

onesteel

SEVENTH EDITION

HOT ROLLED AND STRUCTURAL STEEL PRODUCTS



HOT ROLLED AND STRUCTURAL STEEL PRODUCTS

CONTENTS

INTRODUCTION	1
TEST CERTIFICATES AND CERTIFICATES OF COMPLIANCE	2
BUILD WITH STANDARDS AND ACRS	4
AVAILABILITY	
Structural Steel Sections	5
Merchant Bar Sections	6
DIMENSIONS AND DESIGN INFORMATION	
Welded Beams	10
Welded Columns	12
Universal Beams	14
Universal Columns	16
Tapered Flange Beams	18
Parallel Flange Channels	19
Universal Bearing Piles	20
Equal Angles	21
Unequal Angles	24
STANDARD SPECIFICATIONS	
Structural Steel Sections	27
Merchant Bar Sections	29
CUSTOMER TECHNICAL SERVICE	30

INTRODUCTION

OneSteel has a long and significant presence in the Australian steel industry as an integrated manufacturer of steel and finished steel products that dates back to the establishment of steelmaking in Newcastle in 1915 and continues to the present day.

OneSteel is Australia's premier manufacturer of steel long products. The company manufactures and distributes a wide range of steel products including structural sections, rail, rod, bar, wire and pipe and tube products.

OneSteel's major manufacturing facilities for hot rolled products are located in Whyalla, South Australia; in Melbourne, Victoria and in Newcastle and Western Sydney, New South Wales.

As part of OneSteel's ongoing commitment to the Australian construction and manufacturing industry, this booklet is produced by OneSteel Manufacturing and is intended to provide general information on a range of hot rolled and structural steel products.

Furthermore, this booklet will give you guidance on how OneSteel supports the quality and reputation of its products through initiatives such as our Build With Standards website and our EzyCommerce service.

(N.B. for the sake of simplicity, the following text will refer to OneSteel Manufacturing as OneSteel.)

OneSteel supplies products that are compliant to the relevant Australian Standards or OneSteel's own high quality standards. OneSteel's aim is to supply a consistent high quality product which delivers benefits to our customers by minimising variation and reducing waste.

The quality of products is constantly checked in NATA endorsed testing laboratories, by skilled technical staff using proven equipment. Strict metallurgical control is maintained, from receipt of raw materials to despatch of the finished product.

Products are rigorously tested and certified, with test certificates and certificates of compliance providing assurance that OneSteel sections meet all required specifications. These are made available free of charge via our EzyCommerce® website.

At its manufacturing sites OneSteel has third party accreditation to Quality Management System ISO 9001 and Environmental Management System ISO 14001.

Furthermore, through initiatives such as Build With Standards and ACRS, OneSteel is clearly committed to the ongoing supply of quality product to the Australian and New Zealand marketplace.

Test Certificates / Certificates of Compliance - EzyCommerce

NATA endorsed test certificates are available for all AS/NZS 3679.1 product. Certificates of Compliance for Welded product supplied under AS/NZS 3679.2 are also available. The Steel Structures Design Standard - AS4100, acknowledges that these certificates provide designers and certifiers with sufficient evidence that they are acceptable steels for use in designs to AS4100.

Fabricators can ensure they receive a copy of the relevant certificate covering the steel ordered and delivered by requesting them at the time of order. The certificates can be provided manually, electronically or customers can access these via OneSteel's EzyCommerce® website at <https://ezycommerce.onesteel.com>

All distributors of OneSteel AS/NZS 3679.1 & AS/NZS 3679.2 products have access to certificates via EzyCommerce® - this is a free service that offers the flexibility to access and retrieve this information at anytime of the day.

Access to EzyCommerce® Online is free to approved customers of OneSteel Manufacturing - all you need is a login name and password - please refer to: <https://ezycommerce.onesteel.com/about.aspx> for more information on obtaining access to the website.



For more information:

Ezycommerce: <https://ezycommerce.onesteel.com>

Test Certificate sample



TEST CERTIFICATE

Page 1 of 1
Certificate No.: W803485
 Transmission Date: 15/08/12

Customer: SAMPLE	Supplier: OneSteel Manufacturing Pty Limited Whyalla, SA - 5600, Australia A.B.N. 42 004 651 325
Ship To:	Sales Order No: B1093 Printed on: 15/08/2012

<p>This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced except in full.</p>	Sampling undertaken by OneSteel Whyalla 15352 Approved Signatory - M. Bubicich Chemical results as identified are from Amdel Ltd, Whyalla 0834 Approved Signatory - K. Barsby Mechanical results as identified are from Amdel Ltd, Whyalla 0794 Approved Signatory - I. Hamison
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STEELMAKING: Basic Oxygen - Slab Cast
 SPECIFICATION: **AS/NZS 3679.1-300**
 PRODUCT: **410UB59.7**

INSPECTION: Supplier
 CERTIFICATION: Supplier

ITEMS COVERED BY THIS TEST CERTIFICATE

Item No	Heat No	Customer Order	Length
1606C	517049	7503247532	18.000
1606C	517050	7503247532	18.000
1606C	518504	7503247532	18.000

CHEMICAL ANALYSIS

Percentage of element by mass (L=Cast, P=Product, -S=Soluble, -T=Total, CF=Chemical Formula, n=Min, x=Max)

Item No	Heat / Unit No	NATA Lab	L/P	C	P	Mn	Si	S	Ni	Cr	Mo	Cu	Sn	Al
1606C	517049	0834	L	.196	.010	1.36	.160	.004	.006	.020	.001	.020	.006	.020
1606C	517050	0834	L	.200	.015	1.34	.150	.002	.013	.027	.002	.026	.007	.020
1606C	518504	0834	L	.150	.016	1.46	.150	.012	.008	.027	.001	.018	.001	.026

Item No	Heat / Unit No	NATA Lab	L/P	Nb	Ti	B	V	N	Ca	Zr	CF1
1606C	517049	0834	L	.001	.001	.0003	.001	.0077	.0004	.001	.43
1606C	517050	0834	L	.001	.001	.0003	.001	.0062	.0003	.001	.43
1606C	518504	0834	L	.001	.001	.0003	.001	.0084	.0001	.002	.40

$CF1 = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$

MECHANICAL TESTING

Tensile

Item No	Heat No	Tested Unit	NATA Lab	Test Report	ReH MPa	Rm MPa	ELONGN %
1606C	517049	517049	0794	51643	375	530	35
1606C	517049	517049	0794	51643	360	530	34
1606C	517050	517050	0794	51643	365	530	36
1606C	517050	517050	0794	51643	370	530	36
1606C	518504	518504	0794	51781	365	510	36
1606C	518504	518504	0794	51781	365	500	34

Yield Strength - determined in accordance with requirements of nominated product standard

COMMENTS

OneSteel Whyalla is quality endorsed to AS/NZS ISO9001 under SAI GLOBAL Lic. No. - QEC0351.
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I certify that the above information is in accordance with the records of the company and conforms to the specification(s) stated.

M.Bubicich
 OneSteel Whyalla





Build With Standards

The Build With Standards campaign is an initiative undertaken by OneSteel to improve compliance and generate increased confidence in structural steel quality in all end-use applications.

Changes to Australian and New Zealand Standards for structural steel have been introduced to address industry concerns regarding product quality, identification, certification and traceability.

These revised Australian/New Zealand Standards help ensure the quality of the structural steel specified is supplied.

With the revised Standards and mandatory requirements around markings and test certificates, industry stakeholders can readily check if the steel used was produced to Australian/ New Zealand Standards and the specifications called up in the design.

Visit OneSteel's Build With Standards website for more information on the initiative and how OneSteel meets the Standards (www.buildwithstandards.com.au). In addition you will find valuable information regarding the Green Star® Rating System as well as information regarding OneSteel's environmental management systems and membership of the WorldSteel Association Climate Action group.



ACRS - Third Party Certification

In addition to our quality systems and NATA endorsed laboratories, OneSteel's range of AS/NZS 3679.1 hot rolled products are all produced at mills with ACRS certification. ACRS is an expert, industry based, third party product certifier of reinforcing, prestressing and structural steels to Australian/New Zealand Standards. This certification gives designers and asset owners additional confidence that they are getting compliant steels on which their structural design has been based.

Copies of our ACRS accreditation can be viewed at the ACRS website - www.steelcertification.com, or via the Build With Standards website.

For more information:

Build with Standards: www.buildwithstandards.com.au

ACRS: www.steelcertification.com

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 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 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 30).

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 (page 6) 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 30).

Welded Products

OneSteel Manufacturing 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 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 grade 300.

A higher grade option of AS/NZS 3679.2 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 six 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 Manufacturing 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.

AVAILABILITY

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	300PLUS
	AS/NZS 3679.1	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.

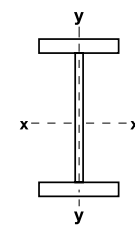
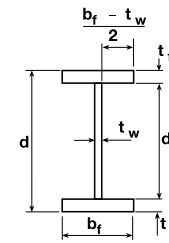
Table 7 Rods Size Availability

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	





Welded Beams

Table 9 Welded Beams - 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_1	$(b_f - t_w)$		I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y			
kg/m	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	1120	70.0	6.05	57900	15300	25600	28200	515	834	3330	5070	120	22000	280000	1200 WB 455
423	1192	500	36	16	1120	70.0	6.72	53900	13900	23300	25800	508	750	3000	4570	118	16500	251000	423
392	1184	500	32	16	1120	70.0	7.56	49900	12500	21100	23400	500	667	2670	4070	116	12100	221000	392
342	1184	400	32	16	1120	70.0	6.00	43500	10400	17500	19800	488	342	1710	2630	88.6	9960	113000	342
317	1176	400	28	16	1120	70.0	6.86	40300	9250	15700	17900	479	299	1500	2310	86.1	7230	98500	317
278	1170	350	25	16	1120	70.0	6.68	35400	7610	13000	15000	464	179	1020	1600	71.1	5090	58700	278
249	1170	275	25	16	1120	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	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	60.0	6.86	37800	6650	13100	14800	420	299	1490	2300	89.0	7010	73000	296
258	1010	350	25	16	960	60.0	6.68	32900	5430	10700	12300	406	179	1020	1590	73.8	4870	43400	258
215	1000	300	20	16	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	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	71.7	6.93	32700	5050	11000	12200	393	299	1490	2270	95.6	6150	58900	257
218	910	350	25	12	860	71.7	6.76	27800	4060	8930	9960	382	179	1020	1560	80.2	4020	35000	218
175	900	300	20	12	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	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	76.0	5.30	21400	2480	6140	6840	341	86.7	631	964	63.7	2990	13400	168
146	800	275	20	10	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	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	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	66.0	4.80	19100	1710	4810	5370	299	65.2	521	798	58.4	2690	7640	150
130	700	250	20	10	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	66.0	7.50	14600	1150	3330	3790	281	41.7	334	516	53.5	888	4770	115

Notes

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

Welded Beams

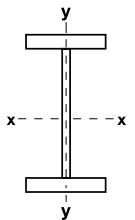
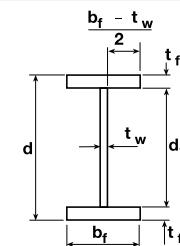
Table 10 Welded Beams - Properties for Assessing Section Capacity

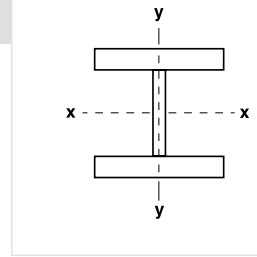
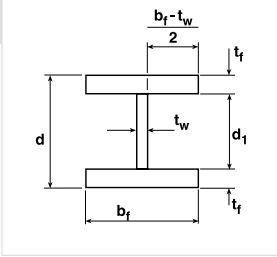
Designation	Yield Stress		Form Factor	About x-axis		About y-axis		Yield Stress		Form Factor	About x-axis		About y-axis		Designation
	Flange	Web		Compactness	Z_{ex}	Compactness	Z_{ey}	Flange	Web		Compactness	Z_{ex}	Compactness	Z_{ey}	
	f_y	f_y	k_f					f_y	f_y	k_f					
	MPa	MPa		10^3mm^3		10^3mm^3	MPa	MPa			10^3mm^3		10^3mm^3		
300PLUS® *							AS/NZS 3679.2-400								
1200 WB 455	280	300	0.837	C	28200	C	5000	360	380	0.820	N	28100	C	5000	1200 WB 455
423	280	300	0.825	C	25800	C	4500	360	380	0.806	N	25700	N	4500	423
392	280	300	0.811	C	23400	N	4000	360	380	0.791	N	23300	N	3900	392
342	280	300	0.783	C	19800	C	2560	360	380	0.760	N	19600	C	2560	342
317	280	300	0.766	C	17900	C	2240	360	380	0.741	N	17700	N	2230	317
278	280	300	0.733	C	15000	C	1530	360	380	0.705	N	14900	N	1530	278
249	280	300	0.701	C	12900	C	949	360	380	0.670	N	12800	C	949	249
1000 WB 322	280	300	0.832	C	16400	C	2560	360	380	0.807	C	16400	C	2560	1000 WB 322
296	280	300	0.817	C	14800	C	2240	360	380	0.791	C	14800	N	2230	296
258	280	300	0.790	C	12300	C	1530	360	380	0.760	C	12300	N	1530	258
215	300	300	0.738	C	9570	C	903	380	380	0.704	C	9570	N	887	215
900 WB 282	280	310	0.845	C	13600	C	2560	360	400	0.830	N	13500	C	2560	900 WB 282
257	280	310	0.830	C	12200	C	2240	360	400	0.813	N	12000	N	2220	257
218	280	310	0.800	C	9960	C	1530	360	400	0.780	N	9840	N	1530	218
175	300	310	0.744	C	7500	C	901	380	400	0.721	N	7320	N	882	175
800 WB 192	280	310	0.824	C	8060	C	1260	360	400	0.808	N	7850	C	1260	800 WB 192
168	280	310	0.799	C	6840	C	946	360	400	0.781	N	6640	C	946	168
146	300	310	0.763	N	5710	C	757	380	400	0.744	N	5510	N	754	146
122	300	310	0.718	N	4530	N	498	380	400	0.695	N	4340	N	486	122
700 WB 173	280	310	0.850	C	6390	C	1060	360	400	0.833	C	6390	C	1060	700 WB 173
150	280	310	0.828	C	5370	C	782	360	400	0.807	C	5370	C	782	150
130	300	310	0.795	C	4490	C	626	380	400	0.773	C	4490	C	626	130
115	300	310	0.767	C	3790	N	498	380	400	0.742	C	3790	N	486	115

* 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.





Welded Columns

Table 11 Welded Columns - Dimensions and Properties

Designation	Depth of Section d	Flange		Web Thickness t _w	Depth Between Flanges d ₁	Gross Area of Cross Section		About x-axis					About y-axis				Torsion Constant J	Warping Constant I _w	Designation
		Width b _f	Thickness t _f			A _g	(b _f - t _w)	I _x	Z _x	S _x	r _x	I _y	Z _y	S _y	r _y				
kg/m	mm	mm	mm	mm	mm	mm ²	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		
500 WC 440	480	500	40	40	400	56000	56000	2150	8980	10400	196	835	3340	5160	122	30100	40400	500 WC 440	
414	480	500	40	32	400	52800	52800	2110	8800	10100	200	834	3340	5100	126	25400	40400	414	
383	472	500	36	32	400	48800	48800	1890	7990	9130	197	751	3000	4600	124	19900	35700	383	
340	514	500	32	25	450	43200	43200	2050	7980	8980	218	667	2670	4070	124	13100	38800	340	
290	506	500	28	20	450	37000	37000	1750	6930	7700	218	584	2330	3540	126	8420	33300	290	
267	500	500	25	20	450	34000	34000	1560	6250	6950	214	521	2080	3170	124	6370	29400	267	
228	490	500	20	20	450	29000	29000	1260	5130	5710	208	417	1670	2540	120	3880	23000	228	
400 WC 361	430	400	40	40	350	46000	46000	1360	6340	7460	172	429	2140	3340	96.5	24800	16300	400 WC 361	
328	430	400	40	28	350	41800	41800	1320	6140	7100	178	427	2140	3270	101	19200	16200	328	
303	422	400	36	28	350	38600	38600	1180	5570	6420	175	385	1920	2950	99.8	14800	14300	303	
270	414	400	32	25	350	34400	34400	1030	4950	5660	173	342	1710	2610	99.8	10400	12500	270	
212	400	400	25	20	350	27000	27000	776	3880	4360	169	267	1330	2040	99.4	5060	9380	212	
181	390	400	20	20	350	23000	23000	620	3180	3570	164	214	1070	1640	96.4	3080	7310	181	
144	382	400	16	16	350	18400	18400	486	2550	2830	163	171	854	1300	96.3	1580	5720	144	
350 WC 280	355	350	40	28	275	35700	35700	747	4210	4940	145	286	1640	2500	89.6	16500	7100	350 WC 280	
258	347	350	36	28	275	32900	32900	661	3810	4450	142	258	1470	2260	88.5	12700	6230	258	
230	339	350	32	25	275	29300	29300	573	3380	3910	140	229	1310	2000	88.4	8960	5400	230	
197	331	350	28	20	275	25100	25100	486	2940	3350	139	200	1140	1740	89.3	5750	4600	197	

Notes

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

Welded Columns

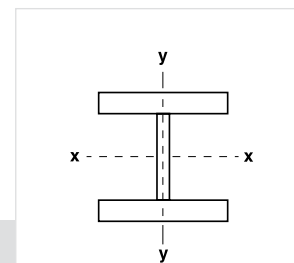
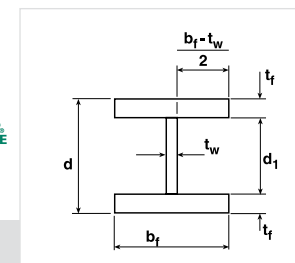
Table 12 Welded Columns - Properties for Assessing Section Capacity

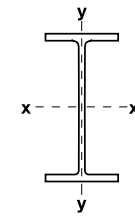
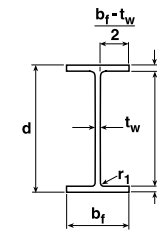
Designation	Yield Stress		Form Factor k_f	About x-axis		About y-axis		Yield Stress		Form Factor k_f	About x-axis		About y-axis		Designation
	Flange	Web		Compactness	Z_{ex}	Compactness	Z_{ey}	Flange	Web		Compactness	Z_{ex}	Compactness	Z_{ey}	
	f_y	f_y						f_y	f_y						
MPa	MPa	10^3mm^3	10^3mm^3	MPa	MPa	10^3mm^3	10^3mm^3								
300PLUS® *								AS/NZS 3679.2-400							
500 WC 440	280	280	1.00	C	10400	C	5010	360	360	1.00	C	10400	C	5010	500 WC 440
414	280	280	1.00	C	10100	C	5010	360	360	1.00	C	10100	C	5010	414
383	280	280	1.00	C	9130	C	4510	360	360	1.00	C	9130	C	4510	383
340	280	280	1.00	C	8980	C	4000	360	360	1.00	N	8830	N	3920	340
290	280	300	1.00	N	7570	N	3410	360	380	1.00	N	7410	N	3310	290
267	280	300	1.00	N	6700	N	2970	360	380	1.00	N	6540	N	2860	267
228	300	300	1.00	N	5210	N	2200	380	380	0.964	S	4920	N	2100	228
400 WC 361	280	280	1.00	C	7470	C	3210	360	360	1.00	C	7470	C	3210	400 WC 361
328	280	280	1.00	C	7100	C	3200	360	360	1.00	C	7100	C	3200	328
303	280	280	1.00	C	6420	C	2880	360	360	1.00	C	6420	C	2880	303
270	280	280	1.00	C	5660	C	2560	360	360	1.00	C	5660	C	2560	270
212	280	300	1.00	N	4360	N	2000	360	380	1.00	N	4270	N	1950	212
181	300	300	1.00	N	3410	N	1510	380	380	1.00	N	3330	N	1460	181
144	300	300	1.00	N	2590	N	1120	380	380	0.964	S	2440	N	1070	144
350 WC 280	280	280	1.00	C	4940	C	2450	360	360	1.00	C	4940	C	2450	350 WC 280
258	280	280	1.00	C	4450	C	2210	360	360	1.00	C	4450	C	2210	258
230	280	280	1.00	C	3910	C	1960	360	360	1.00	C	3910	C	1960	230
197	280	300	1.00	C	3350	C	1720	360	380	1.00	C	3350	C	1720	197

* 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_u) is 430 MPa.
2. For Grade 400 sections the tensile strength (f_u) is 480 MPa.
3. C: Compact Section; N: Non-compact Section; S: Slender Section.





Universal Beams

Table 13 Universal Beams - Dimensions and Properties

Designation	Depth of Section	Flange		Web Thickness	Root Radius	Depth Between Flanges	About x-axis		Gross Area of Cross Section	About y-axis			Torsion Constant	Warping Constant	Designation					
		Width	Thickness				d_1	$(b_f t_w)$		I_x	Z_x	S_x				I_y	Z_y	S_y	r_y	
kg/m	mm	mm	mm	mm	mm	mm	t_w	$2t_f$	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	
610 UB 125	612	229	19.6	11.9	14.0	572	48.1	5.54	16000	986	3230	3680	249	39.3	343	536	49.6	1560	3450	610 UB 125
113	607	228	17.3	11.2	14.0	572	51.1	6.27	14500	875	2880	3290	246	34.3	300	469	48.7	1140	2980	113
101	602	228	14.8	10.6	14.0	572	54.0	7.34	13000	761	2530	2900	242	29.3	257	402	47.5	790	2530	101
530 UB 92.4	533	209	15.6	10.2	14.0	502	49.2	6.37	11800	554	2080	2370	217	23.8	228	355	44.9	775	1590	530 UB 92.4
82.0	528	209	13.2	9.6	14.0	502	52.3	7.55	10500	477	1810	2070	213	20.1	193	301	43.8	526	1330	82.0
460 UB 82.1	460	191	16.0	9.9	11.4	428	43.3	5.66	10500	372	1610	1840	188	18.6	195	303	42.2	701	919	460 UB 82.1
74.6	457	190	14.5	9.1	11.4	428	47.1	6.24	9520	335	1460	1660	188	16.6	175	271	41.8	530	815	74.6
67.1	454	190	12.7	8.5	11.4	428	50.4	7.15	8580	296	1300	1480	186	14.5	153	238	41.2	378	708	67.1
410 UB 59.7	406	178	12.8	7.8	11.4	381	48.8	6.65	7640	216	1060	1200	168	12.1	135	209	39.7	337	467	410 UB 59.7
53.7	403	178	10.9	7.6	11.4	381	50.1	7.82	6890	188	933	1060	165	10.3	115	179	38.6	234	394	53.7
360 UB 56.7	359	172	13.0	8.0	11.4	333	41.6	6.31	7240	161	899	1010	149	11.0	128	198	39.0	338	330	360 UB 56.7
50.7	356	171	11.5	7.3	11.4	333	45.6	7.12	6470	142	798	897	148	9.60	112	173	38.5	241	284	50.7
44.7	352	171	9.7	6.9	11.4	333	48.2	8.46	5720	121	689	777	146	8.10	94.7	146	37.6	161	237	44.7
310 UB 46.2	307	166	11.8	6.7	11.4	284	42.3	6.75	5930	100	654	729	130	9.01	109	166	39.0	233	197	310 UB 46.2
40.4	304	165	10.2	6.1	11.4	284	46.5	7.79	5210	86.4	569	633	129	7.65	92.7	142	38.3	157	165	40.4
32.0	298	149	8.0	5.5	13.0	282	51.3	8.97	4080	63.2	424	475	124	4.42	59.3	91.8	32.9	86.5	92.9	32.0
250 UB 37.3	256	146	10.9	6.4	8.9	234	36.6	6.40	4750	55.7	435	486	108	5.66	77.5	119	34.5	158	85.2	250 UB 37.3
31.4	252	146	8.6	6.1	8.9	234	38.4	8.13	4010	44.5	354	397	105	4.47	61.2	94.2	33.4	89.3	65.9	31.4
25.7	248	124	8.0	5.0	12.0	232	46.4	7.44	3270	35.4	285	319	104	2.55	41.1	63.6	27.9	67.4	36.7	25.7
200 UB 29.8	207	134	9.6	6.3	8.9	188	29.8	6.65	3820	29.1	281	316	87.3	3.86	57.5	88.4	31.8	105	37.6	200 UB 29.8
25.4	203	133	7.8	5.8	8.9	188	32.3	8.15	3230	23.6	232	260	85.4	3.06	46.1	70.9	30.8	62.7	29.2	25.4
22.3	202	133	7.0	5.0	8.9	188	37.5	9.14	2870	21.0	208	231	85.5	2.75	41.3	63.4	31.0	45.0	26.0	22.3
18.2	198	99	7.0	4.5	11.0	184	40.9	6.75	2320	15.8	160	180	82.6	1.14	23.0	35.7	22.1	38.6	10.4	18.2
180 UB 22.2	179	90	10.0	6.0	8.9	159	26.5	4.20	2820	15.3	171	195	73.6	1.22	27.1	42.3	20.8	81.6	8.71	180 UB 22.2
18.1	175	90	8.0	5.0	8.9	159	31.8	5.31	2300	12.1	139	157	72.6	0.975	21.7	33.7	20.6	44.8	6.80	18.1
16.1	173	90	7.0	4.5	8.9	159	35.3	6.11	2040	10.6	123	138	72.0	0.853	19.0	29.4	20.4	31.5	5.88	16.1
150 UB 18.0	155	75	9.5	6.0	8.0	136	22.7	3.63	2300	9.05	117	135	62.8	0.672	17.9	28.2	17.1	60.5	3.56	150 UB 18.0
14.0	150	75	7.0	5.0	8.0	136	27.2	5.00	1780	6.66	88.8	102	61.1	0.495	13.2	20.8	16.6	28.1	2.53	14.0

Universal Beams

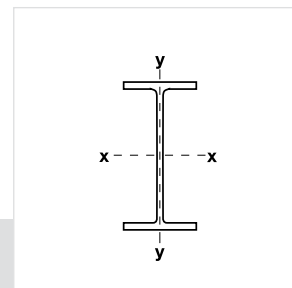
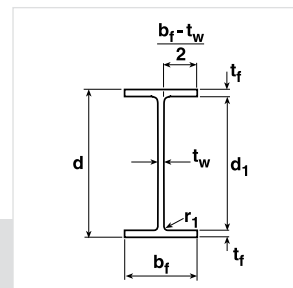
Table 14 Universal Beams – Properties for Assessing Section Capacity

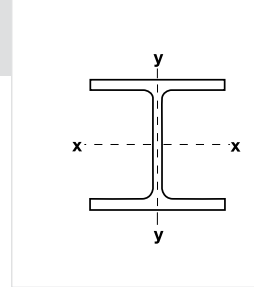
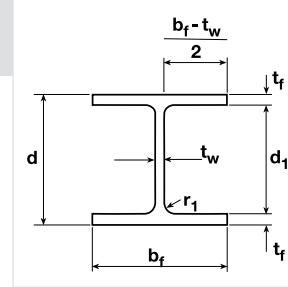
Designation	Yield Stress		Form Factor k_t	About x-axis		About y-axis		Designation							
	Flange	Web		Compactness	Compactness	Yield Stress	Form Factor k_t		About x-axis		About y-axis				
	f_y	f_y	Z_{ex}						Z_{ey}	Flange f_y	Web f_y	Compactness	Compactness	Z_{ex}	Z_{ey}
MPa	MPa		10^3mm^3	10^3mm^3	MPa	MPa		10^3mm^3	10^3mm^3						
300PLUS® *							AS/NZS 3679.1-350								
610 UB 125	280	300	0.950	C	3680	C	515	340	340	0.916	C	3680	C	515	610 UB 125
113	280	300	0.926	C	3290	C	451	340	340	0.891	C	3290	C	451	113
101	300	320	0.888	C	2900	C	386	340	360	0.867	C	2900	C	386	101
530 UB 92.4	300	320	0.928	C	2370	C	342	340	360	0.907	C	2370	C	342	530 UB 92.4
82.0	300	320	0.902	C	2070	C	289	340	360	0.880	C	2070	C	289	82.0
460 UB 82.1	300	320	0.979	C	1840	C	292	340	360	0.956	C	1840	C	292	460 UB 82.1
74.6	300	320	0.948	C	1660	C	262	340	360	0.926	C	1660	C	262	74.6
67.1	300	320	0.922	C	1480	C	230	340	360	0.901	C	1480	C	230	67.1
410 UB 59.7	300	320	0.938	C	1200	C	203	340	360	0.918	C	1200	C	203	410 UB 59.7
53.7	320	320	0.913	C	1060	C	173	360	360	0.894	N	1050	N	172	53.7
360 UB 56.7	300	320	0.996	C	1010	C	193	340	360	0.974	C	1010	C	193	360 UB 56.7
50.7	300	320	0.963	C	897	C	168	340	360	0.943	C	897	C	168	50.7
44.7	320	320	0.930	N	770	N	140	360	360	0.911	N	762	N	139	44.7
310 UB 46.2	300	320	0.991	C	729	C	163	340	360	0.972	C	729	C	163	310 UB 46.2
40.4	320	320	0.952	C	633	C	139	360	360	0.936	N	629	N	138	40.4
32.0	320	320	0.915	N	467	N	86.9	360	360	0.898	N	462	N	85.7	32.0
250 UB 37.3	320	320	1.00	C	486	C	116	360	360	1.00	C	486	C	116	250 UB 37.3
31.4	320	320	1.00	N	395	N	91.4	360	360	0.991	N	392	N	90.3	31.4
25.7	320	320	0.949	C	319	C	61.7	360	360	0.932	C	319	C	61.7	25.7
200 UB 29.8	320	320	1.00	C	316	C	86.3	360	360	1.00	C	316	C	86.3	200 UB 29.8
25.4	320	320	1.00	N	259	N	68.8	360	360	1.00	N	257	N	68.0	25.4
22.3	320	320	1.00	N	227	N	60.3	360	360	1.00	N	225	N	59.4	22.3
18.2	320	320	0.990	C	180	C	34.4	360	360	0.970	C	180	C	34.4	18.2
180 UB 22.2	320	320	1.00	C	195	C	40.7	360	360	1.00	C	195	C	40.7	180 UB 22.2
18.1	320	320	1.00	C	157	C	32.5	360	360	1.00	C	157	C	32.5	18.1
16.1	320	320	1.00	C	138	C	28.4	360	360	1.00	C	138	C	28.4	16.1
150 UB 18.0	320	320	1.00	C	135	C	26.9	360	360	1.00	C	135	C	26.9	150 UB 18.0
14.0	320	320	1.00	C	102	C	19.8	360	360	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 3679.1-300.

Notes

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





Universal Columns

Table 15 Universal Columns - Dimensions and Properties

Designation	Depth of Section d	Flange		Web Thickness t_w	Root Radius r_1	Depth Between Flanges d_1	About x-axis		Gross Area of Cross Section A_g	About y-axis			Torsion Constant J	Warping Constant I_w	Designation					
		Width b_f	Thickness t_f				d_1	$(b_f - t_w)$		I_x	Z_x	S_x				r_x	I_y	Z_y	S_y	r_y
kg/m	mm	mm	mm	mm	mm	mm	t_w	$2t_f$	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

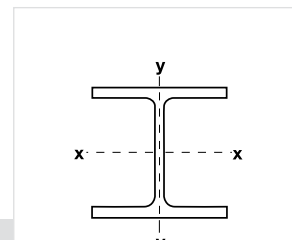
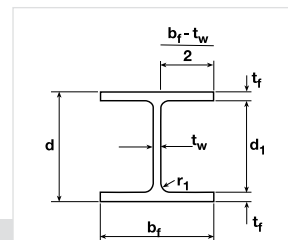
Table 16 Universal Columns - Properties for Assessing Section Capacity

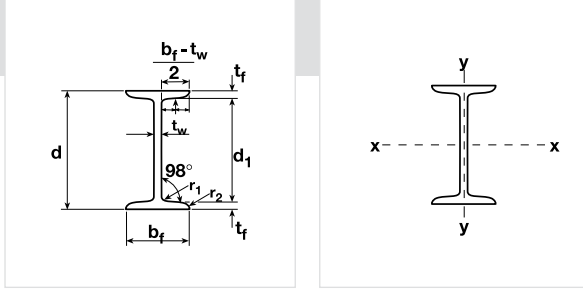
Designation	Yield Stress		Form Factor k_f	About x-axis		About y-axis		Yield Stress		Form Factor k_f	About x-axis		About y-axis		Designation
	Flange	Web		Compactness	Compactness	Z _{ex}	Z _{ey}	Flange	Web		Compactness	Z _{ex}	Compactness	Z _{ey}	
	f_y	f_y						f_y	f_y						
	MPa	MPa			10 ³ mm ³	10 ³ mm ³					10 ³ mm ³	10 ³ mm ³			
300PLUS® *							AS/NZS 3679.1-350								
310 UC 158	280	300	1.00	C	2680	C	1210	340	340	1.00	C	2680	C	1210	310 UC 158
137	280	300	1.00	C	2300	C	1040	340	340	1.00	C	2300	C	1040	137
118	280	300	1.00	C	1960	C	882	340	340	1.00	N	1950	N	878	118
96.8	300	320	1.00	N	1560	N	694	340	360	1.00	N	1550	N	684	96.8
250 UC 89.5	280	320	1.00	C	1230	C	567	340	360	1.00	C	1230	C	567	250 UC 89.5
72.9	300	320	1.00	N	986	N	454	340	360	1.00	N	977	N	448	72.9
200 UC 59.5	300	320	1.00	C	656	C	299	340	360	1.00	C	656	C	299	200 UC 59.5
52.2	300	320	1.00	C	570	C	260	340	360	1.00	N	569	N	260	52.2
46.2	300	320	1.00	N	494	N	223	340	360	1.00	N	490	N	219	46.2
150 UC 37.2	300	320	1.00	C	310	C	137	340	360	1.00	C	310	C	137	150 UC 37.2
30.0	320	320	1.00	C	250	C	110	360	360	1.00	N	248	N	109	30.0
23.4	320	320	1.00	N	176	N	73.5	360	360	1.00	N	174	N	72.3	23.4
100 UC 14.8	320	320	1.00	C	74.4	C	34.4	360	360	1.00	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	Gross Area of Cross Section		About x-axis				About y-axis				Torsion Constant	Warping Constant	Designation	
			Width	Thickness		Root	Toe		A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y					
	kg/m	d	b_f	t_f	t_w	r_1	r_2	d_1	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	mm ²	10 ⁹ 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	
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	125 TFB
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	100 TFB

Table 18 Tapered Flange 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	Web		Compactness	Compactness	Flange	Web			Compactness	Compactness				
	f_y	f_y	k_t	Z_{ex}	Z_{ey}	f_y	f_y	k_t	Z_{ex}	Z_{ey}	Z_{ex}	Z_{ey}			
	MPa	MPa		10 ³ mm ³	10 ³ mm ³	MPa	MPa		10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³			
	300PLUS® *							AS/NZS 3679.1-350							
125 TFB	320	320	1.00	C	80.3	C	15.6	360	360	1.00	C	80.3	C	15.6	125 TFB
100 TFB	320	320	1.00	C	34.1	C	5.30	360	360	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				d_i	$(b_f - t_w)$			A_g	X_L	X_0	I_x	Z_x	S_x	r_x	I_y				Z_{yR}	Z_{yL}	S_y	r_y
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	491	152	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	304	58.1	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	248	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	112	14.9	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	105	10.5	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	84.5	7.75	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	56.6	4.56	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	23.8	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	13.6	0.419	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	8.42	0.103	75 PFC		

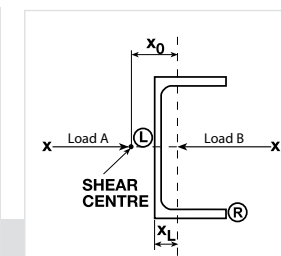
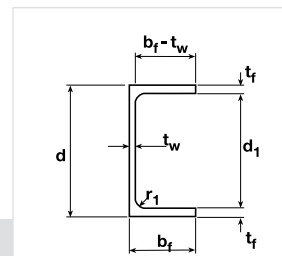
Table 20 Parallel Flange Channels - Properties for Assessing Section Capacity

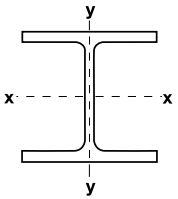
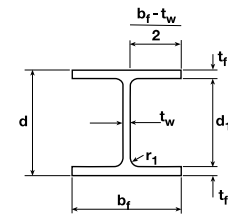
Designation	Yield Stress		Form Factor	About x-axis		About y-axis		Yield Stress	Form Factor	About x-axis		About y-axis		Designation		
	Flange	Web		k_f	Z_{ex}	Load A	Load B			Flange	Web	k_f	Z_{ex}		Load A	Load B
	f_y	f_y				Z_{ey}	Z_{ey}			f_y	f_y				Z_{ey}	Z_{ey}
MPa	MPa	10^3mm^3	10^3mm^3	10^3mm^3	10^3mm^3	MPa	MPa	10^3mm^3	10^3mm^3	10^3mm^3	10^3mm^3	10^3mm^3				
	300PLUS® *						AS/NZS 3679.1-350									
380 PFC	280	320	1.00	946	115	134	340	360	1.00	946	104	134	380 PFC			
300 PFC	300	320	1.00	564	82.3	96.6	340	360	1.00	564	77.2	96.6	300 PFC			
250 PFC	300	320	1.00	421	88.7	89.0	340	360	1.00	421	84.9	89.0	250 PFC			
230 PFC	300	320	1.00	271	45.1	50.4	340	360	1.00	271	42.6	50.4	230 PFC			
200 PFC	300	320	1.00	221	46.7	49.1	340	360	1.00	221	44.5	49.1	200 PFC			
180 PFC	300	320	1.00	182	44.9	44.8	340	360	1.00	182	44.1	44.8	180 PFC			
150 PFC	320	320	1.00	129	38.5	38.5	360	360	1.00	129	38.5	38.5	150 PFC			
125 PFC	320	320	1.00	72.8	22.8	22.8	360	360	1.00	72.0	22.5	22.8	125 PFC			
100 PFC	320	320	1.00	40.3	12.0	12.0	360	360	1.00	40.3	12.0	12.0	100 PFC			
75 PFC	320	320	1.00	21.4	6.84	6.84	360	360	1.00	21.4	6.84	6.84	75 PFC			

* 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.





Universal Bearing Piles (refer Note 4)

Table 21 Universal Bearing Piles - Dimensions and Properties

Designation	Depth of Section d	Flange		Web Thickness t _w	Root Radius r ₁	Depth Between Flanges d ₁	Gross Area of Cross Section		About x-axis				About y-axis				Torsion Constant J	Warping Constant I _w	Designation
		Width b _f	Thickness t _f				A _g	I _x	Z _x	S _x	r _x	I _y	Z _y	S _y	r _y				
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 ³ mm ⁶		
310 UBP 149	318	316	20.6	20.5	16.5	277	19000	330	2080	2370	132	109	691	1070	75.8	2970	2410	310 UBP 149	
110	308	311	15.4	15.3	16.5	277	14000	236	1530	1720	130	76.6	494	759	73.9	1240	1640	110	
78.8	299	306	11.1	11.1	16.5	277	10100	165	1100	1220	128	53.1	347	530	72.5	484	1100	78.8	
200 UBP 122	230	220	25.0	25.0	11.4	180	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 k _t	About x-axis		About y-axis		Yield Stress		Form Factor k _t	About x-axis		About y-axis		Designation
	Flange f _y	Web f _y		Compactness	Z _{ex}	Compactness	Z _{ey}	Flange f _y	Web f _y		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			
	300PLUS® *							AS/NZS 3679.1-350							
310 UBP 149	280	280	1.00	C	2370	C	1040	340	340	1.00	C	2370	C	1040	310 UBP 149
110	300	300	1.00	N	1680	N	718	340	340	1.00	N	1660	N	708	110
78.8	300	300	1.00	N	1130	N	460	340	340	1.00	N	1110	N	450	78.8
200 UBP 122	280	280	1.00	C	1340	C	609	340	340	1.00	C	1340	C	609	200 UBP 122

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

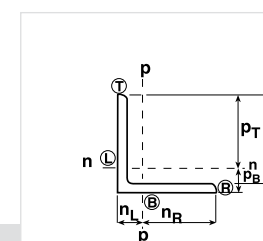
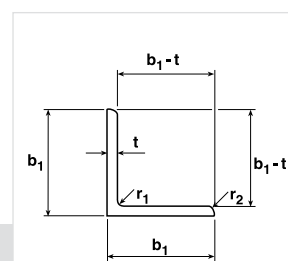
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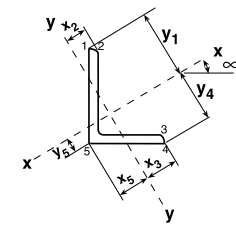
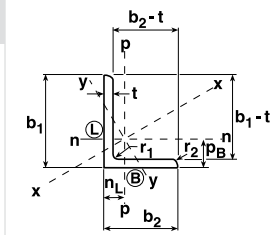
1. For 300PLUS® sections the tensile strength (f_t) is 440 MPa.
2. For Grade 350 sections the tensile strength (f_t) is 480 MPa.
3. C: Compact Section; N: Non-compact Section; S: Slender Section.
4. These sections are generally not stocked and are available for project orders only subject to enquiry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

Equal Angles

Table 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	$I_n = I_p$	$n_L = p_B$	$Z_{nb} = Z_{pL}$	$n_R = p_T$	$Z_{nL} = Z_{pR}$	$S_n = S_p$	$r_n = r_p$	I_{np}	
			10^6mm^4	mm	10^3mm^3	mm	10^3mm^3	10^3mm^3	mm	10^6mm^4	
200	200	x 26 EA	35.8	59.3	605	141	255	460	60.5	-20.9	200 x 200 x 26 EA
	20	EA	28.8	57.0	505	143	201	363	61.3	-16.9	20 EA
	18	EA	26.3	56.2	467	144	183	330	61.5	-15.5	18 EA
	16	EA	23.7	55.4	427	145	164	296	61.8	-14.0	16 EA
	13	EA	19.7	54.2	363	146	135	243	62.2	-11.6	13 EA
150	150	x 19 EA	11.1	44.2	250	106	105	189	45.4	-6.48	150 x 150 x 19 EA
	16	EA	9.48	43.0	220	107	88.7	160	45.8	-5.58	16 EA
	12	EA	7.46	41.5	180	108	68.8	124	46.3	-4.40	12 EA
	10	EA	6.04	40.5	149	109	55.2	99.9	46.6	-3.56	10 EA
125	125	x 16 EA	5.32	36.8	144	88.2	60.3	109	37.9	-3.11	125 x 125 x 16 EA
	12	EA	4.21	35.4	119	89.6	47.0	85.0	38.3	-2.48	12 EA
	10	EA	3.42	34.4	99.4	90.6	37.8	68.4	38.6	-2.02	10 EA
	8	EA	2.86	33.7	84.9	91.3	31.3	56.8	38.8	-1.69	8 EA
100	100	x 12 EA	2.08	29.2	71.1	70.8	29.3	53.2	30.3	-1.22	100 x 100 x 12 EA
	10	EA	1.70	28.2	60.1	71.8	23.6	42.9	30.6	-1.00	10 EA
	8	EA	1.42	27.5	51.7	72.5	19.6	35.7	30.8	-0.842	8 EA
	6	EA	1.12	26.8	41.8	73.2	15.3	27.8	31.0	-0.661	6 EA
90	90	x 10 EA	1.22	25.7	47.3	64.3	18.9	34.4	27.4	-0.716	90 x 90 x 10 EA
	8	EA	1.02	25.0	40.9	65.0	15.7	28.7	27.6	-0.604	8 EA
	6	EA	0.805	24.3	33.2	65.7	12.3	22.4	27.7	-0.475	6 EA
75	75	x 10 EA	0.681	22.0	31.0	53.0	12.8	23.4	22.6	-0.399	75 x 75 x 10 EA
	8	EA	0.575	21.3	27.0	53.7	10.7	19.6	22.7	-0.338	8 EA
	6	EA	0.455	20.5	22.1	54.5	8.35	15.3	22.9	-0.268	6 EA
	5	EA	0.355	19.9	17.9	55.1	6.44	11.8	23.0	-0.208	5 EA
65	65	x 10 EA	0.437	19.6	22.3	45.4	9.62	17.4	19.5	-0.254	65 x 65 x 10 EA
	8	EA	0.371	19.0	19.6	46.0	8.07	14.6	19.7	-0.218	8 EA
	6	EA	0.296	18.3	16.2	46.7	6.34	11.5	19.9	-0.175	6 EA
	5	EA	0.234	17.7	13.2	47.3	4.94	8.97	20.1	-0.138	5 EA
55	55	x 6 EA	0.175	15.8	11.1	39.2	4.46	8.11	16.7	-0.103	55 x 55 x 6 EA
	5	EA	0.139	15.2	9.12	39.8	3.48	6.34	16.8	-0.0814	5 EA
50	50	x 8 EA	0.160	15.2	10.5	34.8	4.61	8.38	14.9	-0.0928	50 x 50 x 8 EA
	6	EA	0.129	14.5	8.90	35.5	3.64	6.63	15.1	-0.0756	6 EA
	5	EA	0.103	13.9	7.36	36.1	2.85	5.19	15.2	-0.0602	5 EA
	3	EA	0.0694	13.2	5.25	36.8	1.89	3.46	15.3	-0.0405	3 EA
45	45	x 6 EA	0.0922	13.3	6.93	31.7	2.91	5.30	13.5	-0.0538	45 x 45 x 6 EA
	5	EA	0.0734	12.7	5.76	32.3	2.28	4.16	13.6	-0.0432	5 EA
	3	EA	0.0498	12.0	4.14	33.0	1.51	2.77	13.8	-0.0292	3 EA
40	40	x 6 EA	0.0631	12.0	5.24	28.0	2.26	4.12	11.9	-0.0366	40 x 40 x 6 EA
	5	EA	0.0505	11.5	4.39	28.5	1.77	3.24	12.0	-0.0296	5 EA
	3	EA	0.0344	10.8	3.19	29.2	1.18	2.17	12.2	-0.0201	3 EA
30	30	x 6 EA	0.0247	9.53	2.59	20.5	1.21	2.22	8.71	-0.0140	30 x 30 x 6 EA
	5	EA	0.0200	8.99	2.22	21.0	0.951	1.76	8.83	-0.0116	5 EA
	3	EA	0.0138	8.30	1.66	21.7	0.635	1.18	8.93	-0.00804	3 EA
25	25	x 6 EA	0.0135	8.28	1.63	16.7	0.807	1.49	7.13	-0.00750	25 x 25 x 6 EA
	5	EA	0.0110	7.75	1.42	17.3	0.638	1.19	7.23	-0.00632	5 EA
	3	EA	0.00765	7.07	1.08	17.9	0.426	0.802	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 Cross Section	Coordinate of Centroid	About x-axis										About y-axis					Torsion Constant Alpha	Designation						
				r ₁	r ₂			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			
Leg-size				Root	Toe																									
b ₁ x b ₂			t	r ₁	r ₂	t	t	A _g	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	
150 x 100 x 12 UA	22.5	12.0	10.0	5.0	11.5	7.33	2870	49.1	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	48.1	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	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
6 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
75 x 50 x 8 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	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	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	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

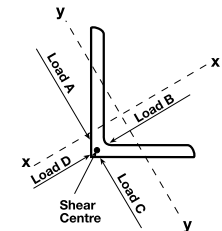
Table 27 Unequal Angles - x-axis and y-axis - Properties for Assessing Section Capacity

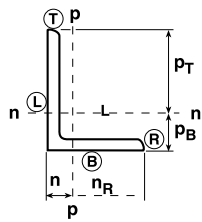
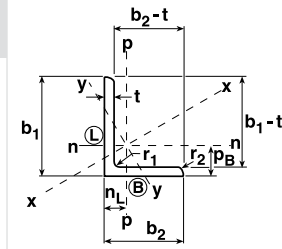
Designation	Yield Stress	Form Factor	About x-axis				About y-axis				Yield Stress	Form Factor	About x-axis				About y-axis				Designation
			Load A		Load C		Load B		Load D				Load A		Load C		Load B		Load D		
			Z_{ex}	Z_{ex}	Z_{ey}	Z_{ey}	Z_{ex}	Z_{ex}	Z_{ey}	Z_{ey}			Z_{ex}	Z_{ex}	Z_{ey}	Z_{ey}	Z_{ex}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

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	n_L	Z_{pL}	n_R	Z_{pR}	S_p	r_p	I_{np}		
mm mm mm	10^6mm^4	mm	10^3mm^3	mm	10^3mm^3	10^3mm^3	mm	10^6mm^4	mm	10^3mm^3	mm	10^3mm^3	10^3mm^3	mm	10^6mm^4		
150 x 100 x 12 UA	6.52	49.1	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	48.1	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	22.7	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

Table 29 Chemical Composition - Welded Sections Base Plate

Grade (1)	Cast or Product Analysis, Percent												
	C	Si	Mn	P	S	Cr (2)	Ni (2)	Cu (2)	Mo (2)	Al (3)	Ti	Micro-alloying Elements	CE (4)
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:

$$CE = C + \frac{Mn}{6} + \frac{Cr}{5} + \frac{Mo}{15} + V + \frac{Ni}{15} + Cu$$
- 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					
		10mm x 10mm		10mm x 7.5mm		10mm x 5mm	
	°C	Average of 3 Tests	Individual Test	Average of 3 Tests	Individual Test	Average of 3 Tests	Individual Test
AS/NZS 3678							
300L15	-15	27	20	22	16	18	13
400L15	-15	27	20	22	16	18	13

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

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®S0	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:

$$CE = C + \frac{Mn}{6} + \frac{Cr}{5} + \frac{Mo}{15} + \frac{V}{15} + \frac{Ni}{15} + \frac{Cu}{15}$$
- 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®S0	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 MPa	Minimum elongation on a gauge length of 5.65√S ₀ %
	Thickness, mm				
	≤ 50	> 50 to < 100	≥ 100		
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.
- S₀ 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 3679.1:2010 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®S0	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 3679.1:2010 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	*	*	*	*
	X4K92M61S*	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

Grade	Maximum Recommended Cross Section*		
	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.

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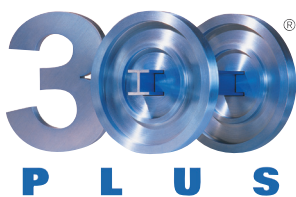
MORE INFORMATION

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