UK EUROCODES

Steel Building Design: Design Data

Universal Column resistances in S460M steel

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FOREWORD

This publication presents design data for Universal Column sections in S460 steel, derived in accordance with BS EN 1993-1-1[1] and its National Annex[2]. The aim of the publication is to facilitate the design of columns in simple construction, used in braced frames.

This publication is a supplement to P363[3], which contains extensive explanatory notes on the derivation of section properties and member resistances; only information specific to the use of S460 steel is given in this publication.

The preparation of this publication was completed by Mr D G Brown, of the SCI.

The work leading to this publication has been funded by ArcelorMittal and their support is gratefully acknowledged.

Contents

1 EXPLANATORY NOTES

1.1 General

This publication is a supplement to P363[3], which should be consulted for comprehensive notes on the derivation of section properties and member resistances. Only notes specific to the design of Universal Columns in S460 steel are given in the following sections.

1.1.1 Section properties

Section properties follow the format of P363. Although the Buckling parameter *U* and the Torsional index *X* are not required for calculations in accordance with the Eurocode, values have been provided to facilitate design to BS 5950[4], if required.

1.2 Material

This publication covers the design of Universal Column sections in S460M steel conforming to EN 10025-4[5]. The range of sections includes those defined in BS 4-1[6] and some additional sections indicated with a '+' symbol in the tables. Tolerances conform to EN 10034[7].

1.3 Resistance Tables: general notes

Design resistance tables are given for steel grade S460, calculated in accordance with BS EN 1993-1-1[1].

1.3.1 Partial factors

The following partial factors for resistance have been used throughout the publication for the calculation of the design resistances. The values are those given in the relevant UK National Annexes to Eurocode 3:

γ_{M0} = 1.0 for the resistance of cross sections

γ_{M1} = 1.0 for the resistance of members

1.3.2 Yield strength

The member resistance tables are based on the following values of yield strength f_y. The use of the values in the product standard is specified in the UK National Annex to BS EN 1993-1-1[2].

Steel Grade	Maximum thickness less than or equal to (mm)	Yield strength f_y (N/mm^2)
S460	16	460
	40	440
	63	430
	80	410
	100	400
	150	385

Table 5 of EN 10025-4 provides minimum yield strengths for material up to 120 mm thick, but this is extended to 150 mm for long products (such as Universal Columns) by note d to Table 5.

1.3.3 Section classification

Under axial load and bending, the following Universal Columns in S460 steel are Class 3:

356 × 368 × 153
356 × 368 × 129
305 × 305 × 97
254 × 254 × 73
203 × 203 × 46
152 × 152 × 23

The lateral torsional buckling resistance $M_{v,Rd}$ for the columns listed above is based on the elastic section modulus. An effective Class 2 web cannot be utilised as the flanges of the columns listed above are Class 3.

All other Universal Columns in S460 are at least Class 2, for all values of axial load. For sections which are at least Class 2, the lateral torsional buckling resistance is based on the plastic section modulus.

Since all Universal Column sections are at least Class 3, all compression resistances are based on gross section properties.

1.4 Flexural buckling resistance

The selection of buckling curve is made from Table 6.2 of BS EN 1993-1-1. Some of the heaviest sections in the range have $h/b > 1.2$ and a flange thickness greater than 100 mm, so are not covered by Table 6.2. For the few sections that fall in this category, buckling curve a is used for major axis buckling and curve b for minor axis buckling[8]. It is anticipated that the Eurocode will be amended to include this guidance.

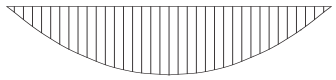
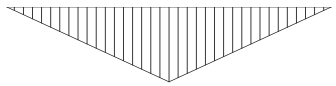
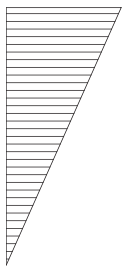
1.5 Lateral torsional buckling resistance

The lateral torsional buckling resistance moment $M_{b,Rd}$ is given in the tables for a range of values of the length between lateral restraints, L, given at the head of the tables and the value of factor C_1.

C_1 is a factor that takes into account the shape of the bending moment diagram. Values of C_1 given in the tables include 1.0; 1.13; 1.35; 1.5; 1.77; 2.0 and 2.5. Access Steel document SN003 *Elastic critical moment for lateral torsional buckling*[9] gives background information related to this factor. To take $C_1 = 1.0$ is conservative.

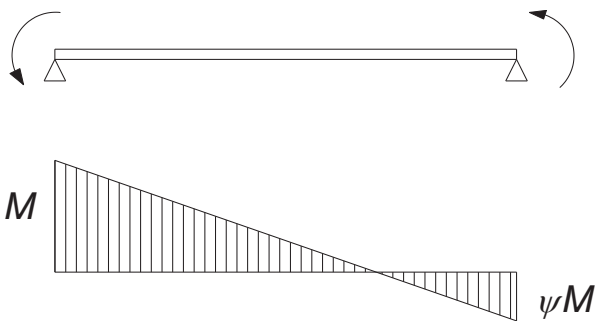
The C_1 values of 1.13, 1.35 and 1.77 correspond to common design situations, as shown in Table 1.1.

Table 1.1 C_1 values for common bending moment diagrams

Loading	Bending moment diagram	C_1 factor
UDL, pin-ended beam		1.13
Central point load, pin-ended beam		1.35
Triangular bending moment diagram, pin at one end		1.77

For linear bending moment diagrams, C_1 may be determined from Table 1.2, based on ψ, the ratio of the end moments.

Table 1.2 C_1 values for linear bending moment diagrams

End moment loading	ψ	C_1
	+1.00	1.00
	+0.75	1.17
	+0.50	1.36
	+0.25	1.56
	0.00	1.77
	-0.25	2.00
	-0.50	2.24
	-0.75	2.49
	-1.00	2.76

For reversing bending moments when $\psi = -1.0$, it is conservative to take $C_1 = 2.5$, which is the value given in the resistance tables.

2 THE USE OF S460 STEEL

2.1 The advantages of S460 Steel

Although there is likely to be a cost premium over other grades of steel, the higher grade is structurally efficient, particularly in flexural buckling, because a more advantageous buckling curve can be used to calculate the resistance. This leads to the selection of lighter, smaller sections. In some cases the use of S460 steel may be an alternative to local strengthening at joints.

2.2 Steel specification

Steel should be specified as S460M, in accordance with EN 10025-4[5].

2.3 Design considerations

There are no special design considerations when using S460 steel, as this strength grade is within the scope of BS EN 1993-1-1.

2.4 Limiting thickness

It is recommended that PD 6695-1-10[10] be used to determine the maximum thickness of steelwork used internally and used externally.

For a column in simple construction in S460M, where the axial compression is sufficient to ensure there is no tension due to the nominal moments, assuming the joint is bolted, the limiting thicknesses from PD 6695-1-10 are:

- Internal steelwork: 137.5 mm
- External Steelwork: 115 mm

If greater thicknesses are necessary, S460ML may be specified.

2.5 Fabrication considerations

The use of S460 steel should not make fabrication more onerous. As for any steel, weld procedures will be required which are appropriate for the material. The key measure of weldability is the carbon equivalent value (CEV), which is very similar for S355 steels and S460M, meaning that weld procedures for S460M should not be any more onerous.

All fabricated steelwork must be in accordance with BS EN 1090[11], and CE Marked. The Certificate of Conformity or the Welding Certificate provided by the steelwork contractor will specify the base materials covered within its scope, so this must include S460 steel.

3 THE DESIGN OF COLUMNS IN SIMPLE CONSTRUCTION

Columns in 'simple construction' are those found in braced multi-storey buildings. The columns carry predominantly axial compression, together with bending moments due to any out-of-balance moments from the beam reactions, which are assumed to act 100 mm from the face of the column. At a given floor level, any applied moment is divided in proportion to the stiffness (I/L) of the column above and below, unless the ratio of column stiffness is less than 1.5, when the moment is divided equally.

Full details and justification of the design approach are given in SN048b-EN-GB[12], which has the status of Non-contradictory complementary information (NCCI).

The application of the simplified expression given in SN048b-EN-GB is subject to the following limitations:

- The column is a hot rolled open section, or hollow section.
- The member is Class 1, 2 or 3 under compression.
- The bending moment diagrams are linear about both axes.
- The column is restrained laterally at each floor level, but unrestrained between floors.
- For Class 1 and 2 sections, the bending moment diagram must reverse (*i.e.* $\psi < 0$). In a ground floor column, when $\psi = 0$, $N_{Ed}/N_{b,y,Rd} < 0.83$.
- For Class 3 sections, the simplified expression is valid if $\psi \leq 0$.

In almost all cases, it can be seen by inspection that these conditions are satisfied. All S460 universal columns are at least Class 3 under compression (Section 1.3.3). The design assumption is that the bending moment diagrams reverse (*i.e.* $\psi < 0$). For ground floor columns, it is highly unlikely that $N_{Ed}/N_{b,y,Rd} > 0.83$, as minor axis buckling will be critical for Universal Column sections.

When the above conditions are satisfied, the following expression may be used to verify columns in simple construction:

$$\frac{N_{Ed}}{N_{b,z,Rd}} + \frac{M_{y,Ed}}{M_{b,Rd}} + 1.5\frac{M_{z,Ed}}{M_{c,z,Rd}} \leq 1.0$$

4 WORKED EXAMPLES

The following worked examples demonstrate the use of the resistance tables. In each example, it is assumed that the stiffness (I/L) of columns above and below are within a ratio of 1.5; applied moments are therefore distributed equally at floor levels. In all cases, the beam end reactions are assumed to be applied 100 mm from the face of the column (web or flange) in accordance with SN048b.

4.1 Internal column

In this example, the beam spans and loading about each axis are identical; there are no out-of-balance loads – the column is subject to axial load only. The column buckling length is 4 m, and is shown, with design values of actions, in Figure 4.1.

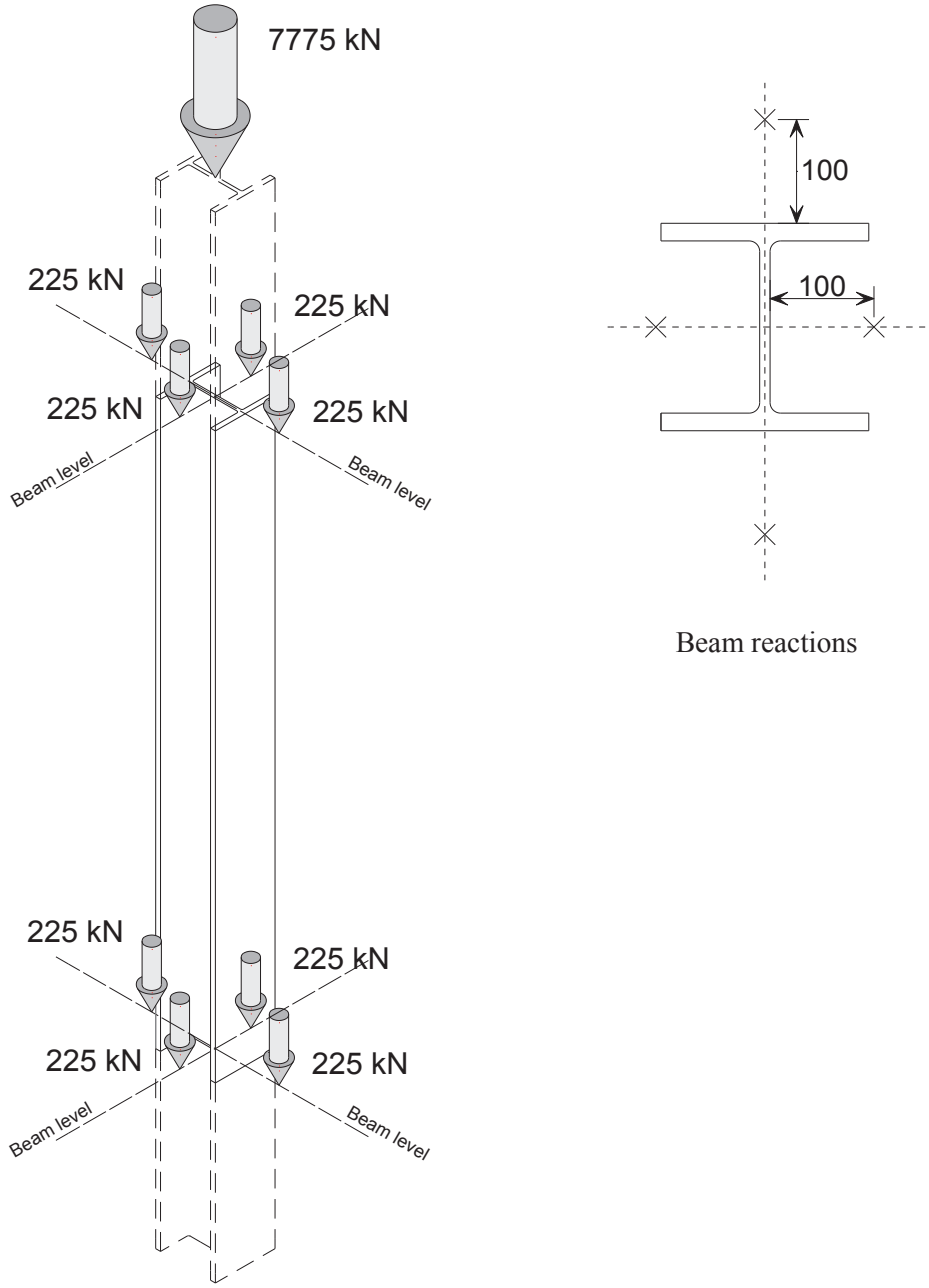


Figure 4.1 Example 1: Internal Column

N_{Ed} = 8675 kN

From the compression tables:

For 356 × 368 × 177 $N_{b,z,Rd}$ = 8810 kN, OK

For 305 × 305 × 198 $N_{b,z,Rd}$ = 9270 kN, OK

In S355, appropriate sections would be:

356 × 406 × 235, or

305 × 305 × 283

4.2 Edge column (1)

In this example, the beam spans and loading in the minor axis are identical. In the major axis, the column is loaded from a beam on one side only. The column buckling length is 4 m. The column is shown in Figure 4.2.

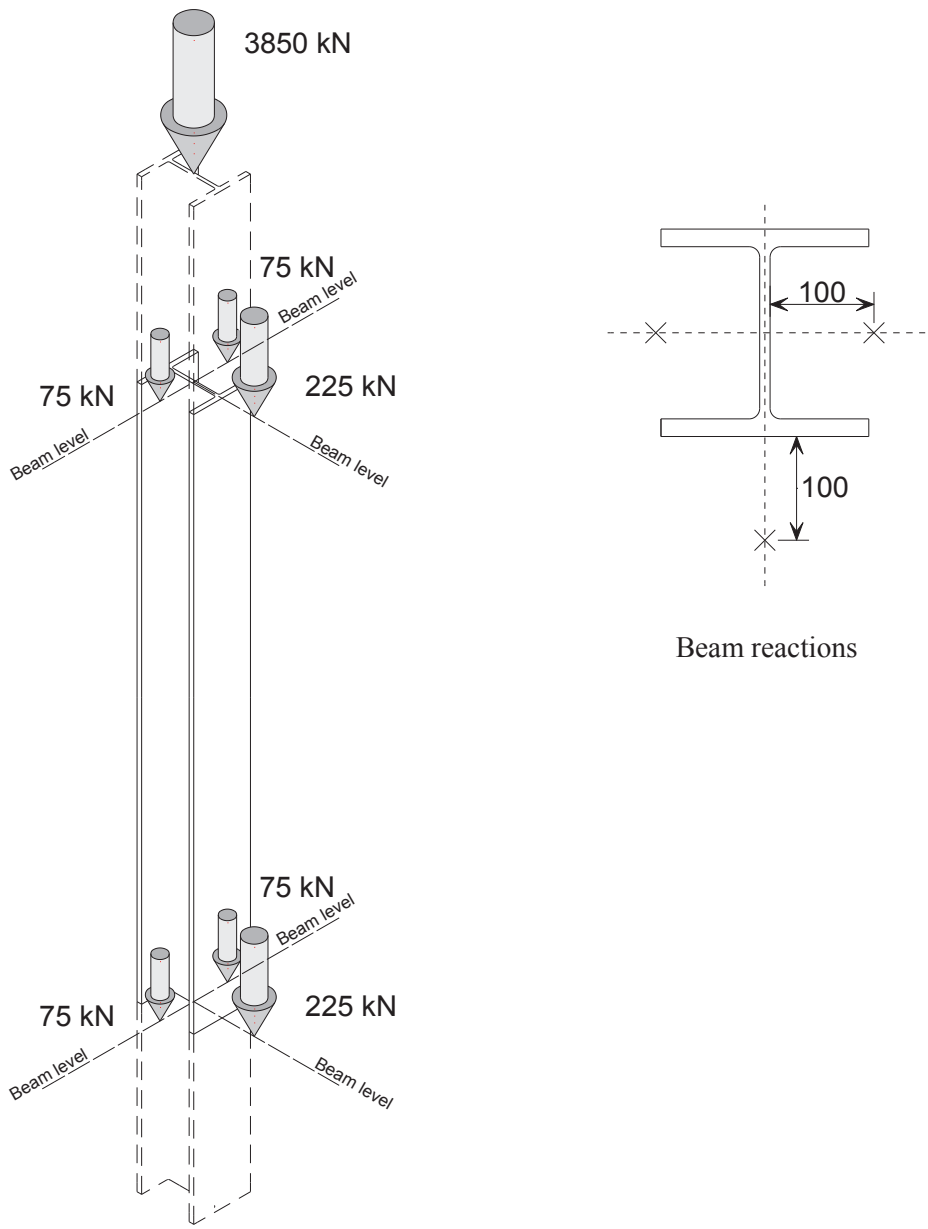


Figure 4.2 Example 2: Edge column

N_{Ed} = 3850 + 225 + 2 × 75 = 4225 kN

Try 305 × 305 × 97

From the section property tables, h = 307.9 mm

Applied moment = 225 × (100 + 307.9/2) × 10^{-3} = 57.14 kNm

Moment in the column = 0.5 × 57.14 = 28.57 kNm

Because the applied moments at the top and bottom of the column are equal and opposite, ψ = -1, and C_1 is taken as 2.5 (see Table 1.2).

From the compression tables:

$N_{b,z,Rd}$ = 4580 kN

From the bending tables:

$M_{b,Rd}$ = 665 kNm

$M_{c,z,Rd}$ = 220 kNm

Using the simplified expression:

$$\frac{4225}{4580}+\frac{28.57}{665}+1.5\frac{0}{220}=0.97, \text{OK}$$

Alternatively, try 254 × 254 × 107

From the section property tables, h = 266.7 mm

Applied moment = 225 × (100 + 266.7/2) × 10^{-3} = 52.50 kNm

Moment in the column = 0.5 × 52.50 = 26.25 kNm

Because the applied moments at the top and bottom of the column are equal and opposite, ψ = -1, and C_1 is taken as 2.5 (see Table 1.2).

From the compression tables:

$N_{b,z,Rd}$ = 4450 kN

From the bending tables:

$M_{b,Rd}$ = 653 kNm

$M_{c,z,Rd}$ = 307 kNm

Using the simplified expression:

$$\frac{4225}{4450}+\frac{26.25}{653}+1.5\frac{0}{307}=0.99, \text{OK}$$

In S355, appropriate sections would be:

305 × 305 × 137

356 × 368 × 129

4.3 Edge column (2)

In this example, the column is verified between the ground level (pinned base) and the first floor. At the first floor, the beam spans and loading in the minor axis are identical. The column buckling length is 8 m and is shown in Figure 4.3.

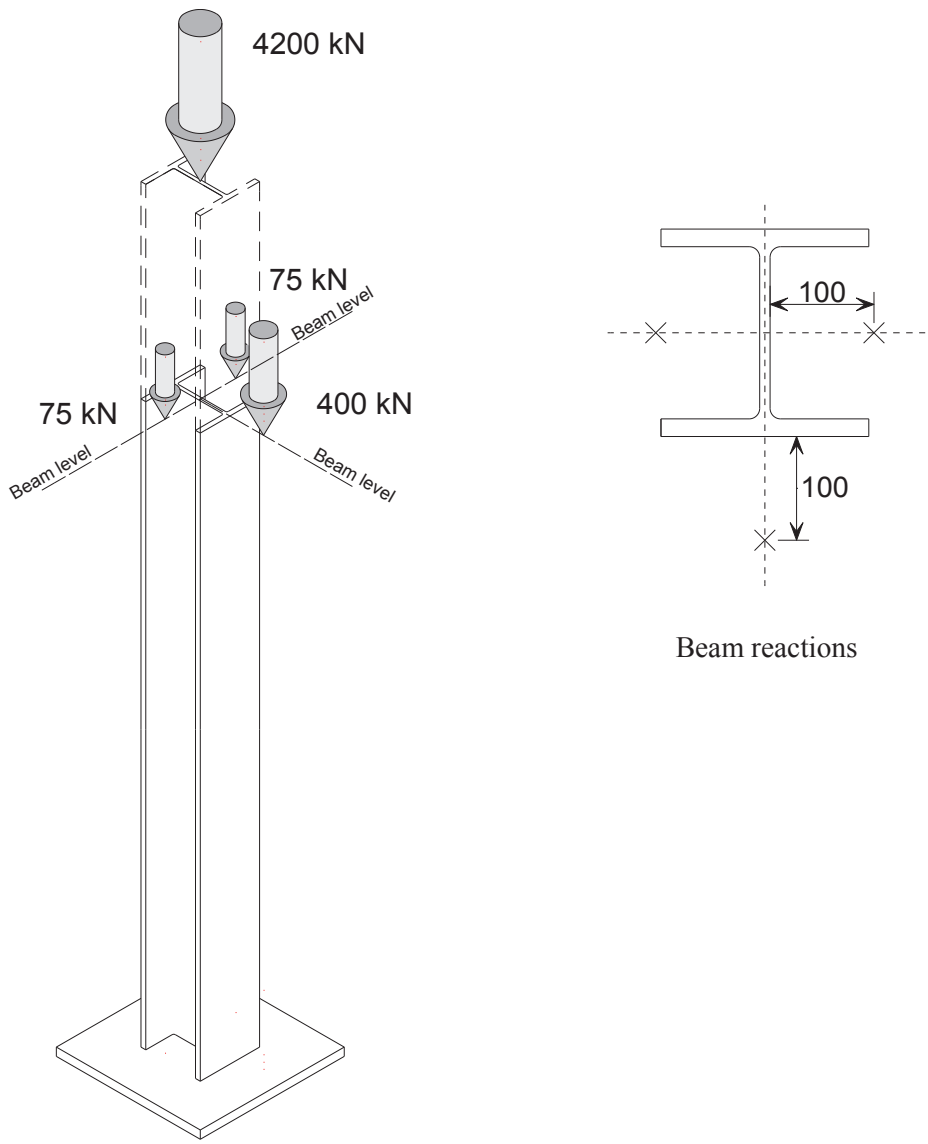


Figure 4.3 Example 3: Edge Column – first storey

N_{Ed} = 4200 + 400 + 2 × 75 = 4750 kN

Try 356 × 368 × 177

From the section property tables, h = 368.2 mm

Applied moment = 400 × (100 + 368.2/2) × 10^{-3} = 113.64 kNm

Moment in the column = 0.5 × 113.64 = 56.82 kNm

Because the moment at the pinned base is zero, from Table 1.1, $\psi = 0$ and C_1 is 1.77.

From the compression tables:

$N_{b,y,Rd} = 8270$ kN

$N_{b,z,Rd} = 5130$ kN

From the bending tables:

$M_{b,Rd} = 1520$ kNm

$M_{c,z,Rd} = 735$ kNm

$$N_{Ed} / N_{b,y,Rd} = 4750 / 8270 = 0.57 < 0.83, \text{ OK}$$

Using the simplified expression:

$$\frac{4750}{5130} + \frac{56.82}{1520} + 1.5\frac{0}{735} = 0.96, \text{ OK}$$

In S355, an appropriate section would be:

356 × 406 × 235

4.4 Corner column

In this example, in both axes, the column is loaded from a beam on one side only. The column buckling length is 4 m and is shown, with design values of actions, in Figure 4.4.

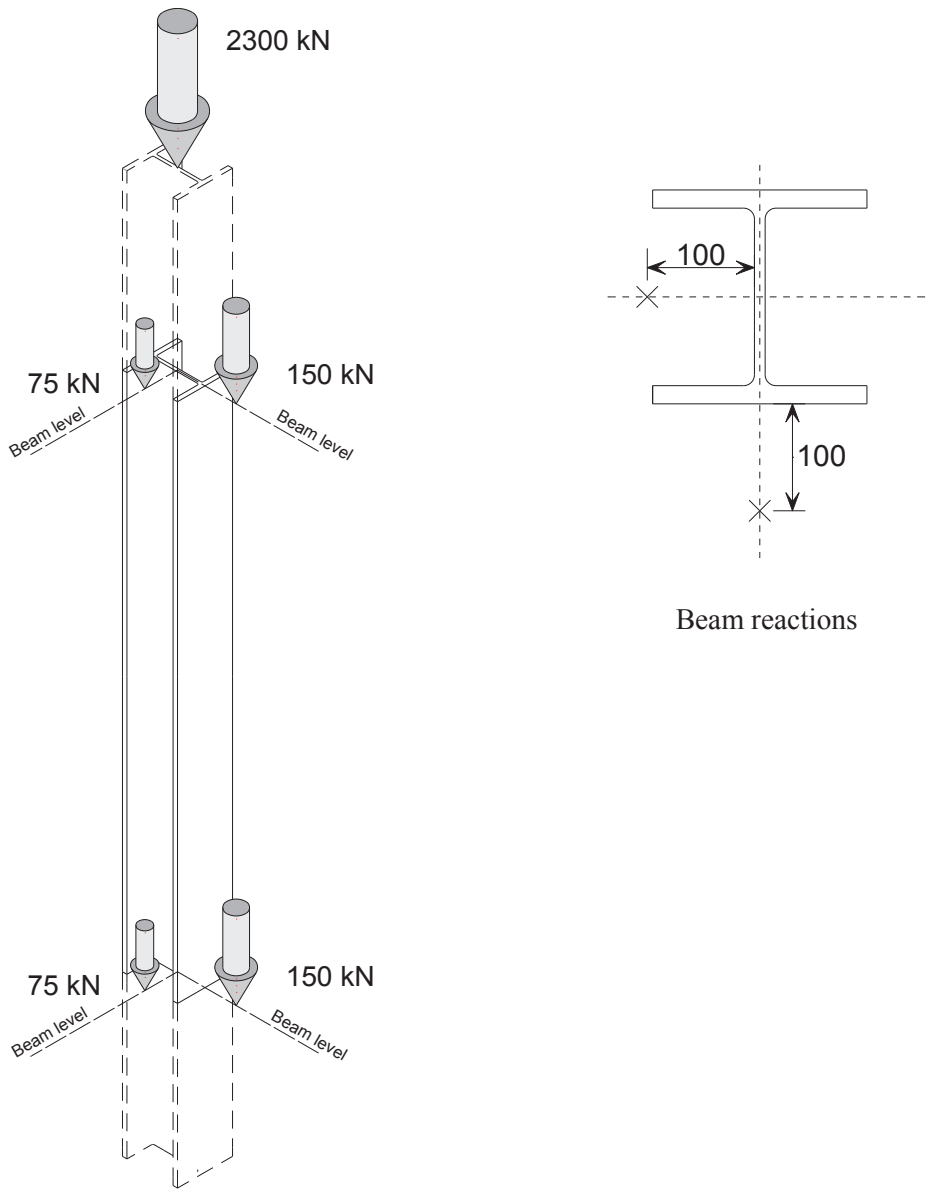


Figure 4.4 Example 4: Corner column

N_{Ed} = 2300 + 150 + 75 = 2525 kN

Try 254 × 254 × 73

From the section property tables, h = 254.1 mm; t_w = 8.6 mm

Applied moment (y-y axis) = 150 × (100 + 254.1/2) × 10^{-3} = 34.06 kNm

Applied moment (z-z axis) = 75 × (100 + 8.6/2) × 10^{-3} = 7.82 kNm

Moment in the column = 0.5 × 34.06 = 17.03 kNm (y-y axis)

Moment in the column = 0.5 × 7.82 = 3.91 kNm (z-z axis)

Because the applied moments at the top and bottom of the column are equal and opposite, $\psi = -1$, and C_1 is taken as 2.5 (see Table 1.2).

From the compression tables:

$N_{b,z,Rd} = 3090$ kN

From the bending tables:

$M_{b,Rd} = 413$ kNm

$M_{c,z,Rd} = 141$ kNm

Using the simplified expression:

$$\frac{2525}{3090} + \frac{17.03}{413} + 1.5\frac{3.91}{141} = 0.90, \text{ OK}$$

Alternatively, try 203 × 203 × 86

From the section property tables, $h = 222.2$ mm; $t_w = 12.7$ mm

Applied moment (y-y axis) = 150 × (100 + 222.2/2) × 10^{-3} = 31.67 kNm

Applied moment (z-z axis) = 75 × (100 + 12.7/2) × 10^{-3} = 7.98 kNm

Moment in the column = 0.5 × 31.67 = 15.84 kNm (y-y axis)

Moment in the column = 0.5 × 7.98 = 3.99 kNm (z-z axis)

Because the applied moments at the top and bottom of the column are equal and opposite, $\psi = -1$, and C_1 is taken as 2.5 (see Table 1.2).

From the compression tables:

$N_{b,z,Rd} = 2910$ kN

From the bending tables:

$M_{b,Rd} = 430$ kNm

$M_{c,z,Rd} = 201$ kNm

Using the simplified expression:

$$\frac{2525}{2910} + \frac{15.84}{430} + 1.5\frac{3.99}{201} = 0.93, \text{ OK}$$

In S355, appropriate sections would be:

305 × 305 × 97

254 × 254 × 107

5 REFERENCES

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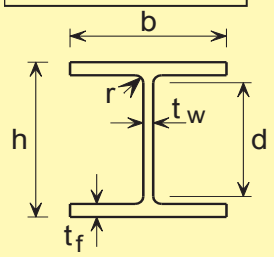
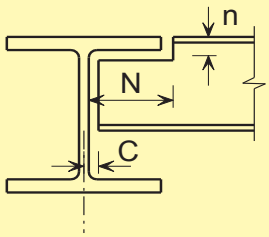
6 DIMENSIONS AND GROSS SECTION PROPERTIES

BS EN 1993-1-1:2005
BS 4-1:2005

UNIVERSAL COLUMNS





Dimensions

Section Designation	Mass per Metre	Depth of Section	Width of Section	Thickness		Root Radius	Depth between Fillets	Ratios for Local Buckling		Dimensions for Detailing			Surface Area	
				Web	Flange			Flange	Web	End Clearance	Notch		Per Metre	Per Tonne
		h	b	t_w	t_f	r	d	c_f / t_f	c_w / t_w	C	N	n		
	kg/m	mm	mm	mm	mm	mm	mm			mm	mm	mm	m^2	m^2
356x406x1299 +	1299.0	600.0	476.0	100.0	140.0	15.4	290.0	1.23	2.89	52	198	156	2.88	2.22
356x406x1202 +	1202.0	580.0	471.0	95.0	130.0	15.4	290.0	1.33	3.04	50	198	146	2.83	2.35
356x406x1086 +	1086.0	569.0	454.0	78.0	125.0	15.0	290.0	1.38	3.71	41	198	140	2.77	2.55
356x406x990 +	990.0	550.0	448.0	71.9	115.0	15.0	290.0	1.50	4.03	38	200	130	2.72	2.75
356x406x900 +	900.0	531.0	442.0	65.9	106.0	15.0	290.0	1.63	4.39	35	200	122	2.67	2.96
356x406x818 +	818.0	514.0	437.0	60.5	97.0	15.0	290.0	1.79	4.79	32	200	112	2.63	3.12
356x406x744 +	744.0	498.0	432.0	55.6	88.9	15.0	290.0	1.95	5.22	30	200	104	2.59	3.48
356x406x677 +	677.0	483.0	428.0	51.2	81.5	15.0	290.0	2.13	5.66	28	200	98	2.55	3.76
356x406x634	633.9	474.6	424.0	47.6	77.0	15.2	290.2	2.25	6.10	26	200	94	2.52	3.98
356x406x592 +	592.0	465.0	421.0	45.0	72.3	15.0	290.0	2.39	6.45	25	198	88	2.50	4.22
356x406x551	551.0	455.6	418.5	42.1	67.5	15.2	290.2	2.56	6.89	23	200	84	2.47	4.48
356x406x509 +	509.0	446.0	416.0	39.1	62.7	15.0	290.0	2.77	7.42	22	200	78	2.45	4.81
356x406x467	467.0	436.6	412.2	35.8	58.0	15.2	290.2	2.98	8.11	20	200	74	2.42	5.18
356x406x393	393.0	419.0	407.0	30.6	49.2	15.2	290.2	3.52	9.48	17	200	66	2.38	6.06
356x406x340	339.9	406.4	403.0	26.6	42.9	15.2	290.2	4.03	10.9	15	200	60	2.35	6.91
356x406x287	287.1	393.6	399.0	22.6	36.5	15.2	290.2	4.74	12.8	13	200	52	2.31	8.05
356x406x235	235.1	381.0	394.8	18.4	30.2	15.2	290.2	5.73	15.8	11	200	46	2.28	9.70
356x368x202	201.9	374.6	374.7	16.5	27.0	15.2	290.2	6.07	17.6	10	190	44	2.19	10.8
356x368x177	177.0	368.2	372.6	14.4	23.8	15.2	290.2	6.89	20.2	9	190	40	2.17	12.3
356x368x153	152.9	362.0	370.5	12.3	20.7	15.2	290.2	7.92	23.6	8	190	36	2.16	14.1
356x368x129	129.0	355.6	368.6	10.4	17.5	15.2	290.2	9.4	27.9	7	190	34	2.14	16.6
305x305x283	282.9	365.3	322.2	26.8	44.1	15.2	246.7	3.00	9.21	15	158	60	1.94	6.86
305x305x240	240.0	352.5	318.4	23.0	37.7	15.2	246.7	3.51	10.7	14	158	54	1.91	7.96
305x305x198	198.1	339.9	314.5	19.1	31.4	15.2	246.7	4.22	12.9	12	158	48	1.87	9.44
305x305x158	158.1	327.1	311.2	15.8	25.0	15.2	246.7	5.30	15.6	10	158	42	1.84	11.6
305x305x137	136.9	320.5	309.2	13.8	21.7	15.2	246.7	6.11	17.90	9	158	38	1.82	13.3
305x305x118	117.9	314.5	307.4	12.0	18.7	15.2	246.7	7.09	20.6	8	158	34	1.81	15.4
305x305x97	96.9	307.9	305.3	9.9	15.4	15.2	246.7	8.60	24.9	7	158	32	1.79	18.5
254x254x167	167.1	289.1	265.2	19.2	31.7	12.7	200.3	3.48	10.4	12	134	46	1.58	9.46
254x254x132	132.0	276.3	261.3	15.3	25.3	12.7	200.3	4.36	13.1	10	134	38	1.55	11.7
254x254x107	107.1	266.7	258.8	12.8	20.5	12.7	200.3	5.38	15.6	8	134	34	1.52	14.2
254x254x89	88.9	260.3	256.3	10.3	17.3	12.7	200.3	6.38	19.4	7	134	30	1.50	16.9
254x254x73	73.1	254.1	254.6	8.6	14.2	12.7	200.3	7.77	23.3	6	134	28	1.49	20.4
203x203x86	86.1	222.2	209.1	12.7	20.5	10.2	160.8	4.29	12.7	8	110	32	1.24	14.4
203x203x71	71.0	215.8	206.4	10.0	17.3	10.2	160.8	5.09	16.1	7	110	28	1.22	17.2
203x203x60	60.0	209.6	205.8	9.4	14.2	10.2	160.8	6.20	17.1	7	110	26	1.21	20.2
203x203x52	52.0	206.2	204.3	7.9	12.5	10.2	160.8	7.04	20.4	6	110	24	1.20	23.1
203x203x46	46.1	203.2	203.6	7.2	11.0	10.2	160.8	8.00	22.3	6	110	22	1.19	25.8
152x152x37	37.0	161.8	154.4	8.0	11.5	7.6	123.6	5.70	15.5	6	84	20	0.912	24.7
152x152x30	30.0	157.6	152.9	6.5	9.4	7.6	123.6	6.98	19.0	5	84	18	0.901	30.0
152x152x23	23.0	152.4	152.2	5.8	6.8	7.6	123.6	9.65	21.3	5	84	16	0.889	38.7

+ These sections are in addition to the range of BS 4 sections.

BS EN 1993-1-1:2005
BS 4-1:2005

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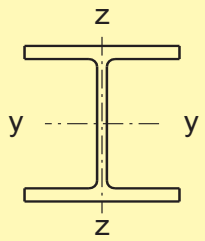


Properties

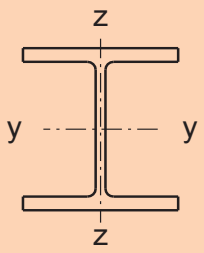
Section Designation	Second Moment of Area		Radius of Gyration		Elastic Modulus		Plastic Modulus		Buckling Parameter	Torsional Index	Warping Constant	Torsional Constant	Area of Section
	Axis y-y	Axis z-z	Axis y-y	Axis z-z	Axis y-y	Axis z-z	Axis y-y	Axis z-z					
	cm^4	cm^4	cm	cm	cm^3	cm^3	cm^3	cm^3	U	X	I_w dm^6	I_T cm^4	A cm^2
356x406x1299 +	755000	254000	21.4	12.4	25200	10700	33300	16700	0.847	3.36	133.1	98100	1650
356x406x1202 +	664000	229000	20.8	12.2	22900	9710	30000	15200	0.842	3.52	114.6	79200	1530
356x406x1086 +	596000	196000	20.7	11.9	20900	8650	27200	13400	0.852	3.74	96.1	62300	1386
356x406x990 +	519000	173000	20.3	11.7	18900	7740	24300	12000	0.851	3.97	81.5	48200	1262
356x406x900 +	450000	153000	19.8	11.6	17000	6940	21600	10700	0.849	4.21	68.9	37400	1149
356x406x818 +	392000	136000	19.4	11.4	15300	6200	19300	9560	0.847	4.51	58.7	28500	1043
356x406x744 +	342000	120000	19.0	11.3	13700	5550	17200	8550	0.845	4.82	50.0	21800	948
356x406x677 +	300000	107000	18.6	11.1	12400	4990	15400	7680	0.844	5.15	42.9	16800	863
356x406x634	275000	98100	18.4	11.0	11600	4630	14200	7110	0.843	5.46	38.8	13700	808
356x406x592 +	250000	90200	18.2	10.9	10800	4280	13100	6570	0.843	5.68	34.7	11600	755
356x406x551	227000	82700	18.0	10.9	9960	3950	12100	6060	0.841	6.05	31.1	9240	702
356x406x509 +	205000	75400	17.8	10.7	9170	3630	11000	5550	0.840	6.37	27.6	7513	649
356x406x467	183000	67800	17.5	10.7	8380	3290	10000	5030	0.839	6.85	24.3	5810	595
356x406x393	147000	55400	17.1	10.5	7000	2720	8220	4150	0.837	7.86	18.9	3550	501
356x406x340	123000	46900	16.8	10.4	6030	2330	7000	3540	0.836	8.84	15.5	2340	433
356x406x287	99900	38700	16.5	10.3	5070	1940	5810	2950	0.835	10.17	12.3	1440	366
356x406x235	79100	31000	16.3	10.2	4150	1570	4690	2380	0.834	12.04	9.54	812	299
356x368x202	66300	23700	16.1	9.60	3540	1260	3970	1920	0.844	13.35	7.16	558	257
356x368x177	57100	20500	15.9	9.54	3100	1100	3460	1670	0.844	15.00	6.09	381	226
356x368x153	48600	17600	15.8	9.49	2680	948	2960	1430	0.844	17.01	5.11	251	195
356x368x129	40200	14600	15.6	9.43	2260	793	2480	1200	0.844	19.81	4.18	153	164
305x305x283	78900	24600	14.8	8.27	4320	1530	5110	2340	0.855	7.64	6.35	2030	360
305x305x240	64200	20300	14.5	8.15	3640	1280	4250	1950	0.854	8.73	5.03	1270	306
305x305x198	50900	16300	14.2	8.04	3000	1040	3440	1580	0.854	10.23	3.88	734	252
305x305x158	38700	12600	13.9	7.90	2370	808	2680	1230	0.851	12.46	2.87	378	201
305x305x137	32800	10700	13.7	7.83	2050	692	2300	1050	0.851	14.13	2.39	249	174
305x305x118	27700	9060	13.6	7.77	1760	589	1960	895	0.850	16.14	1.98	161	150
305x305x97	22200	7310	13.4	7.69	1450	479	1590	726	0.850	19.19	1.56	91.2	123
254x254x167	30000	9870	11.9	6.81	2080	744	2420	1140	0.851	8.48	1.63	626	213
254x254x132	22500	7530	11.6	6.69	1630	576	1870	878	0.850	10.32	1.19	319	168
254x254x107	17500	5930	11.3	6.59	1310	458	1480	697	0.848	12.38	0.898	172	136
254x254x89	14300	4860	11.2	6.55	1100	379	1220	575	0.850	14.46	0.717	102	113
254x254x73	11400	3910	11.1	6.48	898	307	992	465	0.849	17.24	0.562	57.6	93.1
203x203x86	9450	3130	9.28	5.34	850	299	977	456	0.850	10.20	0.318	137	110
203x203x71	7620	2540	9.18	5.30	706	246	799	374	0.853	11.90	0.250	80.2	90.4
203x203x60	6120	2060	8.96	5.20	584	201	656	305	0.846	14.10	0.197	47.2	76.4
203x203x52	5260	1780	8.91	5.18	510	174	567	264	0.848	15.80	0.167	31.8	66.3
203x203x46	4570	1550	8.82	5.13	450	152	497	231	0.847	17.70	0.143	22.2	58.7
152x152x37	2210	706	6.85	3.87	273	91.5	309	140	0.848	13.30	0.040	19.2	47.1
152x152x30	1750	560	6.76	3.83	222	73.3	248	112	0.849	16.00	0.031	10.5	38.3
152x152x23	1250	400	6.54	3.70	164	52.6	182	80.1	0.840	20.70	0.021	4.63	29.2

+ These sections are in addition to the range of BS 4 sections.

7 COMPRESSION RESISTANCE

COMPRESSION

UNIVERSAL COLUMNS

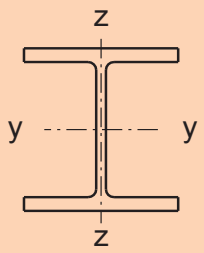


Section Designation	Axis	Compression resistance $N_{b,y,Rd}$, $N_{b,z,Rd}$, $N_{b,T,Rd}$ (kN) for Buckling lengths (m)												
		2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0
356x406x1299 +	$N_{b,y,Rd}$	63500	63500	62700	61800	60800	59700	58500	57100	55600	53800	51700	49400	46900
	$N_{b,z,Rd}$	63100	60500	57800	54700	51200	47200	42800	38400	34000	30100	26500	23500	20900
	$N_{b,T,Rd}$	63500	63500	63500	63400	63300	63200	63200	63200	63100	63100	63100	63100	63100
356x406x1202 +	$N_{b,y,Rd}$	58900	58900	58100	57200	56200	55200	54000	52700	51100	49400	47300	45100	42600
	$N_{b,z,Rd}$	58400	56000	53400	50500	47200	43400	39200	35000	31000	27300	24100	21300	18900
	$N_{b,T,Rd}$	58900	58900	58700	58600	58500	58400	58400	58400	58300	58300	58300	58300	58300
356x406x1086 +	$N_{b,y,Rd}$	53400	53400	52600	51800	50900	50000	48900	47700	46300	44600	42800	40700	38400
	$N_{b,z,Rd}$	52800	50600	48100	45400	42200	38600	34700	30800	27100	23800	21000	18500	16400
	$N_{b,T,Rd}$	53400	53300	53000	52800	52700	52700	52600	52600	52600	52600	52500	52500	52500
356x406x990 +	$N_{b,y,Rd}$	48600	48600	47800	47100	46200	45300	44300	43100	41800	40200	38500	36500	34300
	$N_{b,z,Rd}$	48000	46000	43700	41100	38100	34800	31200	27600	24200	21200	18600	16400	14500
	$N_{b,T,Rd}$	48600	48300	48000	47900	47800	47700	47700	47600	47600	47600	47600	47600	47600
356x406x900 +	$N_{b,y,Rd}$	44200	44200	43500	42800	42000	41100	40200	39000	37700	36200	34500	32600	30500
	$N_{b,z,Rd}$	43700	41800	39700	37200	34500	31300	28000	24700	21600	18900	16600	14600	12900
	$N_{b,T,Rd}$	44200	43900	43500	43400	43300	43200	43200	43100	43100	43100	43100	43100	43100
356x406x818 +	$N_{b,y,Rd}$	41700	41600	40900	40200	39400	38500	37500	36400	35000	33500	31700	29700	27700
	$N_{b,z,Rd}$	41300	40100	38700	37000	34700	31900	28500	25000	21600	18700	16200	14100	12400
	$N_{b,T,Rd}$	41700	41300	41100	41000	40900	40900	40900	40800	40800	40800	40800	40800	40800
356x406x744 +	$N_{b,y,Rd}$	37900	37800	37100	36500	35700	34900	34000	32900	31600	30100	28400	26500	24600
	$N_{b,z,Rd}$	37500	36400	35100	33500	31400	28700	25600	22300	19300	16600	14400	12600	11000
	$N_{b,T,Rd}$	37900	37500	37300	37100	37100	37000	37000	37000	36900	36900	36900	36900	36900
356x406x677 +	$N_{b,y,Rd}$	34500	34400	33800	33100	32500	31700	30800	29700	28500	27100	25500	23700	21900
	$N_{b,z,Rd}$	34200	33100	31900	30400	28400	25900	23000	20000	17300	14900	12900	11200	9840
	$N_{b,T,Rd}$	34400	34100	33800	33700	33600	33600	33500	33500	33500	33500	33400	33400	33400

+ These sections are in addition to the range of BS 4 sections.

COMPRESSION

UNIVERSAL COLUMNS

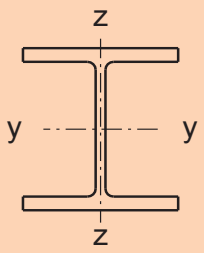


Section Designation	Axis	Compression resistance $N_{b,y,Rd}$, $N_{b,z,Rd}$, $N_{b,T,Rd}$ (kN) for Buckling lengths (m)												
		2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0
356x406x634	$N_{b,y,Rd}$	33100	32900	32300	31700	31000	30200	29300	28300	27000	25600	23900	22200	20400
	$N_{b,z,Rd}$	32700	31700	30500	29000	27000	24400	21500	18600	16000	13700	11900	10300	9040
	$N_{b,T,Rd}$	33000	32600	32300	32200	32100	32000	32000	31900	31900	31900	31900	31900	31900
356x406x592 +	$N_{b,y,Rd}$	31000	30700	30200	29600	28900	28200	27300	26300	25100	23700	22100	20500	18800
	$N_{b,z,Rd}$	30600	29600	28500	27000	25100	22700	20000	17200	14800	12700	11000	9530	8350
	$N_{b,T,Rd}$	30800	30400	30100	30000	29900	29800	29800	29700	29700	29700	29700	29700	29700
356x406x551	$N_{b,y,Rd}$	28800	28600	28000	27500	26900	26200	25300	24400	23200	21900	20400	18800	17300
	$N_{b,z,Rd}$	28400	27500	26500	25100	23300	21100	18500	16000	13700	11800	10100	8820	7730
	$N_{b,T,Rd}$	28600	28200	27900	27700	27600	27600	27500	27500	27400	27400	27400	27400	27400
356x406x509 +	$N_{b,y,Rd}$	27900	27600	27100	26500	25900	25200	24300	23200	22000	20600	19100	17500	15900
	$N_{b,z,Rd}$	27500	26600	25500	24100	22200	19800	17200	14700	12600	10800	9260	8040	7030
	$N_{b,T,Rd}$	27600	27200	26900	26700	26600	26500	26500	26400	26400	26400	26400	26300	26300
356x406x467	$N_{b,y,Rd}$	25600	25300	24800	24300	23700	23000	22200	21200	20000	18700	17200	15800	14300
	$N_{b,z,Rd}$	25200	24400	23300	22000	20200	18000	15700	13400	11400	9740	8380	7270	6360
	$N_{b,T,Rd}$	25300	24900	24600	24400	24200	24100	24100	24000	24000	24000	23900	23900	23900
356x406x393	$N_{b,y,Rd}$	21500	21300	20900	20400	19900	19300	18500	17600	16600	15400	14200	12900	11700
	$N_{b,z,Rd}$	21200	20500	19600	18400	16900	14900	12900	11000	9300	7940	6830	5920	5170
	$N_{b,T,Rd}$	21200	20800	20500	20300	20100	20000	19900	19900	19800	19800	19700	19700	19700
356x406x340	$N_{b,y,Rd}$	18600	18400	18000	17600	17100	16600	15900	15100	14200	13100	12000	10900	9860
	$N_{b,z,Rd}$	18300	17700	16900	15800	14500	12800	11000	9330	7920	6750	5800	5030	4390
	$N_{b,T,Rd}$	18300	17900	17600	17300	17100	17000	16900	16800	16800	16700	16700	16600	16600
356x406x287	$N_{b,y,Rd}$	16100	15900	15500	15200	14700	14200	13600	12900	12000	11000	10000	9080	8170
	$N_{b,z,Rd}$	15800	15200	14500	13600	12300	10800	9250	7820	6610	5630	4830	4190	3650
	$N_{b,T,Rd}$	15800	15400	15000	14700	14500	14300	14200	14100	14000	13900	13800	13800	13800
356x406x235	$N_{b,y,Rd}$	13200	13000	12700	12400	12000	11600	11100	10400	9710	8910	8090	7290	6560
	$N_{b,z,Rd}$	12900	12400	11800	11100	10000	8760	7460	6290	5320	4520	3880	3360	2930
	$N_{b,T,Rd}$	12900	12500	12100	11800	11500	11300	11100	10900	10800	10700	10600	10500	10500

+ These sections are in addition to the range of BS 4 sections.

COMPRESSION

UNIVERSAL COLUMNS



Section Designation	Axis	Compression resistance $N_{b,y,Rd}$, $N_{b,z,Rd}$, $N_{b,T,Rd}$ (kN) for Buckling lengths (m)												
		2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0
356x368x202	$N_{b,y,Rd}$	11300	11100	10900	10600	10300	9910	9460	8900	8260	7560	6850	6160	5530
	$N_{b,z,Rd}$	11000	10600	10000	9250	8220	7030	5890	4920	4130	3500	2990	2580	2250
	$N_{b,T,Rd}$	11000	10700	10300	9990	9700	9440	9230	9050	8900	8780	8680	8600	8530
356x368x177	$N_{b,y,Rd}$	9940	9780	9560	9320	9030	8690	8270	7770	7190	6560	5930	5320	4770
	$N_{b,z,Rd}$	9710	9320	8810	8110	7190	6140	5130	4280	3590	3040	2600	2250	1960
	$N_{b,T,Rd}$	9690	9350	9000	8660	8330	8040	7780	7560	7380	7230	7100	6990	6910
356x368x153	$N_{b,y,Rd}$	8580	8430	8240	8030	7780	7480	7120	6680	6170	5620	5070	4550	4080
	$N_{b,z,Rd}$	8370	8030	7590	6980	6180	5260	4400	3660	3070	2600	2220	1920	1670
	$N_{b,T,Rd}$	8350	8030	7700	7340	6990	6650	6360	6100	5880	5700	5550	5420	5320
356x368x129	$N_{b,y,Rd}$	7220	7090	6920	6740	6530	6270	5950	5570	5130	4660	4200	3760	3360
	$N_{b,z,Rd}$	7040	6750	6370	5850	5170	4390	3660	3050	2550	2160	1850	1600	1390
	$N_{b,T,Rd}$	7010	6740	6420	6070	5690	5330	4990	4700	4460	4260	4090	3960	3850
305x305x283	$N_{b,y,Rd}$	15500	15200	14800	14400	13900	13300	12500	11600	10600	9540	8520	7590	6760
	$N_{b,z,Rd}$	15000	14200	13100	11700	9810	8020	6520	5340	4440	3730	3180	2740	2380
	$N_{b,T,Rd}$	15100	14800	14600	14500	14400	14400	14400	14300	14300	14300	14300	14300	14300
305x305x240	$N_{b,y,Rd}$	13500	13200	12800	12400	12000	11400	10700	9840	8910	7970	7090	6280	5580
	$N_{b,z,Rd}$	13000	12300	11300	9930	8280	6710	5430	4440	3680	3100	2630	2270	1970
	$N_{b,T,Rd}$	13100	12800	12600	12400	12300	12200	12200	12100	12100	12100	12100	12100	12000
305x305x198	$N_{b,y,Rd}$	11100	10800	10500	10200	9800	9300	8690	7960	7180	6390	5660	5010	4440
	$N_{b,z,Rd}$	10700	10100	9270	8090	6700	5410	4370	3570	2960	2490	2110	1820	1580
	$N_{b,T,Rd}$	10700	10400	10200	10000	9860	9760	9690	9630	9590	9550	9530	9510	9490
305x305x158	$N_{b,y,Rd}$	8830	8610	8380	8110	7770	7350	6840	6230	5590	4950	4370	3860	3420
	$N_{b,z,Rd}$	8500	8020	7330	6360	5230	4200	3390	2760	2290	1920	1630	1400	1220
	$N_{b,T,Rd}$	8530	8220	7940	7710	7530	7380	7260	7170	7100	7040	7000	6960	6930
305x305x137	$N_{b,y,Rd}$	7630	7450	7240	7000	6700	6320	5860	5320	4760	4200	3700	3260	2890
	$N_{b,z,Rd}$	7350	6930	6320	5460	4480	3590	2890	2350	1950	1630	1390	1200	1040
	$N_{b,T,Rd}$	7370	7070	6780	6520	6300	6120	5970	5850	5760	5680	5620	5570	5530
305x305x118	$N_{b,y,Rd}$	6580	6420	6240	6020	5760	5430	5030	4560	4060	3590	3160	2780	2460
	$N_{b,z,Rd}$	6330	5960	5430	4680	3820	3060	2460	2000	1660	1390	1180	1020	882
	$N_{b,T,Rd}$	6330	6050	5750	5460	5200	4970	4790	4640	4520	4420	4340	4280	4230
305x305x97	$N_{b,y,Rd}$	5630	5490	5320	5130	4880	4570	4190	3760	3330	2920	2550	2240	1980
	$N_{b,z,Rd}$	5410	5070	4580	3890	3140	2490	1990	1620	1340	1120	952	818	711
	$N_{b,T,Rd}$	5400	5120	4800	4450	4120	3830	3600	3410	3260	3140	3050	2980	2910

COMPRESSION

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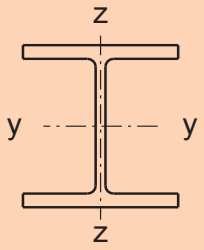

Section Designation	Axis	Compression resistance $N_{b,y,Rd}$, $N_{b,z,Rd}$, $N_{b,T,Rd}$ (kN) for Buckling lengths (m)												
		1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8.0	9.0	10.0
254x254x167	$N_{b,y,Rd}$	9370	9370	9280	9150	9010	8860	8690	8300	7790	7140	6370	5570	4820
	$N_{b,z,Rd}$	9340	9110	8860	8560	8190	7720	7140	5780	4490	3500	2770	2240	1840
	$N_{b,T,Rd}$	9350	9170	9020	8900	8810	8730	8670	8590	8530	8500	8470	8450	8440
254x254x132	$N_{b,y,Rd}$	7390	7390	7310	7200	7090	6960	6830	6500	6070	5520	4890	4250	3660
	$N_{b,z,Rd}$	7360	7180	6970	6730	6420	6040	5560	4460	3450	2680	2120	1710	1410
	$N_{b,T,Rd}$	7360	7200	7060	6940	6830	6740	6670	6550	6470	6410	6370	6340	6320
254x254x107	$N_{b,y,Rd}$	5980	5980	5910	5820	5720	5620	5500	5220	4850	4380	3850	3320	2850
	$N_{b,z,Rd}$	5960	5800	5630	5430	5170	4850	4450	3540	2730	2110	1670	1350	1110
	$N_{b,T,Rd}$	5950	5810	5680	5560	5450	5340	5250	5090	4980	4890	4830	4780	4740
254x254x89	$N_{b,y,Rd}$	4970	4970	4910	4830	4750	4660	4560	4320	4010	3610	3170	2730	2340
	$N_{b,z,Rd}$	4950	4820	4680	4500	4290	4020	3680	2920	2240	1740	1370	1110	909
	$N_{b,T,Rd}$	4940	4820	4700	4580	4460	4340	4240	4040	3890	3770	3680	3610	3560
254x254x73	$N_{b,y,Rd}$	4280	4280	4220	4150	4080	4000	3910	3690	3390	3030	2630	2250	1920
	$N_{b,z,Rd}$	4250	4140	4010	3850	3650	3400	3090	2410	1830	1410	1110	896	736
	$N_{b,T,Rd}$	4240	4130	4010	3890	3750	3620	3480	3220	3010	2840	2710	2620	2540
203x203x86	$N_{b,y,Rd}$	4840	4800	4720	4620	4520	4400	4250	3890	3420	2890	2400	1990	1670
	$N_{b,z,Rd}$	4760	4600	4400	4140	3800	3370	2910	2110	1550	1170	917	734	601
	$N_{b,T,Rd}$	4770	4650	4550	4460	4400	4340	4300	4240	4200	4170	4150	4140	4130
203x203x71	$N_{b,y,Rd}$	3980	3940	3870	3790	3710	3600	3490	3180	2780	2340	1940	1610	1340
	$N_{b,z,Rd}$	3910	3780	3610	3400	3110	2750	2370	1710	1260	952	743	595	487
	$N_{b,T,Rd}$	3910	3800	3700	3610	3530	3470	3410	3330	3270	3230	3200	3180	3170
203x203x60	$N_{b,y,Rd}$	3510	3480	3410	3330	3250	3150	3030	2730	2340	1940	1590	1310	1090
	$N_{b,z,Rd}$	3450	3320	3160	2950	2670	2330	1990	1410	1030	779	607	486	397
	$N_{b,T,Rd}$	3440	3330	3230	3120	3020	2930	2860	2730	2640	2580	2530	2500	2470
203x203x52	$N_{b,y,Rd}$	3050	3020	2960	2890	2820	2730	2630	2360	2020	1670	1370	1130	940
	$N_{b,z,Rd}$	2990	2880	2740	2560	2310	2020	1710	1220	889	671	523	419	342
	$N_{b,T,Rd}$	2980	2890	2780	2680	2570	2470	2380	2230	2120	2040	1990	1940	1910
203x203x46	$N_{b,y,Rd}$	2700	2670	2620	2560	2490	2410	2320	2080	1770	1460	1190	983	818
	$N_{b,z,Rd}$	2650	2550	2420	2260	2030	1770	1500	1060	773	584	455	364	298
	$N_{b,T,Rd}$	2640	2550	2450	2340	2230	2120	2020	1850	1730	1640	1580	1530	1500
152x152x37	$N_{b,y,Rd}$	2160	2100	2040	1970	1880	1770	1630	1310	1010	787	622	502	413
	$N_{b,z,Rd}$	2070	1950	1760	1500	1210	963	771	518	369	276	213	170	139
	$N_{b,T,Rd}$	2080	2000	1920	1850	1800	1750	1720	1670	1640	1610	1600	1590	1580
152x152x30	$N_{b,y,Rd}$	1750	1710	1660	1600	1520	1430	1310	1050	807	625	494	399	328
	$N_{b,z,Rd}$	1680	1580	1420	1210	971	770	616	413	294	220	170	135	110
	$N_{b,T,Rd}$	1690	1610	1530	1450	1370	1310	1270	1200	1150	1120	1100	1090	1070
152x152x23	$N_{b,y,Rd}$	1330	1300	1260	1210	1150	1070	976	765	584	450	355	286	235
	$N_{b,z,Rd}$	1280	1190	1060	888	705	555	442	296	210	157	121	96.6	78.7
	$N_{b,T,Rd}$	1280	1210	1130	1040	952	878	818	734	682	648	625	609	597

8 BENDING RESISTANCE

BENDING

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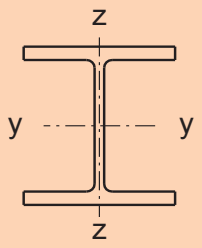


Designation Cross section resistance (kNm) Classification	C_1 (1)	Buckling Resistance Moment $M_{b,Rd}$ (kNm) for Length between lateral restraints (m)													Second Moment of Area y-y axis I_y cm^4
		2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	
356x406x1299 +	1.00	12800	12800	12800	12800	12800	12800	12800	12700	12600	12500	12400	12300	12200	755000
	1.13	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12700	12600	
$M_{c,y,Rd}$ = 12800	1.35	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	
$M_{c,z,Rd}$ = 6420	1.50	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	
	1.77	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	
	2.00	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	
Class = 1	2.50	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	12800	
356x406x1202 +	1.00	11600	11600	11600	11600	11600	11600	11500	11400	11300	11200	11100	11000	10900	664000
	1.13	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11500	11400	11300	
$M_{c,y,Rd}$ = 11600	1.35	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	
$M_{c,z,Rd}$ = 5830	1.50	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	
	1.77	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	
	2.00	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	
Class = 1	2.50	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	
356x406x1086 +	1.00	10500	10500	10500	10500	10500	10500	10400	10300	10200	10100	9960	9860	9760	596000
	1.13	10500	10500	10500	10500	10500	10500	10500	10500	10500	10400	10300	10300	10200	
$M_{c,y,Rd}$ = 10500	1.35	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	
$M_{c,z,Rd}$ = 5150	1.50	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	
	1.77	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	
	2.00	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	
Class = 1	2.50	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	10500	
356x406x990 +	1.00	9350	9350	9350	9350	9350	9310	9200	9100	9000	8900	8800	8710	8620	519000
	1.13	9350	9350	9350	9350	9350	9350	9350	9350	9320	9240	9160	9080	9000	
$M_{c,y,Rd}$ = 9350	1.35	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	
$M_{c,z,Rd}$ = 4600	1.50	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	
	1.77	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	
	2.00	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	
Class = 1	2.50	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	9350	
356x406x900 +	1.00	8320	8320	8320	8320	8320	8250	8140	8040	7950	7860	7770	7680	7600	450000
	1.13	8320	8320	8320	8320	8320	8320	8320	8320	8250	8170	8090	8020	7940	
$M_{c,y,Rd}$ = 8320	1.35	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	
$M_{c,z,Rd}$ = 4120	1.50	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	
	1.77	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	
	2.00	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	
Class = 1	2.50	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	8320	

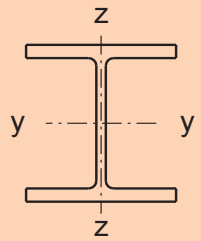
+ These sections are in addition to the range of BS 4 sections.

(1) C_1 is the factor dependent on the loading and end restraints.

Section classification given applies to members subject to bending about the y-y axis only.

BENDING

UNIVERSAL COLUMNS



Designation Cross section resistance (kNm) Classification	C_1 [1]	Buckling Resistance Moment $M_{b,Rd}$ (kNm) for Length between lateral restraints (m)													Second Moment of Area y-y axis I_y cm^4
		2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	
356x406x818 +	1.00	7700	7700	7700	7700	7670	7560	7450	7350	7260	7160	7070	6990	6900	392000
	1.13	7700	7700	7700	7700	7700	7700	7700	7630	7550	7470	7390	7310	7230	
$M_{c,y,Rd}$ = 7700	1.35	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7680	
$M_{c,z,Rd}$ = 3820	1.50	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	
	1.77	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	
	2.00	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	
Class = 1	2.50	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	
356x406x744 +	1.00	6870	6870	6870	6870	6800	6690	6590	6500	6410	6320	6230	6150	6070	342000
	1.13	6870	6870	6870	6870	6870	6870	6830	6750	6670	6600	6520	6450	6370	
$M_{c,y,Rd}$ = 6870	1.35	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6850	6790	
$M_{c,z,Rd}$ = 3420	1.50	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	
	1.77	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	
	2.00	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	
Class = 1	2.50	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	6870	
356x406x677 +	1.00	6140	6140	6140	6140	6040	5940	5850	5760	5670	5590	5500	5420	5340	300000
	1.13	6140	6140	6140	6140	6140	6140	6070	5990	5920	5840	5770	5700	5630	
$M_{c,y,Rd}$ = 6140	1.35	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6130	6070	6010	
$M_{c,z,Rd}$ = 3070	1.50	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	
	1.77	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	
	2.00	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	
Class = 1	2.50	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	6140	
356x406x634	1.00	5840	5840	5840	5810	5700	5590	5500	5410	5320	5230	5150	5070	4980	275000
	1.13	5840	5840	5840	5840	5840	5800	5720	5640	5560	5490	5410	5340	5260	
$M_{c,y,Rd}$ = 5840	1.35	5840	5840	5840	5840	5840	5840	5840	5840	5840	5830	5770	5710	5640	
$M_{c,z,Rd}$ = 2910	1.50	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	
	1.77	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	
	2.00	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	
Class = 1	2.50	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	5840	
356x406x592 +	1.00	5390	5390	5390	5340	5240	5140	5050	4960	4870	4790	4710	4630	4550	250000
	1.13	5390	5390	5390	5390	5390	5330	5250	5180	5100	5030	4960	4890	4810	
$M_{c,y,Rd}$ = 5390	1.35	5390	5390	5390	5390	5390	5390	5390	5390	5390	5350	5290	5230	5170	
$M_{c,z,Rd}$ = 2700	1.50	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5370	
	1.77	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	
	2.00	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	
Class = 1	2.50	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	5390	
356x406x551	1.00	4950	4950	4950	4880	4780	4690	4600	4510	4430	4350	4270	4190	4110	227000
	1.13	4950	4950	4950	4950	4950	4870	4800	4720	4650	4570	4500	4430	4360	
$M_{c,y,Rd}$ = 4950	1.35	4950	4950	4950	4950	4950	4950	4950	4950	4940	4880	4820	4760	4700	
$M_{c,z,Rd}$ = 2480	1.50	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4940	4890	
	1.77	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	
	2.00	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	
Class = 1	2.50	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	4950	

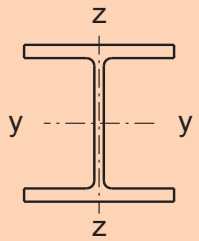
+ These sections are in addition to the range of BS 4 sections.

[1] C_1 is the factor dependent on the loading and end restraints; see note 8.

Section classification given applies to members subject to bending about the y-y axis only.

BENDING

UNIVERSAL COLUMNS



Designation Cross section resistance (kNm) Classification	C_1 [1]	Buckling Resistance Moment $M_{b,Rd}$ (kNm) for Length between lateral restraints (m)													Second Moment of Area y-y axis I_y cm^4
		2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	
356x406x509 +	1.00	4740	4740	4740	4640	4530	4440	4340	4250	4170	4080	4000	3910	3830	205000
	1.13	4740	4740	4740	4740	4700	4620	4540	4460	4380	4300	4230	4150	4080	
$M_{c,y,Rd}$ = 4740	1.35	4740	4740	4740	4740	4740	4740	4740	4740	4670	4610	4550	4480	4420	
$M_{c,z,Rd}$ = 2390	1.50	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4720	4670	4610	
	1.77	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	
	2.00	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	
Class = 1	2.50	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	4740	
356x406x467	1.00	4300	4300	4290	4180	4080	3980	3890	3810	3720	3640	3550	3470	3390	183000
	1.13	4300	4300	4300	4300	4240	4160	4080	4000	3920	3850	3770	3700	3620	
$M_{c,y,Rd}$ = 4300	1.35	4300	4300	4300	4300	4300	4300	4300	4260	4200	4130	4070	4010	3940	
$M_{c,z,Rd}$ = 2160	1.50	4300	4300	4300	4300	4300	4300	4300	4300	4300	4290	4240	4180	4120	
	1.77	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	
	2.00	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	
Class = 1	2.50	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	
356x406x393	1.00	3540	3540	3500	3400	3300	3210	3130	3050	2960	2890	2810	2730	2660	147000
	1.13	3540	3540	3540	3520	3440	3360	3290	3210	3140	3070	3000	2920	2850	
$M_{c,y,Rd}$ = 3540	1.35	3540	3540	3540	3540	3540	3540	3500	3440	3380	3320	3260	3200	3130	
$M_{c,z,Rd}$ = 1790	1.50	3540	3540	3540	3540	3540	3540	3540	3540	3510	3460	3400	3350	3290	
	1.77	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	3520	
	2.00	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	
Class = 1	2.50	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	3540	
356x406x340	1.00	3010	3010	2960	2860	2770	2690	2610	2530	2450	2370	2300	2230	2160	123000
	1.13	3010	3010	3010	2970	2900	2820	2750	2680	2600	2530	2470	2400	2330	
$M_{c,y,Rd}$ = 3010	1.35	3010	3010	3010	3010	3010	3000	2940	2880	2820	2760	2700	2640	2580	
$M_{c,z,Rd}$ = 1520	1.50	3010	3010	3010	3010	3010	3010	3010	2990	2940	2880	2830	2780	2720	
	1.77	3010	3010	3010	3010	3010	3010	3010	3010	3010	3010	3010	2980	2930	
	2.00	3010	3010	3010	3010	3010	3010	3010	3010	3010	3010	3010	3010	3010	
Class = 1	2.50	3010	3010	3010	3010	3010	3010	3010	3010	3010	3010	3010	3010	3010	
356x406x287	1.00	2560	2560	2490	2400	2310	2230	2140	2060	1990	1910	1840	1770	1700	99900
	1.13	2560	2560	2560	2500	2420	2340	2270	2200	2130	2050	1990	1920	1850	
$M_{c,y,Rd}$ = 2560	1.35	2560	2560	2560	2560	2560	2510	2440	2380	2320	2260	2200	2130	2070	
$M_{c,z,Rd}$ = 1300	1.50	2560	2560	2560	2560	2560	2560	2540	2480	2430	2370	2320	2260	2200	
	1.77	2560	2560	2560	2560	2560	2560	2560	2560	2560	2540	2500	2450	2400	
	2.00	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560	2530	
Class = 1	2.50	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560	
356x406x235	1.00	2060	2060	1990	1910	1830	1750	1670	1590	1520	1450	1380	1320	1260	79100
	1.13	2060	2060	2060	1990	1920	1850	1780	1710	1640	1570	1500	1440	1380	
$M_{c,y,Rd}$ = 2060	1.35	2060	2060	2060	2060	2040	1980	1920	1860	1800	1740	1680	1620	1560	
$M_{c,z,Rd}$ = 1050	1.50	2060	2060	2060	2060	2060	2060	2010	1950	1900	1840	1780	1730	1670	
	1.77	2060	2060	2060	2060	2060	2060	2060	2060	2040	1990	1940	1890	1840	
	2.00	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2050	2010	1960	
Class = 1	2.50	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	

+ These sections are in addition to the range of BS 4 sections.

[1] C_1 is the factor dependent on the loading and end restraints; see note 8.

Section classification given applies to members subject to bending about the y-y axis only.

BENDING

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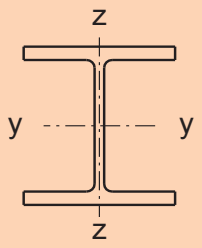

Designation Cross section resistance (kNm) Classification	C_1 (1)	Buckling Resistance Moment $M_{b,Rd}$ (kNm) for Length between lateral restraints (m)													Second Moment of Area y-y axis I_y cm^4
		2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	
356x368x202	1.00	1750	1740	1660	1590	1510	1430	1350	1280	1210	1150	1090	1030	979	66300
	1.13	1750	1750	1730	1660	1590	1520	1450	1380	1310	1250	1190	1130	1080	
$M_{c,y,Rd}$ = 1750	1.35	1750	1750	1750	1750	1700	1640	1580	1520	1460	1400	1340	1290	1230	
$M_{c,z,Rd}$ = 845	1.50	1750	1750	1750	1750	1750	1710	1660	1600	1550	1490	1430	1380	1330	
	1.77	1750	1750	1750	1750	1750	1750	1750	1720	1670	1630	1580	1530	1480	
	2.00	1750	1750	1750	1750	1750	1750	1750	1750	1750	1720	1680	1630	1590	
Class = 1	2.50	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	
356x368x177	1.00	1520	1510	1440	1370	1290	1220	1150	1080	1010	949	893	842	796	57100
	1.13	1520	1520	1500	1430	1370	1300	1230	1160	1100	1040	980	926	877	
$M_{c,y,Rd}$ = 1520	1.35	1520	1520	1520	1520	1470	1410	1350	1290	1230	1170	1110	1060	1010	
$M_{c,z,Rd}$ = 735	1.50	1520	1520	1520	1520	1520	1470	1420	1360	1310	1250	1200	1140	1090	
	1.77	1520	1520	1520	1520	1520	1520	1520	1470	1420	1370	1320	1280	1230	
	2.00	1520	1520	1520	1520	1520	1520	1520	1520	1500	1460	1420	1370	1330	
Class = 2	2.50	1520	1520	1520	1520	1520	1520	1520	1520	1520	1520	1520	1520	1500	
356x368x153	1.00	1180	1180	1130	1070	1010	953	895	839	786	737	692	651	613	48600
	1.13	1180	1180	1170	1120	1070	1010	960	907	855	805	759	716	676	
$M_{c,y,Rd}$ = 1180	1.35	1180	1180	1180	1180	1140	1100	1050	1000	957	909	864	820	779	
$M_{c,z,Rd}$ = 417	1.50	1180	1180	1180	1180	1180	1150	1110	1060	1020	972	928	885	844	
	1.77	1180	1180	1180	1180	1180	1180	1180	1150	1110	1070	1030	988	948	
	2.00	1180	1180	1180	1180	1180	1180	1180	1180	1170	1130	1100	1060	1030	
Class = 3	2.50	1180	1180	1180	1180	1180	1180	1180	1180	1180	1180	1180	1180	1160	
356x368x129	1.00	996	994	944	892	838	783	728	675	626	580	540	504	472	40200
	1.13	996	996	981	936	887	836	784	733	683	637	594	556	520	
$M_{c,y,Rd}$ = 996	1.35	996	996	996	994	954	911	865	818	771	725	682	641	603	
$M_{c,z,Rd}$ = 349	1.50	996	996	996	996	991	953	911	868	823	779	737	696	657	
	1.77	996	996	996	996	996	996	979	942	904	864	824	785	747	
	2.00	996	996	996	996	996	996	996	994	960	924	887	851	814	
Class = 3	2.50	996	996	996	996	996	996	996	996	996	996	996	966	935	
305x305x283	1.00	2200	2190	2110	2040	1970	1910	1850	1790	1730	1670	1610	1560	1510	78900
	1.13	2200	2200	2190	2130	2070	2010	1950	1900	1840	1790	1740	1690	1640	
$M_{c,y,Rd}$ = 2200	1.35	2200	2200	2200	2200	2190	2150	2100	2060	2010	1960	1920	1870	1820	
$M_{c,z,Rd}$ = 1010	1.50	2200	2200	2200	2200	2200	2200	2180	2140	2100	2060	2020	1970	1930	
	1.77	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2170	2130	2090	
	2.00	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	
Class = 1	2.50	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	
305x305x240	1.00	1870	1850	1770	1700	1630	1570	1510	1450	1390	1340	1280	1230	1180	64200
	1.13	1870	1870	1840	1780	1720	1660	1610	1550	1500	1440	1390	1340	1290	
$M_{c,y,Rd}$ = 1870	1.35	1870	1870	1870	1870	1840	1790	1740	1690	1650	1600	1550	1500	1460	
$M_{c,z,Rd}$ = 858	1.50	1870	1870	1870	1870	1870	1860	1820	1770	1730	1690	1640	1600	1550	
	1.77	1870	1870	1870	1870	1870	1870	1870	1870	1850	1820	1780	1740	1700	
	2.00	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1840	1810	
Class = 1	2.50	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	

(1) C_1 is the factor dependent on the loading and end restraints.
Section classification given applies to members subject to bending about the y-y axis only.

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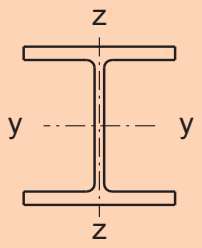

Designation Cross section resistance (kNm) Classification	C_1 [1]	Buckling Resistance Moment $M_{b,Rd}$ (kNm) for Length between lateral restraints (m)													Second Moment of Area y-y axis I_y cm^4
		2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	
305x305x198	1.00	1510	1480	1410	1350	1290	1230	1170	1110	1060	1010	960	915	874	50900
	1.13	1510	1510	1470	1420	1360	1300	1250	1200	1140	1090	1050	1000	959	
$M_{c,y,Rd}$ = 1510	1.35	1510	1510	1510	1510	1460	1410	1370	1320	1270	1230	1180	1140	1090	
$M_{c,z,Rd}$ = 695	1.50	1510	1510	1510	1510	1510	1470	1430	1390	1350	1300	1260	1220	1180	
	1.77	1510	1510	1510	1510	1510	1510	1510	1490	1460	1420	1380	1340	1300	
	2.00	1510	1510	1510	1510	1510	1510	1510	1510	1510	1500	1470	1430	1400	
Class = 1	2.50	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510	
305x305x158	1.00	1180	1150	1080	1020	964	907	852	801	753	709	669	633	600	38700
	1.13	1180	1180	1130	1080	1020	971	919	869	822	777	736	697	661	
$M_{c,y,Rd}$ = 1180	1.35	1180	1180	1180	1150	1110	1060	1020	970	925	882	840	800	763	
$M_{c,z,Rd}$ = 541	1.50	1180	1180	1180	1180	1150	1110	1070	1030	986	945	904	865	828	
	1.77	1180	1180	1180	1180	1180	1180	1150	1120	1080	1040	1010	969	933	
	2.00	1180	1180	1180	1180	1180	1180	1180	1180	1150	1110	1080	1040	1010	
Class = 1	2.50	1180	1180	1180	1180	1180	1180	1180	1180	1180	1180	1180	1180	1150	
305x305x137	1.00	1010	977	919	862	805	750	698	650	606	567	532	500	472	32800
	1.13	1010	1010	962	910	858	807	757	709	665	623	586	552	520	
$M_{c,y,Rd}$ = 1010	1.35	1010	1010	1010	977	933	888	842	797	754	713	674	637	603	
$M_{c,z,Rd}$ = 463	1.50	1010	1010	1010	1010	974	934	892	850	808	768	729	693	658	
	1.77	1010	1010	1010	1010	1010	1000	966	929	892	855	819	783	749	
	2.00	1010	1010	1010	1010	1010	1010	1010	985	952	918	884	851	818	
Class = 1	2.50	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	998	970	942	
305x305x118	1.00	861	828	776	722	668	616	567	522	483	448	417	390	366	27700
	1.13	861	858	813	764	715	665	617	572	531	494	460	430	404	
$M_{c,y,Rd}$ = 861	1.35	861	861	861	823	780	736	691	648	607	568	533	500	470	
$M_{c,z,Rd}$ = 394	1.50	861	861	861	855	817	777	735	694	654	616	580	546	515	
	1.77	861	861	861	861	861	838	802	765	729	692	657	623	591	
	2.00	861	861	861	861	861	861	848	816	782	749	715	682	651	
Class = 2	2.50	861	861	861	861	861	861	861	861	861	847	818	790	761	
305x305x97	1.00	665	639	597	553	507	463	422	385	352	324	300	279	260	22200
	1.13	665	663	626	586	544	501	460	422	388	358	331	307	286	
$M_{c,y,Rd}$ = 665	1.35	665	665	664	632	595	557	519	481	446	414	384	358	334	
$M_{c,z,Rd}$ = 220	1.50	665	665	665	657	624	589	553	517	483	450	420	392	367	
	1.77	665	665	665	665	665	638	606	574	541	510	480	451	424	
	2.00	665	665	665	665	665	665	644	614	584	555	525	497	470	
Class = 3	2.50	665	665	665	665	665	665	665	665	659	634	608	583	558	

[1] C_1 is the factor dependent on the loading and end restraints.
Section classification given applies to members subject to bending about the y-y axis only.

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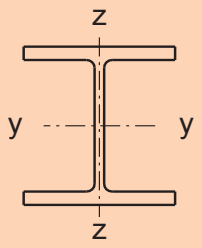
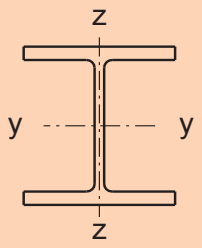


Designation Cross section resistance (kNm) Classification	C_1 [1]	Buckling Resistance Moment $M_{b,Rd}$ (kNm) for Length between lateral restraints (m)													Second Moment of Area y-y axis I_y cm^4
		1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8.0	9.0	10.0	
254x254x167	1.00	1070	1070	1070	1060	1030	1000	981	937	894	854	815	777	741	30000
	1.13	1070	1070	1070	1070	1070	1040	1020	985	947	910	873	837	803	
$M_{c,y,Rd}$ = 1070	1.35	1070	1070	1070	1070	1070	1070	1070	1050	1020	988	956	924	893	
$M_{c,z,Rd}$ = 500	1.50	1070	1070	1070	1070	1070	1070	1070	1070	1060	1030	1000	974	945	
	1.77	1070	1070	1070	1070	1070	1070	1070	1070	1070	1070	1070	1050	1020	
	2.00	1070	1070	1070	1070	1070	1070	1070	1070	1070	1070	1070	1070	1070	
Class = 1	2.50	1070	1070	1070	1070	1070	1070	1070	1070	1070	1070	1070	1070	1070	
254x254x132	1.00	823	823	823	806	783	761	739	697	658	620	584	550	519	22500
	1.13	823	823	823	823	813	794	775	737	701	665	631	598	567	
$M_{c,y,Rd}$ = 823	1.35	823	823	823	823	823	823	822	792	761	730	699	669	639	
$M_{c,z,Rd}$ = 386	1.50	823	823	823	823	823	823	823	822	795	767	738	710	682	
	1.77	823	823	823	823	823	823	823	823	823	821	797	773	748	
	2.00	823	823	823	823	823	823	823	823	823	823	823	816	794	
Class = 1	2.50	823	823	823	823	823	823	823	823	823	823	823	823	823	
254x254x107	1.00	653	653	653	635	614	594	574	534	496	461	428	398	371	17500
	1.13	653	653	653	653	639	621	603	568	532	498	466	436	408	
$M_{c,y,Rd}$ = 653	1.35	653	653	653	653	653	653	643	614	583	553	523	494	466	
$M_{c,z,Rd}$ = 307	1.50	653	653	653	653	653	653	653	639	612	584	556	529	502	
	1.77	653	653	653	653	653	653	653	653	653	631	607	582	558	
	2.00	653	653	653	653	653	653	653	653	653	653	642	620	598	
Class = 1	2.50	653	653	653	653	653	653	653	653	653	653	653	653	653	
254x254x89	1.00	539	539	539	520	501	483	464	427	391	358	328	302	279	14300
	1.13	539	539	539	538	522	506	489	455	421	389	359	332	307	
$M_{c,y,Rd}$ = 539	1.35	539	539	539	539	539	537	524	495	465	436	407	379	354	
$M_{c,z,Rd}$ = 253	1.50	539	539	539	539	539	539	539	518	491	463	435	409	383	
	1.77	539	539	539	539	539	539	539	539	528	504	480	455	431	
	2.00	539	539	539	539	539	539	539	539	539	533	511	489	466	
Class = 1	2.50	539	539	539	539	539	539	539	539	539	539	539	539	528	
254x254x73	1.00	413	413	413	399	384	369	353	322	291	264	239	218	199	11400
	1.13	413	413	413	413	400	387	373	344	315	288	262	240	220	
$M_{c,y,Rd}$ = 413	1.35	413	413	413	413	413	411	400	375	350	324	299	276	255	
$M_{c,z,Rd}$ = 141	1.50	413	413	413	413	413	413	413	393	369	345	321	299	277	
	1.77	413	413	413	413	413	413	413	413	399	378	356	335	314	
	2.00	413	413	413	413	413	413	413	413	413	401	382	362	342	
Class = 3	2.50	413	413	413	413	413	413	413	413	413	413	413	408	392	

[1] C_1 is the factor dependent on the loading and end restraints.
Section classification given applies to members subject to bending about the y-y axis only.

BENDING

UNIVERSAL COLUMNS

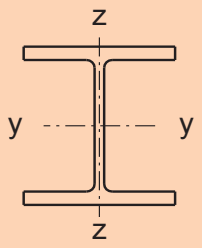


Designation Cross section resistance (kNm) Classification	C_1 [1]	Buckling Resistance Moment $M_{b,Rd}$ (kNm) for Length between lateral restraints (m)													Second Moment of Area y-y axis I_y cm^4
		1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8.0	9.0	10.0	
203x203x86	1.00	430	430	421	406	392	378	365	339	315	293	272	254	237	9450
	1.13	430	430	430	422	410	398	386	362	340	318	297	278	261	
$M_{c,y,Rd}$ = 430	1.35	430	430	430	430	430	424	414	394	374	354	335	316	299	
$M_{c,z,Rd}$ = 201	1.50	430	430	430	430	430	430	430	412	394	376	358	340	322	
	1.77	430	430	430	430	430	430	430	430	423	408	392	376	360	
	2.00	430	430	430	430	430	430	430	430	430	430	416	402	387	
Class = 1	2.50	430	430	430	430	430	430	430	430	430	430	430	430	430	
203x203x71	1.00	351	351	342	328	315	302	289	265	242	222	204	188	174	7620
	1.13	351	351	351	342	330	319	307	284	263	242	224	207	192	
$M_{c,y,Rd}$ = 351	1.35	351	351	351	351	351	341	332	312	292	273	255	238	222	
$M_{c,z,Rd}$ = 164	1.50	351	351	351	351	351	351	345	328	310	292	274	257	241	
	1.77	351	351	351	351	351	351	351	351	336	320	304	288	273	
	2.00	351	351	351	351	351	351	351	351	351	340	325	311	296	
Class = 1	2.50	351	351	351	351	351	351	351	351	351	351	351	350	338	
203x203x60	1.00	302	302	290	277	264	250	237	212	190	171	154	141	129	6130
	1.13	302	302	301	289	278	265	253	230	207	188	170	155	142	
$M_{c,y,Rd}$ = 302	1.35	302	302	302	302	296	286	276	255	234	214	196	180	166	
$M_{c,z,Rd}$ = 140	1.50	302	302	302	302	302	298	289	269	250	231	213	196	181	
	1.77	302	302	302	302	302	302	302	291	274	257	240	224	208	
	2.00	302	302	302	302	302	302	302	302	291	275	260	244	229	
Class = 1	2.50	302	302	302	302	302	302	302	302	302	302	294	281	268	
203x203x52	1.00	261	261	250	238	225	213	200	176	155	138	124	112	102	5260
	1.13	261	261	259	249	237	226	214	191	170	152	137	124	112	
$M_{c,y,Rd}$ = 261	1.35	261	261	261	261	254	245	234	214	194	175	158	144	131	
$M_{c,z,Rd}$ = 122	1.50	261	261	261	261	261	255	246	227	208	189	172	157	144	
	1.77	261	261	261	261	261	261	261	246	229	212	196	181	167	
	2.00	261	261	261	261	261	261	261	260	245	229	214	199	185	
Class = 2	2.50	261	261	261	261	261	261	261	261	261	259	245	232	219	
203x203x46	1.00	207	207	199	190	180	170	160	141	124	110	98.3	88.8	80.8	4570
	1.13	207	207	207	198	190	181	171	153	136	121	109	97.9	88.9	
$M_{c,y,Rd}$ = 207	1.35	207	207	207	207	203	195	187	171	154	139	126	114	104	
$M_{c,z,Rd}$ = 70.0	1.50	207	207	207	207	207	203	196	181	165	151	137	125	114	
	1.77	207	207	207	207	207	207	207	196	183	169	156	143	132	
	2.00	207	207	207	207	207	207	207	207	195	182	170	157	146	
Class = 3	2.50	207	207	207	207	207	207	207	207	207	205	195	184	173	

[1] C_1 is the factor dependent on the loading and end restraints.
Section classification given applies to members subject to bending about the y-y axis only.

BENDING

UNIVERSAL COLUMNS



Designation Cross section resistance (kNm) Classification	C_1 [1]	Buckling Resistance Moment $M_{b,Rd}$ (kNm) for Length between lateral restraints (m)													Second Moment of Area y-y axis I_y cm^4
		1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8.0	9.0	10.0	
152x152x37	1.00	142	137	129	121	113	105	98.0	85.3	75.0	66.6	59.8	54.3	48.9	2210
	1.13	142	142	135	127	120	113	106	93.5	82.6	73.5	66.0	59.7	54.8	
$M_{c,y,Rd}$ = 142	1.35	142	142	142	137	131	124	118	106	95.0	85.2	76.8	69.5	63.2	
$M_{c,z,Rd}$ = 64.2	1.50	142	142	142	142	137	131	125	114	103	92.9	84.1	76.4	69.6	
	1.77	142	142	142	142	142	141	136	125	115	106	96.7	88.6	81.2	
	2.00	142	142	142	142	142	142	142	134	125	115	107	98.4	90.8	
Class = 1	2.50	142	142	142	142	142	142	142	142	141	133	125	117	110	
152x152x30	1.00	114	109	102	94.2	86.8	79.7	73.1	62.0	53.5	46.8	41.5	36.4	32.5	1750
	1.13	114	113	107	100.0	93.1	86.3	79.8	68.3	59.0	51.6	45.9	41.2	36.8	
$M_{c,y,Rd}$ = 114	1.35	114	114	113	108	102	95.8	89.7	78.3	68.4	60.1	53.2	47.6	43.6	
$M_{c,z,Rd}$ = 51.3	1.50	114	114	114	112	107	101	95.6	84.5	74.5	65.9	58.6	52.4	47.3	
	1.77	114	114	114	114	114	110	105	94.5	84.8	75.9	68.1	61.3	55.3	
	2.00	114	114	114	114	114	114	111	102	92.6	83.8	75.9	68.7	62.4	
Class = 2	2.50	114	114	114	114	114	114	114	114	106	98.6	91.0	83.8	77.1	
152x152x23	1.00	75.4	72.2	67.2	61.9	56.4	51.2	46.3	38.3	32.4	28.0	23.9	20.9	18.6	1250
	1.13	75.4	74.9	70.5	65.7	60.6	55.5	50.7	42.3	35.8	30.8	27.1	23.7	21.0	
$M_{c,y,Rd}$ = 75.4	1.35	75.4	75.4	75.0	71.0	66.6	62.0	57.4	48.8	41.6	35.8	31.4	28.2	25.1	
$M_{c,z,Rd}$ = 24.2	1.50	75.4	75.4	75.4	74.0	70.0	65.8	61.4	52.9	45.5	39.4	34.4	30.7	27.9	
	1.77	75.4	75.4	75.4	75.4	75.0	71.4	67.5	59.6	52.3	45.8	40.3	35.7	31.8	
	2.00	75.4	75.4	75.4	75.4	75.4	75.3	71.9	64.6	57.5	51.0	45.2	40.3	36.0	
Class = 3	2.50	75.4	75.4	75.4	75.4	75.4	75.4	75.4	73.4	67.1	61.0	55.2	49.9	45.2	

[1] C_1 is the factor dependent on the loading and end restraints.
Section classification given applies to members subject to bending about the y-y axis only.

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