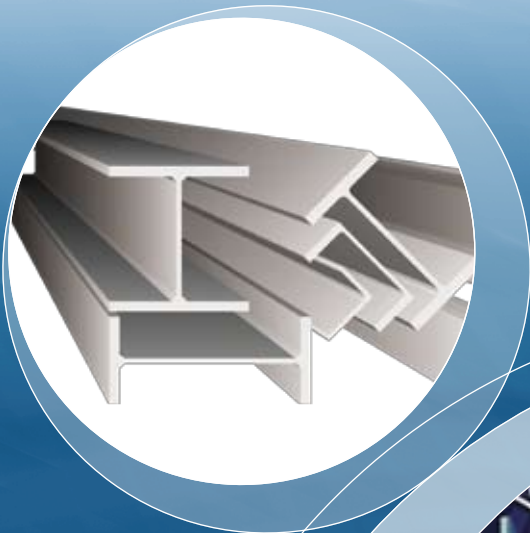




onesteel
market mills

HOT ROLLED AND STRUCTURAL STEEL PRODUCTS

FIFTH EDITION



HOT ROLLED AND STRUCTURAL STEEL PRODUCTS

CONTENTS	
Introduction	1
Availability	
Structural Steel Sections	1
Merchant Bar Sections	3
Dimensions and Design Information	
Welded Beams	5
Welded Columns	7
Universal Beams	9
Universal Columns	11
Tapered Flange Beams	13
Parallel Flange Channels	14
Universal Bearing Piles	15
Equal Angles	16
Unequal Angles	19
Standard Specifications	
Structural Steel Sections	22
Merchant Bar Sections	24
Customer Technical Service	25

INTRODUCTION

OneSteel is a fully integrated, global manufacturer and distributor of steel and finished steel products, self-sufficient in both iron ore and scrap metal.

OneSteel's major manufacturing facilities are located in Whyalla, South Australia, Melbourne, Victoria, Western Sydney and Newcastle, New South Wales and Brisbane, Queensland.

This booklet is produced by OneSteel Market Mills and is intended to provide general information on a range of hot rolled and structural steel products. The following text will refer to OneSteel Market Mills as OneSteel.

AVAILABILITY

Structural Steel Sections

Hot Rolled Products

Hot Rolled Structural Steel sections produced by OneSteel are manufactured in accordance with the requirements of Australian Standard AS/NZS 3679.1:1996 Structural Steel - Hot Rolled Bars and Sections.

Grade Availability

300PLUS® Steel is the standard grade manufactured by OneSteel for hot rolled Structural Steel Sections for Australia.

300PLUS® Steel for hot rolled products is produced to exceed the minimum requirements of AS/NZS 3679.1:1996 grade 300.

In New Zealand, 300PLUS®SO is the standard grade for the range of universal beams and columns shown in Table 1.

Table 1
Standard 300PLUS®SO Grade sections in New Zealand

Universal Beams	Universal Columns
610UB125	310UC158
610UB113	310UC137
610UB101	310UC118
530UB92.4	310UC96.8
530UB82.0	250UC89.5
460UB82.1	250UC72.9
460UB74.6	200UC59.5
460UB67.1	200UC52.2
410UB59.7	200UC46.2
410UB53.7	
360UB56.7	
360UB50.7	
360UB44.7	

Other grades including 300PLUSLO, AS/NZS 3679.1-350 and AS/NZS 3679.1-350LO may also be available depending on the section and quantity required. For further information contact your nearest OneSteel Sales Office (contact details on page 26).

Length Availability

The majority of Structural Steel Sections produced by OneSteel are available in standard length and bundle configurations. We would recommend that attention be given to the standard lengths produced by OneSteel as they are more readily available than other lengths. Table 2 indicates the standard lengths produced by OneSteel in Structural Steel Sections. For other lengths (including those in excess of 18 metres) please contact your nearest OneSteel Sales Office for further details (contact details on page 26).

Welded Products

OneSteel Market Mills also markets a range of large Welded Product Structural Steel sections. These sections are welded from plate and are manufactured in accordance with Australian Standard AS/NZS 3679.2:1996 Structural Steel - Welded I Sections.

Grade Availability

300PLUS® Steel is the standard grade manufactured for Welded Products. 300PLUS® welded products are produced to exceed the minimum requirements of AS/NZS 3679.2:1996 grade 300.

A higher grade option of AS/NZS 3679.2:1996 grade 400 is also available.

Other grades are subject to enquiry and this should be directed to your nearest OneSteel Sales Office.

Length Availability

Lengths are available from a minimum of 6 metres to a maximum of 30 metres. Table 2 indicates the standard lengths produced.



Table 2 Standard Lengths

Section	Length (m)								
	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	20.0*
Welded Sections									
1200 WB, 1000 WB, 900 WB, 800 WB, 700 WB		•	•	•	•	•	•	•	
500 WC, 400 WC, 350 WC		•	•	•	•	•	•	•	
Universal Beams									
610 UB, 530 UB, 460 UB, 410 UB, 360 UB		•	•	•	•	•	•	•	•
310 UB 46.2, 40.4		•	•	•	•	•	•	•	•
310 UB 32.0		•	•	•	•	•		•	
250 UB		•	•	•	•	•	•	•	
200 UB 29.8, 25.4, 22.3		•	•	•	•	•	•	•	
200 UB 18.2		•	•	•	•	•			
180 UB, 150 UB		•	•	•	•	•	•		
Universal Columns									
310 UC 158, 137, 118		•	•	•	•	•	•	•	
310 UC 96.8		•	•	•	•	•	•	•	•
250 UC		•	•	•	•	•	•	•	•
200 UC, 150 UC		•	•	•	•	•	•	•	
100 UC		•		•		•			
Taper Flange Beams									
125 TFB, 100 TFB		•		•					
Parallel Flange Channels									
380 PFC, 300 PFC		•	•	•	•	•	•	•	
250 PFC		•	•	•	•	•	•	•	
230 PFC, 200 PFC, 180 PFC, 150 PFC		•	•	•	•	•	•	•	
125 PFC, 100 PFC, 75 PFC		•		•					
Universal Bearing Piles									
310 UBP 149, 110 [†]									
310 UBP 78.8			•	•	•	•	•	•	•
200 UBP 122		•			•				
Equal Angles									
200 EA, 150 EA, 125 EA		•	•	•	•	•			
100 EA, 90 EA, 75 EA		•		•					
65 EA, 55 EA, 50 EA, 45 EA, 40 EA **	•	•							
30 EA, 25 EA	•								
Unequal Angles									
150 x 100 UA, 150 x 90 UA		•	•	•	•	•			
125 x 75 UA, 100 x 75 UA		•		•					
75 x 50 UA	•	•							
65 x 50 UA		•							

• The Section/Length combination is available in Standard Bundle configurations

* By enquiry - Delivery to Capital cities only

** Certain thicknesses may not be available in both lengths. Confirm availability with a OneSteel Market Mills Sales Office.

† By enquiry

Merchant Bar Sections

Rounds, Squares and Flats

Availability

Merchant bar rounds, squares and flats are available in a variety of steel grades and sizes.

Due to process limitations not all grades are available in all sizes. For new applications we recommend you confirm product availability with a OneSteel Sales Office at an early stage of design. Other specifications and sizes may also be available on enquiry.

Specifications

Merchant bar sections are available in the following standards:

- 300PLUS® and AS/NZS 3679.1 - Structural Steel - Hot Rolled Bars and Sections.
- AS 1442 - Carbon Steels and Carbon Manganese Steels - Hot Rolled Bars and Semifinished Products.
- AS 1444 - Wrought Alloy Steels Standard, Hardenability (H) Series and Hardened and Tempered to Designated Mechanical Properties.
- AS 1447 - Hot-Rolled Spring Steels.
- OneSteel grades (based on AISI-SAE nomenclature).

Table 3 Rounds - Size Availability and Mass

Diameter (mm)	Mass (kg/m)
10	0.616
12	0.887
13	1.04
14	1.21
15	1.39
16	1.58
17	1.78
18	1.99
19	2.23
20	2.46
22	2.98
24	3.55
27	4.49
30	5.55
33	6.71
36	7.99
39	9.38
42	10.9
45	12.5
48	14.2
50	15.4
56	19.3
60	22.2
65	26.0
75	34.7
90	49.9

Standard Length: 6 Metres

Table 4 Squares - Size Availability and Mass

Thickness (mm)	Mass (kg/m)
10*	0.790
12	1.13
16	2.01
20	3.14
25	4.91
40	12.5

Standard Length: 6 Metres

* Confirm availability with sales office.

Table 5 Flats – Size Availability and Mass (kg/m)

Width (mm)	Thickness (mm)							
	5	6	8	10	12	16	20	25
20				1.57				
25	0.981	1.18	1.57	1.96	2.36			
32	1.26	1.51	2.01	2.51	3.01			
40	1.57	1.88	2.51	3.14	3.77	5.02	6.28	
50	1.96	2.36	3.14	3.93	4.71	6.28	7.85	9.81
65	2.55	3.06	4.08	5.10	6.12	8.16	10.2	
75	2.94	3.53	4.71	5.89	7.07	9.42	11.8	14.7
90		4.24	5.65	7.07	8.48			
100	3.93	4.71	6.28	7.85	9.42	12.6	15.7	19.6
110		5.18	6.91	8.64	10.4			
130	5.10	6.12	8.16	10.2	12.2	16.3	20.4	25.5
150	5.89	7.07	9.42	11.8	14.1	18.8	23.6	29.4
180		8.48		14.1	17.0			
200		9.42	12.6	15.7	18.8			
250		11.8	15.7	19.6	23.6			
300		14.1	18.8	23.6	28.3			

Standard Length: 6 Metres

Table 6 Merchant Bar Sections - Regular Grades

Steel Type	Standard	Grades Available
Structural Steels	OneSteel AS/NZS 3679.1	300PLUS 350
Carbon and Carbon-Manganese Steels	AS 1442	1016 1022 1045
Spring Steels	AS 1447	XK5160S XK9258S XK9261S
OneSteel Grades	OneSteel	1015 X4K92M61S

Note

Grade availability can vary with section.

Rods and Light Billets

Rods and light billets are available in a wide range of OneSteel grades, and selected grades from AS 1442, AS 1444 and AS 1447 specifications.

These sections are not available in structural grades 300PLUS® or 350.

Due to process limitations not all grades are available in all sizes.

Confirm product availability with a OneSteel Sales Office at an early stage of design.

Table 7 Rods Size Availability

Diameter (mm)															
5.5	6.5	7.0	8.0	9.0	10.0	11.2	12.5	13.0	14.0	15.0	16.0	17.0	18.0		

Table 8 Light Billets Size Availability

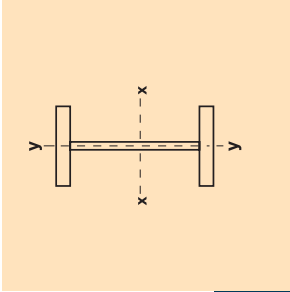
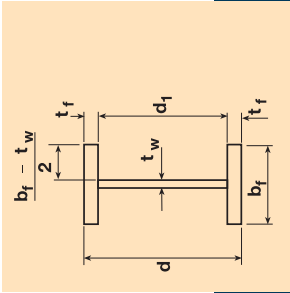
Sizes Available mm x mm	
45 x 45	
50 x 50	
63 x 63	
75 x 75	

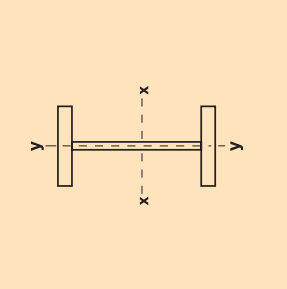
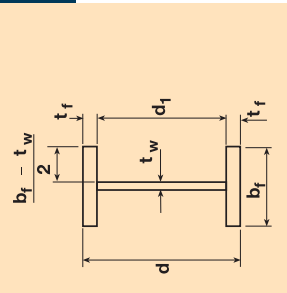
Table 9 Welded Beams - Dimensions and Properties

Designation	Depth of Section	Flange Width	Flange Thickness	Web Thickness	Depth Between Flanges	d_f	t_w	$(b_f - t_f)$	Gross Area of Cross Section	About x-axis				About y-axis				Torsion Constant	Warping Constant	Designation
	d	b_f	t_f	t_w	d_f	d_f	t_w	$2t_f$	A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	I_w	
kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm ²	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ⁴	10 ⁹ mm ⁶	
1200 WB 455	1200	500	40	16	120	120	70.0	6.05	57900	15300	25600	28200	515	834	3330	5070	120	22000	280000	1200 WB 455
423	1192	500	36	16	120	120	70.0	6.72	53900	13900	23300	25800	508	750	3000	4570	118	16500	251000	423
392	1184	500	32	16	120	120	70.0	7.56	49900	12500	2100	23400	500	667	2670	4070	116	12100	221000	392
342	1184	400	32	16	120	120	70.0	6.00	43500	10400	17500	19800	488	342	1710	2630	88.6	9960	113000	342
317	1176	400	28	16	120	120	70.0	6.86	40300	9250	15700	17900	479	299	1500	2310	86.1	7230	98500	317
278	1170	350	25	16	120	120	70.0	6.68	35400	7610	13000	15000	464	179	1020	1600	71.1	5090	58700	278
249	1170	275	25	16	120	120	70.0	5.18	31700	6380	10900	12900	449	87.0	633	1020	52.4	4310	28500	249
1000 WB 322	1024	400	32	16	960	960	60.0	6.00	41000	7480	14600	16400	427	342	1710	2620	91.3	9740	84100	1000 WB 322
296	1016	400	28	16	960	960	60.0	6.86	37800	6650	13100	14800	420	299	1490	2300	89.0	7010	73000	296
258	1010	350	25	16	960	960	60.0	6.68	32900	5430	10700	12300	406	179	1020	1590	73.8	4870	43400	258
215	1000	300	20	16	960	960	60.0	7.10	27400	4060	8120	9570	385	90.3	602	961	57.5	2890	21700	215
900 WB 282	924	400	32	12	860	860	71.7	6.06	35900	5730	12400	13600	399	341	1710	2590	97.5	8870	67900	900 WB 282
257	916	400	28	12	860	860	71.7	6.93	32700	5050	11000	12200	393	299	1490	2270	95.6	6150	58900	257
218	910	350	25	12	860	860	71.7	6.76	27800	4060	8930	9960	382	179	1020	1560	80.2	4020	35000	218
175	900	300	20	12	860	860	71.7	7.20	22300	2960	6580	7500	364	90.1	601	931	63.5	2060	17400	175
800 WB 192	816	300	28	10	760	760	76.0	5.18	24400	2970	7290	8060	349	126	840	1280	71.9	4420	19600	800 WB 192
168	810	275	25	10	760	760	76.0	5.30	21400	2480	6140	6840	341	86.7	631	964	63.7	2990	13400	168
146	800	275	20	10	760	760	76.0	6.63	18600	2040	5100	5730	331	69.4	505	775	61.1	1670	10600	146
122	792	250	16	10	760	760	76.0	7.50	15600	1570	3970	4550	317	41.7	334	519	51.7	921	6280	122
700 WB 173	716	275	28	10	660	660	66.0	4.73	22000	2060	5760	6390	306	97.1	706	1080	66.4	4020	11500	700 WB 173
150	710	250	25	10	660	660	66.0	4.80	19100	1710	4810	5370	299	65.2	521	798	58.4	2690	7640	150
130	700	250	20	10	660	660	66.0	6.00	16600	1400	3990	4490	290	52.1	417	642	56.0	1510	6030	130
115	692	250	16	10	660	660	66.0	7.50	14600	1150	3330	3790	281	41.7	334	516	53.5	888	4770	115

Notes

- All welds to AS/NZS 1554.1 Category SP (deep penetration).
- Web to flange joints develop the minimum tensile strength of the web.
- Flame cut surfaces not incorporated in welds have a minimum surface roughness of class 2, as defined in WTIA Technical Note 5.





Welded Beams

Table 10 Welded Beams - Properties for Assessing Section Capacity

Designation	Yield Stress			Form Factor		About x-axis			About y-axis			Yield Stress			Form Factor		About x-axis			About y-axis			Designation
	Flange f _y	Web f _y	k _f	k _t	Compactness	Z _{ex}	10 ³ mm ³	Z _{ey}	10 ³ mm ³	Compactness	Z _{ex}	10 ³ mm ³	Z _{ey}	10 ³ mm ³	Compactness	Z _{ex}	10 ³ mm ³	Z _{ey}	10 ³ mm ³				
AS/NZS 3679.2-400																							
1200 WB 455	280	300	0.837		C	28200	C	5000															
423	280	300	0.825		C	25800	C	4500															
392	280	300	0.811		C	23400	N	4000															
342	280	300	0.783		C	19800	C	2560															
317	280	300	0.766		C	17900	C	2240															
278	280	300	0.733		C	15000	C	1530															
249	280	300	0.701		C	12900	C	949															
1000 WB 322	280	300	0.832		C	16400	C	2560															
296	280	300	0.817		C	14800	C	2240															
258	280	300	0.790		C	12300	C	1530															
215	300	300	0.738		C	9570	C	903															
900 WB 282	280	310	0.845		C	13600	C	2560															
257	280	310	0.830		C	12200	C	2240															
218	280	310	0.800		C	9960	C	1530															
175	300	310	0.744		C	7500	C	901															
800 WB 192	280	310	0.824		C	8060	C	1260															
168	280	310	0.799		C	6840	C	946															
146	300	310	0.763		N	5710	C	757															
122	300	310	0.718		N	4530	N	498															
700 WB 173	280	310	0.850		C	6390	C	1060															
150	280	310	0.828		C	5370	C	782															
130	300	310	0.795		C	4490	C	626															
115	300	310	0.767		C	3790	N	498															

* 300PLUS® welded sections are produced to exceed the minimum requirements of AS/NZS 3679:2300.

Notes

- 1. For 300PLUS® sections the tensile strength (f_t) is 430 MPa.
- 2. For Grade 400 sections the tensile strength (f_t) is 480 MPa.
- 3. C: Compact Section; N: Non-compact Section; S: Slender Section.

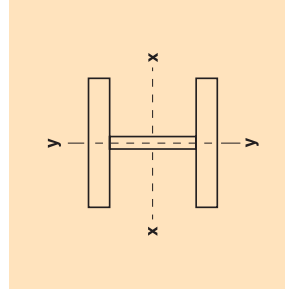
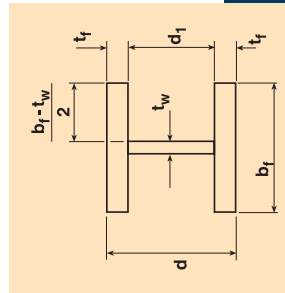
Welded Columns

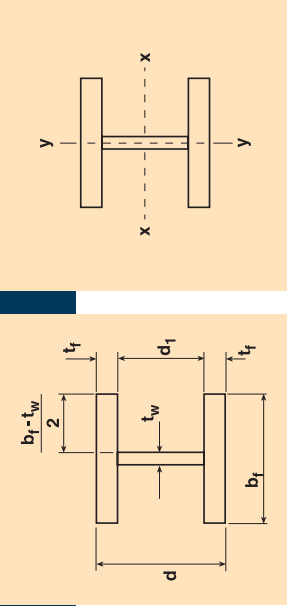
Table 11 Welded Columns - Dimensions and Properties

Designation	Depth of Section	Flange		Web Thickness	Depth Between Flanges	Gross Area of Cross Section		About x-axis			About y-axis			Torsion Constant	Warping Constant	Designation				
		Width	Thickness			d_f	t_w	$2t_f$	A_g	I_x	Z_x	S_x	r_x				I_y	Z_y	S_y	r_y
	d	b_f	t_f	t_w	d_f	d_f	t_w	$2t_f$	A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	I_w	
	mm	mm	mm	mm	mm	mm	mm	mm	mm ²	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ⁴	10 ⁹ mm ⁶	
500 WC 440	480	500	40	40	400	400	10.0	5.75	56000	2150	8980	10400	196	835	3340	5160	122	30100	40400	500 WC 440
414	480	500	40	32	400	400	12.5	5.85	52800	2110	8800	10100	200	834	3340	5100	126	25400	40400	414
383	472	500	36	32	400	400	12.5	6.50	48800	1890	7990	9130	197	751	3000	4600	124	19900	35700	383
340	514	500	32	25	450	450	18.0	7.42	43200	2050	7980	8980	218	667	2670	4070	124	13100	38800	340
290	506	500	28	20	450	450	22.5	8.57	37000	1750	6930	7700	218	584	2330	3540	126	8420	33300	290
267	500	500	25	20	450	450	22.5	9.60	34000	1560	6250	6950	214	521	2080	3170	124	6370	29400	267
228	490	500	20	20	450	450	22.5	12.0	29000	1260	5130	5710	208	417	1670	2540	120	3880	23000	228
400 WC 361	430	400	40	40	350	350	8.75	4.50	46000	1360	6340	7460	172	429	2140	3340	96.5	24800	16300	400 WC 361
328	430	400	40	28	350	350	12.5	4.65	41800	1320	6140	7100	178	427	2140	3270	101	19200	16200	328
303	422	400	36	28	350	350	12.5	5.17	38600	1180	5570	6420	175	385	1920	2950	99.8	14800	14300	303
270	414	400	32	25	350	350	14.0	5.86	34400	1030	4950	5660	173	342	1710	2610	99.8	10400	12500	270
212	400	400	25	20	350	350	17.5	7.60	27000	776	3880	4360	169	267	1330	2040	99.4	5060	9380	212
181	390	400	20	20	350	350	17.5	9.50	23000	620	3180	3570	164	214	1070	1640	96.4	3080	7310	181
144	382	400	16	16	350	350	21.9	12.0	18400	486	2550	2830	163	171	854	1300	96.3	1580	5720	144
350 WC 280	355	350	40	28	275	275	9.82	4.03	35700	747	4210	4940	145	286	1640	2500	89.6	16500	7100	350 WC 280
258	347	350	36	28	275	275	9.82	4.47	32900	661	3810	4450	142	258	1470	2260	88.5	12700	6230	258
230	339	350	32	25	275	275	11.0	5.08	29300	573	3380	3910	140	229	1310	2000	88.4	8960	5400	230
197	331	350	28	20	275	275	13.8	5.89	25100	486	2940	3350	139	200	1140	1740	89.3	5750	4600	197

Notes

1. All welds to AS/NZS 1554.1 Category SP (deep penetration).
2. Web to flange joints develop the minimum tensile strength of a 16mm web only.
3. Flame cut surfaces not incorporated in welds have a minimum surface roughness of class 2, as defined in WTIA Technical Note 5.





Welded Columns

Table 12 Welded Columns - Properties for Assessing Section Capacity

Designation	Yield Stress		Form Factor		About x-axis		About y-axis		Designation	
	Flange f _y MPa	Web f _y MPa	k _f	k _w	Compactness		Compactness		Flange f _y MPa	Web f _y MPa
					Z _{ex} 10 ³ mm ³	Compactness	Z _{ey} 10 ³ mm ³	Compactness		
500 WC 440	280	280	1.00	1.00	C	10400	C	5010	360	360
414	280	280	1.00	1.00	C	10100	C	5010	360	360
383	280	280	1.00	1.00	C	9130	C	4510	360	360
340	280	280	1.00	1.00	C	8980	C	4000	360	360
290	280	300	1.00	1.00	N	7570	N	3410	360	380
267	280	300	1.00	1.00	N	6700	N	2970	360	380
228	300	300	1.00	0.964	N	5210	N	2200	380	380
400 WC 361	280	280	1.00	1.00	C	7470	C	3210	360	360
328	280	280	1.00	1.00	C	7100	C	3200	360	360
303	280	280	1.00	1.00	C	6420	C	2880	360	360
270	280	280	1.00	1.00	C	5660	C	2560	360	360
212	280	300	1.00	1.00	N	4360	N	2000	360	380
181	300	300	1.00	1.00	N	3410	N	1510	380	380
144	300	300	1.00	0.964	N	2590	N	1120	380	380
350 WC 280	280	280	1.00	1.00	C	4940	C	2450	360	360
258	280	280	1.00	1.00	C	4450	C	2210	360	360
230	280	280	1.00	1.00	C	3910	C	1960	360	360
197	280	300	1.00	1.00	C	3350	C	1720	360	380

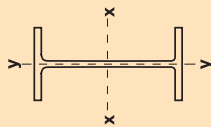
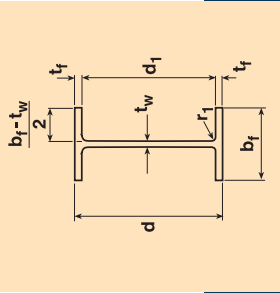
* 300PLUS® welded sections are produced to exceed the minimum requirements of AS/NZS 3679.2:300.

Notes

1. For 300PLUS® sections the tensile strength (f_t) is 430 MPa.
2. For Grade 400 sections the tensile strength (f_t) is 480 MPa.
3. C: Compact Section; N: Non-compact Section; S: Slender Section.

Table 13 Universal Beams - Dimensions and Properties

Designation	Depth of Section	Flange		Web Thickness	Root Radius	Depth Between Flanges	Gross Area of Cross Section		About x-axis				About y-axis				Torsion Constant	Warping Constant	Designation																																																																																																																																																																																																																																																																																																																																																																																													
		Width					d_f	t_w	$2t_f$	A_g	I_x	Z_x	S_x	r_x	I_y	Z_y				S_y	r_y	J	I_w																																																																																																																																																																																																																																																																																																																																																																																									
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kg/m	mm	mm	mm	mm	mm	mm	mm ²	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ³	10 ³ mm ³



Universal Beams

Table 14 Universal Beams - Properties for Assessing Section Capacity

Designation	Yield Stress		Form Factor	About x-axis		About y-axis		Designation
	Flange f_y	Web f_y		Compactness	Z_{ex}	Compactness	Z_{ey}	
	MPa	MPa			10^3mm^3		10^3mm^3	
300PLUS® *								
610 UB 125	280	300	0.950	C	3680	C	515	610 UB 125
113	280	300	0.926	C	3290	C	451	113
101	300	320	0.888	C	2900	C	386	101
530 UB 92.4	300	320	0.928	C	2370	C	342	530 UB 92.4
82.0	300	320	0.902	C	2070	C	289	82.0
460 UB 82.1	300	320	0.979	C	1840	C	292	460 UB 82.1
74.6	300	320	0.948	C	1660	C	262	74.6
67.1	300	320	0.922	C	1480	C	230	67.1
410 UB 59.7	300	320	0.938	C	1200	C	203	410 UB 59.7
53.7	320	320	0.913	C	1060	C	173	53.7
360 UB 56.7	300	320	0.996	C	1010	C	193	360 UB 56.7
50.7	300	320	0.963	C	897	C	168	50.7
44.7	320	320	0.930	N	770	N	140	44.7
310 UB 46.2	300	320	0.991	C	729	C	163	310 UB 46.2
40.4	320	320	0.952	C	633	C	139	40.4
32.0	320	320	0.915	N	467	N	86.9	32.0
250 UB 37.3	320	320	1.00	C	486	C	116	250 UB 37.3
31.4	320	320	1.00	N	395	N	91.4	31.4
25.7	320	320	0.949	C	319	C	61.7	25.7
200 UB 29.8	320	320	1.00	C	316	C	86.3	200 UB 29.8
25.4	320	320	1.00	N	259	N	68.8	25.4
22.3	320	320	1.00	N	227	N	60.3	22.3
18.2	320	320	0.990	C	180	C	34.4	18.2
180 UB 22.2	320	320	1.00	C	195	C	40.7	180 UB 22.2
18.1	320	320	1.00	C	157	C	32.5	18.1
16.1	320	320	1.00	C	138	C	28.4	16.1
150 UB 18.0	320	320	1.00	C	135	C	26.9	150 UB 18.0
14.0	320	320	1.00	C	102	C	19.8	14.0

* 300PLUS® replaced Grade 250 as the base grade for these sections in 1994.

300PLUS® hot rolled sections are produced to exceed the minimum requirements of AS/NZS 3679+300.

Notes

1. For 300PLUS® sections the tensile strength (f_t) is 440 MPa.

2. For Grade 350 sections the tensile strength (f_t) is 480 MPa.

3. C: Compact Section; N: Non-compact Section; S: Slender Section.

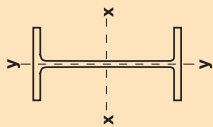
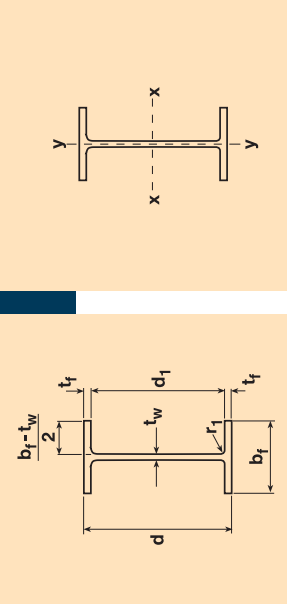
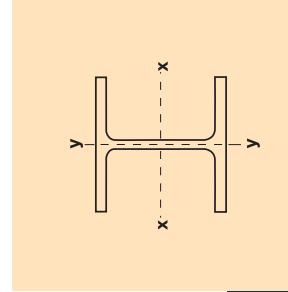
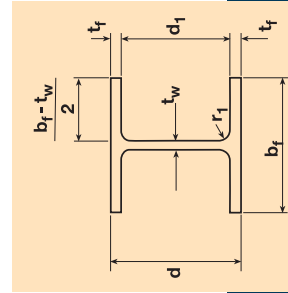
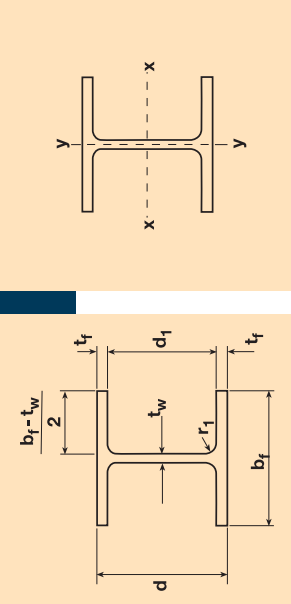


Table 15 Universal Columns - Dimensions and Properties

Designation	Depth of Section	Flange		Web Thickness	Root Radius	Depth Between Flanges	Gross Area of Cross Section		About x-axis				About y-axis				Torsion Constant	Warping Constant	Designation	
		Width	Thickness				d_f	(b_f-t_w)	A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y				r_y
	d	b_f	t_f	t_w	r_1	d_f	t_w	$2t_f$	A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	I_w	
kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm ²	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ⁴	10 ⁹ mm ⁶	
310 UC 158	327	311	25.0	15.7	16.5	277	17.7	5.91	20100	388	2370	2680	139	125	807	1230	78.9	3810	2860	310 UC 158
137	321	309	21.7	13.8	16.5	277	20.1	6.80	17500	329	2050	2300	137	107	691	1050	78.2	2520	2390	137
118	315	307	18.7	11.9	16.5	277	23.3	7.89	15000	277	1760	1960	136	90.2	588	893	77.5	1630	1980	118
96.8	308	305	15.4	9.9	16.5	277	28.0	9.58	12400	223	1450	1600	134	72.9	478	725	76.7	928	1560	96.8
250 UC 89.5	260	256	17.3	10.5	14.0	225	21.5	7.10	11400	143	1100	1230	112	48.4	378	575	65.2	1040	713	250 UC 89.5
72.9	254	254	14.2	8.6	14.0	225	26.2	8.64	9320	114	897	992	111	38.8	306	463	64.5	586	557	72.9
200 UC 59.5	210	205	14.2	9.3	11.4	181	19.5	6.89	7620	61.3	584	656	89.7	20.4	199	303	51.7	477	195	200 UC 59.5
52.2	206	204	12.5	8.0	11.4	181	22.7	7.84	6660	52.8	512	570	89.1	17.7	174	264	51.5	325	166	52.2
46.2	203	203	11.0	7.3	11.4	181	24.8	8.90	5900	45.9	451	500	88.2	15.3	151	230	51.0	228	142	46.2
150 UC 37.2	162	154	11.5	8.1	8.9	139	17.1	6.34	4730	22.2	274	310	68.4	7.01	91.0	139	38.5	197	39.6	150 UC 37.2
30.0	158	153	9.4	6.6	8.9	139	21.0	7.79	3860	17.6	223	250	67.5	5.62	73.4	112	38.1	109	30.8	30.0
23.4	152	152	6.8	6.1	8.9	139	22.8	10.7	2980	12.6	166	184	65.1	3.98	52.4	80.2	36.6	50.2	21.1	23.4
100 UC 14.8	97	99	7.0	5.0	10.0	83.0	16.6	6.71	1890	3.18	65.6	74.4	41.1	1.14	22.9	35.2	24.5	34.9	2.30	100 UC 14.8





Universal Columns

Table 16 Universal Columns - Properties for Assessing Section Capacity

Designation	Yield Stress		Form Factor	About x-axis		About y-axis		Form Factor	Yield Stress		About x-axis		About y-axis		Designation		
	Flange f _y	Web f _y		k _f	Compactness	Z _{ex}	Compactness		Z _{ey}	Flange f _y	Web f _y	k _f	Compactness	Z _{ex}		Compactness	Z _{ey}
	MPa	MPa			10 ³ mm ³		10 ³ mm ³		MPa	MPa		10 ³ mm ³		10 ³ mm ³			
	AS/NZS 3679.1-350																
310 UC 158	280	300	1.00	C	2680	C	1210	1.00	340	340	C	2680	C	1210	310 UC 158		
137	280	300	1.00	C	2300	C	1040	1.00	340	340	C	2300	C	1040	137		
118	280	300	1.00	C	1960	C	882	1.00	340	340	N	1950	N	878	118		
96.8	300	320	1.00	N	1560	N	694	1.00	340	360	N	1550	N	684	96.8		
250 UC 89.5	280	320	1.00	C	1230	C	567	1.00	340	360	C	1230	C	567	250 UC 89.5		
72.9	300	320	1.00	N	986	N	454	1.00	340	360	N	977	N	448	72.9		
200 UC 59.5	300	320	1.00	C	656	C	299	1.00	340	360	C	656	C	299	200 UC 59.5		
52.2	300	320	1.00	C	570	C	260	1.00	340	360	N	569	N	260	52.2		
46.2	300	320	1.00	N	494	N	223	1.00	340	360	N	490	N	219	46.2		
150 UC 37.2	300	320	1.00	C	310	C	137	1.00	340	360	C	310	C	137	150 UC 37.2		
30.0	320	320	1.00	C	250	C	110	1.00	360	360	N	248	N	109	30.0		
23.4	320	320	1.00	N	176	N	73.5	1.00	360	360	N	174	N	72.3	23.4		
100 UC 14.8	320	320	1.00	C	74.4	C	34.4	1.00	360	360	C	74.4	C	34.4	100 UC 14.8		

* 300PLUS® replaced Grade 250 as the base grade for these sections in 1994.
300PLUS® hot rolled sections are produced to exceed the minimum requirements of AS/NZS 3679:1-300.

Notes

1. For 300PLUS® sections the tensile strength (f_t) is 440 MPa.
2. For Grade 350 sections the tensile strength (f_t) is 480 MPa.
3. C: Compact Section; N: Non-compact Section; S: Slender Section.

Tapered Flange Beams

Table 17 Tapered Flange Beams - Dimensions and Properties

Designation	Mass per metre	Depth of Section	Flange		Web Thickness	Radii		Depth Between Flanges	d_1	t_w	$2t_f$	Gross Area of Cross Section	About x-axis			About y-axis			Torsion Constant	Warping Constant	Designation	
			Width	Thickness		Root	Toe						r_1	r_2	d_1	t_w	$2t_f$	I_x				Z_x
	kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm ²	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ⁴	10 ³ mm ⁶
125 TFB	13.1	125	65.0	8.5	5.0	8.0	4.0	108	21.6	3.53	1670	4.34	69.4	80.3	50.9	0.337	10.4	17.2	14.2	40.2	1.14	
100 TFB	7.20	100	45.0	6.0	4.0	7.0	3.0	88	22.0	3.42	917	1.46	29.2	34.1	39.9	0.0795	3.53	6.00	9.31	11.6	0.176	

Table 18 Tapered Flange Beams - Properties for Assessing Section Capacity

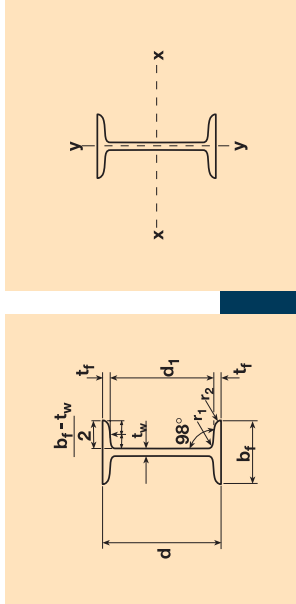
Designation	Yield Stress		Form Factor	About x-axis		About y-axis		Designation
	Flange f_y	Web f_y		Compactness	Z_{ex}	Compactness	Z_{ey}	
	MPa	MPa		10^3mm^3		10^3mm^3		
	300PLUS® *							
125 TFB	320	320	1.00	C	80.3	C	15.6	125 TFB
100 TFB	320	320	1.00	C	34.1	C	5.30	100 TFB

* 300PLUS® replaced Grade 250 as the base grade for these sections in 1997.

300PLUS® hot rolled sections are produced to exceed the minimum requirements of AS/NZS 3679.1:300.

Notes

1. For 300PLUS® sections the tensile strength (f_u) is 430 MPa.
2. For Grade 350 sections the tensile strength (f_u) is 480 MPa.
3. C: Compact Section; N: Non-compact Section; S: Slender Section.





Parallel Flange Channels

Table 19 Parallel Flange Channels - Dimensions and Properties

Designation	Mass per metre	Depth of Section	Flange		Web Thickness	Root Radius	Depth Between Flanges	Gross Area of Cross Section				Coordinate of Centroid		Coordinate of Shear Centre	About x-axis			About y-axis			Torsion Constant	Warping Constant	Designation					
			Width	Thickness				b _f	t _f	t _w	d ₁	t _w	t _f		A _g	X _L	X ₀	I _x	Z _x	S _x				r _x	I _y	Z _{yL}	S _y	r _y
kg/m	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm ²	mm	mm	mm	mm	mm ³	mm ³	mm ³	mm ⁴	mm ³	mm ³	mm	mm ⁴	mm ⁶					
380 PFC	55.2	380	100	17.5	10.0	14.0	345	34.5	5.14	7030	27.5	56.7	152	798	946	147	6.48	89.4	236	161	30.4	472	151	380 PFC				
300 PFC	40.1	300	90	16.0	8.0	14.0	268	33.5	5.13	5110	27.2	56.1	72.4	483	564	119	4.04	64.4	148	117	28.1	290	58.2	300 PFC				
250 PFC	35.5	250	90	15.0	8.0	12.0	220	27.5	5.47	4520	28.6	58.5	45.1	361	421	99.9	3.64	59.3	127	107	28.4	238	35.9	250 PFC				
230 PFC	25.1	230	75	12.0	6.5	12.0	206	31.7	5.71	3200	22.6	46.7	26.8	233	271	91.4	1.76	33.6	77.8	61.0	23.5	108	15.0	230 PFC				
200 PFC	22.9	200	75	12.0	6.0	12.0	176	29.3	5.75	2920	24.4	50.5	19.1	191	221	80.9	1.65	32.7	67.8	58.9	23.8	101	10.6	200 PFC				
180 PFC	20.9	180	75	11.0	6.0	12.0	158	26.3	6.27	2660	24.5	50.3	14.1	157	182	72.9	1.51	29.9	61.5	53.8	23.8	81.4	7.82	180 PFC				
150 PFC	17.7	150	75	9.5	6.0	10.0	131	21.8	7.26	2250	24.9	51.0	8.34	111	129	60.8	1.29	25.7	51.6	46.0	23.9	54.9	4.59	150 PFC				
125 PFC	11.9	125	65	7.5	4.7	8.0	110	23.4	8.04	1520	21.8	45.0	3.97	63.5	73.0	51.1	0.658	15.2	30.2	27.2	20.8	23.1	1.64	125 PFC				
100 PFC	8.33	100	50	6.7	4.2	8.0	86.6	20.6	6.84	1060	16.7	33.9	1.74	34.7	40.3	40.4	0.267	8.01	16.0	14.4	15.9	13.2	0.424	100 PFC				
75 PFC	5.92	75	40	6.1	3.8	8.0	62.8	16.5	5.94	754	13.7	27.2	0.683	18.2	21.4	30.1	0.120	4.56	8.71	8.20	12.6	8.13	0.106	75 PFC				

Table 20 Parallel Flange Channels - Properties for Assessing Section Capacity

Designation	Yield Stress		Form Factor		About x-axis		About y-axis		Designation	
	Flange f _y	Web f _y	Flange f _y	Web f _y	Load A Z _{ey}	Load B Z _{ey}	Load A Z _{ey}	Load B Z _{ey}	Load A Z _{ey}	Load B Z _{ey}
	MPa	MPa	MPa	MPa	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³
	300PLUS® *									
380 PFC	280	320	100	946	115	134	104	134	380 PFC	
300 PFC	300	320	100	564	82.3	96.6	77.2	96.6	300 PFC	
250 PFC	300	320	100	421	88.7	89.0	84.9	89.0	250 PFC	
230 PFC	300	320	100	271	45.1	50.4	42.6	50.4	230 PFC	
200 PFC	300	320	100	221	46.7	49.1	44.5	49.1	200 PFC	
180 PFC	300	320	100	182	44.9	44.8	44.1	44.8	180 PFC	
150 PFC	320	320	100	129	38.5	38.5	38.5	38.5	150 PFC	
125 PFC	320	320	100	72.8	22.8	22.8	22.5	22.8	125 PFC	
100 PFC	320	320	100	40.3	12.0	12.0	12.0	12.0	100 PFC	
75 PFC	320	320	100	21.4	6.84	6.84	6.84	6.84	75 PFC	
	AS/NZS 3679.1-350									
			1.00	946			104	134		
			1.00	564			77.2	96.6		
			1.00	421			84.9	89.0		
			1.00	271			42.6	50.4		
			1.00	221			44.5	49.1		
			1.00	182			44.1	44.8		
			1.00	129			38.5	38.5		
			1.00	72.0			22.5	22.8		
			1.00	40.3			12.0	12.0		
			1.00	21.4			6.84	6.84		

* 300PLUS® replaced Grade 250 as the base grade for these sections in 1994.

300PLUS® hot rolled sections are produced to exceed the minimum requirements of AS/NZS 3679:300.

Notes

1. For 300PLUS® sections the tensile strength (f_t) is 440 MPa.
2. For Grade 350 sections the tensile strength (f_t) is 480 MPa.
3. C: Compact Section; N: Non-compact Section; S: Slender Section.

Universal Bearing Piles (refer Note 4)

Table 21 Universal Bearing Piles - Dimensions and Properties

Designation	Depth of Section	Flange		Web Thickness	Root Radius	Depth Between Flanges	$(b_f - t_w)$		Gross Area of Cross Section	About x-axis			About y-axis			Torsion Constant	Warping Constant	Designation		
		Width	Thickness				d_f	t_w		A_g	I_x	Z_x	S_x	r_x	I_y				Z_y	S_y
	d	b_f	t_f	t_w	r_1	d_f		$2t_f$			I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	I_w
kg/m	mm	mm	mm	mm	mm	mm			mm ²		10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ³ mm ⁴	10 ⁹ mm ⁶
310 UBP 149	318	316	20.6	20.5	16.5	277		7.14	19000		330	2080	2370	132	109	691	1070	75.8	2970	2410
110	308	311	15.4	15.3	16.5	277		9.57	14000		236	1530	1720	130	76.6	494	759	73.9	1240	1640
78.8	299	306	11.1	11.1	16.5	277		13.3	10100		165	1100	1220	128	53.1	347	530	72.5	484	1100
200 UBP 122	230	220	25.0	25.0	11.4	180		3.90	15600		129	1120	1340	91.0	44.6	406	635	53.5	3540	469
																				200 UBP 122

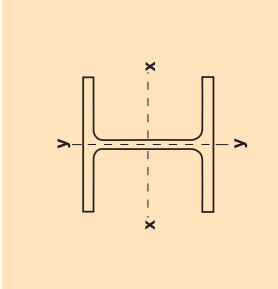
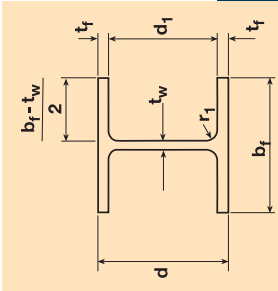
Table 22 Universal Bearing Piles - Properties for Assessing Section Capacity

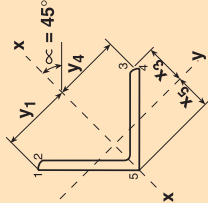
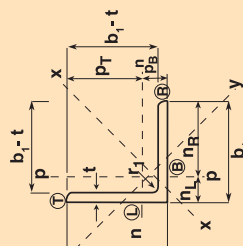
Designation	Yield Stress		Form Factor		About x-axis		About y-axis		Yield Stress		Form Factor		About x-axis		About y-axis		Designation
	Flange f_y	Web f_y	Flange f_y	Web f_y	Compactness	Z_{ex}	Compactness	Z_{ey}	Flange f_y	Web f_y	Flange f_y	Web f_y	Compactness	Z_{ex}	Compactness	Z_{ey}	
	MPa	MPa	MPa	MPa		10 ³ mm ³		10 ³ mm ³	MPa	MPa	MPa	MPa		10 ³ mm ³		10 ³ mm ³	
310 UBP 149	280	280	1.00	1.00	C	2370	C	1040	340	340	1.00	1.00	C	2370	C	1040	310 UBP 149
110	300	300	1.00	1.00	N	1680	N	718	340	340	1.00	1.00	N	1660	N	708	110
78.8	300	300	1.00	1.00	N	1130	N	460	340	340	1.00	1.00	N	1110	N	450	78.8
200 UBP 122	280	280	1.00	1.00	C	1340	C	609	340	340	1.00	1.00	C	1340	C	609	200 UBP 122

* 300PLUS® hot rolled sections are produced to exceed the minimum requirements of AS/NZS 3679:1300.

Notes

- 1. For 300PLUS® sections the tensile strength (f_t) is 440 MPa.
- 2. For Grade 350 sections the tensile strength (f_t) is 480 MPa.
- 3. C: Compact Section; N: Non-compact Section; S: Slender Section.
- 4. These sections are generally not stocked and are available for project orders only subject to enquiry from your nearest OneSteel Sales Office.





Equal Angles

Table 23 Equal Angles - x-axis and y-axis - Dimensions and Properties

Designation Leg-size	Nominal Thickness metre	Mass per metre	Actual Thickness	Radii		Coordinate of Centroid			About x-axis				About y-axis				Torsion Constant		Designation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
				Root	Toe	(b ₁ -t)	Gross Area of Cross Section	n _c		y ₁	Z _{x1}	S _x	r _x	I _y	x ₃	Z _{y3}	x ₅	Z _{y5}		S _y	r _y	J																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
								n _l	p _l														p _r	n _r	I _x	y ₄	Z _{x4}	S _y	r _x	I _y	x ₃	Z _{y3}	x ₅	Z _{y5}	S _y	r _y	J																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
b ₁ x b ₁	t	mm	mm	r ₁	r ₂	t	A ₀	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm

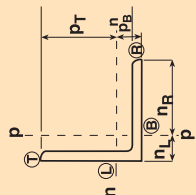
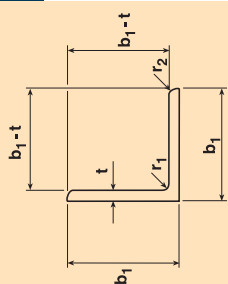
Table 24 Equal Angles - x-axis and y-axis - Properties for Assessing Section Capacity

Designation		Yield Stress		Form Factor		About x-axis		About y-axis		Yield Stress		Form Factor		About x-axis		About y-axis		Designation	
mm	mm	mm	mm	f _y	k _t	Z _{ex}	Load A or C	Z _{ey}	Load B	f _y	k _t	Z _{ex}	Load A or C	Z _{ey}	Load B	f _y	k _t	Z _{ex}	Load D
mm	mm	mm	mm	MPa		10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	MPa		10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	MPa		10 ³ mm ³	10 ³ mm ³
AS/NZS 3679.1-350																			
200 x 200 x 26 EA		280	100	602	267	267	100	602	267	340	100	602	267	267	100	602	267	267	200 x 200 x 26 EA
20 EA		280	100	479	218	220	100	469	214	340	100	469	214	220	100	469	214	220	20 EA
18 EA		280	100	427	196	204	100	417	192	340	100	417	192	204	100	417	192	204	18 EA
16 EA		300	100	369	172	186	100	362	169	340	100	362	169	186	100	362	169	186	16 EA
13 EA		300	100	285	136	158	100	278	132	340	100	278	132	158	100	278	132	158	13 EA
150 x 150 x 19 EA		280	100	248	110	110	100	248	110	340	100	248	110	110	100	248	110	110	150 x 150 x 19 EA
16 EA		300	100	212	95.7	96.3	100	209	94.5	340	100	209	94.5	96.3	100	209	94.5	96.3	16 EA
12 EA		300	100	155	78.1	78.1	100	152	70.9	340	100	152	70.9	78.1	100	152	70.9	78.1	12 EA
10 EA		320	0.958	114	54.5	64.9	100	111	53.1	360	0.906	111	53.1	64.9	100	111	53.1	64.9	10 EA
125 x 125 x 16 EA		300	100	143	63.4	63.4	100	143	63.4	340	100	143	63.4	63.4	100	143	63.4	63.4	125 x 125 x 16 EA
12 EA		300	100	110	50.3	51.7	100	109	49.6	340	100	109	49.6	51.7	100	109	49.6	51.7	12 EA
10 EA		320	100	83.2	38.9	43.1	100	81.6	38.1	360	100	81.6	38.1	43.1	100	81.6	38.1	43.1	10 EA
8 EA		320	0.943	64.3	30.7	36.8	100	62.7	29.9	360	0.892	62.7	29.9	36.8	100	62.7	29.9	36.8	8 EA
100 x 100 x 12 EA		300	100	69.9	31.1	31.1	100	69.9	31.1	340	100	69.9	31.1	31.1	100	69.9	31.1	31.1	100 x 100 x 12 EA
10 EA		320	100	55.1	25.2	26.1	100	54.4	24.8	360	100	54.4	24.8	26.1	100	54.4	24.8	26.1	10 EA
8 EA		320	100	43.7	20.4	22.4	100	42.9	20.0	360	100	42.9	20.0	22.4	100	42.9	20.0	22.4	8 EA
6 EA		320	0.906	30.9	14.8	18.1	100	30.0	14.4	360	0.856	30.0	14.4	18.1	100	30.0	14.4	18.1	6 EA
90 x 90 x 10 EA		320	100	45.0	20.4	20.6	100	44.5	20.1	360	100	44.5	20.1	20.6	100	44.5	20.1	20.6	90 x 90 x 10 EA
8 EA		320	100	36.0	16.7	17.8	100	35.4	16.4	360	100	35.4	16.4	17.8	100	35.4	16.4	17.8	8 EA
6 EA		320	100	25.9	12.4	14.4	100	25.3	12.1	360	0.954	25.3	12.1	14.4	100	25.3	12.1	14.4	6 EA
75 x 75 x 10 EA		320	100	30.5	13.6	13.6	100	30.5	13.6	360	100	30.5	13.6	13.6	100	30.5	13.6	13.6	75 x 75 x 10 EA
8 EA		320	100	25.4	11.6	11.8	100	25.1	11.5	360	100	25.1	11.5	11.8	100	25.1	11.5	11.8	8 EA
6 EA		320	100	18.7	8.85	9.66	100	18.4	8.70	360	100	18.4	8.70	9.66	100	18.4	8.70	9.66	6 EA
5 EA		320	0.927	13.2	6.47	7.82	100	12.8	6.30	360	0.876	12.8	6.30	7.82	100	12.8	6.30	7.82	5 EA
65 x 65 x 10 EA		320	100	22.5	9.90	9.90	100	22.5	9.90	360	100	22.5	9.90	9.90	100	22.5	9.90	9.90	65 x 65 x 10 EA
8 EA		320	100	19.2	8.59	8.59	100	19.2	8.59	360	100	19.2	8.59	8.59	100	19.2	8.59	8.59	8 EA
6 EA		320	100	14.7	6.76	7.07	100	14.5	6.66	360	100	14.5	6.66	7.07	100	14.5	6.66	7.07	6 EA
5 EA		320	100	10.6	5.05	5.75	100	10.4	4.94	360	100	10.4	4.94	5.75	100	10.4	4.94	5.75	5 EA
55 x 55 x 6 EA		320	100	10.7	4.84	4.86	100	10.5	4.78	360	100	10.5	4.78	4.86	100	10.5	4.78	4.86	55 x 55 x 6 EA
5 EA		320	100	7.88	3.70	3.98	100	7.75	3.64	360	100	7.75	3.64	3.98	100	7.75	3.64	3.98	5 EA
50 x 50 x 8 EA		320	100	10.7	4.71	4.71	100	10.7	4.71	360	100	10.7	4.71	4.71	100	10.7	4.71	4.71	50 x 50 x 8 EA
6 EA		320	100	8.69	3.92	3.92	100	8.69	3.92	360	100	8.69	3.92	3.92	100	8.69	3.92	3.92	6 EA
5 EA		320	100	6.60	3.08	3.22	100	6.50	3.03	360	100	6.50	3.03	3.22	100	6.50	3.03	3.22	5 EA
3 EA		320	0.907	3.82	1.90	2.32	100	3.71	1.85	360	0.858	3.71	1.85	2.32	100	3.71	1.85	2.32	3 EA
45 x 45 x 6 EA		320	100	6.88	3.06	3.06	100	6.88	3.06	360	100	6.88	3.06	3.06	100	6.88	3.06	3.06	45 x 45 x 6 EA
5 EA		320	100	5.39	2.47	2.52	100	5.32	2.44	360	100	5.32	2.44	2.52	100	5.32	2.44	2.52	5 EA
3 EA		320	100	3.19	1.55	1.81	100	3.12	1.52	360	0.954	3.12	1.52	1.81	100	3.12	1.52	1.81	3 EA
40 x 40 x 6 EA		320	100	5.29	2.33	2.33	100	5.29	2.33	360	100	5.29	2.33	2.33	100	5.29	2.33	2.33	40 x 40 x 6 EA
5 EA		320	100	4.25	1.93	1.93	100	4.22	1.92	360	100	4.22	1.92	1.93	100	4.22	1.92	1.93	5 EA
3 EA		320	100	2.59	1.25	1.40	100	2.54	1.23	360	100	2.54	1.23	1.40	100	2.54	1.23	1.40	3 EA
30 x 30 x 6 EA		320	100	2.74	1.19	1.19	100	2.74	1.19	360	100	2.74	1.19	1.19	100	2.74	1.19	1.19	30 x 30 x 6 EA
5 EA		320	100	2.23	0.990	0.990	100	2.23	0.990	360	100	2.23	0.990	0.990	100	2.23	0.990	0.990	5 EA
3 EA		320	100	1.50	0.714	0.732	100	1.48	0.705	360	100	1.48	0.705	0.732	100	1.48	0.705	0.732	3 EA
25 x 25 x 6 EA		320	100	1.78	0.769	0.769	100	1.78	0.769	360	100	1.78	0.769	0.769	100	1.78	0.769	0.769	25 x 25 x 6 EA
5 EA		320	100	1.47	0.642	0.642	100	1.47	0.642	360	100	1.47	0.642	0.642	100	1.47	0.642	0.642	5 EA
3 EA		320	100	1.03	0.479	0.479	100	1.03	0.479	360	100	1.03	0.479	0.479	100	1.03	0.479	0.479	3 EA

Equal Angles

Table 25 Equal Angles - n-axis and p-axis - Properties

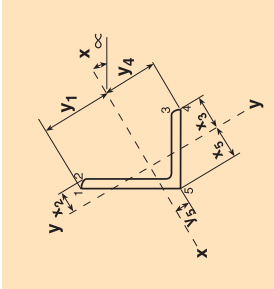
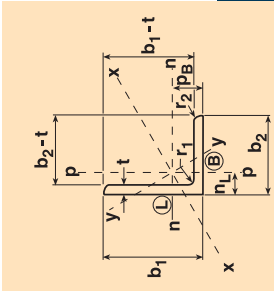
Designation	About n-axis and p-axis					Product of 2nd Moment of Area		Designation
	mm	mm	mm	mm	mm	$I_n = I_p$ 10^6 mm^4	I_{np} 10^6 mm^4	
200 x 200 x 26 EA	59.3	605	255	141	60.5	460	-20.9	200 x 200 x 26 EA
20 EA	28.8	570	201	143	363	201	-16.9	20 EA
18 EA	26.3	467	183	144	330	183	-15.5	18 EA
16 EA	23.7	427	164	145	296	164	-14.0	16 EA
13 EA	19.7	363	135	146	243	135	-11.6	13 EA
150 x 150 x 19 EA	44.2	250	105	106	189	105	-6.48	150 x 150 x 19 EA
16 EA	43.0	220	107	107	160	107	-5.58	16 EA
12 EA	41.5	180	108	108	124	108	-4.40	12 EA
10 EA	40.5	149	109	109	99.9	109	-3.56	10 EA
125 x 125 x 16 EA	36.8	144	60.3	88.2	37.9	109	-3.11	125 x 125 x 16 EA
12 EA	35.4	119	89.6	89.6	85.0	85.0	-2.48	12 EA
10 EA	34.4	99.4	90.6	90.6	68.4	90.6	-2.02	10 EA
8 EA	33.7	84.9	91.3	91.3	56.8	91.3	-1.69	8 EA
100 x 100 x 12 EA	29.2	71.1	29.3	70.8	53.2	53.2	-1.22	100 x 100 x 12 EA
10 EA	28.2	60.1	23.6	71.8	42.9	42.9	-1.00	10 EA
8 EA	27.5	51.7	19.6	72.5	35.7	35.7	-0.842	8 EA
6 EA	26.8	41.8	15.3	73.2	27.8	27.8	-0.661	6 EA
90 x 90 x 10 EA	25.7	47.3	18.9	64.3	34.4	34.4	-0.716	90 x 90 x 10 EA
8 EA	25.0	40.9	15.7	65.0	28.7	28.7	-0.604	8 EA
6 EA	24.3	33.2	12.3	65.7	22.4	22.4	-0.475	6 EA
75 x 75 x 10 EA	22.0	31.0	12.8	53.0	23.4	23.4	-0.399	75 x 75 x 10 EA
8 EA	21.3	27.0	10.7	53.7	19.6	19.6	-0.338	8 EA
6 EA	20.5	22.1	8.35	54.5	15.3	15.3	-0.268	6 EA
5 EA	19.9	17.9	6.44	55.1	11.8	11.8	-0.208	5 EA
65 x 65 x 10 EA	19.6	22.3	9.62	45.4	17.4	17.4	-0.254	65 x 65 x 10 EA
8 EA	19.0	19.6	8.07	46.0	14.6	14.6	-0.218	8 EA
6 EA	18.3	16.2	6.34	46.7	11.5	11.5	-0.175	6 EA
5 EA	17.7	13.2	4.94	47.3	8.97	8.97	-0.138	5 EA
55 x 55 x 6 EA	15.8	11.1	4.46	39.2	16.7	16.7	-0.103	55 x 55 x 6 EA
5 EA	15.2	9.12	3.48	39.8	16.8	16.8	-0.0814	5 EA
50 x 50 x 8 EA	15.2	10.5	4.61	34.8	14.9	14.9	-0.0928	50 x 50 x 8 EA
6 EA	14.5	8.90	3.64	35.5	15.1	15.1	-0.0756	6 EA
5 EA	13.9	7.36	2.85	36.1	15.2	15.2	-0.0602	5 EA
3 EA	13.2	5.25	1.89	36.8	15.3	15.3	-0.0405	3 EA
45 x 45 x 6 EA	13.3	6.93	2.91	31.7	13.5	13.5	-0.0538	45 x 45 x 6 EA
5 EA	12.7	5.76	2.28	32.3	13.6	13.6	-0.0432	5 EA
3 EA	12.0	4.14	1.51	33.0	13.8	13.8	-0.0292	3 EA
40 x 40 x 6 EA	12.0	5.24	2.26	28.0	11.9	11.9	-0.0366	40 x 40 x 6 EA
5 EA	11.5	4.39	1.77	28.5	12.0	12.0	-0.0296	5 EA
3 EA	10.8	3.19	1.18	29.2	12.2	12.2	-0.0201	3 EA
30 x 30 x 6 EA	9.53	2.59	1.21	20.5	8.71	8.71	-0.0140	30 x 30 x 6 EA
5 EA	8.99	2.22	0.951	21.0	8.83	8.83	-0.0116	5 EA
3 EA	8.30	1.66	0.635	21.7	8.93	8.93	-0.00804	3 EA
25 x 25 x 6 EA	8.28	1.63	0.807	16.7	7.13	7.13	-0.00750	25 x 25 x 6 EA
5 EA	7.75	1.42	0.638	17.3	7.23	7.23	-0.00632	5 EA
3 EA	7.07	1.08	0.426	17.9	7.33	7.33	-0.00446	3 EA



Unequal Angles

Table 26 Unequal Angles - x-axis and y-axis - Dimensions and Properties

Designation	Nominal Thickness	Mass per metre	Actual Thickness	Radii		Gross Area of Centroid		About x-axis										About y-axis										Torsion Constant Alpha	Tan Designation		
				t	r ₁	r ₂	t	A ₀	p _B	n _L	l _x	y ₁	Z _{x1}	Y ₄	Z _{x4}	Y ₅	Z _{x5}	S _x	r _x	I _y	x ₂	Z _{y2}	x ₃	Z _{y3}	x ₅	Z _{y5}	S _y			r _y	J
Leg-size	b ₁ x b ₂			t	r ₁	r ₂	t	A ₀	p _B	n _L	l _x	y ₁	Z _{x1}	Y ₄	Z _{x4}	Y ₅	Z _{x5}	S _x	r _x	I _y	x ₂	Z _{y2}	x ₃	Z _{y3}	x ₅	Z _{y5}	S _y	r _y	J		
	mm	mm	mm	mm	mm	mm	mm	mm ²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm ³	mm ³	mm	mm ⁴	mm	mm ³	mm	mm ³	mm	mm ³	mm ³	mm	mm ⁴	
150 x 100 x 12 UA	150 x 100 x 12 UA	22.5	12.0	10.0	5.0	11.5	7.33	2870	491	24.3	7.51	102	73.5	75.3	99.7	35.2	213	127	51.2	1.35	27.6	48.8	52.9	25.5	42.0	32.1	51.7	21.7	141	0.438	150 x 100 x 12 UA
	10 UA	18.0	9.5	10.0	5.0	14.8	9.53	2300	481	23.3	6.11	103	59.5	74.9	81.5	34.6	177	102	51.6	1.09	26.9	40.7	53.0	20.6	40.7	26.9	41.8	21.8	71.9	0.441	10 UA
	150 x 90 x 16 UA	27.9	15.8	10.0	5.0	8.49	4.70	3550	52.5	22.7	8.80	99.5	88.4	71.9	122	41.9	210	154	49.8	1.32	24.6	53.8	49.9	26.5	38.9	34.0	55.9	19.3	300	0.353	150 x 90 x 16 UA
	12 UA	21.6	12.0	10.0	5.0	11.5	6.50	2750	51.0	21.2	6.97	100	69.4	71.3	97.8	40.8	171	120	50.4	1.04	23.4	44.5	50.1	20.8	37.2	28.0	43.8	19.5	136	0.360	12 UA
	10 UA	17.3	9.5	10.0	5.0	14.8	8.47	2200	50.0	20.2	5.66	101	56.1	70.7	80.1	40.1	141	96.6	50.7	0.847	22.6	37.4	50.4	16.8	36.1	23.5	35.4	19.6	69.0	0.363	10 UA
	8 UA	14.3	7.8	10.0	5.0	18.2	10.5	1820	49.2	19.6	4.73	101	46.7	70.3	67.3	39.5	120	80.1	51.0	0.710	22.1	32.2	50.6	14.0	35.2	20.2	29.5	19.7	39.0	0.364	8 UA
	125 x 75 x 12 UA	17.7	12.0	8.0	5.0	9.42	5.25	2260	43.3	18.4	3.91	83.2	47.0	59.7	65.5	34.6	113	81.4	41.6	0.585	19.9	29.3	41.4	14.1	31.9	18.4	29.7	16.1	110	0.356	125 x 75 x 12 UA
	10 UA	14.2	9.5	8.0	5.0	12.2	6.89	1810	42.3	17.5	3.20	83.8	38.2	59.3	53.9	33.9	94.4	65.8	42.0	0.476	19.2	24.9	41.6	11.4	30.7	15.5	24.1	16.2	56.2	0.360	10 UA
	8 UA	11.8	7.8	8.0	5.0	15.0	8.62	1500	41.5	16.8	2.68	84.2	31.8	58.9	45.5	33.3	80.4	54.6	42.2	0.399	18.6	21.5	41.8	9.55	29.9	13.3	20.1	16.3	31.7	0.363	8 UA
	6 UA	9.16	6.0	8.0	5.0	19.8	11.5	1170	40.7	16.0	2.10	84.7	24.8	58.5	36.0	32.8	64.1	42.4	42.5	0.315	18.0	17.5	42.1	7.47	29.0	10.8	15.7	16.4	14.8	0.364	6 UA
100 x 75 x 10 UA	100 x 75 x 10 UA	12.4	9.5	8.0	5.0	9.53	6.89	1580	31.8	19.4	1.89	69.2	27.3	54.5	34.6	18.6	101	46.5	34.6	0.401	22.3	18.0	36.4	11.0	32.2	12.5	21.2	16.0	49.1	0.546	100 x 75 x 10 UA
	8 UA	10.3	7.8	8.0	5.0	11.8	8.62	1310	31.1	18.7	1.59	69.4	22.9	54.3	29.2	18.2	87.0	38.7	34.8	0.337	21.8	15.4	36.4	9.26	31.3	10.7	17.8	16.0	27.8	0.549	8 UA
75 x 50 x 8 UA	75 x 50 x 8 UA	7.98	6.0	8.0	5.0	15.7	11.5	1020	30.3	17.9	1.25	69.7	17.9	54.0	23.1	17.9	70.0	30.1	35.1	0.265	21.4	12.4	36.5	7.27	30.3	8.75	13.9	16.2	13.0	0.551	6 UA
	6 UA	7.23	7.8	7.0	3.0	8.62	5.41	921	25.2	12.8	0.586	50.8	11.5	37.8	15.5	18.0	32.5	20.0	25.2	0.106	14.2	7.46	26.4	4.01	21.7	4.88	8.19	10.7	19.5	0.430	75 x 50 x 8 UA
6 UA	6 UA	5.66	6.0	7.0	3.0	11.5	7.33	721	24.4	12.1	0.468	51.2	9.15	37.5	12.5	17.6	26.7	15.8	25.5	0.0842	13.6	6.17	26.5	3.18	20.8	4.04	6.48	10.8	9.21	0.435	6 UA
	5 UA	4.40	4.6	7.0	3.0	15.3	9.87	560	23.8	11.5	0.370	51.5	7.17	37.2	9.93	17.2	21.5	12.3	25.7	0.0666	13.2	5.03	26.6	2.50	20.1	3.32	5.09	10.9	4.32	0.437	5 UA
65 x 50 x 8 UA	65 x 50 x 8 UA	6.59	7.8	6.0	3.0	7.33	5.41	840	21.1	13.6	0.421	44.9	9.37	36.3	11.6	11.6	36.4	16.1	22.4	0.0936	15.6	6.00	23.9	3.91	22.3	4.20	7.49	10.6	17.6	0.570	65 x 50 x 8 UA
	6 UA	5.16	6.0	6.0	3.0	9.83	7.33	658	20.4	12.9	0.338	45.2	7.48	36.1	9.35	11.2	30.2	12.7	22.7	0.0743	15.1	4.91	23.9	3.11	21.4	3.48	5.93	10.6	8.29	0.575	6 UA
5 UA	5 UA	4.02	4.6	6.0	3.0	13.1	9.87	512	19.8	12.4	0.267	45.4	5.89	35.9	7.43	10.9	24.5	9.92	22.8	0.0587	14.8	3.97	23.9	2.46	20.6	2.85	4.66	10.7	3.87	0.577	5 UA



Unequal Angles

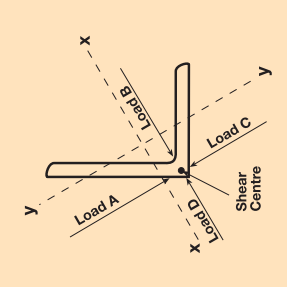
Table 27 Unequal Angles - x-axis and y-axis - Properties for Assessing Section Capacity

Designation	Yield Stress	Form Factor	About x-axis			About y-axis			Yield Stress	Form Factor	About x-axis			About y-axis			Designation			
			Load A	Load B	Load C	Load A	Load B	Load C			Load A	Load B	Load C	Load A	Load B	Load C				
mm mm mm	f _y	k _t	Z _{ex}	Z _{ey}	Z _{ex}	f _y	k _t	Z _{ex}	Z _{ey}	Z _{ex}	f _y	k _t	Z _{ex}	Z _{ey}	Z _{ex}	f _y	k _t	Z _{ex}	Z _{ey}	Z _{ex}
	MPa		10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	MPa		10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	MPa		10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	MPa		10 ³ mm ³	10 ³ mm ³	10 ³ mm ³
AS/NZS 3679.1-350																				
150 x 100 x 12 UA	300	1.00	102	35.3	110	340	1.00	100	34.7	110	340	1.00	100	34.7	110	38.2			150 x 100 x 12 UA	
10 UA	320	0.975	74.8	26.0	81.7	360	0.943	73.0	25.3	78.9	360	0.943	73.0	25.3	30.9	30.9			10 UA	
150 x 90 x 16 UA	300	1.00	132	39.5	133	340	1.00	130	39.0	133	340	1.00	130	39.0	39.8	39.8			150 x 90 x 16 UA	
12 UA	300	1.00	96.3	28.8	104	340	1.00	94.6	28.3	104	340	1.00	94.6	28.3	31.1	31.1			12 UA	
10 UA	320	0.973	70.6	21.2	81.8	360	0.940	68.8	20.6	79.5	360	0.940	68.8	20.6	25.2	25.2			10 UA	
8 UA	320	0.863	53.1	15.9	60.3	360	0.836	51.2	15.4	57.9	360	0.836	51.2	15.4	21.0	21.0			8 UA	
125 x 75 x 12 UA	300	1.00	68.6	20.6	70.5	340	1.00	67.6	20.3	70.5	340	1.00	67.6	20.3	21.2	21.2			125 x 75 x 12 UA	
10 UA	320	1.00	51.6	15.5	57.2	360	1.00	50.6	15.2	57.2	360	1.00	50.6	15.2	17.2	17.2			10 UA	
8 UA	320	0.964	39.8	11.9	46.0	360	0.931	38.8	11.6	44.7	360	0.931	38.8	11.6	14.3	14.3			8 UA	
6 UA	320	0.824	26.8	8.07	30.1	360	0.799	25.8	7.75	28.7	360	0.799	25.8	7.75	11.2	11.2			6 UA	
100 x 75 x 10 UA	320	1.00	39.4	15.9	40.9	360	1.00	38.8	15.7	40.9	360	1.00	38.8	15.7	16.6	16.6			100 x 75 x 10 UA	
8 UA	320	1.00	31.2	12.6	33.1	360	1.00	30.6	12.4	32.1	360	1.00	30.6	12.4	13.9	13.9			8 UA	
6 UA	320	0.946	22.0	8.93	21.8	360	0.917	21.4	8.68	20.7	360	0.917	21.4	8.68	10.9	10.9			6 UA	
75 x 50 x 8 UA	320	1.00	17.0	5.93	17.3	360	1.00	16.8	5.85	17.3	360	1.00	16.8	5.85	6.02	6.02			75 x 50 x 8 UA	
6 UA	320	1.00	12.6	4.37	13.7	360	1.00	12.4	4.30	13.7	360	1.00	12.4	4.30	4.77	4.77			6 UA	
5 UA	320	0.956	8.89	3.10	9.65	360	0.926	8.66	3.02	9.30	360	0.926	8.66	3.02	3.75	3.75			5 UA	
65 x 50 x 8 UA	320	1.00	14.1	5.86	14.1	360	1.00	14.1	5.86	14.1	360	1.00	14.1	5.86	5.86	5.86			65 x 50 x 8 UA	
6 UA	320	1.00	10.7	4.46	11.2	360	1.00	10.6	4.40	11.2	360	1.00	10.6	4.40	4.67	4.67			6 UA	
5 UA	320	1.00	7.76	3.23	7.92	360	1.00	7.59	3.17	7.64	360	1.00	7.59	3.17	3.68	3.68			5 UA	

* 300PLUS® replaced Grade 250 as the base grade for 150 x 90 x 8 unequal angles and larger in 1994.
 300PLUS® replaced Grade 250 as the base grade for 125 x 75 x 12 unequal angles and smaller in 1997.
 300PLUS® hot rolled sections are produced to exceed the minimum requirements of AS/NZS 3679:300.

Notes

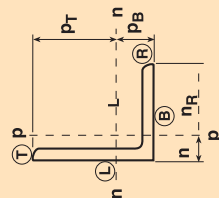
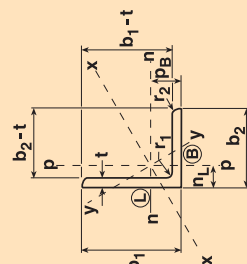
1. For 300PLUS® sections the tensile strength (fu) is 440 MPa.
2. For Grade 350 sections the tensile strength (fu) is 480 MPa.



Unequal Angles

Table 28 Unequal Angles - n-axis and p-axis - Dimensions and Properties

Designation	About n-axis										About p-axis				Product of 2nd Moment of Area	Designation
	I_n	P_B	Z_{nB}	P_T	Z_{nT}	S_n	r_n	I_p	η_L	Z_{pL}	η_R	Z_{pR}	S_p	r_p	I_{np}	
mm mm mm	10^6 mm^4	mm	10^3 mm^3	mm	10^3 mm^3	10^3 mm^3	mm	10^6 mm^4	mm	10^3 mm^3	mm	10^3 mm^3	10^3 mm^3	mm	10^6 mm^4	
150 x 100 x 12 UA	6.52	491	133	101	64.6	117	47.7	2.34	24.3	96.2	75.7	30.9	56.0	28.6	-2.27	150 x 100 x 12 UA
10 UA	5.29	481	110	102	51.9	94.0	48.0	1.91	23.3	81.9	76.7	24.9	44.7	28.8	-1.85	10 UA
150 x 90 x 16 UA	7.97	52.5	152	97.5	81.7	145	47.4	2.15	22.1	94.9	67.3	32.0	59.5	24.6	-2.35	150 x 90 x 16 UA
12 UA	6.29	51.0	123	99.0	63.5	114	47.8	1.72	21.2	81.0	68.8	25.0	45.7	25.0	-1.89	12 UA
10 UA	5.10	50.0	102	100	51.0	91.5	48.2	1.41	20.2	69.5	69.8	20.2	36.5	25.3	-1.54	10 UA
8 UA	4.26	49.2	86.6	101	42.3	76.0	48.4	1.18	19.6	60.4	70.4	16.8	30.1	25.5	-1.29	8 UA
125 x 75 x 12 UA	3.54	43.3	81.8	81.7	43.3	77.3	39.6	0.958	18.4	52.0	56.6	16.9	31.4	20.6	-1.05	125 x 75 x 12 UA
10 UA	2.88	42.3	68.2	82.7	34.9	62.5	39.9	0.789	17.5	45.2	57.5	13.7	25.1	20.9	-0.867	10 UA
8 UA	2.41	41.5	58.1	83.5	28.9	52.0	40.1	0.664	16.8	39.6	58.2	11.4	20.7	21.0	-0.731	8 UA
6 UA	1.89	40.7	46.5	84.3	22.5	40.6	40.3	0.524	16.0	32.7	59.0	8.89	16.0	21.2	-0.575	6 UA
100 x 75 x 10 UA	1.55	31.8	48.6	68.2	22.6	41.3	31.3	0.743	19.4	38.3	55.6	13.4	24.3	21.7	-0.625	100 x 75 x 10 UA
8 UA	1.30	31.1	41.8	68.9	18.8	34.4	31.5	0.626	18.7	33.5	56.3	11.1	20.2	21.9	-0.528	8 UA
6 UA	1.02	30.3	33.7	69.7	14.6	26.9	31.7	0.494	17.9	27.5	57.1	8.67	15.7	22.0	-0.416	6 UA
75 x 50 x 8 UA	0.511	25.2	20.3	49.8	10.3	18.5	23.6	0.181	12.8	14.1	37.2	4.86	8.96	14.0	-0.174	75 x 50 x 8 UA
6 UA	0.407	24.4	16.7	50.6	8.05	14.6	23.8	0.145	12.1	12.0	37.9	3.84	6.98	14.2	-0.140	6 UA
5 UA	0.321	23.8	13.5	51.2	6.27	11.4	23.9	0.115	11.5	10.0	38.5	3.00	5.41	14.3	-0.111	5 UA
65 x 50 x 8 UA	0.341	21.1	16.2	43.9	7.75	14.1	20.1	0.174	13.6	12.7	36.4	4.78	8.74	14.4	-0.141	65 x 50 x 8 UA
6 UA	0.272	20.4	13.4	44.6	6.10	11.1	20.3	0.140	12.9	10.8	37.1	3.77	6.85	14.6	-0.114	6 UA
5 UA	0.215	19.8	10.9	45.2	4.75	8.70	20.5	0.111	12.4	8.96	37.6	2.95	5.32	14.7	-0.0903	5 UA



Structural Steel Sections

Structural Steel - Welded Sections - Standard: AS/NZS 3679.2:1996

Table 29 Chemical Composition - Welded Sections Base Plate

Grade (1)	Cast or Product Analysis, Percent												CE (4)
	C	Si	Mn	P	S	Cr (2)	Ni (2)	Cu (2)	Mo (2)	Al (3)	Ti	Micro-alloying Elements	
AS/NZS 3678	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.	Max.
300 & 300L15	0.22	0.55	1.70	0.040	0.030	0.30	0.50	0.40	0.10	0.100	0.040	(see Note 5)	0.44
400 & 400L15	0.22	0.55	1.70	0.040	0.030	0.30	0.50	0.40	0.35	0.100	0.040	(see Note 6)	0.48

Notes

- The use of sulphide modification steelmaking techniques for listed grades is permitted.
- Cr + Ni + Cu + Mo = 1.00% maximum apply.
- Limits specified are for both acid soluble and total aluminium.
- Carbon equivalent (CE) is calculated from the equation based on actual cast or product analysis:

$$CE = C + \frac{Mn}{6} + \frac{Cr}{5} + \frac{Mo}{5} + \frac{V}{15} + \frac{Ni}{15} + \frac{Cu}{15}$$
- Niobium plus vanadium: 0.030% maximum.
- Vanadium: 0.10% maximum. Niobium plus vanadium plus titanium: 0.15% maximum.

Table 30 Tensile Properties - Welded Sections Base Plate

Property	Grade - AS/NZS 3678	
	300, 300L15	400, 400L15
Minimum Yield Strength - MPa for thickness of:		
> 8 ≤ 12	310	400
> 12 ≤ 20	300	380
> 20 ≤ 50	280	360
Minimum Tensile Strength - MPa	430	480
Minimum Elongation % of Gauge Length of $5.65\sqrt{S_0}$	21	18

Note

- S_0 is the cross-sectional area of the test piece before testing.

Table 31 Charpy V-Notch Impact Test Requirements - Welded Sections Base Plate

Grade	Test Temperature	Minimum Absorbed Energy, J Size of Test Piece					
		10mm x 10mm		10mm x 7.5mm		10mm x 5mm	
AS/NZS 3678	°C	Average of 3 Tests	Individual Test	Average of 3 Tests	Individual Test	Average of 3 Tests	Individual Test
300L15	-15	27	20	22	16	18	13
400L15	-15	27	20	22	16	18	13

STANDARD SPECIFICATIONS

Structural Steel - Hot Rolled Bars and Sections - Standard: AS/NZS 3679.1:1996

Table 32 Chemical Composition - Bars and Sections

Grade (see Note 1)	Cast analysis (max.) (See Notes 2 and 3) %						
	C	Si	Mn	P	S	Micro-alloying elements (see Note 4)	CE (see Note 5)
300PLUS®, 300PLUSLO, 300PLUS®SO	0.25	0.50	1.60	0.040	0.040	(see Note 6)	0.44
350, 350LO	0.22	0.50	1.60	0.040	0.040	(see Note 7)	0.45

- Notes**
- The use of sulfide modification steel making techniques for these grades is permitted.
 - Grain refining elements, i.e. aluminium and titanium, may be added, provided that the total content does not exceed 0.15%. Limits are for total or soluble aluminium.
 - The following elements may be present to the limits stated, subject to a maximum total of 1.00%:

(a) Copper	0.50%
(b) Nickel	0.50%
(c) Chromium	0.30%
(d) Molybdenum	0.10%
 - For grade 300PLUS, the following are not considered as micro-alloying elements:

(a) Titanium	0.040% maximum
(b) Niobium	0.020% maximum
(c) Vanadium	0.030% maximum
(d) Niobium plus vanadium	0.030% maximum
 - Carbon equivalent (CE) is calculated from the following equation:

$$CE = C + \frac{Mn}{6} + \frac{Cr}{5} + \frac{Mo}{5} + \frac{V}{15} + \frac{Ni}{15} + \frac{Cu}{15}$$
 - Micro-alloying elements are not permitted in grade 300 except for thicknesses greater than or equal to 15mm, where the following apply:
 - the maximum combined micro-alloying element content is 0.15%
 - where micro-alloying elements are used, the percentage of each element is to be shown on certificates.
 - For grade 350, micro-alloying elements niobium, vanadium and titanium may be added, provided that their total combined content does not exceed 0.15%.

Table 33 Tensile Properties - Flat Bars and Sections

Grade	Minimum yield stress, MPa			Minimum tensile strength, MPa	Minimum elongation on a gauge length of 5.65√S ₀ (see Note 2) %
	Thickness, mm (see Note 1)				
	< 11	≥ 11 to ≤ 17	> 17 to < 40		
300PLUS®, 300PLUSLO	320	300	280	440	22
300PLUS®SO	NA	300	280	440	25
350	360	340	340	480	20

Table 34 Tensile Properties - Round and Square Bars

Grade	Minimum yield stress, MPa			Minimum tensile strength	Minimum elongation on a gauge length of 5.65√S ₀
	Thickness, mm				
	≤ 50	> 50 to < 100	≥ 100	MPa	%
300PLUS®	300	290	280	440	22
350	340	330	320	480	20

Notes (apply to tables 33 and 34)

- For a section, the term 'thickness' refers to the nominal thickness of the part from which the sample is taken.
- S_0 is the cross-sectional area of the test piece before testing.
- For precise details of properties reference should be made to the latest edition of AS/NZS 3679.1:1996 or the latest OneSteel specification.
- 300PLUS® steel is produced to exceed the latest requirements for grade 300 in AS/NZS 3679.1.

Table 35 Charpy V-Notch Impact Test Requirements - Bars and Sections

Grade	Test Temperature °C	Minimum Absorbed Energy, J Size of Test Piece					
		10mm x 10mm		10mm x 7.5mm		10mm x 5mm	
		Average of 3 Tests	Individual Test	Average of 3 Tests	Individual Test	Average of 3 Tests	Individual Test
300PLUSLO, 350LO*	0	27	20	22	16	18	13
300PLUS®SO	0	70	50	NA	NA	NA	NA

Notes

- This does not cover impact tested grades for thickness less than 8mm.
 *Impact testing is not available for bars and is only available for some sections by enquiry.

Merchant Bar Sections

Table 36 Chemical Composition - For OneSteel Merchant Bar Sections - Regular Grades - AS 1442

Steel Type	Grade	C		Si		Mn		P		S	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Carbon and Carbon Manganese Steels	1016	0.13	0.18	0.10	0.35	0.60	0.90	*	0.040	*	0.040
	1022	0.18	0.23	0.10	0.35	0.70	1.00	*	0.040	*	0.040
	1045	0.43	0.50	0.10	0.35	0.60	0.90	*	0.040	*	0.040

Table 37 Chemical Composition - For OneSteel Merchant Bar Sections - Regular Grades - AS 1447

Steel Type	Grade	C		Si		Mn		P		S		Cr	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Spring Steels	5160	0.55	0.65	0.10	0.35	0.70	1.00	*	0.040	*	0.040	0.70	0.90
	9258	0.50	0.65	1.60	2.20	0.70	1.05	*	0.040	*	0.040	*	*
	9261	0.55	0.65	1.80	2.20	0.70	1.00	*	0.040	*	0.040	0.10	0.25

Note

1. Merchant Bar Sections are also available in AS/NZS 3679.1:1996 specification. See Tables 32 to 35. Other grades may be available on enquiry.

Table 38 OneSteel Grades

Steel Type	Grade	C		Si		Mn		P		S		Cr		V	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
OneSteel	1015	0.13	0.18	0.10	0.35	0.30	0.60	*	0.040	*	0.050	*	*	*	*
	X4K92M6IS*	0.55	0.65	1.60	1.90	0.70	1.00	*	0.040	*	0.040	0.10	0.25	0.15	0.25

Table 39 Heat Treatment Limitations

Maximum Recommended Cross Section*			
Grade	Rounds	Squares	Flats
5160	40mm	36mm	28mm
9261	27mm	25mm	19mm
9258			16mm

* The recommendations are based on the criterion that, at the maximum dimensions, a hardness of 50 HRC can be achieved in the centre of the quenched section.

The actual properties obtained are dependent on both grade and heat treatment process control. As OneSteel has no control over the springmakers' heat treatment process, the above recommendations cannot be guaranteed. However, springmakers with efficient heat treatment facilities will be able to achieve a hardness value of 50 HRC as recommended.

CUSTOMER TECHNICAL SERVICE

OneSteel Direct - free call 1800 1 78335

All customer service enquiries for OneSteel Market Mills products described in this publication should be directed to the OneSteel Direct free call service on 1800 1 STEEL (1800 1 78335).

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