPN 600	199	1710	1140	1710	1140	2800	1870	2760	1840
IPN 550	166	1400	933	1420	947	2300	1530	2230	1480
IPN 500	141	1270	843	1280	850	2040	1360	1920	1280
IPN 450	115	1050	699	1080	721	1700	1130	1550	1040
IPN 400	92.4	852	568	902	601	1390	930	1230	818
IPN 380	84.0	784	523	835	556	1280	854	1110	739
IPN 360	76.1	719	480	772	515	1170	783	997	665
IPN 340	68.0	647	431	702	468	1060	705	884	589
IPN 320	61.0	588	392	644	429	960	640	784	523
IPN 300	54.2	531	354	587	391	866	578	690	460
IPN 280	47.9	478	319	533	355	779	519	602	402
IPN 260	41.9	427	285	480	320	693	462	521	347
IPN 240	36.2	379	253	430	287	614	409	445	296
IPN 220	31.1	342	228	389	259	548	365	380	253
IPN 200	26.2	307	204	349	233	485	323	320	213
IPN 180	21.9	274	182	311	207	426	284	265	176
IPN 160	17.9	243	162	275	183	370	247	215	143
IPN 140	14.3	214	143	240	160	318	212	170	113
IPN 120	11.1	188	125	207	138	270	180	130	86.9
IPN 100	8.30	165	110	176	118	225	150	95.9	63.9
IPN 80	5.90	144	95.9	147	98.1	183	122	66.5	44.3

For V_{nx}	
LRFD	ASD
$\phi_v = 1.00$	$\Omega_v = 1.50$

– Indicates that 80 mm bearing length is insufficient for end beam reactions since $l_b < k$.

l_b = length of bearing, mm

x = location of concentrated force from member end, mm