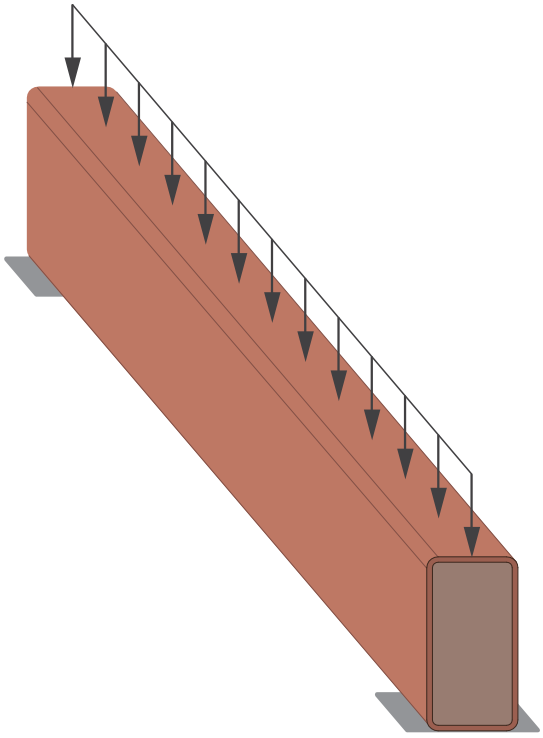
CISC Steel Design Series

Part 7

Beam Load Tables – Rectangular HSS



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PART 7

BEAM LOAD TABLES – RECTANGULAR HSS

1. Introduction

CISC Steel Design Series Part 7 (SDS-7) provides tables for selecting flexural members and estimating maximum beam reactions. The Beam Load Tables for rectangular Hollow Structural Sections (HSS) on the following pages list the total uniformly distributed factored loads (UDL) for beams in strong-axis bending. Two sets of tables are provided: one set based on CSA G40.21-350W steel (F_y = 350 MPa) and another based on ASTM A500 Grade C (F_y = 345 MPa). Two design examples are given to illustrate the use of the tables.

The tables may be used for simply-supported beams that are either laterally braced or unbraced. For all member sizes, L_u, the maximum unbraced length with which a beam will reach either $M_r = \phi M_p$ or $M_r = \phi M_y$ (depending on the class of section) is greater than its maximum tabulated span.

The tables may also be used to estimate loads for other loading conditions by means of the "Equivalent Tabular Load" for the particular loading condition. See the design example on page 4.

The Beam Load Tables (sometimes referred to as "book loads") are frequently used to obtain maximum reactions for the design of connections, when beam reactions are not provided on the structural design drawings.

2. Factored Resistances

The uniformly distributed loads are based on factored moment resistances calculated in accordance with S16:19 Clause 13.5. To obtain the net supported load (factored), the beam factored dead load should be deducted from the total tabulated load.

For beams with very short spans, the loads may be limited by the shear capacity of the web (Clause 13.4.1.1) rather than by the bending capacity of the section. The tabulated beam loads also take into account the shear reduction factor due to combined shear and moment (Clause 14.6), given by:

$$2.20 - 1.60 \frac{M_f}{M_r}$$

The limit states of web yielding and web crippling are not included and should be checked in accordance with Clause 14.3.2.

The following properties and resistances are provided at the bottom of the tables:

S_x = Elastic section modulus with respect to the strong axis, 10^3 mm^3

Z_x = Plastic section modulus with respect to the strong axis, 10^3 mm^3

I_x = Moment of inertia with respect to the strong axis, 10^6 mm^4

C_{rt} = Shear constant, ratio of vertical shear force to maximum shear stress for the strong bending axis, mm^2

$V_{r\,max}$ = Maximum factored shear resistance ($\phi A_w F_s$) calculated in accordance with S16:19 Clause 13.4.1.1. The unreduced shear resistance, $V_{r\,max} = \phi A_w F_s$, applies to beams with $F_s > 0.6 F_y$ when $M_f/M_r \le 0.75$, and to all beams with $F_s \le 0.6 F_y$.

$V_{r\,min}$ = Minimum factored shear resistance under combined shear and moment calculated in accordance with Clause 14.6. $V_{r\,min} = 0.6\,\phi\,A_w\,F_y$ for beams with $F_s > 0.6\,F_y$, and $V_{r\,\min} = \phi\,A_w\,F_s$ for beams with $F_s \le 0.6\,F_y$. For beams with $F_s > 0.6\,F_y$ where $M_f / M_r > 0.75$, $V_{r\,max}$ is multiplied by the above-mentioned reduction factor, and the reduced shear resistance falls between the maximum and minimum values. Alternatively, $V_{r\,min}$ may be used conservatively in all cases.

3. Vertical Deflections

The column headed "Approximate Deflection" lists the approximate theoretical mid-span deflection at an assumed bending stress level of 240 MPa, for beams of various spans designed to support the tabulated factored loads.

The listed deflections are based on the nominal depth of the beam, and are calculated using the formula:

$$\Delta = \frac{5\,W\,L^3}{384\,E\,I}$$

For E = 200 000 MPa and an assumed bending stress of 240 MPa, this formula reduces to:

$$\Delta = \frac{250 \times 10^{-6}\,L^2}{d}$$ where:

Δ = deflection, mm

W = total uniform load including the dead load of the beam, kN

L = beam span, mm

E = modulus of elasticity, MPa

I = moment of inertia, mm^4

d = section depth, mm

More accurate deflections can be determined by multiplying the approximate deflection values listed by the ratio of actual bending stress to the assumed bending stress of 240 MPa. Also see *Deflection of Flexural Members* in Part 5 of the Handbook.

Design Examples

1. Given:

Design a simply-supported beam spanning 6 m to carry a uniformly distributed load of 15 kN/m specified live load and 7 kN/m specified dead load. The dead load includes an assumed beam dead load of 0.5 kN/m. The live load deflection is limited to $L/300$. The beam frames into supporting members, and the beam is laterally supported. Use CSA G40.21-350W steel.

Solution:

Factored load, w_f = (1.25 x 7) + (1.50 x 15) = 31.3 kN/m

Total factored load, W_f = 31.3 x 6 = 188 kN

Factored moment, $M_f = w_f L^2 / 8$ = 31.3 x 6^2 / 8 = 141 kN·m

Factored end shear, $V_f = W_f / 2$ = 94.0 kN

From the Beam Load Tables for CSA G40.21-350W, try a rectangular HSS305x152x6.4 section:

W_r (6 000) = 228 kN > 188 kN

The tabulated beam loads take into account the factored shear resistance, V_r (including the reduced resistance under combined shear and moment according to S16:19 Clause 14.6, if applicable).

When the beam is bearing on supports rather than framing into supporting members, it is necessary to check that the factored bearing resistance is greater than or equal to the factored end reaction.

Approximate deflection listed at an assumed stress of 240 MPa = 30 mm

Stress at specified live load = $\frac{M_{Live}}{S_x} = \frac{w_{live}}{w_f} \times \frac{M_f}{S_x} = \frac{15}{31.3} \times \frac{141 \times 10^6}{440 \times 10^3} = 154$ MPa

Live load deflection = 30 x 154 / 240 = 19.3 mm

L / 300 = 6 000 / 300 = 20.0 mm > 19.3 mm.

The HSS305x152x6.4 beam is adequate.

2. Given:

Design a simply-supported beam spanning 6 m to carry equal point loads of 45 kN specified live load and 21 kN specified dead load applied at the one-third points. An additional beam dead load of w_d = 0.7 kN/m is assumed. The live load deflection is limited to L/300. The beam frames into supporting members, and the beam is laterally supported. Use ASTM A500 Grade C steel.

Solution:

Factored load of each point load, P_f = (1.25 x 21) + (1.50 x 45) = 93.8 kN

Referring to the *Beam Diagrams and Formulas* in Part 5 of the Handbook (loading condition 9), the equivalent tabular load is:

$$W_f = \frac{8P_f a}{L} + 1.25 w_d L = \frac{8 \times 93.8}{3} + 1.25 \times 0.7 \times 6 = 255 \text{ kN}$$

where a is the point load spacing, or L / 3.

From the Beam Load Tables for ASTM A500 Grade C, try a rectangular HSS305x203x7.9 section:

W_r (6 000) = 296 kN > 255 kN

For loading conditions other than uniformly distributed, the shear resistance should be checked, because the end shear may be significantly different from that corresponding to the equivalent tabular load (W_f / 2).

Factored end shear, $V_f = P_f + 1.25\, w_d L / 2$ = 93.8 + 2.6 = 96.4 kN < $V_{r\,min}$ = 736 kN

A more detailed calculation would indicate whether a greater shear resistance could be used (S16:19 Clause 14.6), but $V_{r\,min}$ is sufficient here.

When the beam is bearing on supports rather than framing into supporting members, it is necessary to check that the factored bearing resistance is greater than or equal to the factored end reaction.

Approximate deflection listed at an assumed stress of 240 MPa = 30 mm

Factored moment, $M_f = w_f L^2 / 8 = W_f L / 8$ = 255 x 6 / 8 = 191 kN·m

Stress at specified live load ≈ $\frac{M_{Live}}{S_x} = \frac{P_{live}}{P_f} \times \frac{M_f}{S_x} = \frac{45}{93.8} \times \frac{191 \times 10^6}{594 \times 10^3} = 154 \text{ MPa}$

Live load deflection = 30 x 154 / 240 = 19.3 mm

L / 300 = 6 000 / 300 = 20.0 mm > 19.3 mm

The HSS305x203x7.9 beam is adequate.

BEAM LOAD TABLES

CSA G40.21-350W

Rectangular HSS – Strong-Axis Bending

F_y = 350 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 305 x 203					HSS 305 x 152					Approx. Deflect. (mm)
		16	13	9.5	7.9	6.4	16	13	9.5	7.9	6.4	
Mass (kg/m)		114	93.0	71.3	60.1	48.6	101	82.8	63.7	53.7	43.5	
Span in Millimetres	500											
	1 000	2 900	2 440	1 920	1 640	1 340	2 900	2 440	1 920	1 640	1 340	1
	1 500	2 400	2 000	1 560	1 320	1 080	2 000	1 680	1 320	1 120	914	2
	2 000	1 800	1 500	1 170	990	806	1 500	1 260	987	839	685	3
	2 500	1 440	1 200	933	792	645	1 200	1 010	789	671	548	5
	3 000	1 200	1 000	778	660	538	1 000	839	658	559	457	7
	3 500	1 030	857	667	566	461	857	719	564	480	392	10
	4 000	901	750	583	495	403	750	629	493	420	343	13
	4 500	801	666	519	440	358	666	559	438	373	305	17
	5 000	721	600	467	396	323	600	503	395	336	274	21
	5 500	655	545	424	360	293	545	458	359	305	249	25
	6 000	601	500	389	330	269	500	420	329	280	228	30
	6 500	554	461	359	305	248	461	387	304	258	211	35
	7 000	515	428	333	283	230	428	360	282	240	196	40
	7 500	480	400	311	264	215	400	336	263	224	183	46
	8 000	450	375	292	248	202	375	315	247	210	171	52
	8 500	424	353	275	233	190	353	296	232	197	161	59
	9 000	400	333	259	220	179	333	280	219	186	152	66
	9 500	379	316	246	208	170	316	265	208	177	144	74
	10 000	360	300	233	198	161	300	252	197	168	137	82
DESIGN DATA AND PROPERTIES												
S_x (10^3 mm^3)		1 140	964	762	652	535	922	784	624	535	440	
Z_x (10^3 mm^3)		1 430	1 190	926	786	640	1 190	999	783	666	544	
I_x (10^6 mm^4)		174	147	116	99.3	81.5	141	119	95.1	81.6	67.1	
C_{rt} (mm^2)		7 660	6 450	5 080	4 340	3 550	7 660	6 450	5 080	4 340	3 550	
$V_{r\,max}$ (kN)		1 590	1 340	1 060	901	738	1 590	1 340	1 060	901	738	
$V_{r\,min}$ (kN)		1 450	1 220	961	819	671	1 450	1 220	961	819	671	
IMPERIAL SIZE AND WEIGHT												
Weight (lb./ft.)		76.3	62.5	47.9	40.4	32.6	67.8	55.7	42.8	36.2	29.2	
Thickness (in.)		0.625	0.500	0.375	0.313	0.250	0.625	0.500	0.375	0.313	0.250	
Size (in.)		12 x 8					12 x 6					

BEAM LOAD TABLES

CSA G40.21-350W

Rectangular HSS – Strong-Axis Bending

F_y = 350 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 254 x 203					HSS 254 x 152					Approx. Deflect. (mm)
		16	13	9.5	7.9	6.4	16	13	9.5	7.9	6.4	
Mass (kg/m)		101	82.8	63.7	53.7	43.5	88.3	72.7	56.1	47.4	38.4	
Span in Millimetres	500						2 520	2 150	1 710	1 470	1 210	
	1 000	2 290	1 950	1 560	1 330	1 100	2 240	1 880	1 480	1 270	1 040	1
	1 500	1 810	1 520	1 190	1 010	825	1 490	1 250	990	843	690	2
	2 000	1 360	1 140	891	759	619	1 120	941	742	633	518	4
	2 500	1 090	910	713	607	495	895	753	594	506	414	6
	3 000	907	759	594	506	412	746	627	495	422	345	9
	3 500	778	650	509	433	354	639	538	424	361	296	12
	4 000	680	569	445	379	309	559	471	371	316	259	16
	4 500	605	506	396	337	275	497	418	330	281	230	20
	5 000	544	455	356	303	247	448	376	297	253	207	25
	5 500	495	414	324	276	225	407	342	270	230	188	30
	6 000	454	379	297	253	206	373	314	247	211	173	35
	6 500	419	350	274	233	190	344	290	228	195	159	42
	7 000	389	325	255	217	177	320	269	212	181	148	48
	7 500	363	303	238	202	165	298	251	198	169	138	55
	8 000	340	284	223	190	155	280	235	186	158	129	63
DESIGN DATA AND PROPERTIES												
S_x (10^3 mm^3)		872	740	589	505	416	691	592	475	409	338	
Z_x (10^3 mm^3)		1 080	903	707	602	491	888	747	589	502	411	
I_x (10^6 mm^4)		111	94.0	74.8	64.2	52.8	87.8	75.2	60.4	52.0	42.9	
C_{rt} (mm^2)		6 050	5 160	4 110	3 530	2 900	6 050	5 160	4 110	3 530	2 900	
$V_{r\,max}$ (kN)		1 260	1 070	855	734	604	1 260	1 070	855	734	604	
$V_{r\,min}$ (kN)		1 140	975	778	667	549	1 140	975	778	667	549	
IMPERIAL SIZE AND WEIGHT												
Weight (lb./ft.)		67.8	55.7	42.8	36.2	29.2	59.3	48.9	37.7	31.9	25.8	
Thickness (in.)		0.625	0.500	0.375	0.313	0.250	0.625	0.500	0.375	0.313	0.250	
Size (in.)		10 x 8					10 x 6					

BEAM LOAD TABLES

CSA G40.21-350W

Rectangular HSS – Strong-Axis Bending

F_y = 350 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 203 x 152						HSS 203 x 102					Approx. Deflect. (mm)
		16	13	9.5	7.9	6.4	4.8	13	9.5	7.9	6.4	4.8	
Mass (kg/m)		75.6	62.6	48.5	41.1	33.4	25.5	52.4	40.9	34.7	28.3	21.7	
Span in Millimetres	500	1 840	1 610	1 310	1 130	939	732	1 570	1 270	1 090	904	703	
	1 000	1 570	1 330	1 060	905	743	575	1 020	822	708	585	454	1
	1 500	1 050	887	706	603	496	383	680	548	472	390	302	3
	2 000	785	665	529	452	372	287	510	411	354	292	227	5
	2 500	628	532	423	362	297	230	408	329	283	234	181	8
	3 000	523	444	353	302	248	192	340	274	236	195	151	11
	3 500	449	380	302	258	212	164	292	235	202	167	130	15
	4 000	392	333	265	226	186	144	255	205	177	146	113	20
	4 500	349	296	235	201	165	128	227	183	157	130	101	25
	5 000	314	266	212	181	149	115	204	164	142	117	91	31
	5 500	285	242	192	164	135	104	186	149	129	106	83	37
	6 000	262	222	176	151	124	96	170	137	118	97	76	44
	6 500	242	205	163	139	114	88	157	126	109	90	70	52
	7 000	224	190	151	129	106	82	146	117	101	84	65	60
DESIGN DATA AND PROPERTIES													
S_x (10^3 mm^3)		488	423	343	297	246	192	308	254	221	185	145	
Z_x (10^3 mm^3)		623	528	420	359	295	228	405	326	281	232	180	
I_x (10^6 mm^4)		49.6	43.0	34.8	30.2	25.0	19.5	31.3	25.8	22.5	18.8	14.7	
C_{rt} (mm^2)		4 440	3 870	3 150	2 720	2 260	1 760	3 870	3 150	2 720	2 260	1 760	
$V_{r\,max}$ (kN)		922	805	654	566	469	366	805	654	566	469	366	
$V_{r\,min}$ (kN)		838	732	595	515	427	333	732	595	515	427	333	
IMPERIAL SIZE AND WEIGHT													
Weight (lb./ft.)		50.8	42.1	32.6	27.6	22.4	17.1	35.2	27.5	23.4	19.0	14.6	
Thickness (in.)		0.625	0.500	0.375	0.313	0.250	0.188	0.500	0.375	0.313	0.250	0.188	
Size (in.)		8 x 6						8 x 4					

BEAM LOAD TABLES

CSA G40.21-350W

Rectangular HSS – Strong-Axis Bending

F_y = 350 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 178 x 127					Approx. Deflect. (mm)
		13	9.5	7.9	6.4	4.8	
Mass (kg/m)		52.4	40.9	34.7	28.3	21.7	
Span in Millimetres	500	1 340	1 110	964	805	631	
	1 000	953	764	658	544	423	1
	1 500	635	509	438	363	282	3
	2 000	476	382	329	272	212	6
	2 500	381	305	263	218	169	9
	3 000	318	255	219	181	141	13
	3 500	272	218	188	156	121	17
	4 000	238	191	164	136	106	22
	4 500	212	170	146	121	94	28
	5 000	191	153	132	109	85	35
	5 500	173	139	120	99	77	43
	6 000	159	127	110	91	71	51
DESIGN DATA AND PROPERTIES							
S_x (10^3 mm^3)		297	244	213	178	140	
Z_x (10^3 mm^3)		378	303	261	216	168	
I_x (10^6 mm^4)		26.4	21.7	18.9	15.8	12.4	
C_{rt} (mm^2)		3 230	2 660	2 320	1 940	1 520	
$V_{r\,max}$ (kN)		671	553	482	402	315	
$V_{r\,min}$ (kN)		610	503	438	366	287	
IMPERIAL SIZE AND WEIGHT							
Weight (lb./ft.)		35.2	27.5	23.4	19.0	14.6	
Thickness (in.)		0.500	0.375	0.313	0.250	0.188	
Size (in.)		7 x 5					

G40

BEAM LOAD TABLES

CSA G40.21-350W

Rectangular HSS – Strong-Axis Bending

F_y = 350 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 152 x 102				HSS 152 x 76				Approx. Deflect. (mm)
		9.5	7.9	6.4	4.8	9.5	7.9	6.4	4.8	
Mass (kg/m)		33.3	28.4	23.2	17.9	29.5	25.2	20.7	16.0	
Span in Millimetres	500	832	724	610	482	823	724	610	482	1
	1 000	519	449	373	292	431	375	315	247	2
	1 500	346	299	249	195	287	250	210	165	4
	2 000	260	224	186	146	215	188	158	124	7
	2 500	208	179	149	117	172	150	126	99	10
	3 000	173	150	124	97	144	125	105	82	15
	3 500	148	128	107	84	123	107	90	71	20
	4 000	130	112	93	73	108	94	79	62	26
	4 500	115	100	83	65	96	83	70	55	33
	5 000	104	90	75	59	86	75	63	49	41
DESIGN DATA AND PROPERTIES										
S_x (10^3 mm^3)		162	143	121	95.6	130	115	98.0	78.2	
Z_x (10^3 mm^3)		206	178	148	116	171	149	125	98.1	
I_x (10^6 mm^4)		12.4	10.9	9.19	7.28	9.89	8.78	7.47	5.96	
C_{rt} (mm^2)		2 180	1 920	1 610	1 270	2 180	1 920	1 610	1 270	
$V_{r\,max}$ (kN)		453	398	335	265	453	398	335	265	
$V_{r\,min}$ (kN)		412	362	305	241	412	362	305	241	
IMPERIAL SIZE AND WEIGHT										
Weight (lb./ft.)		22.4	19.1	15.6	12.0	19.8	17.0	13.9	10.7	
Thickness (in.)		0.375	0.313	0.250	0.188	0.375	0.313	0.250	0.188	
Size (in.)		6 x 4				6 x 3				

G40

BEAM LOAD TABLES

CSA G40.21-350W

Rectangular HSS – Strong-Axis Bending

F_y = 350 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 127 x 102				HSS 127 x 76				Approx. Deflect. (mm)
		9.5	7.9	6.4	4.8	9.5	7.9	6.4	4.8	
Mass (kg/m)		29.5	25.2	20.7	16.0	25.7	22.1	18.2	14.1	
Span in Millimetres	500	640	572	488	390	635	559	471	372	1
	1 000	391	340	285	223	318	280	235	186	2
	1 500	260	227	190	149	212	186	157	124	4
	2 000	195	170	142	112	159	140	118	93	8
	2 500	156	136	114	89	127	112	94	74	12
	3 000	130	113	95	74	106	93	79	62	18
	3 500	112	97	81	64	91	80	67	53	24
	4 000	98	85	71	56	79	70	59	47	31
DESIGN DATA AND PROPERTIES										
S_x (10^3 mm^3)		123	109	92.6	73.8	96.5	86.4	74.1	59.6	
Z_x (10^3 mm^3)		155	135	113	88.6	126	111	93.4	73.8	
I_x (10^6 mm^4)		7.80	6.92	5.88	4.69	6.13	5.49	4.70	3.78	
C_{rt} (mm^2)		1 690	1 510	1 290	1 030	1 690	1 510	1 290	1 030	
$V_{r\,max}$ (kN)		352	314	268	214	352	314	268	214	
$V_{r\,min}$ (kN)		320	286	244	195	320	286	244	195	
IMPERIAL SIZE AND WEIGHT										
Weight (lb./ft.)		19.8	17.0	13.9	10.7	17.3	14.9	12.2	9.5	
Thickness (in.)		0.375	0.313	0.250	0.188	0.375	0.313	0.250	0.188	
Size (in.)		5 x 4				5 x 3				

G40

BEAM LOAD TABLES

CSA G40.21-350W

Rectangular HSS – Strong-Axis Bending

F_y = 350 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 102 x 76					HSS 102 x 51					Approx. Deflect. (mm)
		9.5	7.9	6.4	4.8	3.2	9.5	7.9	6.4	4.8	3.2	
Mass (kg/m)		21.9	18.9	15.6	12.2	8.35	18.1	15.7	13.1	10.3	7.09	
Span in Millimetres	500	443	392	333	265	186	331	297	256	206	146	1
	1 000	222	196	166	133	93	165	148	128	103	73	2
	1 500	148	131	111	88	62	110	99	85	69	49	6
	2 000	111	98	83	66	47	83	74	64	51	37	10
	2 500	89	78	67	53	37	66	59	51	41	29	15
	3 000	74	65	55	44	31	55	50	43	34	24	22
	3 500	63	56	48	38	27	47	42	37	29	21	30
	4 000	55	49	42	33	23	41	37	32	26	18	39
DESIGN DATA AND PROPERTIES												
S_x (10^3 mm^3)		67.4	61.0	52.9	43.0	30.8	47.1	43.6	38.5	31.8	23.1	
Z_x (10^3 mm^3)		87.9	77.8	66.0	52.6	37.0	65.6	58.9	50.7	40.8	29.0	
I_x (10^6 mm^4)		3.42	3.10	2.69	2.18	1.57	2.39	2.21	1.95	1.61	1.17	
C_{rt} (mm^2)		1 210	1 110	968	789	565	1 210	1 110	968	789	565	
$V_{r\,max}$ (kN)		252	231	201	164	118	252	231	201	164	118	
$V_{r\,min}$ (kN)		229	210	183	149	107	229	210	183	149	107	
IMPERIAL SIZE AND WEIGHT												
Weight (lb./ft.)		14.7	12.7	10.5	8.2	5.6	12.2	10.6	8.8	6.9	4.8	
Thickness (in.)		0.375	0.313	0.250	0.188	0.125	0.375	0.313	0.250	0.188	0.125	
Size (in.)		4 x 3					4 x 2					

G40

BEAM LOAD TABLES

ASTM A500 Grade C

Rectangular HSS – Strong-Axis Bending

F_y = 345 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 305 x 203					HSS 305 x 152					Approx. Deflect. (mm)
		16	13	9.5	7.9	6.4	16	13	9.5	7.9	6.4	
Mass (kg/m)		114	93.0	71.3	60.1	48.6	101	82.8	63.7	53.7	43.5	
Span in Millimetres	500											
	1 000	2 640	2 210	1 730	1 470	1 200	2 640	2 210	1 730	1 470	1 200	1
	1 500	2 170	1 810	1 400	1 180	805	1 820	1 520	1 180	1 000	818	2
	2 000	1 630	1 350	1 050	887	604	1 370	1 140	887	753	614	3
	2 500	1 300	1 080	838	709	483	1 090	909	709	602	491	5
	3 000	1 080	903	698	591	402	911	758	591	502	409	7
	3 500	930	774	598	507	345	781	649	507	430	351	10
	4 000	814	677	524	443	302	683	568	443	376	307	13
	4 500	723	602	465	394	268	607	505	394	335	273	17
	5 000	651	542	419	355	241	546	455	355	301	245	21
	5 500	592	492	381	322	219	497	413	322	274	223	25
	6 000	542	451	349	296	201	455	379	296	251	205	30
	6 500	501	417	322	273	186	420	350	273	232	189	35
	7 000	465	387	299	253	172	390	325	253	215	175	40
	7 500	434	361	279	236	161	364	303	236	201	164	46
	8 000	407	338	262	222	151	342	284	222	188	153	52
	8 500	383	319	246	209	142	321	267	209	177	144	59
	9 000	362	301	233	197	134	304	253	197	167	136	66
	9 500	343	285	220	187	127	288	239	187	158	129	74
	10 000	325	271	209	177	121	273	227	177	151	123	82
DESIGN DATA AND PROPERTIES												
S_x (10^3 mm^3)		1 060	886	697	594	486	856	722	572	489	401	
Z_x (10^3 mm^3)		1 310	1 090	843	714	581	1 100	915	714	606	494	
I_x (10^6 mm^4)		161	135	106	90.6	74.1	130	110	87.1	74.5	61.1	
C_{rt} (mm^2)		7 080	5 920	4 640	3 950	3 230	7 080	5 920	4 640	3 950	3 230	
$V_{r\,max}$ (kN)		1 450	1 210	951	809	661	1 450	1 210	951	809	661	
$V_{r\,min}$ (kN)		1 320	1 100	865	736	601	1 320	1 100	865	736	601	
IMPERIAL SIZE AND WEIGHT												
Weight (lb./ft.)		76.3	62.5	47.9	40.4	32.6	67.8	55.7	42.8	36.2	29.2	
Design thick. (in.)		0.563	0.450	0.338	0.281	0.225	0.563	0.450	0.338	0.281	0.225	
Size (in.)		12 x 8					12 x 6					

A500

BEAM LOAD TABLES

ASTM A500 Grade C

Rectangular HSS – Strong-Axis Bending

F_y = 345 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 254 x 203					HSS 254 x 152					Approx. Deflect. (mm)
		16	13	9.5	7.9	6.4	16	13	9.5	7.9	6.4	
Mass (kg/m)		101	82.8	63.7	53.7	43.5	88.3	72.7	56.1	47.4	38.4	
Span in Millimetres	500					1 080	2 310	1 950	1 550	1 320	1 080	
	1 000	2 100	1 770	1 400	1 200	941	2 040	1 700	1 340	1 140	929	1
	1 500	1 650	1 370	1 070	907	628	1 360	1 140	891	758	619	2
	2 000	1 230	1 030	801	681	471	1 020	852	668	569	465	4
	2 500	988	822	641	544	377	815	682	535	455	372	6
	3 000	823	685	534	454	314	679	568	445	379	310	9
	3 500	705	587	458	389	269	582	487	382	325	265	12
	4 000	617	514	401	340	235	509	426	334	284	232	16
	4 500	549	457	356	302	209	453	379	297	253	206	20
	5 000	494	411	320	272	188	407	341	267	228	186	25
	5 500	449	374	291	247	171	370	310	243	207	169	30
	6 000	412	342	267	227	157	339	284	223	190	155	35
	6 500	380	316	246	209	145	313	262	206	175	143	42
	7 000	353	293	229	194	134	291	243	191	163	133	48
	7 500	329	274	214	181	126	272	227	178	152	124	55
	8 000	309	257	200	170	118	255	213	167	142	116	63
DESIGN DATA AND PROPERTIES												
S_x (10^3 mm^3)		809	682	540	462	379	644	548	436	374	308	
Z_x (10^3 mm^3)		994	827	645	548	446	820	686	538	458	374	
I_x (10^6 mm^4)		103	86.7	68.5	58.6	48.1	81.8	69.6	55.4	47.5	39.1	
C_{rt} (mm^2)		5 630	4 760	3 770	3 220	2 640	5 630	4 760	3 770	3 220	2 640	
$V_{r\,max}$ (kN)		1 150	976	773	661	542	1 150	976	773	661	542	
$V_{r\,min}$ (kN)		1 050	887	702	600	493	1 050	887	702	600	493	
IMPERIAL SIZE AND WEIGHT												
Weight (lb./ft.)		67.8	55.7	42.8	36.2	29.2	59.3	48.9	37.7	31.9	25.8	
Design thick. (in.)		0.563	0.450	0.338	0.281	0.225	0.563	0.450	0.338	0.281	0.225	
Size (in.)		10 x 8					10 x 6					

BEAM LOAD TABLES

ASTM A500 Grade C

Rectangular HSS – Strong-Axis Bending

F_y = 345 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 203 x 152						HSS 203 x 102					Approx. Deflect. (mm)
		16	13	9.5	7.9	6.4	4.8	13	9.5	7.9	6.4	4.8	
Mass (kg/m)		75.6	62.6	48.5	41.1	33.4	25.5	52.4	40.9	34.7	28.3	21.7	
Span in Millimetres	500	1 710	1 480	1 190	1 020	845	654	1 430	1 150	986	812	631	
	1 000	1 430	1 210	954	815	668	435	932	743	638	524	407	1
	1 500	956	805	636	543	445	290	621	495	426	349	272	3
	2 000	717	604	477	407	334	217	466	371	319	262	204	5
	2 500	573	483	382	326	267	174	373	297	255	210	163	8
	3 000	478	402	318	272	223	145	311	248	213	175	136	11
	3 500	410	345	273	233	191	124	266	212	182	150	116	15
	4 000	358	302	238	204	167	109	233	186	160	131	102	20
	4 500	319	268	212	181	148	97	207	165	142	116	91	25
	5 000	287	241	191	163	134	87	186	149	128	105	82	31
	5 500	261	219	173	148	121	79	169	135	116	95	74	37
	6 000	239	201	159	136	111	73	155	124	106	87	68	44
	6 500	221	186	147	125	103	67	143	114	98	81	63	52
	7 000	205	172	136	116	96	62	133	106	91	75	58	60
DESIGN DATA AND PROPERTIES													
S_x (10^3 mm^3)		457	393	316	272	225	175	288	235	204	169	132	
Z_x (10^3 mm^3)		577	486	384	328	269	207	375	299	257	211	164	
I_x (10^6 mm^4)		46.5	39.9	32.1	27.7	22.9	17.8	29.2	23.8	20.7	17.2	13.4	
C_{rt} (mm^2)		4 170	3 600	2 900	2 500	2 060	1 600	3 600	2 900	2 500	2 060	1 600	
$V_{r\,max}$ (kN)		855	738	594	512	423	328	738	594	512	423	328	
$V_{r\,min}$ (kN)		778	671	540	465	384	298	671	540	465	384	298	
IMPERIAL SIZE AND WEIGHT													
Weight (lb./ft.)		50.8	42.1	32.6	27.6	22.4	17.1	35.2	27.5	23.4	19.0	14.6	
Design thick. (in.)		0.563	0.450	0.338	0.281	0.225	0.169	0.450	0.338	0.281	0.225	0.169	
Size (in.)		8 x 6						8 x 4					

BEAM LOAD TABLES

ASTM A500 Grade C

Rectangular HSS – Strong-Axis Bending

F_y = 345 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 178 x 127					Approx. Deflect. (mm)
		13	9.5	7.9	6.4	4.8	
Mass (kg/m)		52.4	40.9	34.7	28.3	21.7	
Span in Millimetres	500	1 240	1 010	874	726	566	
	1 000	869	693	594	489	378	1
	1 500	580	462	396	326	252	3
	2 000	435	347	297	245	189	6
	2 500	348	277	237	196	151	9
	3 000	290	231	198	163	126	13
	3 500	248	198	170	140	108	17
	4 000	217	173	148	122	94	22
	4 500	193	154	132	109	84	28
	5 000	174	139	119	98	76	35
	5 500	158	126	108	89	69	43
	6 000	145	116	99	82	63	51
DESIGN DATA AND PROPERTIES							
S_x (10^3 mm^3)		278	226	196	163	127	
Z_x (10^3 mm^3)		350	279	239	197	152	
I_x (10^6 mm^4)		24.7	20.1	17.4	14.5	11.3	
C_{rt} (mm^2)		3 020	2 460	2 130	1 770	1 380	
$V_{r\,max}$ (kN)		619	505	437	363	283	
$V_{r\,min}$ (kN)		563	459	397	330	257	
IMPERIAL SIZE AND WEIGHT							
Weight (lb./ft.)		35.2	27.5	23.4	19.0	14.6	
Design thick. (in.)		0.450	0.338	0.281	0.225	0.169	
Size (in.)		7 x 5					

A500

BEAM LOAD TABLES

ASTM A500 Grade C

Rectangular HSS – Strong-Axis Bending

F_y = 345 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 152 x 102					HSS 152 x 76					Approx. Deflect. (mm)
		13	9.5	7.9	6.4	4.8	13	9.5	7.9	6.4	4.8	
Mass (kg/m)		42.3	33.3	28.4	23.2	17.9	37.3	29.5	25.2	20.7	16.0	
Span in Millimetres	500	928	759	660	552	433	909	755	660	552	433	1
	1 000	584	472	407	338	263	482	392	340	283	222	2
	1 500	389	315	272	225	176	321	262	227	189	148	4
	2 000	292	236	204	169	132	241	196	170	142	111	7
	2 500	233	189	163	135	105	193	157	136	113	89	10
	3 000	195	157	136	113	88	161	131	113	94	74	15
	3 500	167	135	116	97	75	138	112	97	81	63	20
	4 000	146	118	102	85	66	120	98	85	71	56	26
	4 500	130	105	91	75	59	107	87	76	63	49	33
	5 000	117	94	82	68	53	96	79	68	57	44	41
DESIGN DATA AND PROPERTIES												
S_x (10^3 mm^3)		182	151	132	111	87.3	144	121	107	90.4	71.6	
Z_x (10^3 mm^3)		235	190	164	136	106	194	158	137	114	89.4	
I_x (10^6 mm^4)		13.9	11.5	10.1	8.45	6.65	11.0	9.25	8.15	6.89	5.45	
C_{rt} (mm^2)		2 440	2 030	1 770	1 480	1 160	2 440	2 030	1 770	1 480	1 160	
$V_{r\,max}$ (kN)		500	415	363	304	238	500	415	363	304	238	
$V_{r\,min}$ (kN)		454	377	330	276	217	454	377	330	276	217	
IMPERIAL SIZE AND WEIGHT												
Weight (lb./ft.)		28.4	22.4	19.1	15.6	12.0	25.0	19.8	17.0	13.9	10.7	
Design thick. (in.)		0.450	0.338	0.281	0.225	0.169	0.450	0.338	0.281	0.225	0.169	
Size (in.)		6 x 4					6 x 3					

A500

BEAM LOAD TABLES

ASTM A500 Grade C

Rectangular HSS – Strong-Axis Bending

F_y = 345 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm mm		HSS 127 x 102					HSS 127 x 76					Approx. Deflect. (mm)
		13	9.5	7.9	6.4	4.8	13	9.5	7.9	6.4	4.8	
Mass (kg/m)		37.3	29.5	25.2	20.7	16.0	32.2	25.7	22.1	18.2	14.1	
Span in Millimetres	500	700	593	524	444	352	692	581	512	426	335	1
	1 000	437	355	308	256	201	353	291	256	213	167	2
	1 500	291	237	205	171	134	235	194	171	142	112	4
	2 000	219	178	154	128	100	176	145	128	107	84	8
	2 500	175	142	123	102	80	141	116	102	85	67	12
	3 000	146	118	103	85	67	118	97	85	71	56	18
	3 500	125	101	88	73	57	101	83	73	61	48	24
	4 000	109	89	77	64	50	88	73	64	53	42	31
DESIGN DATA AND PROPERTIES												
S_x (10^3 mm^3)		137	115	101	85.4	67.6	106	90.7	80.6	68.5	54.6	
Z_x (10^3 mm^3)		176	143	124	103	80.8	142	117	103	85.8	67.4	
I_x (10^6 mm^4)		8.67	7.29	6.42	5.42	4.29	6.72	5.76	5.12	4.35	3.47	
C_{rt} (mm^2)		1 860	1 590	1 410	1 190	944	1 860	1 590	1 410	1 190	944	
$V_{r\,max}$ (kN)		381	326	288	244	194	381	326	288	244	194	
$V_{r\,min}$ (kN)		346	296	262	222	176	346	296	262	222	176	
IMPERIAL SIZE AND WEIGHT												
Weight (lb./ft.)		25.0	19.8	17.0	13.9	10.7	21.6	17.3	14.9	12.2	9.5	
Design thick. (in.)		0.450	0.338	0.281	0.225	0.169	0.450	0.338	0.281	0.225	0.169	
Size (in.)		5 x 4					5 x 3					

A500

BEAM LOAD TABLES

ASTM A500 Grade C

Rectangular HSS – Strong-Axis Bending

F_y = 345 MPa

ϕ = 0.90

Total Uniformly Distributed Factored Loads for Laterally Supported Beams (kN)

Size mm x mm		HSS 102 x 76					HSS 102 x 51					Approx. Deflect. (mm)
		9.5	7.9	6.4	4.8	3.2	9.5	7.9	6.4	4.8	3.2	
Mass (kg/m)		21.9	18.9	15.6	12.2	8.35	18.1	15.7	13.1	10.3	7.09	
Span in Millimetres	500	408	359	302	239	167	307	273	233	186	131	1
	1 000	204	179	151	119	84	154	137	116	93	66	2
	1 500	136	120	101	80	56	102	91	78	62	44	6
	2 000	102	90	76	60	42	77	68	58	47	33	10
	2 500	82	72	60	48	33	61	55	47	37	26	15
	3 000	68	60	50	40	28	51	46	39	31	22	22
	3 500	58	51	43	34	24	44	39	33	27	19	30
	4 000	51	45	38	30	21	38	34	29	23	16	39
DESIGN DATA AND PROPERTIES												
S_x (10^3 mm^3)		63.8	57.2	49.1	39.6	28.1	45.2	41.2	36.0	29.4	21.2	
Z_x (10^3 mm^3)		82.1	72.2	60.8	48.1	33.6	61.8	55.0	46.9	37.5	26.4	
I_x (10^6 mm^4)		3.24	2.91	2.50	2.01	1.43	2.29	2.09	1.83	1.49	1.08	
C_{rt} (mm^2)		1 150	1 040	901	726	516	1 150	1 040	901	726	516	
$V_{r\,max}$ (kN)		237	214	185	149	106	237	214	185	149	106	
$V_{r\,min}$ (kN)		215	194	168	135	96.1	215	194	168	135	96.1	
IMPERIAL SIZE AND WEIGHT												
Weight (lb./ft.)		14.7	12.7	10.5	8.2	5.6	12.2	10.6	8.8	6.9	4.8	
Design thick. (in.)		0.338	0.281	0.225	0.169	0.113	0.338	0.281	0.225	0.169	0.113	
Size (in.)		4 x 3					4 x 2					

A500