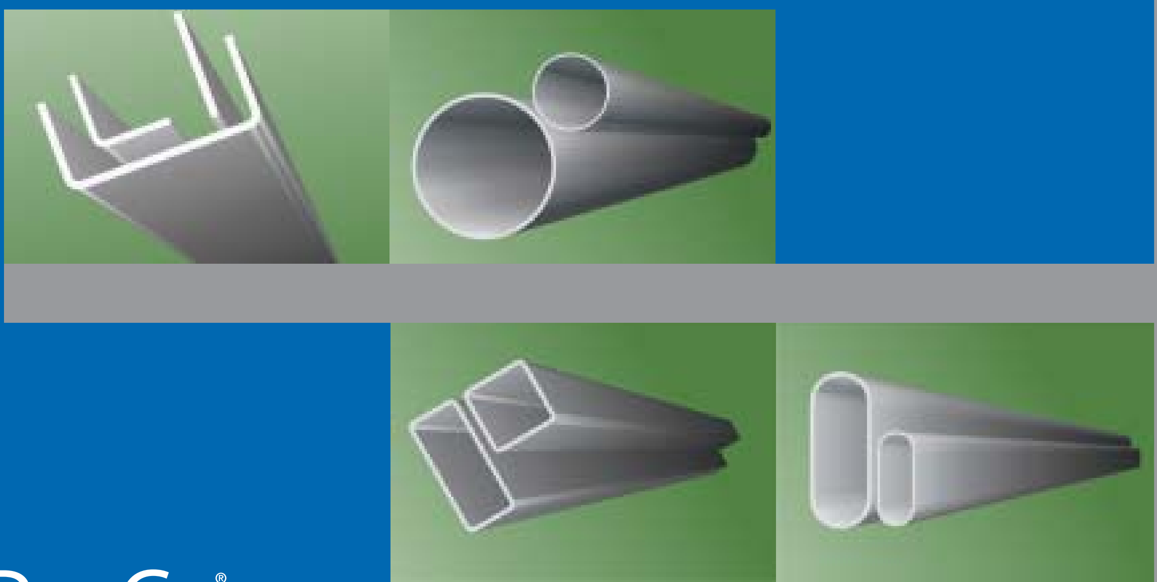
Fourth Edition

Cold Formed Structural Hollow Sections & Profiles



DuraGal®

TUBELINE®

Galtube® Plus

ULTRAPIPE®

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market mills

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OneSteel Market Mills is AustraliaÕs leading manufacturer of tubular and profile sections, offering a wide range and variety of sizes and product finishes to meet your needs.

OneSteel Market MillsÕ primary strength is its people, who have the ability to provide distinct competencies through our research and development, production, sales, marketing and technical support, to make a difference for you.

Providing Innovative Solution

At OneSteel Market Mills we know the only way we have become the premier manufacturer of steel hollow sections and profiles is because of what we offer to our customers.

Our commitment to customers goes beyond providing the best quality, best delivery and best service...we also provide you with innovative solutions.

Expert Technical Support

When you buy from OneSteel Market Mills, the products are supported by a network of Engineers and Technical personnel who are able to supply design assistance and product support to help you get the best advantage from our products.

The Coating Range

Manufactured by cold forming and electric resistance welding, OneSteel Market Mills hollow sections have all the features: strength, good looks, weld integrity, smooth uniform profile. There is also a range of angles, channels and flats available with the famous DuraGal finish.

There are a number of coating alternatives:

In-line, Hot-dip Galvanized

For DuraGal® and Galtube® Plus, a controlled in-line, hot-dip galvanized coating is applied that fully covers the weld. Galtube® Plus is further protected internally by a paint coating applied over a prepared metal surface.

Hot-dip Galvanized

A 300 g/m^2 minimum average hot-dip galvanized coating is applied to both the external and internal surfaces.

Blue Painted RHS / Red Painted CHS

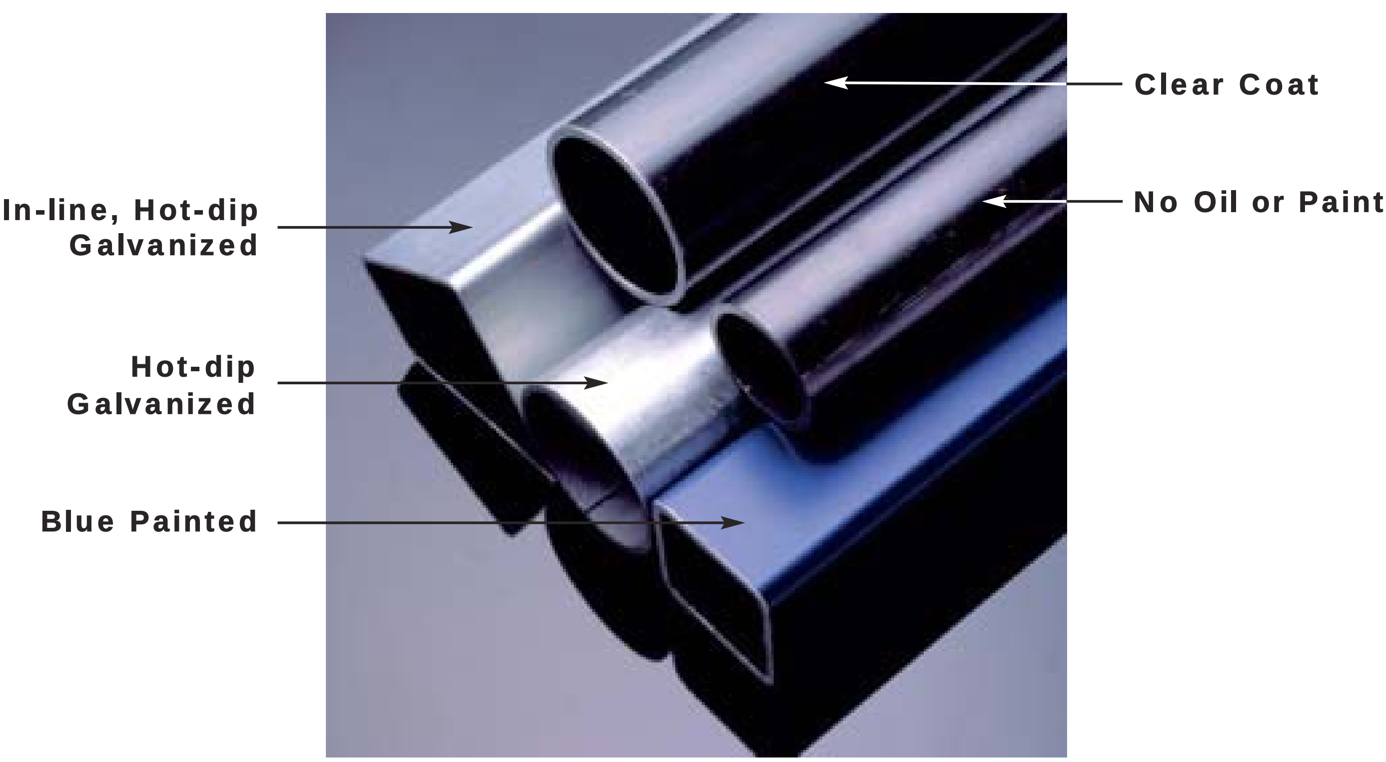
A smooth, even coat of general purpose paint is applied to act as a temporary rust preventative.

Clear Coat

A clear polymer coat is applied to the external surface for protection prior to fabrication.

No Oil or Paint

The tube is supplied in the as rolled condition without protective coatings.



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PRODUCT AVAILABILTY

Note: Not all coatings, sizes and thickness combinations listed in this publication will be stocked.

Refer to your steel distributor(s) for availability or visit our web site www.onesteel.com for more information.

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DIMENSIONS AND SECTION PROPERTIES

CIRCULAR HOLLOW SECTIONS

Surface Finish

DuraGal®

External Surface - In-line Hot dip galvanized over a prepared metal surface, to produce a fully bonded coating with a minimum average coating mass of 100g/m^2, in accordance with AS/NZS 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialized process. The external zinc coating then has a surface conversion coating applied to improve resistance to white rusting and improve the adhesion of paint and powder coatings.

DuraGal Internally painted

External Surface - As for DuraGal

Internal Surface - A 35 µm aim DFT of Zinc Phosphate paint is applied over a prepared metal surface.

Galtube® Plus

External Surface - In-line Hot dip galvanized over a prepared metal surface, to produce a fully bonded coating with a minimum average coating mass of 125g/m^2, in accordance with AS/NZS 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialized process. The external zinc coating then has a surface conversion coating applied to improve resistance to white rusting and improve the adhesion of paint and powder coatings.

Internal Surface - A 35 µm aim DFT of Zinc Phosphate paint is applied over a prepared metal surface.

Hot Dip Galvanized (HDG)

A hot dip galvanized coating, minimum average coating mass of 300 g/m^2 is applied to both the external and internal surfaces. The HDG coating is applied in accordance with AS/NZS 4792 :Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialised process.

Red Painted

A smooth, even coat of a red, general purpose paint is applied to the external surface to act as a temporary rust preventative. The paint coating is 6 to12 microns DFT. This temporary coating should be removed prior to powder-coating or the application of coating systems intended for corrosion protection or architectural finishes. It is easily removed with any of the commercially available solvent based paint strippers, also usually removed as part of the available pre-treatment (caustic bath) system used in the batch hot dip galvanizing process.

The resultant steel surface from the manufacturing process prior to the red paint being applied is of better appearance than AS1627.4 Class 1. OneSteel strongly recommends that you check with your coatings manufacturer or supplier whether any additional surface preparation may need to be carried out on the pipe surface, prior to the application of any paint primers, top coats or special finishes.

Black (Clear Coat)

A smooth, even coat of clear polymer is applied to the external surface. This coating is meant to act as a temporary rust preventative. It is easily removed with any of the commercially available solvent based paint strippers, and is normally removed prior to galvanizing as part of the available pre-treatments (caustic bath) used in the batch hot dip galvanizing process.

Oiled

This is not a mill option for the OneSteel products within this publication.

No Oil or Paint (NOP)

Both the external and internal surface of the tube is supplied in the as rolled condition without protective coatings. The ends are not colour coded.

Varnish

This is usually only found on imported products.

Mechanical Properties

Specified Minimum Mechanical Properties

Product Designation	Standard or Specification	Grade	Minimum Yield Stress f_y (MPa)	Minimum Tensile Strength f_u (MPa)	Minimum Elongation as a Proportion of Gauge Length of $5.65\sqrt{S_o}$ (%)
DuraGal®	DuraGal C350	C350	350	430	15
Tubeline®	AS 1163	C250L0	250	320	22
	AS 1163	C350L0	350	430	20
	Tubeline 350L0 - Type 2	350L0	350	380	12
	Tubeline 350L0 - Type 3	350L0	350	430	12
UltraPipe®	AS 1163	C350L0	350	450	20
Galtube® Plus	Tubeline 350L0 - Type 1	350L0	350	380	18

Typical Mechanical Properties

Product Designation	Standard or Specification	Grade	Mean (Max.) Yield Stress f_y (MPa)	Mean (Max.) Tensile Strength f_u (MPa)	Mean (Maximum) Elongation as a Proportion of Gauge Length of $5.65\sqrt{S_o}$ (%)
DuraGal®	DuraGal C350	C350L0	525 (593)	572 (638)	22.0 (35.0)
Tubeline®	AS 1163	C250L0	376 (478)	399 (501)	32.4 (52.5)
		C350L0	436 (535)	498 (578)	32.2 (56.9)
Galtube® Plus	Tubeline 350L0 - Type 1	350L0	406 (496)	435 (518)	27.4 (46.0)

L0 indicates that CHS has Charpy V-notch impact properties as specified in AS 1163. Table 10.4.1 of AS 4100 Steel Structures permits AS 1163 L0 grades to have the following minimum permissible service temperatures:

Thickness (mm)	Lowest One Day Mean Ambient Temperature (°C)
$t \le 6$	-30
$6 < t \le 12$	-20
$12 < t \le 20$	-10

Size Range

Quality	Grade	Size Range OD (mm)
Extra Light	AS 1163 C350L0	26.9 to 139.7
	DuraGal C350L0	26.9 to 76.1
Light	Tubeline 350L0-Type 3	21.3
	AS 1163 C350L0	26.9 to 165.1
Medium	Tubeline 350L0-Type 2	21.3
	AS 1074/AS 1163 C250L0	26.9 to 165.1
Heavy	AS 1074/Tubeline 350L0-Type 2	21.3
	AS 1074/AS 1163 C250L0	26.9 to 165.1
Extra Heavy	AS 1163 C250L0	48.3 to 88.9
Large Structural & UltraPipe®	AS 1163 C350L0	168.3 to 457.0

Thicknesses available within the above size range are listed in the Section Property tables.

End Finish

The standard end finish for Structural Circular Hollow Sections is mill cut ends. See “Definitions” for more information.

CIRCULAR HOLLOW SECTIONS - Continued

Length Range

Size OD (mm)	Thickness*1 (mm)	Product and Surface Finish*2	Standard Length (m)	Maximum Length (m)
26.9 to 76.1	2.0 to 2.6	Galtube® Plus	6.5	8.0
26.9 to 42.4 48.3 to 76.1	2.0 2.3	DuraGal®	6.5 6.5	8.0 13.0
26.9 to 165.1	2.3 to 5.4	Tubeline® - HDG	6.5	7.3
21.3 to 42.4 48.3 to 88.9 114.3 to 165.1	2.0 to 4.0 2.3 to 5.9 3.2 to 5.4	Tubeline® - NOP, Black or Red Painted	6.5 6.5 6.5	8.0 13.0 12.2
168.3 to 457.0	3.2 to 6.0	Large Structural CHS & UltraPipe® - NOP or Black	12.0	12.0

*1 All thicknesses are not available in all sizes. Check the tables in this publication for details, enquire for others.
*2 All finishes and product types are not available in all sizes and lengths. Refer to our website www.onesteel.com or your steel distributor(s),enquire for others. See Surface Finish definitions at start of this section or in "Definitions"

Chemistry

Specification	Chemical Composition (Cast or Product) % max.						
	C	Si	Mn	P	S	Al	CE
AS 1163 C250L0* Tubeline® 350L0 - Type 1 Tubeline® 350L0 - Type 2	0.12	0.05	0.50	0.040	0.030	0.10	0.25
AS 1163 C350L0* DuraGal® C350 Tubeline® 350L0 - Type 3	0.20	0.25	1.60	0.040	0.030	0.10	0.39

* This is an extract from Table 1, AS 1163 Structural Steel Hollow Sections

The following table lists typical chemical compositions and carbon equivalents of the steels used:

Specification	Typical Chemical Composition %						
	C	Si	Mn	P	S	Al	CE
AS 1163 C250L0 Tubeline® 350L0 - Type 1 Tubeline® 350L0 - Type 2	0.04 to 0.07	0.005 to 0.020	0.19 to 0.30	0.006 to 0.018	0.005 to 0.018	0.015 to 0.060	0.07 to 0.12
AS 1163 C350L0 DuraGal® C350 Tubeline® 350L0 - Type 3	0.13 to 0.17	0.005 to 0.020	0.65 to 0.80	0.010 to 0.025	0.005 to 0.015	0.020 to 0.055	0.24 to 0.30

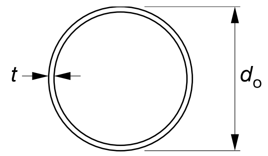
The carbon equivalent (CE) in the above is calculated for an actual composition using the following equation:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

This value is used in AS/NZS 1554.1 Welding of Steel Structures, to determine the welding preheat required. Steel with CE less than 0.39 in general, do not require preheat.

Tolerances

Cross Section



Outside Diameter d_o (mm)	Maximum Permissible Variation in Specified Outside Diameter (mm)
≤ 50	+0.4, -0.8
> 50	$\pm 0.01 d_o$

Thickness

For AS 1163 products DuraGal®, Galtube® Plus, Tubeline®, UltraPipe® and Large Structural CHS:

±10% of nominal

***Note*: Galtube® Plus:**

The section property tables within this publication for Galtube® Plus have data that has been calculated using a design thickness to comply with AS/NZS 4600 Clause 1.5.1.6. (refer to the notes accompanying each table for Galtube® Plus).

Mass

For AS 1163 products DuraGal®, Tubeline®, UltraPipe® and Large Structurals:

not less than 96% of nominal

Straightness

Specified length
500

Mill Length

-0 to +100 mm for Large Structural (168.3 to 457.0 mm OD)

-0 to +50 mm for all others

SQUARE/RECTANGULAR HOLLOW SECTIONS

Surface Finish

DuraGal®

External Surface - In-line Hot dip galvanized over a prepared metal surface, to produce a fully bonded coating with a minimum average coating mass of 100g/m^2 in accordance with AS/NZS 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialized process. The external zinc coating then has a surface conversion coating applied to improve resistance to white rusting and improve the adhesion of paint and powder coatings.

DuraGal Internally painted

External Surface - As for DuraGal

IInternal Surface - A 35 µm aim DFT of Zinc Phosphate paint is applied over a prepared metal surface.

Galtube® Plus

External Surface - In-line Hot dip galvanized over a prepared metal surface, to produce a fully bonded coating with a minimum average coating mass of 125g/m^2, in accordance with AS/NZS 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialized process. The external zinc coating then has a surface conversion coating applied to improve resistance to white rusting and improve the adhesion of paint and powder coatings.

Internal Surface - A 35 µm aim DFT of Zinc Phosphate paint is applied over a prepared metal surface.

Hot Dip Galvanized (HDG)

Not available as an ex-mill option for square or rectangular hollow sections. (see also Definitions)

Blue Painted

A smooth, even coat of a blue, general purpose paint is applied to the external surface to act as a temporary rust preventative. The paint coating is 6 to12 or 15 to 20 microns DFT, depending on the machine used. This temporary coating should be removed prior to powder-coating or the application of coating systems intended for corrosion protection or architectural finishes. It is easily removed with any of the commercially available solvent based paint strippers, also usually removed as part of the available pre-treatment (caustic bath) system used in the batch hot dip galvanizing process.

The resultant steel surface from the manufacturing process prior to the blue paint being applied is of better appearance than AS1627.4 Class 1. OneSteel strongly recommends that you check with your coatings manufacturer or supplier whether any additional surface preparation may need to be carried out on the SHS/RHS surface, prior to the application of any paint primers, top coats or special finishes.

Black (Clear Coat)

A smooth, even coat of clear polymer is applied to the external surface. This coating is meant to act as a temporary rust preventative. It is easily removed with any of the commercially available solvent based paint strippers, also usually removed as part of the available pre-treatments (caustic bath) used in the batch hot dip galvanizing process.

No Oil or Paint (NOP)

Both the external and internal surface of the hollow section is supplied in the as rolled condition without protective coatings. The ends are not colour coded.

Mechanical Properties

Specified Minimum Mechanical Properties

Product Designation	Standard or Specification	Grade	Minimum Yield Stress f_y (MPa)	Minimum Tensile Strength f_u (MPa)	Minimum Elongation as a Proportion of Gauge Length of $5.65\sqrt{S_o}$ (%)
DuraGal® (DualGrade®)	AS 1163	C350L0/ C450L0	450	500	16
DuraGal®	AS 1163	C450L0	450	500	14
Tubeline®	AS 1163	C350L0	350	430	16
	Tubeline 350L0 - Type 2	350L0	350	380	12
Galtube® Plus	Tubeline 350L0 - Type 1	350L0	350	380	18

Typical Mechanical Properties

Product Designation	Standard or Specification	Grade	Mean (Max.) Yield Stress f_y (MPa)	Mean (Max.) Tensile Strength f_u (MPa)	Mean (Maximum) Elongation as a Proportion of Gauge Length of $5.65\sqrt{S_o}$ (%)
DuraGal® (DualGrade®)	AS 1163	C350L0/ C450L0	531 (674)	576 (693)	20.9 (56.5)
Tubeline®	AS 1163	C350L0	485 (626)	528 (665)	25.1 (48.7)
Galtube® Plus	Tubeline 350L0 - Type 1	350L0	418 (503)	444 (542)	27.4 (42.3)

L0 indicates that RHS has Charpy V-notch impact properties as specified in AS 1163. Table 10.4.1 of AS 4100 Steel Structures permits L0 grades to have the following minimum permissible service temperatures:

Thickness (mm)	Lowest One Day Mean Ambient Temperature (°C)
$t \le 6$	-30
$6 < t \le 12$	-20

Size Range

Product	Squares (mm x mm)	Rectangular (mm x mm)
DuraGal® (DualGrade®)	20 x 20 to 100 x 100	50 x 20 to 150 x 50
Tubeline® C350L0	20 x 20 to 250 x 250	50 x 20 to 250 x 150
Tubeline® 350L0 - Type 2	13 x 13 & 15 x 15	-
Galtube® Plus	20 x 20 to 65 x 65	50 x 20 to 75 x 25

Thicknesses available within the above size range are listed in the Section Property tables.

End Finish

The standard end finish for Structural Square and Rectangular Hollow Sections is mill cut ends. See "Definitions" for more information.

SQUARE/RECTANGULAR HOLLOW SECTIONS - Continued

Length Range

Size (mm)	Thickness*1 (mm)	Surface Finish*2	Standard Length (m)	Maximum Length (m)
20 x 20 to 65 x 65 50 x 20 to 75 x 25	1.6 to 2.5	Galtube® Plus	6.5	8.0
20 x 20 & 25 x 25 30 x 30 35 x 35 to 100 x 100 50 x 20 to 150 x 50	1.6 to 3.0 1.6 & 2.0 1.6 to 6.0 1.6 to 6.0	DuraGal® (DualGrade®)	6.5 8.0 8.0 8.0	8.0 8.0 13.0 13.0
13 x 13 to 25 x 25 30 x 30 35 x 35 to 100 x 100 89 x 89 100 x 100 to 150 x 150 200 x 200 & 250 x 250	1.6 to 3.0 1.6 to 2.0 1.6 to 6.0 3.5 to 6.0 3.0 to 9.0 5.0 to 9.0	Tubeline® SHS - NOP, Black or Blue Painted	6.5 8.0 8.0 8.0 8.0 & 12.0 8.0 & 12.0	8.0 8.0 13.0 12.2 12.2 18.0
50 x 20 to 150 x 50 150 x 100 & 200 x 100 250 x 150	1.6 to 6.0 4.0 to 9.0 5.0 to 9.0	Tubeline® RHS - NOP, Black or Blue Painted	8.0 8.0 & 12.0 8.0 & 12.0	13.0 12.2 18.0

*1 All thicknesses are not available in all sizes. Check the tables in this publication for details, enquire for others.

*2 All finishes and product types are not available in all sizes and lengths. Refer to our website www.onesteel.com or your steel distributor(s),enquire for others. See Surface Finish definitions at start of this section or in "Definitions"

Chemistry

Specification	Chemical Composition (Cast or Product) % max.						
	C	Si	Mn	P	S	Al	CE
Tubeline® 350L0 - Type 1	0.12	0.05	0.50	0.040	0.030	0.10	0.25
AS 1163 C350L0* DuraGal® (DualGrade) to - AS 1163 C350L0/C450L0* Tubeline® 350L0 - Type 2	0.20	0.25	1.60	0.040	0.030	0.10	0.39
AS 1163 C450L0*	0.20	0.45	1.60	0.040	0.030	0.10	0.39

*This is an extract from Table 1, AS 1163 Structural Steel Hollow Sections

The following table lists typical chemical compositions and carbon equivalents of the steels used:

Specification	Typical Chemical Composition %						
	C	Si	Mn	P	S	Al	CE
Tubeline® 350L0 - Type 1	0.04 to 0.07	0.005 to 0.020	0.19 to 0.30	0.006 to 0.018	0.005 to 0.018	0.015 to 0.060	0.07 to 0.12
AS 1163 C350L0* DuraGal® (DualGrade) to - AS 1163 C350L0/C450L0* Tubeline® 350L0 - Type 2	0.13 to 0.17	0.005 to 0.020	0.65 to 0.80	0.010 to 0.025	0.005 to 0.015	0.020 to 0.055	0.24 to 0.30
AS 1163 C450L0*	0.14 to 0.18	0.180 to 0.210	0.93 to 1.10	0.018 to 0.027	0.008 to 0.014	0.018 to 0.028	0.30 to 0.36

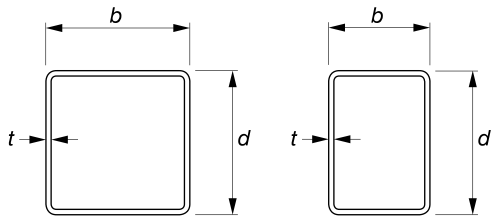
The carbon equivalent (CE) in the above is calculated for an actual composition using the following equation:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

This value is used in AS/NZS 1554.1 Welding of Steel Structures, to determine the welding preheat required. Steels with CE less than 0.39 in general, do not require preheat.

Tolerances

Cross Section



Outside dimension of side b or d (mm)	Maximum Permissible Variation in Specified Outside Dimension of Side (mm)	Maximum Permissible Out of Square at Corners (degree)
≤ 50	± 0.5	1
> 50	± 0.01b or ± 0.01d	

Thickness

For AS 1163 products DuraGal®, Galtube® Plus, and Tubeline®:

±10% of nominal

***Note*: Galtube® Plus:**

The section property tables within this publication for Galtube® Plus have data that has been calculated using a design thickness to comply with AS/NZS 4600 Clause 1.5.1.6. (refer to the notes accompanying each table for Galtube® Plus).

Mass

For AS 1163 products DuraGal® and Tubeline®:

not less than 96% of nominal

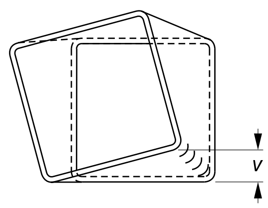
Straightness

Specified length
500

Mill Length

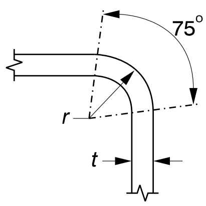
Size (mm)	Product	Length Tolerance
20 x 20 to 50 x 50 50 x 20 to 75 x 25 65 x 65	Galtube® Plus	-0, +20 -0, +20 -0, +50
35 x 35 to 100 x 100 50 x 20 to 150 x 50	DuraGal®	-0, +50
13 x 13 to 150 x 150 50 x 20 to 200 x 100	Tubeline®	-0, +50
200 x 200 to 250 x 250 250 x 150	Tubeline®	-0, +150

Twist



2 mm plus 0.5 mm per metre length

Corner Radii



Section Thickness (mm)	Section Size	Typical external corner radii	Typical angle of arc (degree)
t ≤ 3	All	r = 2.0 t	75
t > 3	≤ 125 x 125 ≤ 150 x 100	r = 2.5 t	75
	> 125 x 125 > 150 x 100	r = 3.0 t	75

ANGLES, CHANNELS AND FLATS

Surface Finish

DuraGal®

In-line Hot dip galvanized over a prepared metal surface to produce a fully bonded coating, with a minimum average coating mass of 100g/m², in accordance with AS/NZS 4791: Hot-dip galvanized (zinc) coatings on ferrous open sections, applied by an in-line process. The zinc surface then has a surface conversion coating applied. All profiles, with the exception of equal angles up to and including 50.0 mm x 50.0 mm and all Flats, are coated with a clear polymer over the conversion coat.

Mechanical Properties

Specified Minimum Mechanical Properties

Product Design-ation	Standard or Specif-cation	Actual Thick-ness t (mm)	Grade	Minimum Yield Stress f_y (MPa)	Minimum Tensile Strength f_u (MPa)	Minimum Elongation as a Proportion of Gauge Length of $5.65\sqrt{S_o}$ (%)
DuraGal® Angles & Channels	TS100	$t \le 2.5$	C350L0	350	400	20
		$2.5 < t \le 6$	C450L0	450	500	16
		$t > 6$	C400L0	400	450	16
DuraGal® Flats	TS100	$t \le 6$	C400L0	400	450	20
		$t > 6$	C350L0	350	400	20

Typical Mechanical Properties

Product Design-ation	Standard or Specif-cation	Actual Thick-ness t (mm)	Grade	Mean (Max.) Yield Stress f_y (MPa)	Mean (Max.) Tensile Strength f_u (MPa)	Mean (Max.) Elongation as a Proportion of Gauge Length of $5.65\sqrt{S_o}$ (%)
DuraGal® Angles	TS100	$t \le 2.5$	C350L0	457 (551)	527 (615)	31 (48)
		$2.5 < t \le 6$	C450L0	488 (551)	549 (608)	28 (35)
		$t > 6$	C400L0	469 (555)	531 (602)	26 (35)
DuraGal® Channels	TS100	$t \le 6$	C450L0	499 (575)	556 (642)	25 (34)
		$t > 6$	C400L0	452 (515)	514 (566)	26 (33)
DuraGal® Flats	TS100	$t \le 6$	C400L0	515 (593)	561 (624)	24 (39)
		$t > 6$	C350L0	448 (495)	501 (534)	26 (32)

L0 indicated that Profiles have Charpy V-notch impact properties as specified in TS100. Table 10.4.1 of AS 4100 Steel Structures permits L0 grades to have the following minimum permissible service temperatures:

Actual Thickness (mm)	Lowest One Day Mean Ambient Temperature (°C)
$t \le 6$	-30
$6 < t \le 10$	-20

Size Range

Product	Size Range (mm)
DuraGal® Equal Angle	30 x30 to 150 x 150
DuraGal® Unequal Angle	75 x 50 to 150 x 100
DuraGal® Channel	75 x 40 to 300 x 90
DuraGal® Flat	50 to 300

Thicknesses available within the above size range are listed in the Section Property tables.

End Finish

The standard end finish for DuraGal Angles, Channels and Flats is mill cut ends. See "Definitions" for more information.

Length Range

Product	Size Range (mm)	Standard Lengths (m)	Non- Standard Lengths* (m)
DuraGal® Equal Angle	30 x 30 to 45 x 45 50 x 50 to 90 x 90 100 x 100 to 150 x 150	6.0 9.0 12.0	6.0 to 12.0 6.0 to 12.0 6.0 to 12.0
DuraGal® Unequal Angle	75 x 50 100 x 75 to 150 x 100	9.0 12.0	6.0 to 12.0 6.0 to 12.0
DuraGal® Channel	75 x 40 to 125 x 65 150 x 75 to 300 x 90	9.0 12.0	6.0 to 12.0 6.0 to 12.0
DuraGal® Flat	50 to 300	6.0	6.0 to 12.0

Notes:

No off line cutting facilities are available at the DuraGal Profile mill

Lengths longer than the standard length may be restricted on some sizes and section shapes due to material handling issues in storage and transit. Check with your steel distributor(s) for more information.

Chemistry

Grade	Chemical Composition (Cast or Product) % max.						
	C	Si	Mn	P	S	Al	CE
C350L0/C400L0 C400L0/C450L0	0.20	0.05	1.60	0.040	0.030	0.10	0.39

The following table lists typical chemical compositions and carbon equivalent of the steel used:

Grade	Typical Chemical Composition %						
	C	Si	Mn	P	S	Al	CE
C350L0/C400L0 C400L0/C450L0	0.13 to 0.17	0.005 to 0.020	0.65 to 0.80	0.010 to 0.025	0.005 to 0.015	0.020 to 0.055	0.24 to 0.30

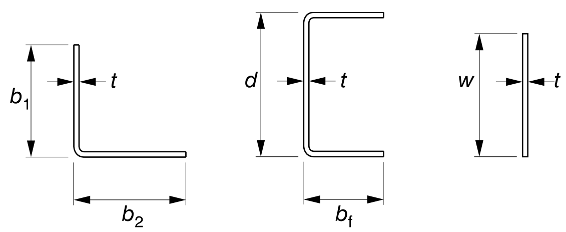
The carbon equivalent (CE) in the above is calculated for an actual composition using the following equation:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

This value is used in AS/NZS 1554.1 Welding of Steel Structures, to determine the welding preheat required. Steel with CE less than 0.39 in general, do not require preheat.

Tolerances

Cross Section



The maximum permissible variation in dimension b_u (which applies to b_1, b_2 and b_f) is shown below:

Dimension b_u (mm)	Maximum Permissible Variations in Dimension b_u (mm)		
	Actual Thickness t (mm)		
	$1.5 < t \le 3$	$3 < t \le 6$	$6 < t \le 8$
$b_u \le 40$	±0.80	±1.00	±1.25
$40 < b_u \le 100$	±1.00	±1.25	±1.50
$100 < b_u \le 150$	±1.25	±1.50	±1.75
$150 < b_u \le 200$	±1.50	±1.75	±2.00

ANGLES, CHANNELS AND FLATS - Continued

The maximum permissible variation in dimension *d* is shown below:

Dimension d (mm)	Maximum Permissible Variations in Dimension d (mm)		
	Actual Thickness t (mm)		
	$1.5 < t \leq 3$	$3 < t \leq 6$	$6 < t \leq 8$
$40 < d \leq 100$	±0.75	±1.00	±1.25
$100 < d \leq 200$	±1.00	±1.25	±1.50
$200 < d \leq 400$	±1.50	±1.75	±2.00

The maximum permissible variation in dimension *w* is shown below:

Dimension w (mm)	Maximum Permissible Variations in Dimension w (mm)
$40 < w \leq 100$	±0.75
$100 < w \leq 200$	±1.00
$200 < w \leq 400$	±1.50

Thickness

+10% to -5% of actual thickness. The relationship of the nominal thickness to the actual thickness is shown below:

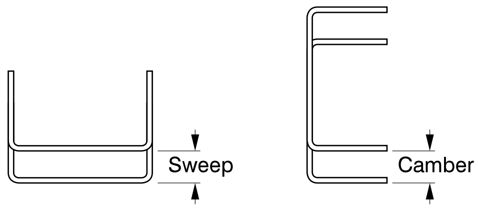
Nominal Thickness (mm)	Actual Thickness t (mm)
2.5	2.4
4.0	3.8
5.0	4.7
6.0	6.0
8.0	8.0

Mass

not less than 0.95 times nominal mass.

Straightness

$\frac{\text{Specified length}}{500}$

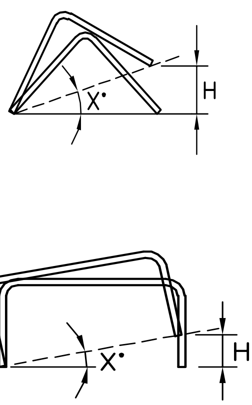


The maximum out of straightness applies to camber and sweep for angles and channels.

Mill Length

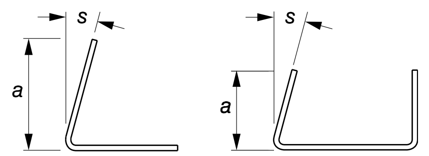
-0, +25 mm

Twist



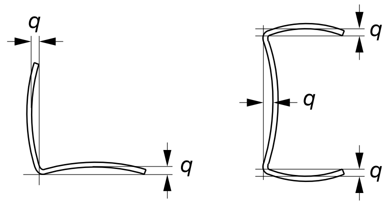
X = 1 degree per metre of length.

Squareness



Shorter Leg Length (mm)	Maximum Permissible Angular Tolerance (degree)
$a \leq 100$	±2.0
$50 < a \leq 80$	±1.5
$80 < a$	±1.0

Flatness of Sides



less than 1% of the width of the side

Corner Radii (Tolerance)

The inside radius tolerance is shown below:

Inside Corner Radius (mm)	Maximum Permissible Corner Radius Tolerance
< 2.5	±0.5 mm
≥ 2.5	±20% of inside corner radius

Corner Radii

Nominal Thickness (mm)	Inside Corner Radius (mm)
2.5	2.5
4.0	4.0
5.0	4.0
6.0	8.0
8.0	8.0

WELDING

DuraGal®

DuraGal is readily weldable. Its thin evenly applied galvanized coating ensures minimal welding fumes. However, the ventilation recommendations given in Table 17.2 of Technical Note 7 published by WTIA (Welding Technology Institute of Australia), July 1994 should be observed. Mechanical dilution ventilation is advised for open work space and mechanical ventilation by local exhaust system for limited work space and confined space.

DuraGal's carbon equivalent of less than 0.39 allows it to be welded in accordance with AS/NZS 1554.1 Welding of Steel Structures, without preheat. The following are recommended consumables:

Process	*Recommended Consumables*
Manual Metal-Arc (AS 1553.1)	*E48XX (Grade 2)*
Submerged Arc (AS 1858.1)	*W502Y*
Flux-Cored Arc (AS 2203.1)	*W502X.X*
Gas Metal-Arc (AS 2717.1)	*W502*

Refer to the "DuraGal® Easy Welding Guide" for advice on welder setting and suitable consumables.

Tubeline®

As detailed in "Chemistry", Tubeline® & UltraPipe® CHS and Tubeline SHS/RHS are readily weldable in accordance with AS/NZS 1554.1 Welding of Steel Structures.

The following are recommended consumables for welding Tubeline & UltraPipe CHS and Tubeline SHS/RHS:

Process	*Recommended Consumables*
Manual Metal-Arc (AS 1553.1)	*E41XX, E48XX (Grade 2)*
Submerged Arc (AS 1858.1)	*W402Y, W502Y*
Flux-Cored Arc (AS 2203.1)	*W402X.X, W502X.X*
Gas Metal-Arc (AS 2717.1)	*W502*

PAINTING

DuraGal® / Galtube® Plus

The most cost effective way to use DuraGal and Galtube Plus products is unpainted, touching up any welds and black attachments. When painted or powder coated, the result provides enhanced surface protection. Authoritative research has shown that by teaming the in-line hot dip galvanized coating with paint a synergistic effect occurs, ie. the corrosion life of duplex coating system can be 1.6 to 2.3 times greater than the sum of the corrosion lives of the zinc and the paint used separately.

For weld touch-up, If DuraGal / Galtube Plus is to be used without topcoating, weld protection through the use of a zinc rich primer or epoxy mastic applied to a suitably prepared surface willl be sufficient for most applications. GALMET® "DuraGal Silver Paint" or any other equivalent colour matching paint may be used as a top coat for colour matching.

If the DuraGal / Galtube Plus system is to be topcoated for exposure to more severe environmnetsthe weld areas should be adequately protected according to the coating manufacturers recommendations prior to topcoating.

Some environments cause especially rapid corrosion. They include industrial areas, marine environments, polluted cities, some farming activities, animal husbandry and other corrosive environments.

Refer to the "DuraGal Painting and Corrosion Protection Guide" available from OneSteel Market Mills for detailed recommendations on painting of DuraGal and Galtube products.

Other Products

Refer to your preferred paint supplier or painting contractor.

GALMET® is the registered trademark of ITW Polymers Pty Ltd

BENDING

Here are some guidelines on bending of CHS, SHS, RHS and profiles (angles, channels and flats). Best results are dependent upon the type of equipment, the quality of the formers, the centreline radius, the speed of bending and the thickness of member.

Draw Bending Using an Internal Mandrel - CHS, SHS & RHS

If the appearance of the finish bend is all important, particularly if no flattening or distortion of the product is desired, cold draw bending using an inner mandrel is recommended for CHS, SHS and RHS. This method can achieve bend centreline radii as low as 2 times the outside diameter (d_o) for CHS and 4 times the section dimension (d or b), in the plane of bending, for SHS and RHS.

Press Bending or Draw Bending Without a Mandrel - CHS

If a little distortion can be tolerated the cost of bending CHS can be reduced by draw bending without the mandrel or press bending. Both these methods can achieve bend centreline radii of $4d_o$ to $5d_o$ for the lightest wall thickness pipe. Heavier wall CHS can be bent to tighter radii with minimum distortion.

Roll Curving

Roll Curving - CHS

Information received from specialist benders, using appropriate profiled rolls, has shown that bend radii from 100 mm on 26.9 OD to 1500 mm on 219.1 OD are possible.

For more information contact the Roll Bending companies in your area.

Roll Curving - SHS & RHS

SHS and RHS can be economically bent by roll curving. Some distortion of the section will result using this method. If a flat roll, 3 roll bender is used, OneSteel Market Mills does not recommend bend centreline radii less than 30 times the depth of section in the plane of bending. If the 3 working rolls are profiled to suit the section being bent, bend centreline radii as low as 10 times the depth of section in the plane of bending can be achieved with reduction in section stiffness (I_x) of less than 10%.

Roll Curving - DuraGal Angles, Channels and Flats

The following table sets out the known results of roll bending profiles:

Product	*Size*	*Achieved Minimum Inside Bend Radii for Various Bending Modes (mm)*			
		On Edge	*Toe In*	*Toe Out*	*Weak axis*2*
DuraGal® Angle	*50 x 50 x 5.0* *100 x 100 x 7.0* *150 x 150 x 8.0*	- - -	*500* *750* *6000*	*350* *3000* *6500*	- - -
DuraGal® Channel	*100 x 50 x 4.0* *150 x 75 x 5.0* *200 x 75 x 5.0* *250 x 90 x 6.0*	**1* **1* **1* **1*	*1250* *6000* *3500* *4500*	*1200* *2100* *2100* *4300*	- - - -
DuraGal® Flat	*Thickness, $t \leq 6$* *Thickness, $t > 6$*	*No Trial to date*	-	-	*2.0 t* *2.0 t*

**1 Not suitable for bending in this mode using trial equipment used for the trial (see next paragraph for more information)*
**2 Bent in the longitudinal and transverse direction*

Channels bent on edge collapsed during the rolling process. It was thought that adding support rolls between channel flanges would stop this crushing failure and would allow successful roll bending.

There was some minor scuffing/pick-up damage to the galvanized coating during roll bending, particularly on the edge of angles. The scuffing can be minimised if the rolls are smooth and hard.

The galvanized coating should not flake off the steel substrate but some peeling due to mechanical pressure or rubbing can occur.

Crush Bending - SHS & RHS

Tight radius SHS and RHS bends can be formed by crush bending, often using the press bending technique. This method of bending dramatically reduces the sectional properties of the hollow section and is therefore only suitable for applications which are non load-bearing, or lightly loaded, unless the deformed section is stiffened.

BENDING - Continued

Ram Bending - CHS

Testing has shown that good bends can be made in CHS up to DN50 using a well maintained, simple ram bender. It is critical that a suitable former be used. If the former being used fails to bend cold formed ERW pipe, it is usually because the former does not give good support to the pipe during bending and/or the bend centreline radius is too small. There is a range of suitable formers available from most Merchants, as set out below.

An alternative range of formers is available from Dawn Tool & Vice. Because these formers are made from ductile iron, the surface finish of the completed bend is not as good as that achieved with the preferred formers.

OneSteel has not tested Ram Bender Formers for CHS sizes larger than DN50 (60.3mm outside diameter) but this does not mean that the larger pipes can not be bent by this method. The difficulty of bending pipe increases as the outside diameter to thickness ratio (d_o/t) increases. OneSteel has successfully bent pipes with a d_o/t up to 27.4 (i.e. 60.3/2.2 = 27.4)

Ram Bending Recommended Formers - Machined from Plate

Profile	Bend Centreline Radius (mm)					
	DN15 (21.3OD)	DN20 (26.9OD)	DN25 (33.7OD)	DN32 (42.4OD)	DN40 (48.3OD)	DN50 (60.3OD)
Cathedral	80	90	120	190	225	270
Circular	-	120	150	-	-	-

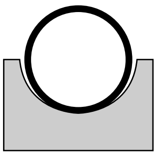
Ram Bending Alternative Formers (by Dawn Tool & Vice*) - Cast

Profile	Bend Centreline Radius (mm)					
	DN15 (21.3OD)	DN20 (26.9OD)	DN25 (33.7OD)	DN32 (42.4OD)	DN40 (48.3OD)	DN50 (60.3OD)
Cathedral	80	-	-	-	-	300
Elliptical	-	100	140	190	225	-

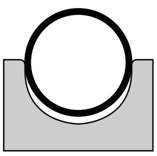
** Contact number for Dawn Tool & Vice: (03) 9462 1934*

The Right Former

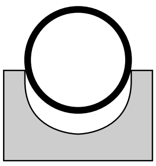
The most critical element is the former. It must give the pipe adequate support. Good results can be achieved from the simplest of benders if suitable formers are used. Three types of formers exist, each giving the bent section a different profile.



Circular: Pipe generally falls to the bottom of the former. Absence of side support could result in pipe collapsing on bending. (Not recommended for Light or Extra-Light pipe)



Elliptical: Pipe sits close to, but not on, the bottom of the former. Good side support, sides of the former are above the centreline of the pipe.



Cathedral: Pipe sits on the entry to the former and will move to the bottom when bending starts. This action gives a small amount of squeeze that supports the lighter gauge pipe.

Ram Bending Hints

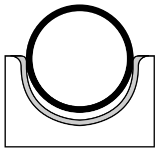
- Some wrinkling of the inside of the bend can be expected on CHS (DN32 and DN50 are most prone to wrinkling).
- If the bend collapses (i.e. the centre of the bend lifts out of the former) during bending, move the support rollers in. For the support roller centres used during development and testing of the formers refer to the following table.

Size (DN)	20	25	32	40	50
Rollers Centres (mm)	310	380	450	520	590

If the bend is still collapsing when the support rollers are at the suggested centres then check the condition of your former. If the former is damaged and/or badly worn bend failures may occur.

When bending CHS at these support pin centres it will generally be necessary to use a pivoting support block which is grooved to the OD of the tube being bent.

Recommended Weld Position



For best results, the weld should be touching the former in the shaded area, with the ideal weld location in the 3 or 9 O'Clock position.

Problems encountered with ram bending.

Flattening / Collapsing / Wrinkling

Possible causes

The former is worn or the former does not adequately support the pipe.

Alternatives

Try a former with an ellipitcal or cathedral profile to increase the side support, (recommended for Light and Extra-Light pipes).

Go to a larger bending radius.

Move the supports closer to the centre.

Try a different bending technique.

Try a heavier gauge pipe.

Effect of Bending Former profile

Using the Elliptical and Cathedral formers tabled in this section, a series of ram bending trials were performed on OneSteels' Tubeline® & DuraGal® Extra-Light (350 MPa) CHS, sizes DN 20,25,32,40 & 50.

With conventional (circular profile) formers this range of pipe would typically be expected to require the use of an internal mandrel.

The OneSteel results plotted on the chart below demonstrate how the increased side support to the pipe by the Elliptical and Cathedral profile, enabled the OneSteel pipes to be bent successfully without an internal mandrel.

Notes: *1. Centre line radius can vary between former manufacturers.*
2. Results apply only to OneSteel products, and only for the sizes and grades listed above.
3. Roll type bender recommended for DuraGal DN50 Extra-Light

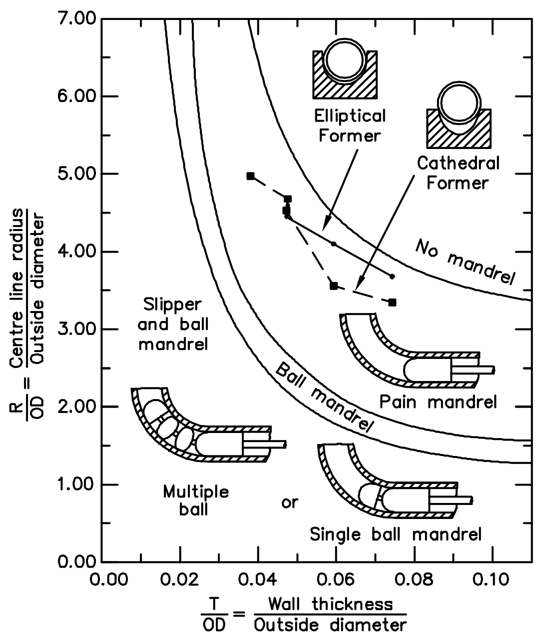


***Chart:** The Piping Handbook, King, C Reno, McGraw-Hill Australia, 5th Edition (1967) pp 7-126, Fig 50 (Mandrel and shoe requirements for cold-bending of pipe)*
OneSteel makes no representation or endorsement of the information contained in this chart, being reproduced here for information only.

DEFINITIONS

Black

A smooth, even coat of clear polymer is applied to the external surface. This coating is meant to act as temporary rust preventative.

Blue Painted

A smooth, even coat of blue general purpose paint is applied to act as a temporary rust prevention. See “Surface Finish” for RHS/SHS in this Product Information section for more details.

CHS

Circular hollow section. Also called pipe or tube. These names originated from the designations “pressure pipe” and “mechanical tube”.

Clear Coated

See “Black”

DFT

Dry Film Thickness of paint and polymer.

DN

See Nominal Size

DualGrade® (DuraGal DualGrade)

DuraGal DualGrade is available in the standard thicknesses of DuraGal RHS & SHS. This range of DuraGal RHS & SHS complies with the requirements of AS1163 grades C350L0 and C450L0. (Refer to the tables and notes on pages 22, 23, 31 & 32).

DuraGal®

A high strength hollow section or angle, channel or flat that is in-line hot dip galvanized with a minimum average zinc coating mass of 100 g/m^2 per coated side. Only the outside of the hollow sections is galvanized. See “Surface Finish” in this Product Information section for more details.

DuraGal® Internally Painted

A DuraGal hollow section that has been internally painted over a prepared metal surface. See “Surface Finish” in Product Information at the front of this section for more details.

End Colour Coding

To assist in easy recognition of the thickness of SHS, RHS, angles, channels & flats and the Quality of CHS, a colour is applied to the cut ends of all Australian made sections, except Galtube Plus, UltraPipe and sections ordered with NOP (No Oil or Paint) surface finish.

The end colour codes are set out in AS/NZS 4496: 1997 Recommended practice for the colour coding of steel products.

Galtube® Plus

A ductile hollow section that is in-line hot dip galvanized with a minimum average zinc coating mass of 125 g/m^2 per coated side. This product is generally internally painted with an Zinc Phospahte paint over a prepared metal surface. This product has the same strength as AS 1163 C350L0 hollow section but with the ductility to allow the product to be further processed without splitting or tearing, ie. crush bending or flat trapping. See “Surface Finish” in this Product Information section for more details.

HDG

See “Hot Dip Galvanized”.

Hot Dip Galvanized

A process in which mechanically and/or chemically cleaned steel is submerged in molten zinc. This results in a zinc coating which forms a strong metallurgical bond with steel (without further processing) unlike electroplating, zinc spraying, painting with zinc rich coatings, mechanical plating or metallising. See “Surface Finish” in this Product Information section for more details.

Mill (Cut) Ends

DuraGal® , Galtube® Plus and Tubeline® products have friction sawn or shear cut ends. There may be some rag. The cutting tooling is changed regularly to minimise the rag.

Ultrapipe® is generally supplied with Bevelled ends.

Nominal Size (DN)

A pressure pipe term, but commonly used by distributors to describe all circular hollow sections in sizes up to 165.1 OD. Historically it was used to describe pressure pipes with similar flow rates at a given pressure or head.

Standards Australia has adopted DN (from French *diametre nominel*) as the nominal size designator for pressure pipe. NB, nominal bore (nominal inside diameter) was the term used in Australia up till the late 1980’s.

No Oil or Paint (NOP)

Both the external and internal surface of the hollow section is supplied in the “As Rolled” condition without protective coatings. Some dirt, usually loose mill scale, and mill lubricant contamination is unavoidable. The ends are not colour coded.

Oiled

This is not a mill option for the OneSteel products within this publication.

Profiles

DuraGal profiles are in-line hot dip galvanized angles, channels and flats. See “Surface Finish” in the Product Information at the front of this section for more details.

Quality

An indication of the wall thickness of CHS. Historically used to describe pressure pipe where each “Quality” designated pipes with similar pressure capacity. Changes in steel making and pipe manufacturing methods have overtaken this link.

Five Qualities are commonly manufactured in Australia; Extra-Light, Light, Medium, Heavy and Extra-Heavy.

Not all Qualities are available in all sizes.

Generally the thickness of the pipe increases, as size increases, for a particular Quality.

Red Painted

A smooth, even coat of red general purpose paint is applied to act as a temporary rust prevention. See “Surface Finish” for CHS in the Product Information at the front of this section for more details.

RHS

Rectangular Hollow Section. Often used to describe both RHS and SHS.

SHS

Square Hollow Section.

Tubeline®

The OneSteel range of HDG, Black and Painted CHS & RHS hollow sections. Most Tubeline hollow sections comply with AS 1163 Grades C250L0, C350L0 or C450L0. Refer to the sectional property tables for details of sizes and shapes that can be manufactured within the different grade designations of AS1163.

UltraPipe®

For Structural applications, UltraPipe is tested to and complies with the requirements of AS 1163 Grade C350L0 and is included within the relevant tables for Large Structural CHS (168.3 to 457.0mm) hollow sections AS1163 Grade C350L0.

Varnish

This is usually only found on imported products.

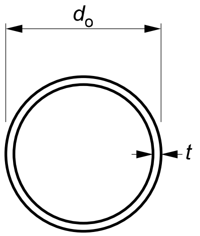
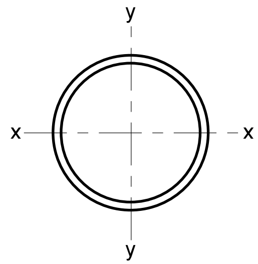


TABLE 1.1(a)

DIMENSIONS AND PROPERTIES

TUBELINE CIRCULAR HOLLOW SECTIONS

GRADE C250L0 (AS 1163)



DIMENSION AND RATIOS						PROPERTIES							PROPERTIES FOR DESIGN TO AS 4100			
Designation		Mass per m	External Surface Area		$\frac{d_o}{t}$	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus	Form Factor	About any axis		
d_o	t		per m	per t		A_g	I	Z	S	r	J	C	k_f	λ_s	Compactness(3)	Z_e
mm	mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
165.1 x	5.4 CHS	21.3	0.519	24.4	30.6	2710	8.65	105	138	56.5	17.3	209	1.00	30.6	C	138
	5.0 CHS	19.7	0.519	26.3	33.0	2510	8.07	97.7	128	56.6	16.1	195	1.00	33.0	C	128
139.7 x	5.4 CHS	17.9	0.439	24.5	25.9	2280	5.14	73.7	97.4	47.5	10.3	147	1.00	25.9	C	97.4
	5.0 CHS	16.6	0.439	26.4	27.9	2120	4.81	68.8	90.8	47.7	9.61	138	1.00	27.9	C	90.8
114.3 x	5.4 CHS	14.5	0.359	24.8	21.2	1850	2.75	48.0	64.1	38.5	5.49	96.1	1.00	21.2	C	64.1
	4.5 CHS	12.2	0.359	29.5	25.4	1550	2.34	41.0	54.3	38.9	4.69	82.0	1.00	25.4	C	54.3
101.6 x	5.0 CHS	11.9	0.319	26.8	20.3	1520	1.77	34.9	46.7	34.2	3.55	69.9	1.00	20.3	C	46.7
	4.0 CHS	9.63	0.319	33.2	25.4	1230	1.46	28.8	38.1	34.5	2.93	57.6	1.00	25.4	C	38.1
88.9 x	5.9 CHS	12.1	0.279	23.1	15.1	1540	1.33	30.0	40.7	29.4	2.66	59.9	1.00	15.1	C	40.7
	5.0 CHS	10.3	0.279	27.0	17.8	1320	1.16	26.2	35.2	29.7	2.33	52.4	1.00	17.8	C	35.2
	4.0 CHS	8.38	0.279	33.3	22.2	1070	0.963	21.7	28.9	30.0	1.93	43.3	1.00	22.2	C	28.9
76.1 x	5.9 CHS	10.2	0.239	23.4	12.9	1300	0.807	21.2	29.1	24.9	1.61	42.4	1.00	12.9	C	29.1
	4.5 CHS	7.95	0.239	30.1	16.9	1010	0.651	17.1	23.1	25.4	1.30	34.2	1.00	16.9	C	23.1
	3.6 CHS	6.44	0.239	37.1	21.1	820	0.540	14.2	18.9	25.7	1.08	28.4	1.00	21.1	C	18.9

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 250 MPa and design tensile strength f_u = 320 MPa as per AS 4100 table 2.1 for AS 1163 grade C250L0.
2. Grade C250L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.

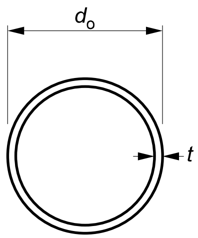
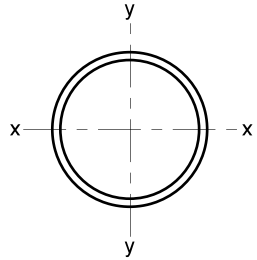


TABLE 1.1(b)

DIMENSIONS AND PROPERTIES

TUBELINE CIRCULAR HOLLOW SECTIONS

GRADE C250L0 (AS 1163)



DIMENSION AND RATIOS						PROPERTIES							PROPERTIES FOR DESIGN TO AS 4100			
Designation		Mass per m	External Surface Area		$\frac{d_o}{t}$	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus	Form Factor	About any axis		
d_o	t		per m	per t		A_g	I	Z	S	r	J	C	k_f	λ_s	Compactness(3)	Z_e
mm	mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
60.3 x	5.4 CHS	7.31	0.189	25.9	11.2	931	0.354	11.8	16.3	19.5	0.709	23.5	1.00	11.2	C	16.3
	4.5 CHS	6.19	0.189	30.6	13.4	789	0.309	10.2	14.0	19.8	0.618	20.5	1.00	13.4	C	14.0
	3.6 CHS	5.03	0.189	37.6	16.8	641	0.259	8.58	11.6	20.1	0.517	17.2	1.00	16.8	C	11.6
48.3 x	5.4 CHS	5.71	0.152	26.6	8.94	728	0.170	7.04	9.99	15.3	0.340	14.1	1.00	8.94	C	9.99
	4.0 CHS	4.37	0.152	34.7	12.1	557	0.138	5.70	7.87	15.7	0.275	11.4	1.00	12.1	C	7.87
	3.2 CHS	3.56	0.152	42.6	15.1	453	0.116	4.80	6.52	16.0	0.232	9.59	1.00	15.1	C	6.52
42.4 x	4.0 CHS	3.79	0.133	35.2	10.6	483	0.0899	4.24	5.92	13.6	0.180	8.48	1.00	10.6	C	5.92
	3.2 CHS	3.09	0.133	43.1	13.3	394	0.0762	3.59	4.93	13.9	0.152	7.19	1.00	13.3	C	4.93
33.7 x	4.0 CHS	2.93	0.106	36.1	8.43	373	0.0419	2.49	3.55	10.6	0.0838	4.97	1.00	8.43	C	3.55
	3.2 CHS	2.41	0.106	44.0	10.5	307	0.0360	2.14	2.99	10.8	0.0721	4.28	1.00	10.5	C	2.99
26.9 x	3.2 CHS	1.87	0.0845	45.2	8.41	238	0.0170	1.27	1.81	8.46	0.0341	2.53	1.00	8.41	C	1.81
	2.6 CHS	1.56	0.0845	54.2	10.3	198	0.0148	1.10	1.54	8.64	0.0296	2.20	1.00	10.3	C	1.54

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 250 MPa and design tensile strength f_u = 320 MPa as per AS 4100 table 2.1 for AS 1163 grade C250L0.
2. Grade C250L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.

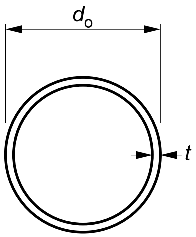
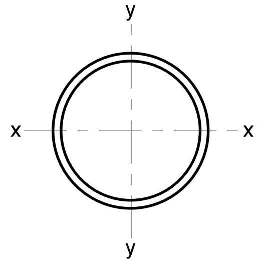


TABLE 1.2(a)

DIMENSIONS AND PROPERTIES

TUBELINE/ULTRAPIPE CIRCULAR HOLLOW SECTIONS

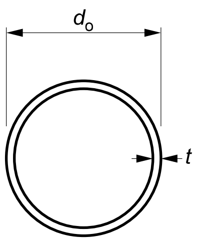
GRADE C350L0 (AS 1163)



DIMENSION AND RATIOS					PROPERTIES							PROPERTIES FOR DESIGN TO AS 4100			
Designation	Mass per m	External Surface Area		$\frac{d_o}{t}$	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus	Form Factor	About any axis		
d_o t		per m	per t		A_g	I	Z	S	r	J	C	k_f	λ_s	Compactness[3]	Z_e
mm mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
457.0 x 12.7 CHS	139	1.44	10.3	36.0	17700	438	1920	2510	157	876	3830	1.00	50.4	N	2500
9.5 CHS	105	1.44	13.7	48.1	13400	334	1460	1900	158	669	2930	1.00	67.3	N	1790
6.4 CHS	71.1	1.44	20.2	71.4	9060	230	1010	1300	159	460	2010	0.904	100	N	1090
406.4 x 12.7 CHS	123	1.28	10.4	32.0	15700	305	1500	1970	139	609	3000	1.00	44.8	C	1970
9.5 CHS	93.0	1.28	13.7	42.8	11800	233	1150	1500	140	467	2300	1.00	59.9	N	1450
6.4 CHS	63.1	1.28	20.2	63.5	8040	161	792	1020	141	322	1580	0.960	88.9	N	895
355.6 x 12.7 CHS	107	1.12	10.4	28.0	13700	201	1130	1490	121	403	2260	1.00	39.2	C	1490
9.5 CHS	81.1	1.12	13.8	37.4	10300	155	871	1140	122	310	1740	1.00	52.4	N	1130
6.4 CHS	55.1	1.12	20.3	55.6	7020	107	602	781	123	214	1200	1.00	77.8	N	710
323.9 x 12.7 CHS	97.5	1.02	10.4	25.5	12400	151	930	1230	110	301	1860	1.00	35.7	C	1230
9.5 CHS	73.7	1.02	13.8	34.1	9380	116	717	939	111	232	1430	1.00	47.7	C	939
6.4 CHS	50.1	1.02	20.3	50.6	6380	80.5	497	645	112	161	994	1.00	70.9	N	601
273.1 x 12.7 CHS	81.6	0.858	10.5	21.5	10400	88.3	646	862	92.2	177	1290	1.00	30.1	C	862
9.3 CHS	60.5	0.858	14.2	29.4	7710	67.1	492	647	93.3	134	983	1.00	41.1	C	647
6.4 CHS	42.1	0.858	20.4	42.7	5360	47.7	349	455	94.3	95.4	699	1.00	59.7	N	441
4.8 CHS	31.8	0.858	27.0	56.9	4050	36.4	267	346	94.9	72.8	533	1.00	79.7	N	312

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 MPa as per AS 4100 table 2.1 for AS 1163 grade C350L0.
2. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.

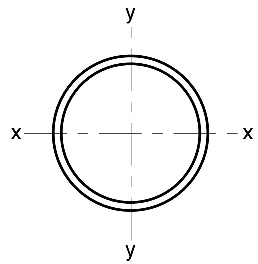
TABLE 1.2(b)



DIMENSIONS AND PROPERTIES

TUBELINE/ULTRAPIPE CIRCULAR HOLLOW SECTIONS

GRADE C350L0 (AS 1163)



DIMENSION AND RATIOS						PROPERTIES							PROPERTIES FOR DESIGN TO AS 4100			
Designation		Mass per m	External Surface Area		$\frac{d_o}{t}$	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus	Form Factor	About any axis		
d_o	t		per m	per t		A_g	I	Z	S	r	J	C	k_f	λ_s	Compactness(3)	Z_e
mm	mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
219.1 x	8.2 CHS	42.6	0.688	16.1	26.7	5430	30.3	276	365	74.6	60.5	552	1.00	37.4	C	365
	6.4 CHS	33.6	0.688	20.5	34.2	4280	24.2	221	290	75.2	48.4	442	1.00	47.9	C	290
	4.8 CHS	25.4	0.688	27.1	45.6	3230	18.6	169	220	75.8	37.1	339	1.00	63.9	N	210
168.3 x	7.1 CHS	28.2	0.529	18.7	23.7	3600	11.7	139	185	57.0	23.4	278	1.00	33.2	C	185
	6.4 CHS	25.6	0.529	20.7	26.3	3260	10.7	127	168	57.3	21.4	254	1.00	36.8	C	168
	4.8 CHS	19.4	0.529	27.3	35.1	2470	8.25	98.0	128	57.8	16.5	196	1.00	49.1	C	128
165.1 x	3.5 CHS	13.9	0.519	37.2	47.2	1780	5.80	70.3	91.4	57.1	11.6	141	1.00	66.0	N	86.6
139.7 x	3.5 CHS	11.8	0.439	37.3	39.9	1500	3.47	49.7	64.9	48.2	6.95	99.5	1.00	55.9	N	63.7
	3.0 CHS	10.1	0.439	43.4	46.6	1290	3.01	43.1	56.1	48.3	6.02	86.2	1.00	65.2	N	53.3
114.3 x	3.6 CHS	9.83	0.359	36.5	31.8	1250	1.92	33.6	44.1	39.2	3.84	67.2	1.00	44.5	C	44.1
	3.2 CHS	8.77	0.359	41.0	35.7	1120	1.72	30.2	39.5	39.3	3.45	60.4	1.00	50.0	N	39.5
101.6 x	3.2 CHS	7.77	0.319	41.1	31.8	989	1.20	23.6	31.0	34.8	2.40	47.2	1.00	44.5	C	31.0
	2.6 CHS	6.35	0.319	50.3	39.1	809	0.991	19.5	25.5	35.0	1.98	39.0	1.00	54.7	N	25.1

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 MPa as per AS 4100 table 2.1 for AS 1163 grade C350L0.
2. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification is AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.

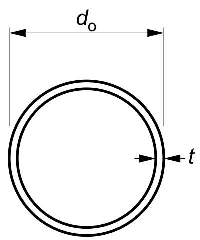
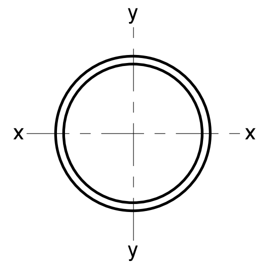


TABLE 1.2(c)

DIMENSIONS AND PROPERTIES

TUBELINE CIRCULAR HOLLOW SECTIONS

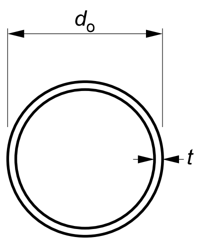
GRADE C350L0 (AS 1163)



DIMENSION AND RATIOS						PROPERTIES										
Designation		Mass per m	External Surface Area		$\frac{d_o}{t}$	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus	Form Factor	About any axis		
d_o	t		per m	per t		A_g	I	Z	S	r	J	C	k_f	λ_s	Compactness[3]	Z_e
mm	mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
88.9 x	3.2 CHS	6.76	0.279	41.3	27.8	862	0.792	17.8	23.5	30.3	1.58	35.6	1.00	38.9	C	23.5
	2.6 CHS	5.53	0.279	50.5	34.2	705	0.657	14.8	19.4	30.5	1.31	29.6	1.00	47.9	C	19.4
76.1 x	3.2 CHS	5.75	0.239	41.6	23.8	733	0.488	12.8	17.0	25.8	0.976	25.6	1.00	33.3	C	17.0
	2.3 CHS	4.19	0.239	57.1	33.1	533	0.363	9.55	12.5	26.1	0.727	19.1	1.00	46.3	C	12.5
60.3 x	2.9 CHS	4.11	0.189	46.1	20.8	523	0.216	7.16	9.56	20.3	0.432	14.3	1.00	29.1	C	9.56
	2.3 CHS	3.29	0.189	57.6	26.2	419	0.177	5.85	7.74	20.5	0.353	11.7	1.00	36.7	C	7.74
48.3 x	2.9 CHS	3.25	0.152	46.7	16.7	414	0.107	4.43	5.99	16.1	0.214	8.86	1.00	23.3	C	5.99
	2.3 CHS	2.61	0.152	58.2	21.0	332	0.0881	3.65	4.87	16.3	0.176	7.30	1.00	29.4	C	4.87
42.4 x	2.6 CHS	2.55	0.133	52.2	16.3	325	0.0646	3.05	4.12	14.1	0.129	6.10	1.00	22.8	C	4.12
	2.0 CHS	1.99	0.133	66.8	21.2	254	0.0519	2.45	3.27	14.3	0.104	4.90	1.00	29.7	C	3.27
33.7 x	2.6 CHS	1.99	0.106	53.1	13.0	254	0.0309	1.84	2.52	11.0	0.0619	3.67	1.00	18.1	C	2.52
	2.0 CHS	1.56	0.106	67.7	16.9	199	0.0251	1.49	2.01	11.2	0.0502	2.98	1.00	23.6	C	2.01
26.9 x	2.3 CHS	1.40	0.0845	60.6	11.7	178	0.0136	1.01	1.40	8.74	0.0271	2.02	1.00	16.4	C	1.40
	2.0 CHS	1.23	0.0845	68.8	13.5	156	0.0122	0.907	1.24	8.83	0.0244	1.81	1.00	18.8	C	1.24

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 MPa as per AS 4100 table 2.1 for AS 1163 grade C350L0.
2. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.

TABLE 1.3

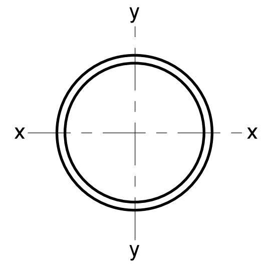


DIMENSIONS AND PROPERTIES

TUBELINE CIRCULAR HOLLOW SECTIONS

GRADE C350L0

(TUBELINE 350L0 - TYPE 2[(1)] AND TYPE 3[(2)])



DIMENSION AND RATIOS						PROPERTIES							PROPERTIES FOR DESIGN TO AS 4100			
Designation		Mass per m	External Surface Area		$\frac{d_o}{t}$	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus	Form Factor	About any axis		
d_o	t		per m	per t		A_g	I	Z	S	r	J	C	k_f	λ_s	Compactness[(5)]	Z_e
mm	mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
21.3 x	3.2 CHS[(1)]	1.43	0.0669	46.8	6.66	182	0.00768	0.722	1.06	6.50	0.0154	1.44	1.00	9.32	C	1.06
	2.6 CHS[(1)]	1.20	0.0669	55.8	8.19	153	0.00681	0.639	0.915	6.68	0.0136	1.28	1.00	11.5	C	0.915
	2.0 CHS[(2)]	0.952	0.0669	70.3	10.7	121	0.00571	0.536	0.748	6.86	0.0114	1.07	1.00	14.9	C	0.748

NOTES:
1. In this table, the properties of these products are calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 380.
2. In this table, the properties of these products are calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 as per AS 4100 table 2.1 for AS 1163 grade C350L0.
3. Type 2 and 3 products are not made strictly in accordance with AS 1163. Care should be used when designing structures using these products.
4. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
5. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.

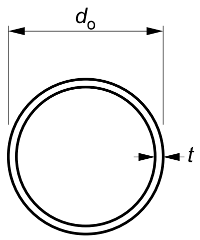
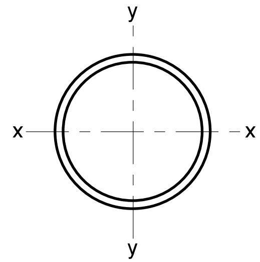


TABLE 1.4

DIMENSIONS AND PROPERTIES

DURAGAL CIRCULAR HOLLOW SECTIONS

GRADE C350 (DURAGAL C350)



DIMENSION AND RATIOS					PROPERTIES							PROPERTIES FOR DESIGN TO AS 4100			
Designation	Mass per m	External Surface Area		$\frac{d_o}{t}$	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus	Form Factor	About any axis		
d_o t		per m	per t		A_g	I	Z	S	r	J	C	k_f	λ_s	Compactness(3)	Z_e
mm mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
76.1 x 2.3 CHS	4.19	0.239	57.1	33.1	533	0.363	9.55	12.5	26.1	0.727	19.1	1.00	46.3	C	12.5
60.3 x 2.3 CHS	3.29	0.189	57.6	26.2	419	0.177	5.85	7.74	20.5	0.353	11.7	1.00	36.7	C	7.74
48.3 x 2.3 CHS	2.61	0.152	58.2	21.0	332	0.0881	3.65	4.87	16.3	0.176	7.30	1.00	29.4	C	4.87
42.4 x 2.0 CHS	1.99	0.133	66.8	21.2	254	0.0519	2.45	3.27	14.3	0.104	4.90	1.00	29.7	C	3.27
33.7 x 2.0 CHS	1.56	0.106	67.7	16.9	199	0.0251	1.49	2.01	11.2	0.0502	2.98	1.00	23.6	C	2.01
26.9 x 2.0 CHS	1.23	0.0845	68.8	13.5	156	0.0122	0.907	1.24	8.83	0.0244	1.81	1.00	18.8	C	1.24

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 MPa.
2. DuraGal C350 is manufactured generally in accordance with the requirements of the chemical and dimensional requirements of AS 1163 Grade C350
3. DuraGal C350 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
4. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.

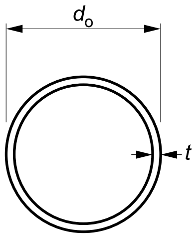
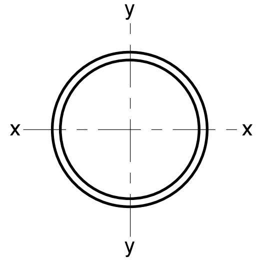


TABLE 1.5

DIMENSIONS AND PROPERTIES

GALTUBE PLUS CIRCULAR HOLLOW SECTIONS

GRADE C350L0 (TUBELINE 350L0 - TYPE 1)



DIMENSION AND RATIOS						FULL SECTION PROPERTIES							EFFECTIVE SECTION PROPERTIES		
Designation		Nominal Mass per m	External Surface Area		$\frac{d_o}{t}$	Full Section Area	About any axis				Torsion Constant	Torsion Modulus	Effective Section Area	About any axis	
d_o	t		per m	per t		A_f	I	Z	S	r	J	C	A_e	I_e	Z_e
mm	mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	mm^2	10^6mm^4	10^3mm^3
76.1 x	**2.6 CHS**	**4.71**	**0.239**	**50.7**	**30.4**	**578**	**0.392**	**10.3**	**13.5**	**26.0**	**0.784**	**20.6**	**578**	**0.392**	**12.9**
60.3 x	**2.3 CHS**	**3.29**	**0.189**	**57.6**	**27.4**	**402**	**0.170**	**5.63**	**7.43**	**20.6**	**0.339**	**11.3**	**402**	**0.170**	**7.03**
48.3 x	**2.3 CHS**	**2.61**	**0.152**	**58.2**	**22.0**	**319**	**0.0848**	**3.51**	**4.68**	**16.3**	**0.170**	**7.03**	**319**	**0.0848**	**4.39**
42.4 x	**2.0 CHS**	**1.99**	**0.133**	**66.8**	**22.3**	**242**	**0.0497**	**2.34**	**3.12**	**14.3**	**0.0993**	**4.69**	**242**	**0.0497**	**2.93**
33.7 x	**2.0 CHS**	**1.56**	**0.106**	**67.7**	**17.7**	**190**	**0.0241**	**1.43**	**1.92**	**11.3**	**0.0482**	**2.86**	**190**	**0.0241**	**1.79**
26.9 x	**2.0 CHS**	**1.23**	**0.0845**	**68.8**	**14.2**	**149**	**0.0117**	**0.872**	**1.19**	**8.86**	**0.0235**	**1.74**	**149**	**0.0117**	**1.09**

NOTES:
1. In this table, the properties of these products are calculated in accordance with AS/NZS 4600 using design yield stress f_y = 350 MPa and design tensile strength f_u = 380.
2. Effective section properties are calculated in accordance with AS/NZS 4600.
3. All columns of the table (except for “Nominal Mass per m” and “External Surface Area per t”) are calculated using design thicknesses of 1.9mm, 2.2mm and 2.5mm rather than the respective thicknesses t of 2.0mm, 2.3mm and 2.6mm. This is to comply with clause 1.5.1.6 of AS/NZS 4600

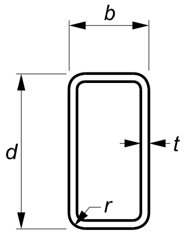
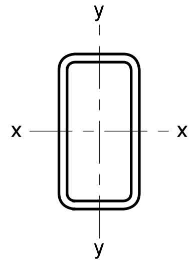


TABLE 2.1(a)

DIMENSIONS AND PROPERTIES

TUBELINE RECTANGULAR HOLLOW SECTIONS

GRADE C350L0 (AS 1163)



DIMENSION AND RATIOS						PROPERTIES											PROPERTIES FOR DESIGN TO AS 4100						
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	$\frac{d-2t}{t}$	Gross Section Area	About x-axis				About y-axis				Torsion Constant	Torsion Modulus	Form Factor	About x-axis			About y-axis		
d b t		per m	per t			A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	C	k_f	λ_{ex}	Compact-ness(3)	Z_{ex}	λ_{ey}	Compact-ness(3)	Z_{ey}
mm mm mm	kg/m	m^2/m	m^2/t			mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3		(C,N,S)	10^3mm^3
250 x150x9.0 RHS	51.8	0.761	14.7	14.7	25.8	6600	53.7	430	533	90.2	24.3	324	375	60.7	56.0	554	1.00	17.4	C	533	30.5	N	373
6.0 RHS	35.6	0.774	21.8	23.0	39.7	4530	38.4	307	374	92.0	17.5	233	264	62.2	39.0	395	0.907	27.2	C	374	46.9	S	208
5.0 RHS	29.9	0.779	26.0	28.0	48.0	3810	32.7	262	317	92.6	15.0	199	224	62.6	33.0	337	0.814	33.1	N	300	56.8	S	156
200 x100x9.0 RHS	37.7	0.561	14.9	9.11	20.2	4800	22.8	228	293	68.9	7.64	153	180	39.9	19.9	272	1.00	10.8	C	293	23.9	C	180
6.0 RHS	26.2	0.574	22.0	14.7	31.3	3330	16.7	167	210	70.8	5.69	114	130	41.3	14.2	200	1.00	17.4	C	210	37.1	N	119
5.0 RHS	22.1	0.579	26.2	18.0	38.0	2810	14.4	144	179	71.5	4.92	98.3	111	41.8	12.1	172	0.925	21.3	C	179	45.0	S	90.1
4.0 RHS	17.9	0.583	32.5	23.0	48.0	2280	11.9	119	147	72.1	4.07	81.5	91.0	42.3	9.89	142	0.801	27.2	C	147	56.8	S	63.1
150x100x9.0 RHS	30.6	0.461	15.1	9.11	14.7	3900	10.9	145	185	52.9	5.77	115	140	38.5	13.2	197	1.00	10.8	C	185	17.4	C	140
6.0 RHS	21.4	0.474	22.1	14.7	23.0	2730	8.17	109	134	54.7	4.36	87.3	102	40.0	9.51	147	1.00	17.4	C	134	27.2	C	102
5.0 RHS	18.2	0.479	26.3	18.0	28.0	2310	7.07	94.3	115	55.3	3.79	75.7	87.3	40.4	8.12	127	1.00	21.3	C	115	33.1	N	83.6
4.0 RHS	14.8	0.483	32.7	23.0	35.5	1880	5.87	78.2	94.6	55.9	3.15	63.0	71.8	40.9	6.64	105	0.971	27.2	C	94.6	42.0	S	60.9
150 x 50 x6.0 RHS	16.7	0.374	22.4	6.33	23.0	2130	5.06	67.5	91.2	48.7	0.860	34.4	40.9	20.1	2.63	64.3	1.00	7.49	C	91.2	27.2	C	40.9
5.0 RHS	14.2	0.379	26.6	8.00	28.0	1810	4.44	59.2	78.9	49.5	0.765	30.6	35.7	20.5	2.30	56.8	1.00	9.47	C	78.9	33.1	N	34.1
4.0 RHS	11.6	0.383	32.9	10.5	35.5	1480	3.74	49.8	65.4	50.2	0.653	26.1	29.8	21.0	1.93	48.2	0.963	12.4	C	65.4	42.0	S	25.1
3.0 RHS	8.96	0.390	43.5	14.7	48.0	1140	2.99	39.8	51.4	51.2	0.526	21.1	23.5	21.5	1.50	38.3	0.776	17.4	C	51.4	56.8	S	16.0
2.5 RHS	7.53	0.391	52.0	18.0	58.0	959	2.54	33.9	43.5	51.5	0.452	18.1	19.9	21.7	1.28	32.8	0.685	21.3	C	43.5	68.6	S	11.9
2.0 RHS	6.07	0.393	64.7	23.0	73.0	774	2.08	27.7	35.3	51.8	0.372	14.9	16.3	21.9	1.04	26.9	0.595	27.2	C	34.3	86.4	S	8.32

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 MPa as per AS 4100 table 2.1 for AS 1163 grade C350L0.
2. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
4. For Square and Rectangular Hollow Sections the outside corner radius r used in calculating the section properties is equal to $2t$ for sections with thickness $t \leq 3.0$mm and $2.5t$ for sections with $t > 3.0$mm.

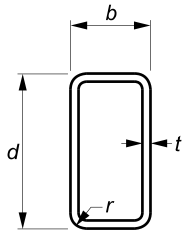
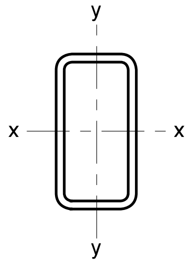


TABLE 2.1(b)

DIMENSIONS AND PROPERTIES

TUBELINE RECTANGULAR HOLLOW SECTIONS

GRADE C350L0 (AS 1163)



DIMENSION AND RATIOS						PROPERTIES											PROPERTIES FOR DESIGN TO AS 4100						
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	$\frac{d-2t}{t}$	Gross Section Area	About x-axis				About y-axis				Torsion Constant	Torsion Modulus	Form Factor	About x-axis			About y-axis		
																			Compact-ness(3)			Compact-ness(3)	
d b t		per m	per t			A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	C	k_f	λ_{ex}		Z_{ex}	λ_{ey}		Z_{ey}
mm mm mm	kg/m	m^2/m	m^2/t			mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3		(C,N,S)	10^3mm^3
125 x 75 x6.0 RHS	16.7	0.374	22.4	10.5	18.8	2130	4.16	66.6	84.2	44.2	1.87	50.0	59.1	29.6	4.44	86.2	1.00	12.4	C	84.2	22.3	C	59.1
5.0 RHS	14.2	0.379	26.6	13.0	23.0	1810	3.64	58.3	72.7	44.8	1.65	43.9	51.1	30.1	3.83	75.3	1.00	15.4	C	72.7	27.2	C	51.1
4.0 RHS	11.6	0.383	32.9	16.8	29.3	1480	3.05	48.9	60.3	45.4	1.39	37.0	42.4	30.6	3.16	63.0	1.00	19.8	C	60.3	34.6	N	39.9
3.0 RHS	8.96	0.390	43.5	23.0	39.7	1140	2.43	38.9	47.3	46.1	1.11	29.5	33.3	31.1	2.43	49.5	0.908	27.2	C	47.3	46.9	S	26.3
2.5 RHS	7.53	0.391	52.0	28.0	48.0	959	2.07	33.0	40.0	46.4	0.942	25.1	28.2	31.4	2.05	42.1	0.815	33.1	N	37.8	56.8	S	19.8
2.0 RHS	6.07	0.393	64.7	35.5	60.5	774	1.69	27.0	32.5	46.7	0.771	20.6	22.9	31.6	1.67	34.4	0.706	42.0	S	26.3	71.6	S	14.0
100 x 50 x6.0 RHS	12.0	0.274	22.8	6.33	14.7	1530	1.71	34.2	45.3	33.4	0.567	22.7	27.7	19.2	1.53	40.9	1.00	7.49	C	45.3	17.4	C	27.7
5.0 RHS	10.3	0.279	27.0	8.00	18.0	1310	1.53	30.6	39.8	34.1	0.511	20.4	24.4	19.7	1.35	36.5	1.00	9.47	C	39.8	21.3	C	24.4
4.0 RHS	8.49	0.283	33.3	10.5	23.0	1080	1.31	26.1	33.4	34.8	0.441	17.6	20.6	20.2	1.13	31.2	1.00	12.4	C	33.4	27.2	C	20.6
3.5 RHS	7.53	0.285	37.9	12.3	26.6	959	1.18	23.6	29.9	35.1	0.400	16.0	18.5	20.4	1.01	28.2	1.00	14.5	C	29.9	31.4	N	18.1
3.0 RHS	6.60	0.290	43.9	14.7	31.3	841	1.06	21.3	26.7	35.6	0.361	14.4	16.4	20.7	0.886	25.0	1.00	17.4	C	26.7	37.1	N	15.0
2.5 RHS	5.56	0.291	52.4	18.0	38.0	709	0.912	18.2	22.7	35.9	0.311	12.4	14.0	20.9	0.754	21.5	0.926	21.3	C	22.7	45.0	S	11.4
2.0 RHS	4.50	0.293	65.1	23.0	48.0	574	0.750	15.0	18.5	36.2	0.257	10.3	11.5	21.2	0.616	17.7	0.802	27.2	C	18.5	56.8	S	7.98
1.6 RHS	3.64	0.295	81.0	29.3	60.5	463	0.613	12.3	15.0	36.4	0.211	8.43	9.33	21.3	0.501	14.5	0.705	34.6	N	13.8	71.6	S	5.61
75 x 50 x 6.0 RHS	9.67	0.224	23.2	6.33	10.5	1230	0.800	21.3	28.1	25.5	0.421	16.9	21.1	18.5	1.01	29.3	1.00	7.49	C	28.1	12.4	C	21.1
5.0 RHS	8.35	0.229	27.4	8.00	13.0	1060	0.726	19.4	24.9	26.1	0.384	15.4	18.8	19.0	0.891	26.4	1.00	9.47	C	24.9	15.4	C	18.8
4.0 RHS	6.92	0.233	33.7	10.5	16.8	881	0.630	16.8	21.1	26.7	0.335	13.4	16.0	19.5	0.754	22.7	1.00	12.4	C	21.1	19.8	C	16.0
3.0 RHS	5.42	0.240	44.2	14.7	23.0	691	0.522	13.9	17.1	27.5	0.278	11.1	12.9	20.0	0.593	18.4	1.00	17.4	C	17.1	27.2	C	12.9
2.5 RHS	4.58	0.241	52.7	18.0	28.0	584	0.450	12.0	14.6	27.7	0.240	9.60	11.0	20.3	0.505	15.9	1.00	21.3	C	14.6	33.1	N	10.6
2.0 RHS	3.72	0.243	65.4	23.0	35.5	474	0.372	9.91	12.0	28.0	0.199	7.96	9.06	20.5	0.414	13.1	0.971	27.2	C	12.0	42.0	S	7.70
1.6 RHS	3.01	0.245	81.3	29.3	44.9	383	0.305	8.14	9.75	28.2	0.164	6.56	7.40	20.7	0.337	10.8	0.852	34.6	N	9.01	53.1	S	5.42

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 MPa as per AS 4100 table 2.1 for AS 1163 grade C350L0.
2. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
4. For Square and Rectangular Hollow Sections the outside corner radius r used in calculating the section properties is equal to $2t$ for sections with thickness $t \leq 3.0$mm and $2.5t$ for sections with $t > 3.0$mm.

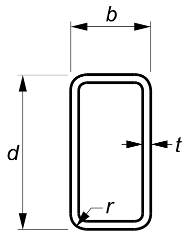
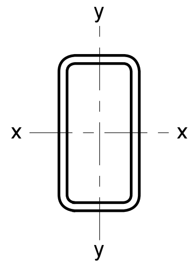


TABLE 2.1(c)

DIMENSIONS AND PROPERTIES

TUBELINE RECTANGULAR HOLLOW SECTIONS

GRADE C350L0 (AS 1163)

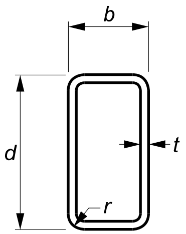


DIMENSION AND RATIOS						PROPERTIES											PROPERTIES FOR DESIGN TO AS 4100						
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	$\frac{d-2t}{t}$	Gross Section Area	About x-axis				About y-axis				Torsion Constant	Torsion Modulus	Form Factor	About x-axis			About y-axis		
d b t		per m	per t			A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	C	k_f	λ_{ex}	Compact-ness(3)	Z_{ex}	λ_{ey}	Compact-ness(3)	Z_{ey}
mm mm mm	kg/m	m^2/m	m^2/t			mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3		(C,N,S)	10^3mm^3
75 x 25 x 2.5 RHS	3.60	0.191	53.1	8.00	28.0	459	0.285	7.60	10.1	24.9	0.0487	3.89	4.53	10.3	0.144	7.14	1.00	9.47	C	10.1	33.1	N	4.33
2.0 RHS	2.93	0.193	65.8	10.5	35.5	374	0.238	6.36	8.31	25.3	0.0414	3.31	3.77	10.5	0.120	6.04	0.964	12.4	C	8.31	42.0	S	3.18
1.6 RHS	2.38	0.195	81.7	13.6	44.9	303	0.197	5.26	6.81	25.5	0.0347	2.78	3.11	10.7	0.0993	5.05	0.813	16.1	C	6.81	53.1	S	2.22
65 x 35x 4.0 RHS	5.35	0.183	34.2	6.75	14.3	681	0.328	10.1	13.3	22.0	0.123	7.03	8.58	13.4	0.320	12.5	1.00	7.99	C	13.3	16.9	C	8.58
3.0 RHS	4.25	0.190	44.7	9.67	19.7	541	0.281	8.65	11.0	22.8	0.106	6.04	7.11	14.0	0.259	10.4	1.00	11.4	C	11.0	23.3	C	7.11
2.5 RHS	3.60	0.191	53.1	12.0	24.0	459	0.244	7.52	9.45	23.1	0.0926	5.29	6.13	14.2	0.223	9.10	1.00	14.2	C	9.45	28.4	C	6.13
2.0 RHS	2.93	0.193	65.8	15.5	30.5	374	0.204	6.28	7.80	23.4	0.0778	4.44	5.07	14.4	0.184	7.62	1.00	18.3	C	7.80	36.1	N	4.69
50 x 25 x 3.0 RHS	3.07	0.140	45.5	6.33	14.7	391	0.112	4.47	5.86	16.9	0.0367	2.93	3.56	9.69	0.0964	5.18	1.00	7.49	C	5.86	17.4	C	3.56
2.5 RHS	2.62	0.141	54.0	8.00	18.0	334	0.0989	3.95	5.11	17.2	0.0328	2.62	3.12	9.91	0.0843	4.60	1.00	9.47	C	5.11	21.3	C	3.12
2.0 RHS	2.15	0.143	66.6	10.5	23.0	274	0.0838	3.35	4.26	17.5	0.0281	2.25	2.62	10.1	0.0706	3.92	1.00	12.4	C	4.26	27.2	C	2.62
1.6 RHS	1.75	0.145	82.5	13.6	29.3	223	0.0702	2.81	3.53	17.7	0.0237	1.90	2.17	10.3	0.0585	3.29	1.00	16.1	C	3.53	34.6	N	2.05
50 x 20 x 3.0 RHS	2.83	0.130	45.8	4.67	14.7	361	0.0951	3.81	5.16	16.2	0.0212	2.12	2.63	7.67	0.0620	3.88	1.00	5.52	C	5.16	17.4	C	2.63
2.5 RHS	2.42	0.131	54.2	6.00	18.0	309	0.0848	3.39	4.51	16.6	0.0192	1.92	2.32	7.89	0.0550	3.49	1.00	7.10	C	4.51	21.3	C	2.32
2.0 RHS	1.99	0.133	66.8	8.00	23.0	254	0.0723	2.89	3.78	16.9	0.0167	1.67	1.96	8.11	0.0466	3.00	1.00	9.47	C	3.78	27.2	C	1.96
1.6 RHS	1.63	0.135	82.7	10.5	29.3	207	0.0608	2.43	3.14	17.1	0.0142	1.42	1.63	8.29	0.0389	2.55	1.00	12.4	C	3.14	34.6	N	1.54

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 MPa as per AS 4100 table 2.1 for AS 1163 grade C350L0.
2. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
4. For Square and Rectangular Hollow Sections the outside corner radius r used in calculating the section properties is equal to $2t$ for sections with thickness $t \leq 3.0$mm and $2.5t$ for sections with $t > 3.0$mm.

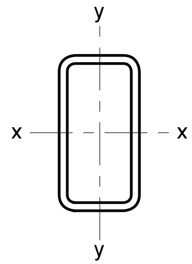
TABLE 2.2(a)

DIMENSIONS AND PROPERTIES



DURAGAL DUALGRADE RECTANGULAR HOLLOW SECTIONS

GRADE C450L0 (AS 1163)



DIMENSION AND RATIOS						PROPERTIES											PROPERTIES FOR DESIGN TO AS 4100						
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	$\frac{d-2t}{t}$	Gross Section Area	About x-axis				About y-axis				Torsion Constant	Torsion Modulus	Form Factor	About x-axis			About y-axis		
																			Compact-ness(3)			Compact-ness(3)	
d b t		per m	per t			A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	C	k_f	λ_{ex}		Z_{ex}	λ_{ey}		Z_{ey}
mm mm mm	kg/m	m^2/m	m^2/t			mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3		(C,N,S)	10^3mm^3
150 x 50 x6.0 RHS	16.7	0.374	22.4	6.33	23.0	2130	5.06	67.5	91.2	48.7	0.860	34.4	40.9	20.1	2.63	64.3	1.00	8.50	C	91.2	30.9	N	40.4
5.0 RHS	14.2	0.379	26.6	8.00	28.0	1810	4.44	59.2	78.9	49.5	0.765	30.6	35.7	20.5	2.30	56.8	1.00	10.7	C	78.9	37.6	N	31.8
4.0 RHS	11.6	0.383	32.9	10.5	35.5	1480	3.74	49.8	65.4	50.2	0.653	26.1	29.8	21.0	1.93	48.2	0.877	14.1	C	65.4	47.6	S	22.7
3.0 RHS	8.96	0.390	43.5	14.7	48.0	1140	2.99	39.8	51.4	51.2	0.526	21.1	23.5	21.5	1.50	38.3	0.713	19.7	C	51.4	64.4	S	14.5
2.5 RHS	7.53	0.391	52.0	18.0	58.0	959	2.54	33.9	43.5	51.5	0.452	18.1	19.9	21.7	1.28	32.8	0.633	24.1	C	43.5	77.8	S	10.9
2.0 RHS	6.07	0.393	64.7	23.0	73.0	774	2.08	27.7	35.3	51.8	0.372	14.9	16.3	21.9	1.04	26.9	0.553	30.9	N	31.6	97.9	S	7.64
125 x 75 x6.0 RHS	16.7	0.374	22.4	10.5	18.8	2130	4.16	66.6	84.2	44.2	1.87	50.0	59.1	29.6	4.44	86.2	1.00	14.1	C	84.2	25.3	C	59.1
5.0 RHS	14.2	0.379	26.6	13.0	23.0	1810	3.64	58.3	72.7	44.8	1.65	43.9	51.1	30.1	3.83	75.3	1.00	17.4	C	72.7	30.9	N	50.5
4.0 RHS	11.6	0.383	32.9	16.8	29.3	1480	3.05	48.9	60.3	45.4	1.39	37.0	42.4	30.6	3.16	63.0	1.00	22.5	C	60.3	39.2	N	37.4
3.0 RHS	8.96	0.390	43.5	23.0	39.7	1140	2.43	38.9	47.3	46.1	1.11	29.5	33.3	31.1	2.43	49.5	0.845	30.9	N	46.5	53.2	S	24.2
2.5 RHS	7.53	0.391	52.0	28.0	48.0	959	2.07	33.0	40.0	46.4	0.942	25.1	28.2	31.4	2.05	42.1	0.763	37.6	N	34.7	64.4	S	18.2
2.0 RHS	6.07	0.393	64.7	35.5	60.5	774	1.69	27.0	32.5	46.7	0.771	20.6	22.9	31.6	1.67	34.4	0.624	47.6	S	24.8	81.2	S	13.0
100 x 50 x6.0 RHS	12.0	0.274	22.8	6.33	14.7	1530	1.71	34.2	45.3	33.4	0.567	22.7	27.7	19.2	1.53	40.9	1.00	8.50	C	45.3	19.7	C	27.7
5.0 RHS	10.3	0.279	27.0	8.00	18.0	1310	1.53	30.6	39.8	34.1	0.511	20.4	24.4	19.7	1.35	36.5	1.00	10.7	C	39.8	24.1	C	24.4
4.0 RHS	8.49	0.283	33.3	10.5	23.0	1080	1.31	26.1	33.4	34.8	0.441	17.6	20.6	20.2	1.13	31.2	1.00	14.1	C	33.4	30.9	N	20.3
3.5 RHS	7.53	0.285	37.9	12.3	26.6	959	1.18	23.6	29.9	35.1	0.400	16.0	18.5	20.4	1.01	28.2	1.00	16.5	C	29.9	35.6	N	17.1
3.0 RHS	6.60	0.290	43.9	14.7	31.3	841	1.06	21.3	26.7	35.6	0.361	14.4	16.4	20.7	0.886	25.0	0.967	19.7	C	26.7	42.0	S	13.9
2.5 RHS	5.56	0.291	52.4	18.0	38.0	709	0.912	18.2	22.7	35.9	0.311	12.4	14.0	20.9	0.754	21.5	0.856	24.1	C	22.7	51.0	S	10.4
2.0 RHS	4.50	0.293	65.1	23.0	48.0	574	0.750	15.0	18.5	36.2	0.257	10.3	11.5	21.2	0.616	17.7	0.746	30.9	N	18.2	64.4	S	7.33
1.6 RHS	3.64	0.295	81.0	29.3	60.5	463	0.613	12.3	15.0	36.4	0.211	8.43	9.33	21.3	0.501	14.5	0.661	39.2	N	12.5	81.2	S	5.19

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 450 MPa and design tensile strength f_u = 500 MPa as per AS 4100 table 2.1 for AS 1163 grade C450L0.
2. Grade C450L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
4. For SHS and RHS the outside corner radius r used in calculating the section properties is equal to $2t$ for sections with thickness $t \leq 3.0$mm and $2.5t$ for sections with $t > 3.0$mm.
5. DuraGal Dual Grade C350L0/C450L0 hollow sections have a minimum yield stress of 450MPa (f_y = 450MPa), a minimum tensile strength of 500MPa (f_u = 500MPa) and a minimum elongation equal to 16%, ie. the strength of AS 1163 grade C450L0 and the elongation of AS 1163 grade C350L0.

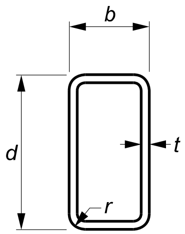
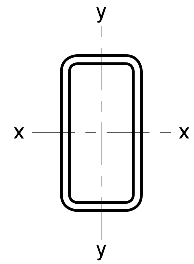


TABLE 2.2(b)

DIMENSIONS AND PROPERTIES

DURAGAL DUALGRADE RECTANGULAR HOLLOW SECTIONS

GRADE C450L0 (AS 1163)



DIMENSION AND RATIOS						PROPERTIES											PROPERTIES FOR DESIGN TO AS 4100						
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	$\frac{d-2t}{t}$	Gross Section Area	About x-axis				About y-axis				Torsion Constant	Torsion Modulus	Form Factor	About x-axis			About y-axis		
d b t		per m	per t			A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	C	k_f	λ_{ex}	Compactness(3)	Z_{ex}	λ_{ey}	Compactness(3)	Z_{ey}
mm mm mm	kg/m	m^2/m	m^2/t			mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3		(C,N,S)	10^3mm^3
75 x 50 x 6.0 RHS	9.67	0.224	23.2	6.33	10.5	1230	0.800	21.3	28.1	25.5	0.421	16.9	21.1	18.5	1.01	29.3	1.00	8.50	C	28.1	14.1	C	21.1
5.0 RHS	8.35	0.229	27.4	8.00	13.0	1060	0.726	19.4	24.9	26.1	0.384	15.4	18.8	19.0	0.891	26.4	1.00	10.7	C	24.9	17.4	C	18.8
4.0 RHS	6.92	0.233	33.7	10.5	16.8	881	0.630	16.8	21.1	26.7	0.335	13.4	16.0	19.5	0.754	22.7	1.00	14.1	C	21.1	22.5	C	16.0
3.0 RHS	5.42	0.240	44.2	14.7	23.0	691	0.522	13.9	17.1	27.5	0.278	11.1	12.9	20.0	0.593	18.4	1.00	19.7	C	17.1	30.9	N	12.8
2.5 RHS	4.58	0.241	52.7	18.0	28.0	584	0.450	12.0	14.6	27.7	0.240	9.60	11.0	20.3	0.505	15.9	1.00	24.1	C	14.6	37.6	N	9.95
2.0 RHS	3.72	0.243	65.4	23.0	35.5	474	0.372	9.91	12.0	28.0	0.199	7.96	9.06	20.5	0.414	13.1	0.904	30.9	N	11.8	47.6	S	7.07
1.6 RHS	3.01	0.245	81.3	29.3	44.9	383	0.305	8.14	9.75	28.2	0.164	6.56	7.40	20.7	0.337	10.8	0.799	39.2	N	8.26	60.2	S	5.01
75 x 25 x 2.5 RHS	3.60	0.191	53.1	8.00	28.0	459	0.285	7.60	10.1	24.9	0.0487	3.89	4.53	10.3	0.144	7.14	1.00	10.7	C	10.1	37.6	N	4.05
2.0 RHS	2.93	0.193	65.8	10.5	35.5	374	0.238	6.36	8.31	25.3	0.0414	3.31	3.77	10.5	0.120	6.04	0.878	14.1	C	8.31	47.6	S	2.88
1.6 RHS	2.38	0.195	81.7	13.6	44.9	303	0.197	5.26	6.81	25.5	0.0347	2.78	3.11	10.7	0.0993	5.05	0.746	18.3	C	6.81	60.2	S	2.02
65 x 35 x 3.0 RHS	4.25	0.190	44.7	9.67	19.7	541	0.281	8.65	11.0	22.8	0.106	6.04	7.11	14.0	0.259	10.4	1.00	13.0	C	11.0	26.4	C	7.11
2.5 RHS	3.60	0.191	53.1	12.0	24.0	459	0.244	7.52	9.45	23.1	0.0926	5.29	6.13	14.2	0.223	9.10	1.00	16.1	C	9.45	32.2	N	5.95
2.0 RHS	2.93	0.193	65.8	15.5	30.5	374	0.204	6.28	7.80	23.4	0.0778	4.44	5.07	14.4	0.184	7.62	0.985	20.8	C	7.80	40.9	S	4.37
50 x 25 x 3.0 RHS	3.07	0.140	45.5	6.33	14.7	391	0.112	4.47	5.86	16.9	0.0367	2.93	3.56	9.69	0.0964	5.18	1.00	8.50	C	5.86	19.7	C	3.56
2.5 RHS	2.62	0.141	54.0	8.00	18.0	334	0.0989	3.95	5.11	17.2	0.0328	2.62	3.12	9.91	0.0843	4.60	1.00	10.7	C	5.11	24.1	C	3.12
2.0 RHS	2.15	0.143	66.6	10.5	23.0	274	0.0838	3.35	4.26	17.5	0.0281	2.25	2.62	10.1	0.0706	3.92	1.00	14.1	C	4.26	30.9	N	2.58
1.6 RHS	1.75	0.145	82.5	13.6	29.3	223	0.0702	2.81	3.53	17.7	0.0237	1.90	2.17	10.3	0.0585	3.29	1.00	18.3	C	3.53	39.2	N	1.92
50 x 20 x 3.0 RHS	2.83	0.130	45.8	4.67	14.7	361	0.0951	3.81	5.16	16.2	0.0212	2.12	2.63	7.67	0.0620	3.88	1.00	6.26	C	5.16	19.7	C	2.63
2.5 RHS	2.42	0.131	54.2	6.00	18.0	309	0.0848	3.39	4.51	16.6	0.0192	1.92	2.32	7.89	0.0550	3.49	1.00	8.05	C	4.51	24.1	C	2.32
2.0 RHS	1.99	0.133	66.8	8.00	23.0	254	0.0723	2.89	3.78	16.9	0.0167	1.67	1.96	8.11	0.0466	3.00	1.00	10.7	C	3.78	30.9	N	1.93
1.6 RHS	1.63	0.135	82.7	10.5	29.3	207	0.0608	2.43	3.14	17.1	0.0142	1.42	1.63	8.29	0.0389	2.55	1.00	14.1	C	3.14	39.2	N	1.44

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 450 MPa and design tensile strength f_u = 500 MPa as per AS 4100 table 2.1 for AS 1163 grade C450L0.
2. Grade C450L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
4. For SHS and RHS the outside corner radius *r* used in calculating the section properties is equal to 2*t* for sections with thickness $t \leq 3.0$mm and 2.5*t* for sections with $t > 3.0$mm.
5. DuraGal Dual Grade C350L0/C450L0 hollow sections have a minimum yield stress of 450MPa (f_y = 450MPa), a minimum tensile strength of 500MPa (f_u = 500MPa) and a minimum elongation equal to 16%, ie. the strength of AS 1163 grade C450L0 and the elongation of AS 1163 grade C350L0.

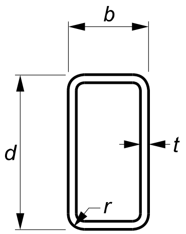
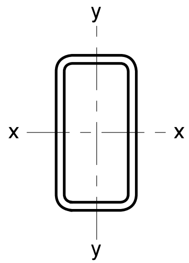


TABLE 2.3

DIMENSIONS AND PROPERTIES

GALTUBE PLUS RECTANGULAR HOLLOW SECTIONS

GRADE C350L0 (TUBELINE 350L0 - TYPE 1)



DIMENSION AND RATIOS						FULL SECTION PROPERTIES											EFFECTIVE SECTION PROPERTIES				
Designation	Nominal Mass per m	External Surface Area				Full Section Area	About x-axis				About y-axis				Torsion Constant	Torsion Modulus	Effective Section Area	About x- and y- axis			
d b t		per m	per t	$\frac{b-2r}{t}$	$\frac{d-2r}{t}$	A_f	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	C	A_e	I_{ex}	Z_{ex}	I_{ey}	Z_{ey}
mm mm mm	kg/m	m^2/m	m^2/t			mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	mm^2	10^6mm^4	10^3mm^3	10^6mm^4	10^3mm^3
75 x 25 x 2.5 RHS	3.60	0.191	53.1	6.42	27.3	442	0.276	7.37	9.72	25.0	0.0473	3.78	4.38	10.3	0.139	6.93	442	0.276	7.37	0.0473	3.78
1.6 RHS	2.38	0.195	81.7	13.2	47.7	276	0.181	4.83	6.23	25.6	0.0320	2.56	2.85	10.8	0.0911	4.65	227	0.181	4.83	0.0251	2.01
50 x 25 x 2.5 RHS	2.62	0.141	54.0	6.42	16.8	322	0.0960	3.84	4.94	17.3	0.0319	2.55	3.02	9.95	0.0817	4.47	322	0.0960	3.84	0.0319	2.55
1.6 RHS	1.75	0.145	82.5	13.2	30.5	204	0.0647	2.59	3.23	17.8	0.0219	1.75	2.00	10.4	0.0537	3.04	204	0.0647	2.59	0.0219	1.75
50 x 20 x 2.5 RHS	2.42	0.131	54.2	4.33	16.8	298	0.0824	3.30	4.37	16.6	0.0188	1.88	2.25	7.93	0.0534	3.40	298	0.0824	3.30	0.0188	1.88
1.6 RHS	1.63	0.135	82.7	9.79	30.5	189	0.0561	2.25	2.88	17.2	0.0132	1.32	1.50	8.35	0.0359	2.36	189	0.0561	2.25	0.0132	1.32

NOTES:
1. This table is calculated in accordance with AS/NZS 4600 using a design yield stress f_y = 350MPa and design tensile strength f_u = 380MPa.
2. Effective section properties are calculated in accordance with AS/NZS 4600.
3. All columns of the table (except for “Nominal Mass per m” and External Surface Area”) are calculated using design thicknesses of 1.45mm and 2.4mm rather than the respective thicknesses *t* of 1.6mm and 2.5mm. This is to comply with clause 1.5.1.6 of AS/NZS 4600.
4. For Square and Rectangular Hollow Sections the outside corner radius *r* used in calculating the section properties is equal to 2*t* for sections with thickness *t* $\leq$ 3.0mm and 2.5*t* for sections with *t* > 3.0mm.

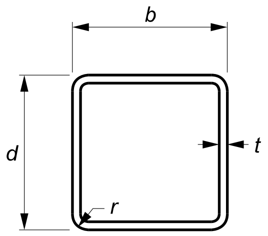
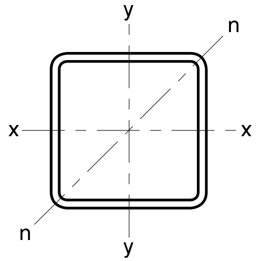


TABLE 3.1(a)

DIMENSIONS AND PROPERTIES

TUBELINE SQUARE HOLLOW SECTIONS

GRADE C350L0 (AS 1163)



DIMENSION AND RATIOS					PROPERTIES								PROPERTIES FOR DESIGN TO AS 4100			
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	Gross Section Area	About x-, y- and n-axis					Torsion Constant	Torsion Modulus	Form Factor	About x- and y-axis		
d *b* *t*		per m	per t		A_g	I_x	Z_x	Z_n	S_x	r_x	*J*	*C*	k_f	λ_e	Compactness(3)	Z_e
mm mm mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
250x250x9.0 SHS	65.9	0.961	14.6	25.8	8400	79.8	639	477	750	97.5	129	972	1.00	30.5	N	744
6.0 SHS	45.0	0.974	21.7	39.7	5730	56.2	450	330	521	99.0	88.7	681	0.853	46.9	S	409
200x200x9.0 SHS	51.8	0.761	14.7	20.2	6600	39.2	392	297	465	77.1	64.5	599	1.00	23.9	C	465
6.0 SHS	35.6	0.774	21.8	31.3	4530	28.0	280	207	327	78.6	44.8	425	1.00	37.1	N	294
5.0 SHS	29.9	0.779	26.0	38.0	3810	23.9	239	175	277	79.1	37.8	362	0.890	45.0	S	223
150x150x9.0 SHS	37.7	0.561	14.9	14.7	4800	15.4	205	159	248	56.6	26.1	316	1.00	17.4	C	248
6.0 SHS	26.2	0.574	22.0	23.0	3330	11.3	150	113	178	58.2	18.4	229	1.00	27.2	C	178
5.0 SHS	22.1	0.579	26.2	28.0	2810	9.70	129	96.1	151	58.7	15.6	197	1.00	33.1	N	144
125x125x9.0 SHS	30.6	0.461	15.1	11.9	3900	8.38	134	106	165	46.4	14.5	208	1.00	14.1	C	165
6.0 SHS	21.4	0.474	22.1	18.8	2730	6.29	101	76.5	120	48.0	10.4	154	1.00	22.3	C	120
5.0 SHS	18.2	0.479	26.3	23.0	2310	5.44	87.1	65.4	103	48.5	8.87	133	1.00	27.2	C	103
4.0 SHS	14.8	0.483	32.7	29.3	1880	4.52	72.3	53.6	84.5	49.0	7.25	110	1.00	34.6	N	78.9
100x100x9.0 SHS	23.5	0.361	15.4	9.11	3000	3.91	78.1	63.6	98.6	36.1	7.00	123	1.00	10.8	C	98.6
6.0 SHS	16.7	0.374	22.4	14.7	2130	3.04	60.7	47.1	73.5	37.7	5.15	93.6	1.00	17.4	C	73.5
5.0 SHS	14.2	0.379	26.6	18.0	1810	2.66	53.1	40.5	63.5	38.3	4.42	81.4	1.00	21.3	C	63.5
4.0 SHS	11.6	0.383	32.9	23.0	1480	2.23	44.6	33.5	52.6	38.8	3.63	68.0	1.00	27.2	C	52.6
3.0 SHS	8.96	0.390	43.5	31.3	1140	1.77	35.4	26.0	41.2	39.4	2.79	53.2	1.00	37.1	N	37.1
2.5 SHS	7.53	0.391	52.0	38.0	959	1.51	30.1	21.9	34.9	39.6	2.35	45.2	0.891	45.0	S	28.1
2.0 SHS	6.07	0.393	64.7	48.0	774	1.23	24.6	17.8	28.3	39.9	1.91	36.9	0.706	56.8	S	20.2

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 MPa as per AS 4100 table 2.1 for AS 1163 grade C350L0.
2. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
4. For Square and Rectangular Hollow Sections the outside corner radius *r* used in calculating the section properties is equal to 2*t* for sections with thickness $t \leq 3.0$mm and 2.5*t* for sections with $t > 3.0$mm.

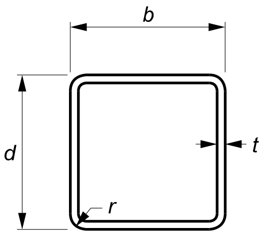
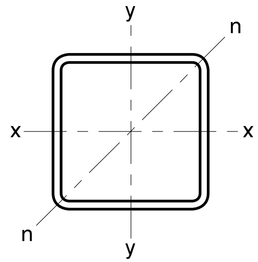


TABLE 3.1(b)

DIMENSIONS AND PROPERTIES

TUBELINE SQUARE HOLLOW SECTIONS

GRADE C350L0 (AS 1163)



DIMENSION AND RATIOS					PROPERTIES								PROPERTIES FOR DESIGN TO AS 4100			
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	Gross Section Area	About x-, y- and n-axis					Torsion Constant	Torsion Modulus	Form Factor	About x- and y-axis		
d b t		per m	per t		A_g	I_x	Z_x	Z_n	S_x	r_x	J	C	k_f	λ_e	Compactness[(3)]	Z_e
mm mm mm	kg/m	m^2/m	m^2/t		mm^2	$10^6 mm^4$	$10^3 mm^3$	$10^3 mm^3$	$10^3 mm^3$	mm	$10^6 mm^4$	$10^3 mm^3$			(C,N,S)	$10^3 mm^3$
89 x 89 x6.0 SHS	14.6	0.330	22.5	12.8	1870	2.06	46.2	36.3	56.6	33.2	3.54	71.6	1.00	15.2	C	56.6
5.0 SHS	12.5	0.334	26.7	15.8	1590	1.81	40.7	31.4	49.1	33.7	3.05	62.7	1.00	18.7	C	49.1
3.5 SHS	9.06	0.341	37.6	23.4	1150	1.37	30.9	23.2	36.5	34.5	2.24	47.1	1.00	27.7	C	36.5
75 x 75 x6.0 SHS	12.0	0.274	22.8	10.5	1530	1.16	30.9	24.7	38.4	27.5	2.04	48.2	1.00	12.4	C	38.4
5.0 SHS	10.3	0.279	27.0	13.0	1310	1.03	27.5	21.6	33.6	28.0	1.77	42.6	1.00	15.4	C	33.6
4.0 SHS	8.49	0.283	33.3	16.8	1080	0.882	23.5	18.0	28.2	28.6	1.48	36.1	1.00	19.8	C	28.2
3.5 SHS	7.53	0.285	37.9	19.4	959	0.797	21.3	16.1	25.3	28.8	1.32	32.5	1.00	23.0	C	25.3
3.0 SHS	6.60	0.290	43.9	23.0	841	0.716	19.1	14.2	22.5	29.2	1.15	28.7	1.00	27.2	C	22.5
2.5 SHS	5.56	0.291	52.4	28.0	709	0.614	16.4	12.0	19.1	29.4	0.971	24.6	1.00	33.1	N	18.3
2.0 SHS	4.50	0.293	65.1	35.5	574	0.505	13.5	9.83	15.6	29.7	0.790	20.2	0.953	42.0	S	13.1
65 x 65 x6.0 SHS	10.1	0.234	23.1	8.83	1290	0.706	21.7	17.8	27.5	23.4	1.27	34.2	1.00	10.5	C	27.5
5.0 SHS	8.75	0.239	27.3	11.0	1110	0.638	19.6	15.6	24.3	23.9	1.12	30.6	1.00	13.0	C	24.3
4.0 SHS	7.23	0.243	33.6	14.3	921	0.552	17.0	13.2	20.6	24.5	0.939	26.2	1.00	16.9	C	20.6
3.0 SHS	5.66	0.250	44.1	19.7	721	0.454	14.0	10.4	16.6	25.1	0.733	21.0	1.00	23.3	C	16.6
2.5 SHS	4.78	0.251	52.6	24.0	609	0.391	12.0	8.91	14.1	25.3	0.624	18.1	1.00	28.4	C	14.1
2.0 SHS	3.88	0.253	65.3	30.5	494	0.323	9.94	7.29	11.6	25.6	0.509	14.9	1.00	36.1	N	10.6
1.6 SHS	3.13	0.255	81.2	38.6	399	0.265	8.16	5.94	9.44	25.8	0.414	12.2	0.876	45.7	S	7.54
50 x 50 x5.0 SHS	6.39	0.179	27.9	8.00	814	0.257	10.3	8.51	13.2	17.8	0.469	16.3	1.00	9.47	C	13.2
4.0 SHS	5.35	0.183	34.2	10.5	681	0.229	9.15	7.33	11.4	18.3	0.403	14.3	1.00	12.4	C	11.4
3.0 SHS	4.25	0.190	44.7	14.7	541	0.195	7.79	5.92	9.39	19.0	0.321	11.8	1.00	17.4	C	9.39
2.5 SHS	3.60	0.191	53.1	18.0	459	0.169	6.78	5.09	8.07	19.2	0.275	10.2	1.00	21.3	C	8.07
2.0 SHS	2.93	0.193	65.8	23.0	374	0.141	5.66	4.20	6.66	19.5	0.226	8.51	1.00	27.2	C	6.66
1.6 SHS	2.38	0.195	81.7	29.3	303	0.117	4.68	3.44	5.46	19.6	0.185	7.03	1.00	34.6	N	5.10

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 MPa as per AS 4100 table 2.1 for AS 1163 grade C350L0.
2. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
4. For Square and Rectangular Hollow Sections the outside corner radius r used in calculating the section properties is equal to $2t$ for sections with thickness $t \leq 3.0$mm and $2.5t$ for sections with $t > 3.0$mm.

SHS

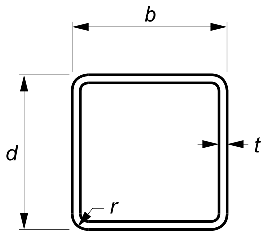
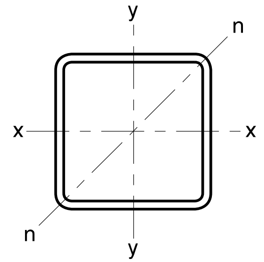


TABLE 3.1(c)

DIMENSIONS AND PROPERTIES

TUBELINE SQUARE HOLLOW SECTIONS

GRADE C350L0 (AS 1163)



DIMENSION AND RATIOS					PROPERTIES								PROPERTIES FOR DESIGN TO AS 4100			
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	Gross Section Area	About x-, y- and n-axis					Torsion Constant	Torsion Modulus	Form Factor	About x- and y-axis		
d b t		per m	per t		A_g	I_x	Z_x	Z_n	S_x	r_x	J	C	k_f	λ_e	Compactness(3)	Z_e
mm mm mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
40 x 40 x4.0 SHS	4.09	0.143	34.9	8.00	521	0.105	5.26	4.36	6.74	14.2	0.192	8.33	1.00	9.47	C	6.74
3.0 SHS	3.30	0.150	45.3	11.3	421	0.0932	4.66	3.61	5.72	14.9	0.158	7.07	1.00	13.4	C	5.72
2.5 SHS	2.82	0.151	53.7	14.0	359	0.0822	4.11	3.13	4.97	15.1	0.136	6.21	1.00	16.6	C	4.97
2.0 SHS	2.31	0.153	66.4	18.0	294	0.0694	3.47	2.61	4.13	15.4	0.113	5.23	1.00	21.3	C	4.13
1.6 SHS	1.88	0.155	82.3	23.0	239	0.0579	2.90	2.15	3.41	15.6	0.0927	4.36	1.00	27.2	C	3.41
35 x 35 x3.0 SHS	2.83	0.130	45.8	9.67	361	0.0595	3.40	2.67	4.23	12.8	0.102	5.18	1.00	11.4	C	4.23
2.5 SHS	2.42	0.131	54.2	12.0	309	0.0529	3.02	2.33	3.69	13.1	0.0889	4.58	1.00	14.2	C	3.69
2.0 SHS	1.99	0.133	66.8	15.5	254	0.0451	2.58	1.95	3.09	13.3	0.0741	3.89	1.00	18.3	C	3.09
1.6 SHS	1.63	0.135	82.7	19.9	207	0.0379	2.16	1.62	2.57	13.5	0.0611	3.26	1.00	23.5	C	2.57
30 x 30 x2.0 SHS	1.68	0.113	67.4	13.0	214	0.0272	1.81	1.39	2.21	11.3	0.0454	2.75	1.00	15.4	C	2.21
1.6 SHS	1.38	0.115	83.3	16.8	175	0.0231	1.54	1.16	1.84	11.5	0.0377	2.32	1.00	19.8	C	1.84
25 x 25 x3.0 SHS	1.89	0.0897	47.4	6.33	241	0.0184	1.47	1.21	1.91	8.74	0.0333	2.27	1.00	7.49	C	1.91
2.5 SHS	1.64	0.0914	55.7	8.00	209	0.0169	1.35	1.08	1.71	8.99	0.0297	2.07	1.00	9.47	C	1.71
2.0 SHS	1.36	0.0931	68.3	10.5	174	0.0148	1.19	0.926	1.47	9.24	0.0253	1.80	1.00	12.4	C	1.47
1.6 SHS	1.12	0.0945	84.1	13.6	143	0.0128	1.02	0.780	1.24	9.44	0.0212	1.54	1.00	16.1	C	1.24
20 x 20 x1.6 SHS	0.873	0.0745	85.4	10.5	111	0.00608	0.608	0.474	0.751	7.39	0.0103	0.924	1.00	12.4	C	0.751

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 430 MPa as per AS 4100 table 2.1 for AS 1163 grade C350L0.
2. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
4. For Square and Rectangular Hollow Sections the outside corner radius r used in calculating the section properties is equal to $2t$ for sections with thickness $t \leq 3.0$mm and $2.5t$ for sections with $t > 3.0$mm.

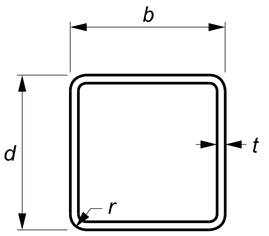
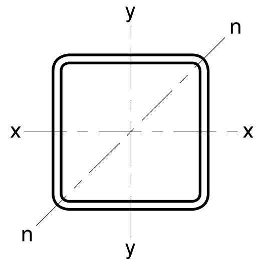


TABLE 3.2

DIMENSIONS AND PROPERTIES

TUBELINE SQUARE HOLLOW SECTIONS

GRADE C350L0 (TUBELINE 350L0 - TYPE 2)



DIMENSION AND RATIOS					PROPERTIES								PROPERTIES FOR DESIGN TO AS 4100			
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	Gross Section Area	About x-, y- and n-axis					Torsion Constant	Torsion Modulus	Form Factor	About x- and y-axis		
d b t		per m	per t		A_g	I_x	Z_x	Z_n	S_x	r_x	J	C	k_f	λ_e	Compactness(4)	Z_e
mm mm mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
15 x 15 x1.8 SHS	0.681	0.0538	79.1	6.33	86.7	0.00239	0.318	0.262	0.414	5.25	0.00431	0.491	1.00	7.49	C	0.414
13 x 13 x1.8 SHS	0.568	0.0458	80.7	5.22	72.3	0.00142	0.218	0.184	0.290	4.42	0.00262	0.339	1.00	6.18	C	0.290

NOTES:
1. In this table, the properties of these products are calculated in accordance with AS 4100 using design yield stress f_y = 350 MPa and design tensile strength f_u = 380.
2. Type 2 products are not made strictly in accordance with AS 1163. Care should be used when designing structures using these products.
3. Grade C350L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
4. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
5. For Square and Rectangular Hollow Sections the outside corner radius r used in calculating the section properties is equal to 2t for sections with thickness t ≤ 3.0mm and 2.5t for sections with t > 3.0mm.

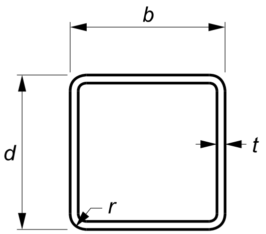
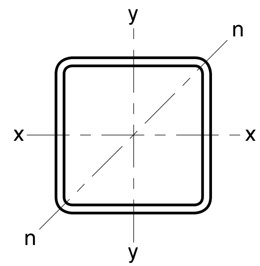


TABLE 3.3(a)

DIMENSIONS AND PROPERTIES

DURAGAL DUALGRADE SQUARE HOLLOW SECTIONS

GRADE C450L0 (AS 1163)



DIMENSION AND RATIOS					PROPERTIES								PROPERTIES FOR DESIGN TO AS 4100			
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	Gross Section Area	About x-, y- and n-axis					Torsion Constant	Torsion Modulus	Form Factor	About x- and y-axis		
d b t		per m	per t		A_g	I_x	Z_x	Z_n	S_x	r_x	J	C	k_f	λ_e	Compactness[(3)]	Z_e
mm mm mm	kg/m	m^2/m	m^2/t		mm^2	$10^6 mm^4$	$10^3 mm^3$	$10^3 mm^3$	$10^3 mm^3$	mm	$10^6 mm^4$	$10^3 mm^3$			(C,N,S)	$10^3 mm^3$
100x100x6.0 SHS	16.7	0.374	22.4	14.7	2130	3.04	60.7	47.1	73.5	37.7	5.15	93.6	1.00	19.7	C	73.5
5.0 SHS	14.2	0.379	26.6	18.0	1810	2.66	53.1	40.5	63.5	38.3	4.42	81.4	1.00	24.1	C	63.5
4.0 SHS	11.6	0.383	32.9	23.0	1480	2.23	44.6	33.5	52.6	38.8	3.63	68.0	1.00	30.9	N	51.9
3.0 SHS	8.96	0.390	43.5	31.3	1140	1.77	35.4	26.0	41.2	39.4	2.79	53.2	0.952	42.0	S	34.4
2.5 SHS	7.53	0.391	52.0	38.0	959	1.51	30.1	21.9	34.9	39.6	2.35	45.2	0.787	51.0	S	26.1
2.0 SHS	6.07	0.393	64.7	48.0	774	1.23	24.6	17.8	28.3	39.9	1.91	36.9	0.624	64.4	S	18.8
90 x 90 x2.5SHS	6.74	0.351	52.1	34.0	859	1.09	24.1	17.6	28.0	35.6	1.70	36.2	0.878	45.6	S	22.3
2.0 SHS	5.45	0.353	64.8	43.0	694	0.889	19.7	14.3	22.8	35.8	1.38	29.6	0.696	57.7	S	16.0
75x 75 x6.0 SHS	12.0	0.274	22.8	10.5	1530	1.16	30.9	24.7	38.4	27.5	2.04	48.2	1.00	14.1	C	38.4
5.0 SHS	10.3	0.279	27.0	13.0	1310	1.03	27.5	21.6	33.6	28.0	1.77	42.6	1.00	17.4	C	33.6
4.0 SHS	8.49	0.283	33.3	16.8	1080	0.882	23.5	18.0	28.2	28.6	1.48	36.1	1.00	22.5	C	28.2
3.5 SHS	7.53	0.285	37.9	19.4	959	0.797	21.3	16.1	25.3	28.8	1.32	32.5	1.00	26.1	C	25.3
3.0 SHS	6.60	0.290	43.9	23.0	841	0.716	19.1	14.2	22.5	29.2	1.15	28.7	1.00	30.9	N	22.2
2.5 SHS	5.56	0.291	52.4	28.0	709	0.614	16.4	12.0	19.1	29.4	0.971	24.6	1.00	37.6	N	17.0
2.0 SHS	4.50	0.293	65.1	35.5	574	0.505	13.5	9.83	15.6	29.7	0.790	20.2	0.841	47.6	S	12.1
65x 65 x6.0 SHS	10.1	0.234	23.1	8.83	1290	0.706	21.7	17.8	27.5	23.4	1.27	34.2	1.00	11.9	C	27.5
5.0 SHS	8.75	0.239	27.3	11.0	1110	0.638	19.6	15.6	24.3	23.9	1.12	30.6	1.00	14.8	C	24.3
4.0 SHS	7.23	0.243	33.6	14.3	921	0.552	17.0	13.2	20.6	24.5	0.939	26.2	1.00	19.1	C	20.6
3.0 SHS	5.66	0.250	44.1	19.7	721	0.454	14.0	10.4	16.6	25.1	0.733	21.0	1.00	26.4	C	16.6
2.5 SHS	4.78	0.251	52.6	24.0	609	0.391	12.0	8.91	14.1	25.3	0.624	18.1	1.00	32.2	N	13.7
2.0 SHS	3.88	0.253	65.3	30.5	494	0.323	9.94	7.29	11.6	25.6	0.509	14.9	0.978	40.9	S	9.80
1.6 SHS	3.13	0.255	81.2	38.6	399	0.265	8.16	5.94	9.44	25.8	0.414	12.2	0.774	51.8	S	7.01

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 450 MPa and design tensile strength f_u = 500 MPa as per AS 4100 table 2.1 for AS 1163 grade C450L0.
2. Grade C450L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
4. For SHS and RHS the outside corner radius r used in calculating the section properties is equal to $2t$ for sections with thickness $t \leq 3.0$mm and $2.5t$ for sections with $t > 3.0$mm.
5. DuraGal Dual Grade C350L0/C450L0 hollow sections have a minimum yield stress of 450MPa (f_y = 450MPa), a minimum tensile strength of 500MPa (f_u = 500MPa) and a minimum elongation equal to 16%, ie. the strength of AS 1163 grade C450L0 and the elongation of AS 1163 grade C350L0.

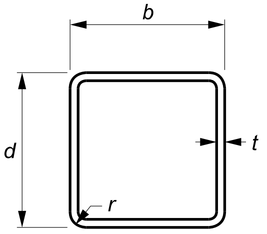
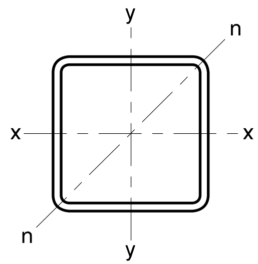


TABLE 3.3(b)

DIMENSIONS AND PROPERTIES

DURAGAL DUALGRADE SQUARE HOLLOW SECTIONS

GRADE C450L0 (AS 1163)



DIMENSION AND RATIOS					PROPERTIES								PROPERTIES FOR DESIGN TO AS 4100			
Designation	Mass per m	External Surface Area		$\frac{b-2t}{t}$	Gross Section Area	About x-, y- and n-axis					Torsion Constant	Torsion Modulus	Form Factor	About x- and y-axis		
d b t		per m	per t		A_g	I_x	Z_x	Z_n	S_x	r_x	J	C	k_f	λ_e	Compactness(3)	Z_e
mm mm mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
50 x 50 x5.0 SHS	6.39	0.179	27.9	8.00	814	0.257	10.3	8.51	13.2	17.8	0.469	16.3	1.00	10.7	C	13.2
4.0 SHS	5.35	0.183	34.2	10.5	681	0.229	9.15	7.33	11.4	18.3	0.403	14.3	1.00	14.1	C	11.4
3.0 SHS	4.25	0.190	44.7	14.7	541	0.195	7.79	5.92	9.39	19.0	0.321	11.8	1.00	19.7	C	9.39
2.5 SHS	3.60	0.191	53.1	18.0	459	0.169	6.78	5.09	8.07	19.2	0.275	10.2	1.00	24.1	C	8.07
2.0 SHS	2.93	0.193	65.8	23.0	374	0.141	5.66	4.20	6.66	19.5	0.226	8.51	1.00	30.9	N	6.58
1.6 SHS	2.38	0.195	81.7	29.3	303	0.117	4.68	3.44	5.46	19.6	0.185	7.03	1.00	39.2	N	4.74
40 x 40 x4.0 SHS	4.09	0.143	34.9	8.00	521	0.105	5.26	4.36	6.74	14.2	0.192	8.33	1.00	10.7	C	6.74
3.0 SHS	3.30	0.150	45.3	11.3	421	0.0932	4.66	3.61	5.72	14.9	0.158	7.07	1.00	15.2	C	5.72
2.5 SHS	2.82	0.151	53.7	14.0	359	0.0822	4.11	3.13	4.97	15.1	0.136	6.21	1.00	18.8	C	4.97
2.0 SHS	2.31	0.153	66.4	18.0	294	0.0694	3.47	2.61	4.13	15.4	0.113	5.23	1.00	24.1	C	4.13
1.6 SHS	1.88	0.155	82.3	23.0	239	0.0579	2.90	2.15	3.41	15.6	0.0927	4.36	1.00	30.9	N	3.37
35 x 35 x3.0 SHS	2.83	0.130	45.8	9.67	361	0.0595	3.40	2.67	4.23	12.8	0.102	5.18	1.00	13.0	C	4.23
2.5 SHS	2.42	0.131	54.2	12.0	309	0.0529	3.02	2.33	3.69	13.1	0.0889	4.58	1.00	16.1	C	3.69
2.0 SHS	1.99	0.133	66.8	15.5	254	0.0451	2.58	1.95	3.09	13.3	0.0741	3.89	1.00	20.8	C	3.09
1.6 SHS	1.63	0.135	82.7	19.9	207	0.0379	2.16	1.62	2.57	13.5	0.0611	3.26	1.00	26.7	C	2.57
30 x 30 x2.0 SHS	1.68	0.113	67.4	13.0	214	0.0272	1.81	1.39	2.21	11.3	0.0454	2.75	1.00	17.4	C	2.21
1.6 SHS	1.38	0.115	83.3	16.8	175	0.0231	1.54	1.16	1.84	11.5	0.0377	2.32	1.00	22.5	C	1.84
25 x 25 x3.0 SHS	1.89	0.0897	47.4	6.33	241	0.0184	1.47	1.21	1.91	8.74	0.0333	2.27	1.00	8.50	C	1.91
2.5 SHS	1.64	0.0914	55.7	8.00	209	0.0169	1.35	1.08	1.71	8.99	0.0297	2.07	1.00	10.7	C	1.71
2.0 SHS	1.36	0.0931	68.3	10.5	174	0.0148	1.19	0.926	1.47	9.24	0.0253	1.80	1.00	14.1	C	1.47
1.6 SHS	1.12	0.0945	84.1	13.6	143	0.0128	1.02	0.780	1.24	9.44	0.0212	1.54	1.00	18.3	C	1.24
20 x 20 x1.6 SHS	0.873	0.0745	85.4	10.5	111	0.00608	0.608	0.474	0.751	7.39	0.0103	0.924	1.00	14.1	C	0.751

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 450 MPa and design tensile strength f_u = 500 MPa as per AS 4100 table 2.1 for AS 1163 grade C450L0.
2. Grade C450L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.
4. For SHS and RHS the outside corner radius r used in calculating the section properties is equal to 2t for sections with thickness t ≤ 3.0mm and 2.5t for sections with t > 3.0mm.
5. DuraGal Dual Grade C350L0/C450L0 hollow sections have a minimum yield stress of 450MPa (f_y = 450MPa), a minimum tensile strength of 500MPa (f_u = 500MPa) and a minimum elongation equal to 16%, ie. the strength of AS 1163 grade C450L0 and the elongation of AS 1163 grade C350L0.

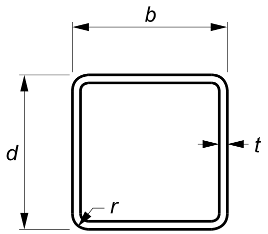
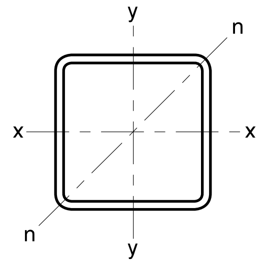


TABLE 3.4

DIMENSIONS AND PROPERTIES

GALTUBE PLUS SQUARE HOLLOW SECTIONS

GRADE C350L0 (TUBELINE 350L0 - TYPE 1)



DIMENSION AND RATIOS					FULL SECTION PROPERTIES								EFFECTIVE SECTION PROPERTIES			
Designation	Nominal Mass per m	External Surface Area		$\frac{b-2r}{t}$	Full Section Area	About x-, y- and n-axis					Torsion Constant	Torsion Modulus	Effective Section Area	About x-, y- and n-axis		
d b t		per m	per t		A_f	I_x	Z_x	Z_n	S_x	r_x	J	C	A_e	I_{ex}	Z_{ex}	Z_{en}
mm mm mm	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	mm^2	10^6mm^4	10^3mm^3	10^3mm^3
65 x 65 x2.5 SHS	4.78	0.251	52.6	23.1	586	0.378	11.6	8.59	13.6	25.4	0.601	17.5	586	0.378	11.6	8.59
1.6 SHS	3.13	0.255	81.2	40.8	363	0.243	7.46	5.42	8.61	25.8	0.377	11.2	308	0.215	6.61	5.42
50 x 50 x2.5 SHS	3.60	0.191	53.1	16.8	442	0.164	6.56	4.92	7.80	19.3	0.266	9.89	442	0.164	6.56	4.92
1.6 SHS	2.38	0.195	81.7	30.5	276	0.107	4.30	3.14	4.99	19.7	0.169	6.45	276	0.107	4.30	3.14
40 x 40 x2.5 SHS	2.82	0.151	53.7	12.7	346	0.0797	3.99	3.03	4.81	15.2	0.132	6.02	346	0.0797	3.99	3.03
1.6 SHS	1.88	0.155	82.3	23.6	218	0.0534	2.67	1.97	3.13	15.6	0.0848	4.01	218	0.0534	2.67	1.97
35 x 35 x2.5 SHS	2.42	0.131	54.2	10.6	298	0.0514	2.94	2.26	3.58	13.1	0.0860	4.45	298	0.0514	2.94	2.26
1.6 SHS	1.63	0.135	82.7	20.1	189	0.0350	2.00	1.48	2.36	13.6	0.0561	3.01	189	0.0350	2.00	1.48
30 x 30 x1.6 SHS	1.38	0.115	83.3	16.7	160	0.0214	1.43	1.07	1.69	11.6	0.0346	2.15	160	0.0214	1.43	1.07
25 x 25 x1.6 SHS	1.12	0.0945	84.1	13.2	131	0.0119	0.949	0.720	1.14	9.51	0.0195	1.43	131	0.0119	0.949	0.720
20 x 20 x1.6 SHS	0.873	0.0745	85.4	9.79	102	0.00570	0.570	0.440	0.697	7.47	0.00959	0.864	102	0.00570	0.570	0.440

NOTES:
1. This table is calculated in accordance with AS/NZS 4600 using a design yield stress f_y = 350MPa and design tensile strength f_u = 380MPa.
2. Effective section properties are calculated in accordance with AS/NZS 4600.
3. All columns of the table (except for "Nominal Mass per m" and "External Surface Area") are calculated using design thicknesses of 1.45mm and 2.4mm rather than the respective thicknesses *t* of 1.6mm and 2.5mm. This is to comply with clause 1.5.1.6 of AS/NZS 4600.
4. For Square and Rectangular Hollow Sections the outside corner radius *r* used in calculating the section properties is equal to 2*t* for sections with thickness $t \leq$ 3.0mm and 2.5*t* for sections with $t >$ 3.0mm.

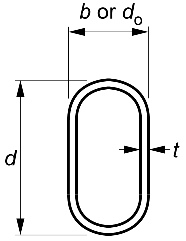
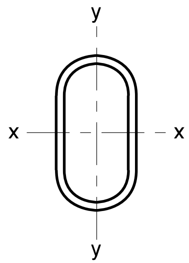


TABLE 4.1

DIMENSIONS AND PROPERTIES

DURAGAL RAIL HOLLOW SECTIONS

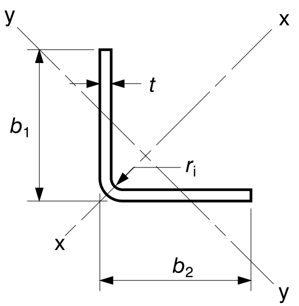
GRADE C450L0 (AS 1163)



DIMENSION AND RATIOS						PROPERTIES											PROPERTIES FOR DESIGN TO AS 4100						
Designation	Mass per m	External Surface Area				Gross Section Area	About x-axis				About y-axis				Torsion Constant	Torsion Modulus	Form Factor	About x-axis			About y-axis		
																			Compact-ness(3)			Compact-ness(3)	
d *b* *t*		per m	per t	$\frac{d_o}{t}$	$\frac{d-2t}{t}$	A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	C	k_f	λ_{ex}		Z_{ex}	λ_{ey}		Z_{ey}
mm mm mm	kg/m	m^2/m	m^2/t			mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3		(C,N,S)	10^3mm^3
120 x 48 x2.0 Rail	4.53	0.295	65.1	24.0	58.0	577	0.880	14.7	19.8	39.1	0.229	9.54	10.9	19.9	0.687	18.8	0.914	43.2	C	19.8	48.3	S	5.24

NOTES:
1. This table is calculated in accordance with AS 4100 using design yield stress f_y = 450 MPa and design tensile strength f_u = 500 MPa as per AS 4100 table 2.1 for AS 1163 grade C450L0.
2. Grade C450L0 is cold formed and therefore is allocated the CF residual stresses classification in AS 4100.
3. C = Compact Section; N = Non-compact Section; S = Slender Section; as defined in AS 4100.

TABLE 5.1.1(a)

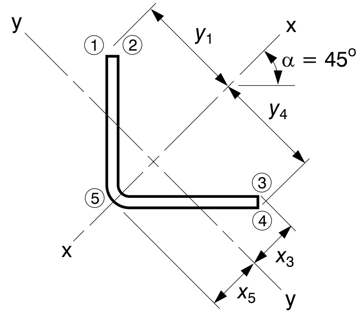


DIMENSIONS AND FULL SECTION PROPERTIES

DURAGAL EQUAL ANGLE SECTIONS

GRADE C450L0/C400L0 (TS 100)

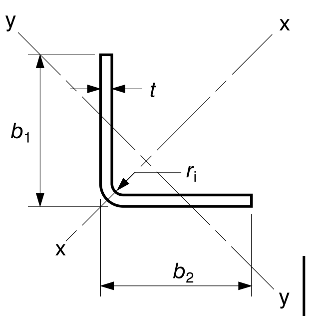
about principal x- and y-axes



DIMENSIONS							SECTION PROPERTIES									
Designation: Leg Size b_1 b_2, Nominal Thickness	Mass per metre	Actual Thickness t	Inside Corner Radius r_i	Co-ordinates of Centroid $y_1 = y_4$	$x_2 = x_3$	x_5	Full Area of Section A_f	About x-axis I_x	$Z_{x1} = Z_{x4}$	S_x	r_x	About y-axis I_y	$Z_{y2} = Z_{y3}$	Z_{y5}	S_y	r_y
mm mm mm	kg/m	mm	mm	mm	mm	mm	mm^2	$10^6 mm^4$	$10^3 mm^3$	$10^3 mm^3$	mm	$10^6 mm^4$	$10^3 mm^3$	$10^3 mm^3$	$10^3 mm^3$	mm
150 x 150 x 8.0 CA	18.0	8.0	8.0	106	53.5	51.6	2290	8.30	78.3	120	60.2	1.96	36.7	38.1	58.2	29.3
5.0 CA	10.8	4.7	4.0	106	53.4	52.4	1380	5.04	47.6	72.4	60.6	1.23	23.0	23.4	35.6	29.9
125 x 125 x 8.0 CA	14.9	8.0	8.0	88.4	44.6	42.8	1890	4.73	53.5	82.7	50.0	1.11	24.7	25.8	39.6	24.1
5.0 CA	8.95	4.7	4.0	88.4	44.5	43.6	1140	2.89	32.7	50.0	50.4	0.699	15.7	16.0	24.4	24.8
4.0 CA	7.27	3.8	4.0	88.4	44.4	43.4	926	2.36	26.7	40.7	50.5	0.572	12.9	13.2	19.9	24.9
100 x 100 x 8.0 CA	11.7	8.0	8.0	70.7	35.8	33.9	1490	2.36	33.4	52.0	39.8	0.542	15.1	16.0	24.7	19.0
6.0 CA	8.92	6.0	8.0	70.7	35.5	33.6	1140	1.83	25.8	39.8	40.1	0.421	11.9	12.5	19.0	19.3
90 x 90 x 8.0 CA	10.5	8.0	8.0	63.6	32.3	30.4	1330	1.70	26.7	41.7	35.7	0.386	12.0	12.7	19.7	17.0
5.0 CA	6.37	4.7	4.0	63.6	32.2	31.2	811	1.06	16.6	25.5	36.1	0.252	7.83	8.06	12.4	17.6
75 x 75 x 8.0 CA	8.59	8.0	8.0	53.0	26.9	25.1	1090	0.957	18.0	28.4	29.6	0.213	7.89	8.46	13.2	13.9
6.0 CA	6.56	6.0	8.0	53.0	26.7	24.8	836	0.747	14.1	21.9	29.9	0.167	6.26	6.73	10.2	14.1
5.0 CA	5.26	4.7	4.0	53.0	26.8	25.9	670	0.601	11.3	17.5	30.0	0.142	5.29	5.48	8.44	14.6
4.0 CA	4.29	3.8	4.0	53.0	26.7	25.8	546	0.495	9.34	14.3	30.1	0.117	4.39	4.55	6.93	14.7

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm $f_y = 350$ MPa and $f_u = 400$ MPa, for 2.5 mm $< t \leq 6.0$ mm $f_y = 450$ MPa and $f_u = 500$ MPa, and for $t > 6.0$ mm $f_y = 400$ MPa and $f_u = 450$ MPa).
2. Full section properties are calculated in accordance with AS/NZS 4600.

TABLE 5.1.1(b)

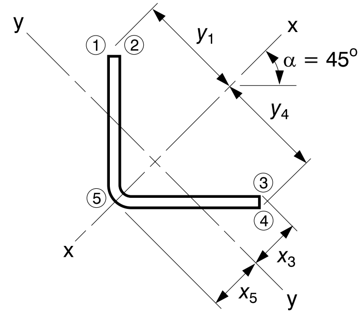


DIMENSIONS AND FULL SECTION PROPERTIES

DURAGAL EQUAL ANGLE SECTIONS

GRADE C450L0/C400L0/C350L0 (TS 100)

about principal x- and y-axes



Designation: Leg Size b_1 x b_2 x Nominal Thickness	Mass per metre	Actual Thickness t	Inside Corner Radius r_i	Co-ordinates of Centroid $y_1 = y_4$	$x_2 = x_3$	x_5	Full Area of Section A_f	About x-axis I_x	$Z_{x1} = Z_{x4}$	S_x	r_x	About y-axis I_y	$Z_{y2} = Z_{y3}$	Z_{y5}	S_y	r_y
	DIMENSIONS						**SECTION PROPERTIES**									
mm mm mm	kg/m	mm	mm	mm	mm	mm	mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm
65 x 65 x 6.0 CA	5.62	6.0	8.0	46.0	23.1	21.3	716	0.477	10.4	16.2	25.8	0.104	4.52	4.91	7.50	12.1
5.0 CA	4.52	4.7	4.0	46.0	23.3	22.4	576	0.386	8.39	13.0	25.9	0.0902	3.87	4.03	6.24	12.5
4.0 CA	3.69	3.8	4.0	46.0	23.2	22.2	470	0.318	6.93	10.7	26.0	0.0747	3.22	3.36	5.13	12.6
50 x 50 x 6.0 CA	4.21	6.0	8.0	35.4	17.8	16.0	536	0.208	5.89	9.29	19.7	0.0434	2.44	2.71	4.18	9.00
5.0 CA	3.42	4.7	4.0	35.4	18.0	17.1	435	0.170	4.80	7.53	19.8	0.0389	2.16	2.28	3.56	9.45
4.0 CA	2.79	3.8	4.0	35.4	17.9	16.9	356	0.141	3.99	6.20	19.9	0.0324	1.81	1.91	2.94	9.54
2.5 CA	1.81	2.4	2.5	35.4	17.8	17.2	230	0.0930	2.63	4.04	20.1	0.0221	1.24	1.28	1.95	9.79
45 x 45 x 4.0 CA	2.50	3.8	4.0	31.8	16.1	15.2	318	0.102	3.19	4.98	17.9	0.0231	1.43	1.52	2.35	8.52
2.5 CA	1.62	2.4	2.5	31.8	16.0	15.4	206	0.0673	2.11	3.25	18.1	0.0159	0.990	1.03	1.57	8.77
40 x 40 x 4.0 CA	2.20	3.8	4.0	28.3	14.3	13.4	280	0.0702	2.48	3.89	15.8	0.0157	1.10	1.17	1.82	7.50
2.5 CA	1.43	2.4	2.5	28.3	14.3	13.7	182	0.0468	1.65	2.55	16.0	0.0110	0.768	0.801	1.22	7.75
30 x 30 x 2.5 CA	1.06	2.4	2.5	21.2	10.7	10.2	134	0.0191	0.902	1.40	11.9	0.00438	0.408	0.431	0.664	5.71

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \le 2.5$ mm $f_y = 350$ MPa and $f_u = 400$ MPa, for 2.5 mm $< t \le 6.0$ mm $f_y = 450$ MPa and $f_u = 500$ MPa, and for $t > 6.0$ mm $f_y = 400$ MPa and $f_u = 450$ MPa).
2. Full section properties are calculated in accordance with AS/NZS 4600.

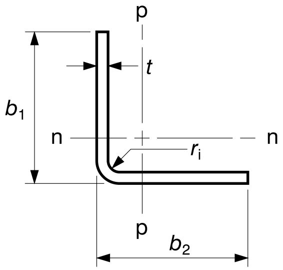


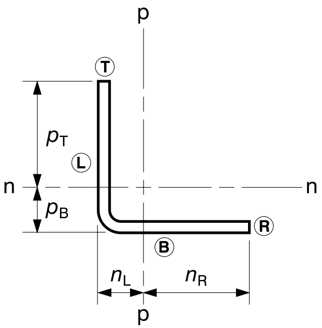
TABLE 5.1.1(c)

DIMENSIONS AND FULL SECTION PROPERTIES

DURAGAL EQUAL ANGLE SECTIONS

GRADE C450L0/C400L0 (TS 100)

about non-principal n- and p-axes



DIMENSIONS							SECTION PROPERTIES						
Designation Leg Size b_1 b_2	Nominal Thickness	Mass per metre	Actual Thickness t	Inside Corner Radius r_i	Coordinates of Centroid $p_B = n_L$	Coordinates of Centroid $p_T = n_R$	Full Area of Section A_f	About n- and p-axes $I_n = I_p$	$Z_{nB} = Z_{pL}$	$Z_{nT} = Z_{pR}$	$S_n = S_p$	$r_n = r_p$	Product of 2nd Moment of Area I_{np}
mm mm	mm	kg/m	mm	mm	mm	mm	mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4
150 x150 x	8.0 CA	18.0	8.0	8.0	41.2	109	2290	5.13	125	47.2	85.2	47.3	-3.17
	5.0 CA	10.8	4.7	4.0	39.6	110	1380	3.14	79.1	28.4	51.2	47.7	-1.91
125 x125 x	8.0 CA	14.9	8.0	8.0	34.9	90.1	1890	2.92	83.5	32.4	58.5	39.2	-1.81
	5.0 CA	8.95	4.7	4.0	33.4	91.6	1140	1.80	53.8	19.6	35.3	39.7	-1.10
	4.0 CA	7.27	3.8	4.0	33.0	92.0	926	1.47	44.5	16.0	28.8	39.8	-0.896
100 x100 x	8.0 CA	11.7	8.0	8.0	28.7	71.3	1490	1.45	50.6	20.4	36.8	31.2	-0.910
	6.0 CA	8.92	6.0	8.0	27.9	72.1	1140	1.12	40.3	15.6	28.2	31.5	-0.703
90 x 90 x	8.0 CA	10.5	8.0	8.0	26.2	63.8	1330	1.04	39.8	16.3	29.5	27.9	-0.657
	5.0 CA	6.37	4.7	4.0	24.6	65.4	811	0.654	26.6	10.0	18.0	28.4	-0.402
75 x 75 x	8.0 CA	8.59	8.0	8.0	22.5	52.5	1090	0.585	26.0	11.1	20.1	23.1	- 0.372
	6.0 CA	6.56	6.0	8.0	21.7	53.3	836	0.457	21.1	8.57	15.5	23.4	- 0.290
	5.0 CA	5.26	4.7	4.0	20.9	54.1	670	0.372	17.8	6.86	12.4	23.5	- 0.230
	4.0 CA	4.29	3.8	4.0	20.5	54.5	546	0.306	14.9	5.62	10.1	23.7	- 0.189

NOTES: 1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm $f_y = 350$ MPa and $f_u = 400$ MPa, for 2.5 mm $< t \leq 6.0$ mm $f_y = 450$ MPa and $f_u = 500$ MPa, and for $t > 6.0$ mm $f_y = 400$ MPa and $f_u = 450$ MPa).

2. Full section properties are calculated in accordance with AS/NZS 4600.

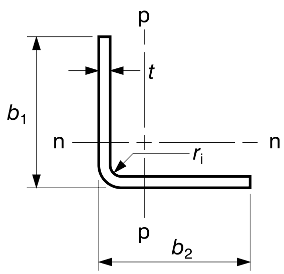


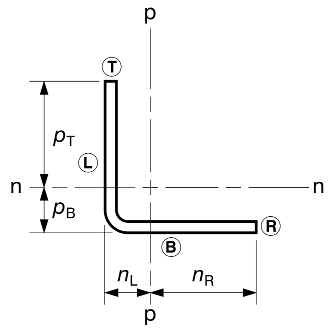
TABLE 5.1.1(d)

DIMENSIONS AND FULL SECTION PROPERTIES

DURAGAL EQUAL ANGLE SECTIONS

GRADE C450L0/C400L0/C350L0 (TS 100)

about non-principal n- and p-axes



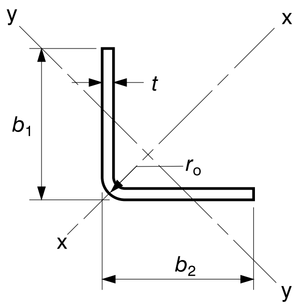
DIMENSIONS						SECTION PROPERTIES						
Designation: Leg Size b_1 b_2, Nominal Thickness	Mass per metre	Actual Thickness t	Inside Corner Radius r_i	Coordinates of Centroid $p_B = n_L$	Coordinates of Centroid $p_T = n_R$	Full Area of Section A_f	About n- and p-axes $I_n = I_p$	$Z_{nB} = Z_{pL}$	$Z_{nT} = Z_{pR}$	$S_n = S_p$	$r_n = r_p$	Product of 2nd Moment of Area I_{np}
mm mm mm	kg/m	mm	mm	mm	mm	mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4
65 x 65 x 6.0 CA	5.62	6.0	8.0	19.2	45.8	716	0.291	15.2	6.35	11.5	20.2	- 0.186
5.0 CA	4.52	4.7	4.0	18.4	46.6	576	0.238	13.0	5.10	9.22	20.3	- 0.148
4.0 CA	3.69	3.8	4.0	18.0	47.0	470	0.197	10.9	4.18	7.56	20.5	- 0.122
50 x 50 x 6.0 CA	4.21	6.0	8.0	15.4	34.6	536	0.126	8.15	3.64	6.59	15.3	- 0.0823
5.0 CA	3.42	4.7	4.0	14.6	35.4	435	0.104	7.14	2.95	5.33	15.5	- 0.0655
4.0 CA	2.79	3.8	4.0	14.3	35.7	356	0.0868	6.08	2.43	4.39	15.6	- 0.0544
2.5 CA	1.81	2.4	2.5	13.6	36.4	230	0.0576	4.23	1.58	2.86	15.8	- 0.0355
45 x 45 x 4.0 CA	2.50	3.8	4.0	13.0	32.0	318	0.0623	4.79	1.95	3.52	14.0	- 0.0392
2.5 CA	1.62	2.4	2.5	12.4	32.6	206	0.0416	3.36	1.27	2.30	14.2	- 0.0257
40 x 40 x 4.0 CA	2.20	3.8	4.0	11.8	28.2	280	0.0430	3.65	1.52	2.75	12.4	- 0.0272
2.5 CA	1.43	2.4	2.5	11.1	28.9	182	0.0289	2.60	0.999	1.80	12.6	- 0.0179
30 x 30 x 2.5 CA	1.06	2.4	2.5	8.61	21.4	134	0.0118	1.37	0.550	0.994	9.35	- 0.00738

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm $f_y = 350$ MPa and $f_u = 400$ MPa, for 2.5 mm $< t \leq 6.0$ mm $f_y = 450$ MPa and $f_u = 500$ MPa, and for $t > 6.0$ mm $f_y = 400$ MPa and $f_u = 450$ MPa).
2. Full section properties are calculated in accordance with AS/NZS 4600.

ANGLE

TABLE 5.1.2(a)

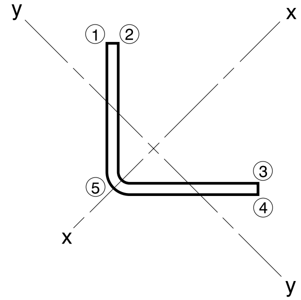
EFFECTIVE SECTION PROPERTIES



DURAGAL EQUAL ANGLE SECTIONS

GRADE C450L0/C400L0 (TS 100)

about principal x- and y-axes



DIMENSIONS				RATIOS		GRADE	EFFECTIVE SECTION PROPERTIES							
Designation: Leg Size b_1 b_2, Nominal Thickness	Mass per metre	Actual Thickness t	Outside Corner Radius r_o	$\frac{b_1 - r_o}{t}$	$\frac{b_2 - r_o}{t}$	Yield Stress f_y	Effective Area of Section A_e	$\frac{A_e}{A_f}$	About x-axis: $I_{ex1} = I_{ex4}$	About x-axis: $Z_{ex1} = Z_{ex4}$	About y-axis: $I_{ey2,3}$	About y-axis: $Z_{ey2,3}$	About y-axis: I_{ey5}	About y-axis: Z_{ey5}
mm mm mm	kg/m	mm	mm			MPa	mm^2		10^6mm^4	10^3mm^3	10^6mm^4	10^3mm^3	10^6mm^4	10^3mm^3
150 x 150 x 8.0 CA	18.0	8.0	16.0	16.8	16.8	400	1610	0.701	5.74	60.8	1.56	31.4	1.96	36.7
5.0 CA	10.8	4.7	8.7	30.1	30.1	450	572	0.416	1.99	25.3	0.544	13.2	1.23	23.0
125 x 125 x 8.0 CA	14.9	8.0	16.0	13.6	13.6	400	1530	0.809	3.90	46.9	1.05	23.9	1.11	24.7
5.0 CA	8.95	4.7	8.7	24.7	24.7	450	560	0.491	1.34	19.4	0.368	10.2	0.699	15.7
4.0 CA	7.27	3.8	7.8	30.8	30.8	450	379	0.409	0.917	14.0	0.248	7.31	0.572	12.9
100 x 100 x 8.0 CA	11.7	8.0	16.0	10.5	10.5	400	1410	0.946	2.36	33.4	0.542	15.1	0.542	15.1
6.0 CA	8.92	6.0	14.0	14.3	14.3	450	859	0.756	1.38	21.3	0.363	10.7	0.421	11.9
90 x 90 x 8.0 CA	10.5	8.0	16.0	9.25	9.25	400	1330	1.00	1.70	26.7	0.386	12.0	0.386	12.0
5.0 CA	6.37	4.7	8.7	17.3	17.3	450	530	0.654	0.672	12.2	0.185	6.33	0.252	7.83
75 x 75 x 8.0 CA	8.59	8.0	16.0	7.38	7.38	400	1090	1.00	0.957	18.0	0.213	7.89	0.213	7.89
6.0 CA	6.56	6.0	14.0	10.2	10.2	450	781	0.934	0.735	13.9	0.167	6.26	0.167	6.26
5.0 CA	5.26	4.7	8.7	14.1	14.1	450	508	0.759	0.458	9.41	0.125	4.84	0.142	5.29
4.0 CA	4.29	3.8	7.8	17.7	17.7	450	353	0.646	0.310	6.78	0.0840	3.49	0.117	4.39

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm f_y = 350 MPa and f_u = 400 MPa, for 2.5 mm < $t \leq 6.0$ mm f_y = 450 MPa and f_u = 500 MPa, and for $t > 6.0$ mm f_y = 400 MPa and f_u = 450 MPa).
2. A_e is calculated for sections with uniform axial compressive stress f_y.
3. I_e and Z_e are calculated with the extreme compression or tension fibres at f_y (first yield). Z_e is calculated at the extreme tension or compression fibre of the effective section.
4. I_{ex1} and Z_{ex1} are for compression at point "1"; I_{ex4} and Z_{ex4} are for compression at point "4"; $I_{ey2,3}$ and $Z_{ey2,3}$ are for compression at points "2" and "3"; I_{ey5} and Z_{ey5} are for compression at point "5".
5. Effective section properties are calculated in accordance with AS/NZS 4600.

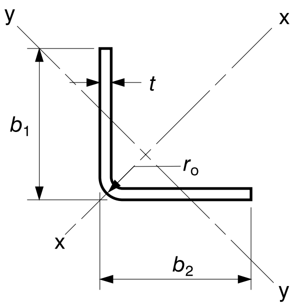


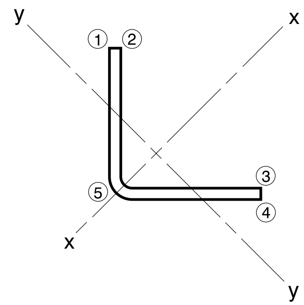
TABLE 5.1.2(b)

EFFECTIVE SECTION PROPERTIES

DURAGAL EQUAL ANGLE SECTIONS

GRADE C450L0/C400L0/C350L0 (TS 100)

about principal x- and y-axes



DIMENSIONS				RATIOS		GRADE	EFFECTIVE SECTION PROPERTIES							
Designation: Leg Size b_1 b_2, Nominal Thickness	Mass per metre	Actual Thickness t	Outside Corner Radius r_o	$\frac{b_1 - r_o}{t}$	$\frac{b_2 - r_o}{t}$	Yield Stress f_y	Effective Area of Section A_e	$\frac{A_e}{A_f}$	About x-axis: $I_{ex1} = I_{ex4}$	About x-axis: $Z_{ex1} = Z_{ex4}$	About y-axis: $I_{ey2,3}$	About y-axis: $Z_{ey2,3}$	About y-axis: I_{ey5}	About y-axis: Z_{ey5}
mm mm mm	kg/m	mm	mm			MPa	mm^2		10^6mm^4	10^3mm^3	10^6mm^4	10^3mm^3	10^6mm^4	10^3mm^3
65 x 65 x 6.0 CA	5.62	6.0	14.0	8.50	8.50	450	716	1.00	0.477	10.4	0.104	4.52	0.104	4.52
5.0 CA	4.52	4.7	8.7	12.0	12.0	450	487	0.846	0.337	7.65	0.0902	3.87	0.0902	3.87
4.0 CA	3.69	3.8	7.8	15.1	15.1	450	342	0.727	0.230	5.54	0.0619	2.83	0.0747	3.22
50 x 50 x 6.0 CA	4.21	6.0	14.0	6.00	6.00	450	536	1.00	0.208	5.89	0.0434	2.44	0.0434	2.44
5.0 CA	3.42	4.7	8.7	8.79	8.79	450	435	1.00	0.170	4.80	0.0389	2.16	0.0389	2.16
4.0 CA	2.79	3.8	7.8	11.1	11.1	450	316	0.888	0.131	3.78	0.0324	1.81	0.0324	1.81
2.5 CA	1.81	2.4	4.9	18.8	18.8	350	156	0.676	0.0615	1.98	0.0169	1.03	0.0221	1.24
45 x 45 x 4.0 CA	2.50	3.8	7.8	9.79	9.79	450	303	0.952	0.102	3.19	0.0231	1.43	0.0231	1.43
2.5 CA	1.62	2.4	4.9	16.7	16.7	350	152	0.736	0.0494	1.71	0.0135	0.884	0.0159	0.990
40 x 40 x 4.0 CA	2.20	3.8	7.8	8.47	8.47	450	280	1.00	0.0702	2.48	0.0157	1.10	0.0157	1.10
2.5 CA	1.43	2.4	4.9	14.6	14.6	350	147	0.806	0.0385	1.45	0.0104	0.740	0.0110	0.768
30 x 30 x 2.5 CA	1.06	2.4	4.9	10.5	10.5	350	132	0.980	0.0191	0.902	0.00438	0.408	0.00438	0.408

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \le 2.5$ mm f_y = 350 MPa and f_u = 400 MPa, for 2.5 mm < $t \le 6.0$ mm f_y = 450 MPa and f_u = 500 MPa, and for $t > 6.0$ mm f_y = 400 MPa and f_u = 450 MPa).
2. A_e is calculated for sections with uniform axial compressive stress f_y.
3. I_e and Z_e are calculated with the extreme compression or tension fibres at f_y (first yield). Z_e is calculated at the extreme tension or compression fibre of the effective section.
4. I_{ex1} and Z_{ex1} are for compression at point "1"; I_{ex4} and Z_{ex4} are for compression at point "4"; $I_{ey2,3}$ and $Z_{ey2,3}$ are for compression at points "2" and "3"; I_{ey5} and Z_{ey5} are for compression at point "5".
5. Effective section properties are calculated in accordance with AS/NZS 4600.

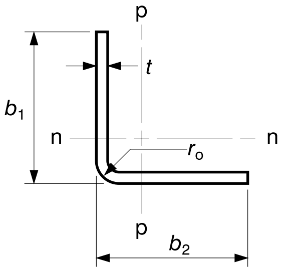
TABLE 5.1.2(c)

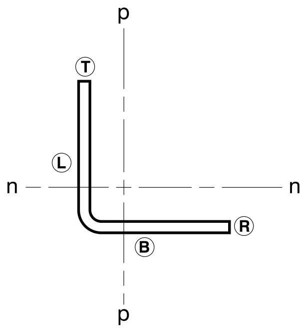
EFFECTIVE SECTION PROPERTIES

DURAGAL EQUAL ANGLE SECTIONS

GRADE C450L0/C400L0 (TS 100)

about non-principal n- and p-axes





DIMENSIONS				RATIOS		GRADE	EFFECTIVE SECTION PROPERTIES					
Designation: Leg Size b_1 b_2, Nominal Thickness	Mass per metre	Actual Thickness t	Outside Corner Radius r_o	$\frac{b_1 - r_o}{t}$	$\frac{b_2 - r_o}{t}$	Yield Stress f_y	Effective Area of Section A_e	$\frac{A_e}{A_f}$	About n-and p-axes: $I_{enT} = I_{epR}$	$Z_{enT} = Z_{epR}$	$I_{enB} = I_{epL}$	$Z_{enB} = Z_{epL}$
mm mm mm	kg/m	mm	mm			MPa	mm^2		$10^6 mm^4$	$10^3 mm^3$	$10^6 mm^4$	$10^3 mm^3$
150 x 150 x 8.0 CA	18.0	8.0	16.0	16.8	16.8	400	1610	0.701	3.17	33.8	5.04	46.8
5.0 CA	10.8	4.7	8.7	30.1	30.1	450	572	0.416	0.791	11.0	2.57	25.9
125 x 125 x 8.0 CA	14.9	8.0	16.0	13.6	13.6	400	1530	0.809	2.34	27.8	2.92	32.4
5.0 CA	8.95	4.7	8.7	24.7	24.7	450	560	0.491	0.594	9.13	1.57	18.4
4.0 CA	7.27	3.8	7.8	30.8	30.8	450	379	0.409	0.357	6.01	1.20	14.5
100 x 100 x 8.0 CA	11.7	8.0	16.0	10.5	10.5	400	1410	0.946	1.45	20.4	1.45	20.4
6.0 CA	8.92	6.0	14.0	14.3	14.3	450	859	0.756	0.782	12.1	1.12	15.6
90 x 90 x 8.0 CA	10.5	8.0	16.0	9.25	9.25	400	1330	1.00	1.04	16.3	1.04	16.3
5.0 CA	6.37	4.7	8.7	17.3	17.3	450	530	0.654	0.357	6.58	0.629	9.83
75 x 75 x 8.0 CA	8.59	8.0	16.0	7.38	7.38	400	1090	1.00	0.585	11.1	0.585	11.1
6.0 CA	6.56	6.0	14.0	10.2	10.2	450	781	0.934	0.457	8.57	0.457	8.57
5.0 CA	5.26	4.7	8.7	14.1	14.1	450	508	0.759	0.266	5.45	0.372	6.86
4.0 CA	4.29	3.8	7.8	17.7	17.7	450	353	0.646	0.162	3.62	0.293	5.51

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm $f_y = 350$ MPa and $f_u = 400$ MPa, for 2.5 mm $< t \leq 6.0$ mm $f_y = 450$ MPa and $f_u = 500$ MPa, and for $t > 6.0$ mm $f_y = 400$ MPa and $f_u = 450$ MPa).
2. A_e is calculated for sections with uniform axial compressive stress f_y.
3. I_e and Z_e are calculated with the extreme compression or tension fibres at f_y (first yield). Z_e is calculated at the extreme tension or compression fibre of the effective section.
4. I_{enT} and Z_{enT} are for compression at point "T"; I_{enB} and Z_{enB} are for compression at point "B"; I_{epR} and Z_{epR} are for compression at point "R"; I_{epL} and Z_{epL} are for compression at point "L".
5. Effective section properties are calculated in accordance with AS/NZS 4600.

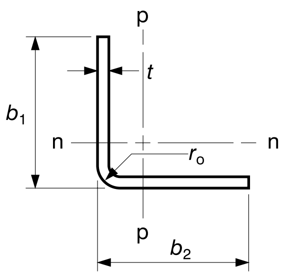
TABLE 5.1.2(d)

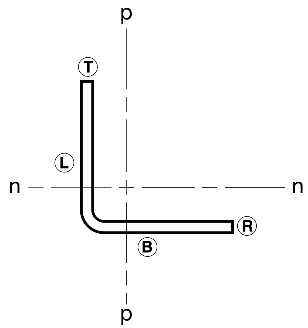
EFFECTIVE SECTION PROPERTIES

DURAGAL EQUAL ANGLE SECTIONS

GRADE C450L0/C400L0/C350L0 (TS 100)

about non-principal n- and p-axes





DIMENSIONS				RATIOS		GRADE	EFFECTIVE SECTION PROPERTIES					
Designation Leg Size b_1 b_2 Nominal Thick-ness	Mass per metre	Actual Thick-ness t	Outside Corner Radius r_o	$\frac{b_1 - r_o}{t}$	$\frac{b_2 - r_o}{t}$	Yield Stress f_y	Effective Area of Section A_e	$\frac{A_e}{A_f}$	About n- and p-axes $I_{enT} = I_{epR}$	$Z_{enT} = Z_{epR}$	$I_{enB} = I_{epL}$	$Z_{enB} = Z_{epL}$
mm mm mm	kg/m	mm	mm			MPa	mm^2		$10^6 mm^4$	$10^3 mm^3$	$10^6 mm^4$	$10^3 mm^3$
65 x 65 x 6.0 CA	5.62	6.0	14.0	8.50	8.50	450	716	1.00	0.291	6.35	0.291	6.35
5.0 CA	4.52	4.7	8.7	12.0	12.0	450	487	0.846	0.208	4.65	0.238	5.10
4.0 CA	3.69	3.8	7.8	15.1	15.1	450	342	0.727	0.129	3.13	0.195	4.17
50 x 50 x 6.0 CA	4.21	6.0	14.0	6.00	6.00	450	536	1.00	0.126	3.64	0.126	3.64
5.0 CA	3.42	4.7	8.7	8.79	8.79	450	435	1.00	0.104	2.95	0.104	2.95
4.0 CA	2.79	3.8	7.8	11.1	11.1	450	316	0.888	0.0821	2.34	0.0868	2.43
2.5 CA	1.81	2.4	4.9	18.8	18.8	350	156	0.676	0.0333	1.08	0.0560	1.56
45 x 45 x 4.0 CA	2.50	3.8	7.8	9.79	9.79	450	303	0.952	0.0623	1.95	0.0623	1.95
2.5 CA	1.62	2.4	4.9	16.7	16.7	350	152	0.736	0.0281	0.972	0.0414	1.27
40 x 40 x 4.0 CA	2.20	3.8	7.8	8.47	8.47	450	280	1.00	0.0430	1.52	0.0430	1.52
2.5 CA	1.43	2.4	4.9	14.6	14.6	350	147	0.806	0.0231	0.856	0.0289	0.999
30 x 30 x 2.5 CA	1.06	2.4	4.9	10.5	10.5	350	132	0.980	0.0118	0.550	0.0118	0.550

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \le 2.5$ mm $f_y = 350$ MPa and $f_u = 400$ MPa, for 2.5 mm $< t \le 6.0$ mm $f_y = 450$ MPa and $f_u = 500$ MPa, and for $t > 6.0$ mm $f_y = 400$ MPa and $f_u = 450$ MPa).
2. A_e is calculated for sections with uniform axial compressive stress f_y.
3. I_e and Z_e are calculated with the extreme compression or tension fibres at f_y (first yield). Z_e is calculated at the extreme tension or compression fibre of the effective section.
4. I_{enT} and Z_{enT} are for compression at point "T"; I_{enB} and Z_{enB} are for compression at point "B"; I_{epR} and Z_{epR} are for compression at point "R"; I_{epL} and Z_{epL} are for compression at point "L".
5. Effective section properties are calculated in accordance with AS/NZS 4600.

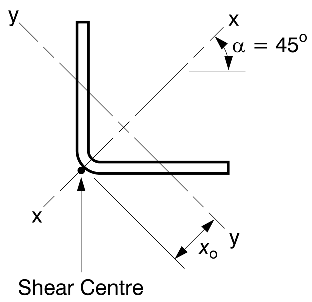
TABLE 5.1.3

SECTION PROPERTIES for MEMBER STABILITY

DURAGAL EQUAL ANGLE SECTIONS

GRADE C450L0/C400L0/C350L0 (TS 100)

about principal x- and y-axes



Designation Leg Size b_1	b_2	Nominal Thick-ness	Mass per metre	Torsion Constant J	Coordinate of Shear Centre x_o	Polar Radius of Gyration about the Shear Centre r_{o1}	Monosymmetry Section Constant β_y
mm	mm	mm	kg/m	10^3mm^4	mm	mm	mm
150	x150 x	8.0 CA	18.0	49.0	51.6	84.3	206
		5.0 CA	10.8	10.1	52.2	85.2	209
125	x125 x	8.0 CA	14.9	40.4	42.8	69.9	171
		5.0 CA	8.95	8.39	43.4	70.8	173
		4.0 CA	7.27	4.46	43.5	71.1	174
100	x100 x	8.0 CA	11.7	31.9	33.9	55.4	136
		6.0 CA	8.92	13.6	34.3	56.0	137
90	x 90 x	8.0 CA	10.5	28.5	30.4	49.7	122
		5.0 CA	6.37	5.97	31.0	50.6	124
75	x 75 x	8.0 CA	8.59	23.4	25.1	41.0	100
		6.0 CA	6.56	10.0	25.5	41.6	102
		5.0 CA	5.26	4.93	25.7	41.9	103
		4.0 CA	4.29	2.63	25.8	42.2	103
65	x 65 x	6.0 CA	5.62	8.59	21.9	35.8	87.7
		5.0 CA	4.52	4.24	22.2	36.2	88.6
		4.0 CA	3.69	2.26	22.3	36.4	89.2
50	x 50 x	6.0 CA	4.21	6.43	16.6	27.1	66.5
		5.0 CA	3.42	3.20	16.8	27.5	67.4
		4.0 CA	2.79	1.71	17.0	27.8	68.0
		2.5 CA	1.81	0.442	17.3	28.2	69.0
45	x 45 x	4.0 CA	2.50	1.53	15.2	24.9	61.0
		2.5 CA	1.62	0.396	15.5	25.3	61.9
40	x 40 x	4.0 CA	2.20	1.35	13.5	22.0	53.9
		2.5 CA	1.43	0.350	13.7	22.4	54.9
30	x 30 x	2.5 CA	1.06	0.258	10.2	16.6	40.7

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm f_y = 350 MPa and f_u = 400 MPa, for 2.5 mm < $t \leq 6.0$ mm f_y = 450 MPa and f_u = 500 MPa, and for $t > 6.0$ mm f_y = 400 MPa and f_u = 450 MPa).
2. With the exception of J, properties are calculated assuming a simplified shape where the bends are eliminated and the section is represented by straight mid-lines in accordance with Clause 2.1.2.1 of AS/NZS 4600.
3. β_x is zero for equal angles.
4. I_w is equal to zero for angles.
5. The shear centre is assumed to be located at the intersection of the centre lines of the angle legs.

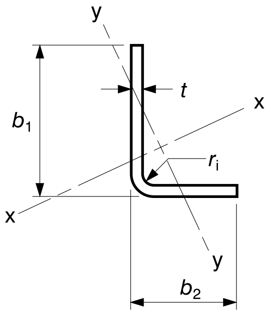


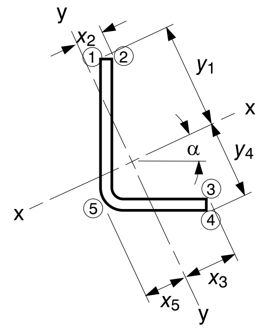
TABLE 5.2.1(a)

DIMENSIONS AND FULL SECTION PROPERTIES

DURAGAL UNEQUAL ANGLE SECTIONS

GRADE C450L0/C400L0 (TS 100)

about principal x- and y-axes



DIMENSIONS

Designation Leg Size b_1 b_2 Nominal Thickness	Mass per metre	Actual Thickness t	Inside Corner Radius r_i	Coordinates of Centroid y_1	y_4	x_2	x_3	x_5	Tan α
mm mm mm	kg/m	mm	mm	mm	mm	mm	mm	mm	
150 x 100 x 8.0 CA	14.9	8.0	8.0	101	76.6	28.4	52.2	36.7	0.463
6.0 CA	11.3	6.0	8.0	102	76.3	27.8	52.3	36.3	0.465
125 x 75 x 8.0 CA	11.7	8.0	8.0	82.6	61.0	20.6	40.9	27.2	0.386
6.0 CA	8.92	6.0	8.0	83.1	60.6	19.9	41.2	26.8	0.388
100 x 75 x 8.0 CA	10.2	8.0	8.0	68.3	55.8	23.6	35.8	27.4	0.576
6.0 CA	7.74	6.0	8.0	68.6	55.5	23.1	35.8	27.0	0.578
75 x 50 x 6.0 CA	5.38	6.0	8.0	50.0	39.2	14.9	25.3	17.8	0.472
5.0 CA	4.34	4.7	4.0	50.6	38.4	14.4	26.1	18.5	0.462
4.0 CA	3.54	3.8	4.0	50.8	38.3	14.1	26.1	18.3	0.464

SECTION PROPERTIES

Designation Leg Size b_1 b_2 Nominal Thickness	Mass per metre	Full Area of Section A_f	About x-axis I_x	Z_{x1}	Z_{x4}	S_x	r_x	About y-axis I_y	Z_{y2}	Z_{y3}	Z_{y5}	S_y	r_y
mm mm mm	kg/m	mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	10^3mm^3	mm
150 x 100 x 8.0 CA	14.9	1890	5.23	51.5	68.3	87.3	52.5	0.878	30.9	16.8	23.9	34.2	21.5
6.0 CA	11.3	1440	4.02	39.4	52.7	66.6	52.9	0.679	24.4	13.0	18.7	26.2	21.7
125 x 75 x 8.0 CA	11.7	1490	2.74	33.1	44.8	56.2	42.8	0.381	18.5	9.30	14.0	19.8	16.0
6.0 CA	8.92	1140	2.11	25.4	34.9	43.0	43.1	0.297	14.9	7.21	11.1	15.2	16.2
100 x 75 x 8.0 CA	10.2	1290	1.64	24.0	29.4	40.4	35.6	0.312	13.2	8.72	11.4	17.1	15.5
6.0 CA	7.74	986	1.27	18.6	22.9	31.1	36.0	0.244	10.6	6.81	9.03	13.2	15.7
75 x 50 x 6.0 CA	5.38	686	0.464	9.29	11.9	15.7	26.0	0.0731	4.89	2.89	4.10	5.97	10.3
5.0 CA	4.34	553	0.378	7.47	9.83	12.7	26.2	0.0631	4.38	2.42	3.42	4.96	10.7
4.0 CA	3.54	451	0.312	6.15	8.15	10.4	26.3	0.0524	3.71	2.01	2.87	4.08	10.8

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm f_y = 350 MPa and f_u = 400 MPa, for 2.5 mm < $t \leq 6.0$ mm f_y = 450 MPa and f_u = 500 MPa, and for t > 6.0 mm f_y = 400 MPa and f_u = 450 MPa).
2. Full section properties are calculated in accordance with AS/NZS 4600.

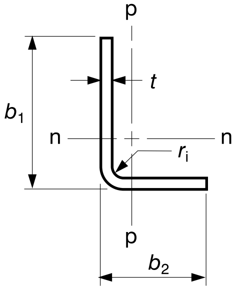


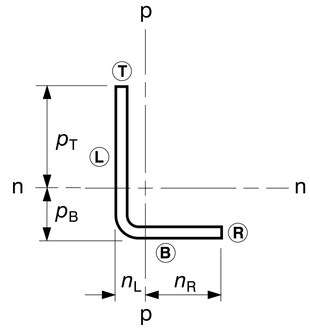
TABLE 5.2.1(b)

DIMENSIONS AND FULL SECTION PROPERTIES

DURAGAL UNEQUAL ANGLE SECTIONS

GRADE C450L0/C400L0 (TS 100)

about non-principal n- and p-axes



DIMENSIONS							SECTION PROPERTIES											
Designation: Leg Size b_1	Leg Size b_2	Nominal Thickness	Mass per metre	Coordinates of Centroid p_B	p_T	n_L	n_R	Full Area of Section A_f	About n-axis I_n	Z_{nB}	Z_{nT}	S_n	r_n	About p-axis I_p	Z_{pL}	Z_{pR}	S_p	r_p	Product of 2nd Moment of Area I_{np}
mm	mm	mm	kg/m	mm	mm	mm	mm	mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4
150 x	100 x	8.0 CA	14.9	49.0	101	23.5	76.5	1890	4.46	91.0	44.2	79.1	48.5	1.65	70.1	21.5	38.1	29.5	-1.66
		6.0 CA	11.3	48.2	102	22.7	77.3	1440	3.42	71.1	33.6	60.3	48.8	1.27	56.1	16.4	28.9	29.8	-1.28
125 x	75 x	8.0 CA	11.7	43.2	81.8	17.5	57.5	1490	2.43	56.2	29.7	52.4	40.3	0.687	39.2	11.9	21.4	21.4	-0.791
		6.0 CA	8.92	42.3	82.7	16.7	58.3	1140	1.87	44.3	22.7	40.1	40.6	0.535	32.0	9.18	16.2	21.7	-0.613
100 x	75 x	8.0 CA	10.2	32.5	67.5	19.6	55.4	1290	1.31	40.3	19.4	35.0	31.8	0.643	32.8	11.6	20.8	22.3	-0.575
		6.0 CA	7.74	31.7	68.3	18.8	56.2	986	1.02	32.1	14.9	26.9	32.1	0.502	26.7	8.93	15.9	22.6	-0.446
75 x	50 x	6.0 CA	5.38	25.7	49.3	12.7	37.3	686	0.393	15.3	7.98	14.2	23.9	0.144	11.4	3.87	6.97	14.5	-0.151
		5.0 CA	4.34	24.8	50.2	12.0	38.0	553	0.323	13.0	6.43	11.5	24.2	0.119	9.86	3.12	5.56	14.6	-0.120
		4.0 CA	3.54	24.4	50.6	11.7	38.3	451	0.266	10.9	5.26	9.43	24.3	0.0983	8.44	2.57	4.54	14.8	-0.0991

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm f_y = 350 MPa and f_u = 400 MPa, for 2.5 mm < $t \leq 6.0$ mm f_y = 450 MPa and f_u = 500 MPa, and for $t > 6.0$ mm f_y = 400 MPa and f_u = 450 MPa).
2. Full section properties are calculated in accordance with AS/NZS 4600.

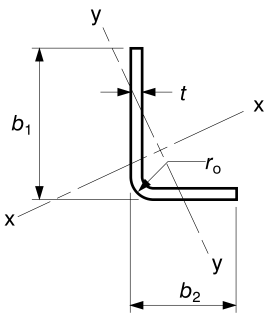


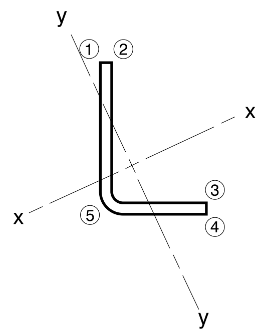
TABLE 5.2.2(a)

EFFECTIVE SECTION PROPERTIES

DURAGAL UNEQUAL ANGLE SECTIONS

GRADE C450L0/C400L0 (TS 100)

about principal x- and y-axes



DIMENSIONS					RATIOS		GRADE	EFFECTIVE SECTION PROPERTIES									
Designation		Mass per metre	Actual Thickness	Outside Corner Radius			Yield Stress	Effective Area of Section		About x-axis				About y-axis			
Leg Size b_1 b_2	Nominal Thickness		t	r_o	$\frac{b_1 - r_o}{t}$	$\frac{b_2 - r_o}{t}$	f_y	A_e	$\frac{A_e}{A_f}$	I_{ex1}	Z_{ex1}	I_{ex4}	Z_{ex4}	$I_{ey2,3}$	$Z_{ey2,3}$	I_{ey5}	Z_{ey5}
mm mm	mm	kg/m	mm	mm			MPa	mm^2		10^6mm^4	10^3mm^3	10^6mm^4	10^3mm^3	10^6mm^4	10^3mm^3	10^6mm^4	10^3mm^3
150 x 100 x	8.0 CA	14.9	8.0	16.0	16.8	10.5	400	1510	0.797	3.52	39.2	5.23	51.5	0.878	16.8	0.878	16.8
	6.0 CA	11.3	6.0	14.0	22.7	14.3	450	894	0.623	1.82	22.9	3.59	36.8	0.539	11.2	0.679	13.0
125 x 75 x	8.0 CA	11.7	8.0	16.0	13.6	7.38	400	1310	0.879	2.30	29.4	2.74	33.1	0.381	9.30	0.381	9.30
	6.0 CA	8.92	6.0	14.0	18.5	10.2	450	841	0.741	1.20	17.3	2.11	25.4	0.295	7.16	0.297	7.21
100 x 75 x	8.0 CA	10.2	8.0	16.0	10.5	7.38	400	1250	0.969	1.64	24.0	1.64	24.0	0.312	8.72	0.312	8.72
	6.0 CA	7.74	6.0	14.0	14.3	10.2	450	820	0.832	0.936	15.0	1.27	18.6	0.244	6.81	0.244	6.81
75 x 50 x	6.0 CA	5.38	6.0	14.0	10.2	6.00	450	658	0.960	0.464	9.29	0.464	9.29	0.0731	2.89	0.0731	2.89
	5.0 CA	4.34	4.7	8.7	14.1	8.79	450	472	0.854	0.286	6.17	0.378	7.47	0.0631	2.42	0.0631	2.42
	4.0 CA	3.54	3.8	7.8	17.7	11.1	450	334	0.741	0.185	4.30	0.309	6.10	0.0520	1.99	0.0524	2.01

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm f_y = 350 MPa and f_u = 400 MPa, for 2.5 mm < $t \leq 6.0$ mm f_y = 450 MPa and f_u = 500 MPa, and for $t > 6.0$ mm f_y = 400 MPa and f_u = 450 MPa).
2. A_e is calculated for sections with uniform axial compressive stress f_y.
3. I_e and Z_e are calculated with the extreme compression or tension fibres at f_y (first yield). Z_e is calculated at the extreme tension or compression fibre of the effective section.
4. I_{ex1} and Z_{ex1} are for compression at point "1"; I_{ex4} and Z_{ex4} are for compression at point "4".
   $I_{ey2,3}$ and $Z_{ey2,3}$ are for compression at points "2" and "3"; I_{ey5} and Z_{ey5} are for compression at point "5".
5. Effective section properties are calculated in accordance with AS/NZS 4600

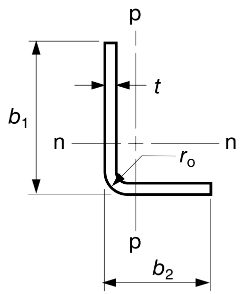


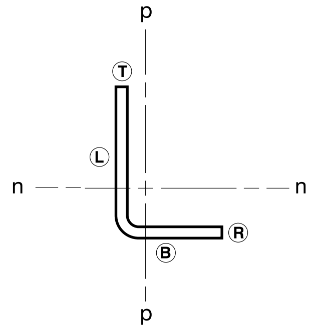
TABLE 5.2.2(b)

EFFECTIVE SECTION PROPERTIES

DURAGAL UNEQUAL ANGLE SECTIONS

GRADE C450L0/C400L0 (TS 100)

about non-principal n- and p-axes



DIMENSIONS				RATIOS		GRADE	EFFECTIVE SECTION PROPERTIES										
Designation: Leg Size b_1 b_2, Nominal Thickness	Mass per metre	Actual Thickness t	Outside Corner Radius r_o	$\frac{b_1 - r_o}{t}$	$\frac{b_2 - r_o}{t}$	Yield Stress f_y	Effective Area of Section A_e	$\frac{A_e}{A_f}$	About n-axis I_{enT}	Z_{enT}	I_{enB}	Z_{enB}	About p-axis I_{epR}	Z_{epR}	I_{epL}	Z_{epL}
mm mm mm	kg/m	mm	mm			MPa	mm^2		$10^6 mm^4$	$10^3 mm^3$	$10^6 mm^4$	$10^3 mm^3$	$10^6 mm^4$	$10^3 mm^3$	$10^6 mm^4$	$10^3 mm^3$
150 x 100 x 8.0 CA	14.9	8.0	16.0	16.8	10.5	400	1510	0.797	2.94	33.2	4.46	44.2	1.65	21.5	1.65	21.5
6.0 CA	11.3	6.0	14.0	22.7	14.3	450	894	0.623	1.44	18.5	3.35	33.3	0.837	12.3	1.19	16.0
125 x 75 x 8.0 CA	11.7	8.0	16.0	13.6	7.38	400	1310	0.879	2.05	26.4	2.43	29.7	0.687	11.9	0.687	11.9
6.0 CA	8.92	6.0	14.0	18.5	10.2	450	841	0.741	1.04	15.1	1.87	22.7	0.535	9.18	0.525	9.11
100 x 75 x 8.0 CA	10.2	8.0	16.0	10.5	7.38	400	1250	0.969	1.31	19.4	1.31	19.4	0.643	11.6	0.643	11.6
6.0 CA	7.74	6.0	14.0	14.3	10.2	450	820	0.832	0.735	11.9	1.02	14.9	0.502	8.93	0.502	8.93
75 x 50 x 6.0 CA	5.38	6.0	14.0	10.2	6.00	450	658	0.960	0.393	7.98	0.393	7.98	0.144	3.87	0.144	3.87
5.0 CA	4.34	4.7	8.7	14.1	8.79	450	472	0.854	0.243	5.29	0.323	6.43	0.119	3.12	0.119	3.12
4.0 CA	3.54	3.8	7.8	17.7	11.1	450	334	0.741	0.153	3.59	0.266	5.26	0.0909	2.43	0.0967	2.55

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm f_y = 350 MPa and f_u = 400 MPa, for 2.5 mm < $t \leq 6.0$ mm f_y = 450 MPa and f_u = 500 MPa, and for $t > 6.0$ mm f_y = 400 MPa and f_u = 450 MPa).
2. A_e is calculated for sections with uniform axial compressive stress f_y.
3. I_e and Z_e are calculated with the extreme compression or tension fibres at f_y (first yield). Z_e is calculated at the extreme tension or compression fibre of the effective section.
4. I_{enT} and Z_{enT} are for compression at point "T"; I_{enB} and Z_{enB} are for compression at point "B"; I_{epR} and Z_{epR} are for compression at point "R"; I_{epL} and Z_{epL} are for compression at point "L".
5. Effective section properties are calculated in accordance with AS/NZS 4600.

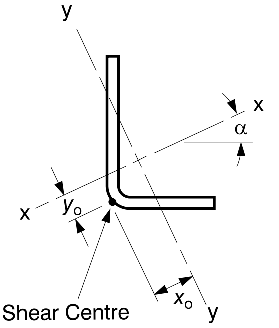
TABLE 5.2.3

SECTION PROPERTIES for MEMBER STABILITY

DURAGAL UNEQUAL ANGLE SECTIONS

GRADE C450L0/C400L0 (TS 100)

about principal x- and y-axes



Designation Leg Size b_1 b_2	Nominal Thickness	Mass per metre	Torsion Constant J	Coordinates of Shear Centre x_o	y_o	Polar Radius of Gyration about the Shear Centre r_{o1}	Monosymmetry Section Constants β_x	β_y
mm mm	mm	kg/m	10^3mm^4	mm	mm	mm	mm	mm
150 x 100 x	8.0 CA	14.9	40.4	35.4	32.4	74.2	78.6	161
	6.0 CA	11.3	17.2	35.8	32.4	74.7	78.7	163
125 x 75 x	8.0 CA	11.7	31.9	25.5	31.2	60.8	74.7	126
	6.0 CA	8.92	13.6	25.9	31.3	61.3	74.9	127
100 x 75 x	8.0 CA	10.2	27.6	26.6	16.8	49.8	41.3	114
	6.0 CA	7.74	11.8	27.0	16.8	50.4	41.3	115
75 x 50 x	6.0 CA	5.38	8.23	17.3	16.2	36.6	39.2	79.2
	5.0 CA	4.34	4.07	17.6	16.2	36.9	39.2	80.2
	4.0 CA	3.54	2.17	17.7	16.2	37.2	39.3	80.8

NOTES:
1. Steel grade C450L0 / C400L0 / C350L0 (for $t \leq 2.5$ mm $f_y = 350$ MPa and $f_u = 400$ MPa, for 2.5 mm < $t \leq 6.0$ mm $f_y = 450$ MPa and $f_u = 500$ MPa, and for $t > 6.0$ mm $f_y = 400$ MPa and $f_u = 450$ MPa).
2. With the exception of J, properties are calculated assuming a simplified shape where the bends are eliminated and the section is represented by straight mid-lines in accordance with Clause 2.1.2.1 of AS/NZS 4600.
3. I_w is equal to zero for angles.
4. The shear centre is assumed to be located at the intersection of the centre lines of the angle legs.

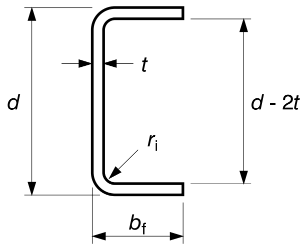


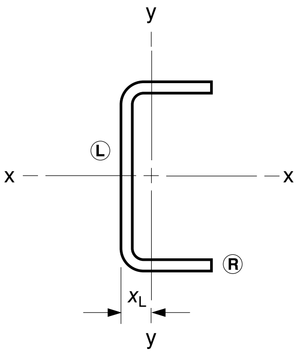
TABLE 6.1.1

DIMENSIONS AND FULL SECTION PROPERTIES

DURAGAL CHANNEL SECTIONS

GRADE C450L0/C400L0 (TS 100)

about principal x- and y-axes



DIMENSIONS						SECTION PROPERTIES									
Designation d x b_f x Nominal Thickness	Mass per metre	Actual Thickness t	Inside Corner Radius r_i	Depth Between Flanges $d - 2t$	Coord. of Centroid x_L	Full Area of Section A_f	About x-axis I_x	Z_x	S_x	r_x	About y-axis I_y	Z_{yR}	Z_{yL}	S_y	r_y
mm mm mm	kg/m	mm	mm	mm	mm	mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm
300 x 90 x 8.0 CC	28.5	8.0	8.0	284	20.3	3630	44.2	294	359	110	2.44	35.0	120	62.1	25.9
6.0 CC	21.6	6.0	8.0	288	19.5	2750	34.0	227	275	111	1.89	26.8	96.6	47.1	26.2
250 x 90 x 6.0 CC	19.2	6.0	8.0	238	21.6	2450	21.9	176	210	94.6	1.79	26.2	83.3	46.4	27.1
230 x 75 x 6.0 CC	16.9	6.0	8.0	218	17.5	2150	15.7	137	166	85.5	1.05	18.2	59.8	32.2	22.0
200 x 75 x 6.0 CC	15.5	6.0	8.0	188	18.8	1970	11.2	112	135	75.5	1.00	17.9	53.4	31.8	22.6
5.0 CC	12.4	4.7	4.0	191	18.1	1580	9.18	91.8	109	76.4	0.812	14.3	44.9	25.3	22.7
180 x 75 x 5.0 CC	11.6	4.7	4.0	171	19.1	1480	7.16	79.5	93.7	69.5	0.787	14.1	41.2	25.1	23.1
150 x 75 x 5.0 CC	10.5	4.7	4.0	141	20.9	1340	4.67	62.3	72.5	59.0	0.743	13.7	35.6	24.8	23.5
125 x 65 x 4.0 CC	7.23	3.8	4.0	117	18.3	921	2.25	36.1	41.8	49.5	0.388	8.32	21.2	15.1	20.5
100 x 50 x 4.0 CC	5.59	3.8	4.0	92.4	14.3	712	1.08	21.7	25.4	39.0	0.174	4.86	12.2	8.78	15.6
75 x 40 x 4.0 CC	4.25	3.8	4.0	67.4	12.1	541	0.457	12.2	14.4	29.1	0.0840	3.01	6.93	5.46	12.5

NOTES:
1. Steel grade C450L0 / C400L0 (for $t \leq 6.0$ mm f_y = 450 MPa and f_u = 500 MPa, and for $t > 6.0$ mm f_y = 400 MPa and f_u = 450 MPa).
2. Full section properties are calculated in accordance with AS/NZS 4600.

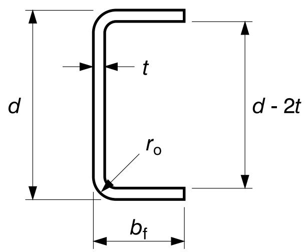


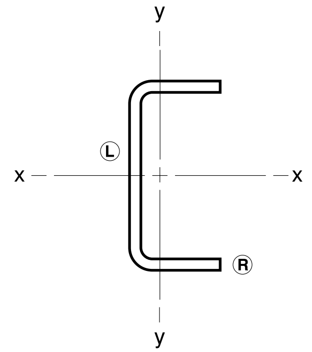
TABLE 6.1.2

EFFECTIVE SECTION PROPERTIES

DURAGAL CHANNEL SECTIONS

GRADE C450L0/C400L0 (TS 100)

about principal x- and y-axes



DIMENSIONS					RATIOS					GRADE	EFFECTIVE SECTION PROPERTIES						
Designation d b_f Nominal Thickness	Mass per metre	Actual Thickness t	Outside Corner Radius r_o	Depth Between Flanges $d - 2t$	$\frac{(d-2r_o)}{t}$	$\frac{(b-r_o)}{t}$	$\frac{d_e}{(d-2r_o)}$	$\frac{b_e}{(b-r_o)}$	$\frac{A_e}{A_f}$	Yield Stress f_y	Effective Area of Section A_e	About x-axis I_{ex}	About x-axis Z_{ex}	About y-axis I_{eyR}	About y-axis Z_{eyR}	About y-axis I_{eyL}	About y-axis Z_{eyL}
mm mm mm	kg/m	mm	mm	mm						MPa	mm^2	10^6mm^4	10^3mm^3	10^6mm^4	10^3mm^3	10^6mm^4	10^3mm^3
300 x 90 x 8.0 CC	28.5	8.0	16.0	284	33.5	9.25	0.915	1.00	0.950	400	3450	44.2	294	2.44	35.0	2.44	35.0
6.0 CC	21.6	6.0	14.0	288	45.3	12.7	0.712	0.801	0.763	450	2100	32.0	206	1.46	22.4	1.89	26.8
250 x 90 x 6.0 CC	19.2	6.0	14.0	238	37.0	12.7	0.825	0.801	0.831	450	2040	20.5	158	1.41	22.2	1.79	26.2
230 x 75 x 6.0 CC	16.9	6.0	14.0	218	33.7	10.2	0.879	0.925	0.906	450	1950	15.4	132	1.05	18.2	1.05	18.2
200 x 75 x 6.0 CC	15.5	6.0	14.0	188	28.7	10.2	0.968	0.925	0.955	450	1880	11.0	108	1.00	17.9	1.00	17.9
5.0 CC	12.4	4.7	8.7	191	38.9	14.1	0.797	0.741	0.787	450	1240	8.37	79.5	0.560	11.0	0.812	14.3
180 x 75 x 5.0 CC	11.6	4.7	8.7	171	34.6	14.1	0.863	0.741	0.820	450	1220	6.50	68.4	0.550	11.0	0.787	14.1
150 x 75 x 5.0 CC	10.5	4.7	8.7	141	28.2	14.1	0.977	0.741	0.869	450	1160	4.22	52.9	0.532	10.9	0.743	13.7
125 x 65 x 4.0 CC	7.23	3.8	7.8	117	28.8	15.1	0.966	0.705	0.845	450	779	2.00	29.8	0.256	6.24	0.388	8.32
100 x 50 x 4.0 CC	5.59	3.8	7.8	92.4	22.2	11.1	1.00	0.875	0.944	450	672	1.04	20.1	0.164	4.67	0.174	4.86
75 x 40 x 4.0 CC	4.25	3.8	7.8	67.4	15.6	8.47	1.00	1.00	1.00	450	541	0.457	12.2	0.0840	3.01	0.0840	3.01

NOTES:
1. Steel grade C450L0 / C400L0 (for $t \leq 6.0$ mm f_y = 450 MPa and f_u = 500 MPa, and for $t > 6.0$ mm f_y = 400 MPa and f_u = 450 MPa).
2. d_e and b_e are the effective widths of the web and flange respectively.
3. d_e, b_e and A_e are calculated for sections with uniform axial compressive stress f_y.
4. I_{eyL} and Z_{eyL} are for compression at point "L"; I_{eyR} and Z_{eyR} are for compression at point "R".
5. Effective section properties are calculated in accordance with AS/NZS 4600.

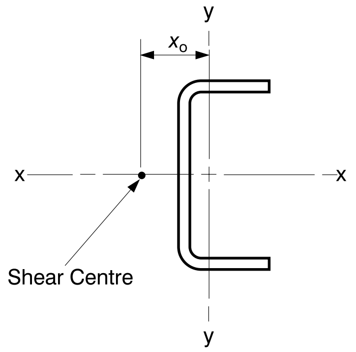
TABLE 6.1.3

SECTION PROPERTIES for MEMBER STABILITY

DURAGAL CHANNEL SECTIONS

GRADE C450L0/C400L0 (TS 100)

about principal x- and y-axes



Designation d × b_f × Nominal Thickness	Mass per metre	Torsion Constant J	Warping Constant I_w	Coordinate of Shear Centre x_o	Polar Radius of Gyration about the Shear Centre r_{o1}	Monosymmetry Section Constant β_y
mm mm mm	kg/m	10^3mm^4	10^9mm^6	mm	mm	mm
300 x 90 x 8.0 CC	28.5	77.4	37.7	43.4	122	338
6.0 CC	21.6	33.0	29.6	44.0	123	340
250 x 90 x 6.0 CC	19.2	29.4	19.2	47.8	110	273
230 x 75 x 6.0 CC	16.9	25.8	9.48	37.8	96.7	254
200 x 75 x 6.0 CC	15.5	23.7	6.78	40.2	89.0	217
5.0 CC	12.4	11.6	5.52	40.6	89.7	218
180 x 75 x 5.0 CC	11.6	10.9	4.29	42.4	84.9	197
150 x 75 x 5.0 CC	10.5	9.87	2.77	45.4	78.3	171
125 x 65 x 4.0 CC	7.23	4.43	1.01	40.0	67.0	145
100 x 50 x 4.0 CC	5.59	3.43	0.285	30.1	51.8	113
75 x 40 x 4.0 CC	4.25	2.60	0.0760	24.4	40.1	85.9

NOTES:
1. Steel grade C450L0 / C400L0 (for $t \leq 6.0$ mm $f_y = 450$ MPa and $f_u = 500$ MPa, and for $t > 6.0$ mm $f_y = 400$ MPa and $f_u = 450$ MPa).
2. With the exception of J, properties are calculated assuming a simplified shape where the bends are eliminated and the section is represented by straight mid-lines in accordance with Clause 2.1.2.1 of AS/NZS 4600.
3. β_x is zero for channels.

CHANNEL

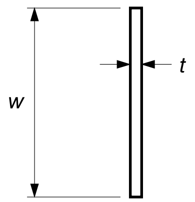
TABLE 7.1(a)

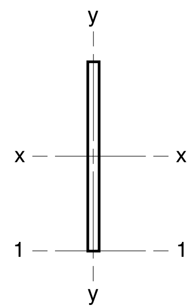
DIMENSIONS AND FULL SECTION PROPERTIES

DURAGAL FLAT SECTIONS

GRADE C400L0/C350L0 (TS 100)

about principal x- and y-axes and baseline axis





DIMENSIONS			GRADE	SECTION PROPERTIES										
Designation Width w × Nominal Thickness	Mass per metre	Actual Thickness t	Yield Stress f_y	Full Area of Section A_f	About 1-axis I_1	About x-axis I_x	Z_x	S_x	r_x	About y-axis I_y	Z_y	S_y	r_y	Torsion Constant J
mm mm	kg/m	mm	MPa	mm^2	10^6mm^4	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^3mm^4
300 x 8.0 CF	18.8	8.0	350	2400	72.0	18.0	120	180	86.6	0.0128	3.20	4.80	2.31	51.2
5.0 CF	11.1	4.7	400	1410	42.3	10.6	70.5	106	86.6	0.00260	1.10	1.66	1.36	10.4
250 x 8.0 CF	15.7	8.0	350	2000	41.7	10.4	83.3	125	72.2	0.0107	2.67	4.00	2.31	42.7
5.0 CF	9.22	4.7	400	1180	24.5	6.12	49.0	73.4	72.2	0.00216	0.920	1.38	1.36	8.65
200 x 8.0 CF	12.6	8.0	350	1600	21.3	5.33	53.3	80.0	57.7	0.00853	2.13	3.20	2.31	34.1
6.0 CF	9.42	6.0	400	1200	16.0	4.00	40.0	60.0	57.7	0.00360	1.20	1.80	1.73	14.4
5.0 CF	7.38	4.7	400	940	12.5	3.13	31.3	47.0	57.7	0.00173	0.736	1.10	1.36	6.92
150 x 8.0 CF	9.42	8.0	350	1200	9.00	2.25	30.0	45.0	43.3	0.00640	1.60	2.40	2.31	25.6
6.0 CF	7.07	6.0	400	900	6.75	1.69	22.5	33.8	43.3	0.00270	0.900	1.35	1.73	10.8
5.0 CF	5.53	4.7	400	705	5.29	1.32	17.6	26.4	43.3	0.00130	0.552	0.828	1.36	5.19

NOTES:
1. Steel grade C400L0 / C350L0 (for $t \le 6.0$ mm $f_y = 400$ MPa and $f_u = 450$ MPa, and for $t > 6.0$ mm $f_y = 350$ MPa and $f_u = 400$ MPa).
2. Section properties are calculated in accordance with AS/NZS 4600.

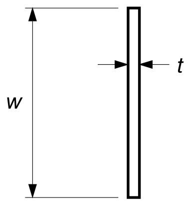


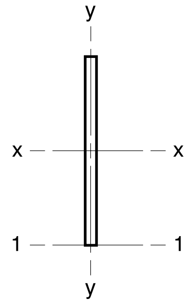
TABLE 7.1(b)

DIMENSIONS AND FULL SECTION PROPERTIES

DURAGAL FLAT SECTIONS

GRADE C400L0/C350L0 (TS 100)

about principal x- and y-axes and baseline axis



DIMENSIONS			GRADE	SECTION PROPERTIES										
Designation Width w × Nominal Thickness	Mass per metre	Actual Thickness t	Yield Stress f_y	Full Area of Section A_f	About 1-axis I_1	About x-axis I_x	Z_x	S_x	r_x	About y-axis I_y	Z_y	S_y	r_y	Torsion Constant J
mm mm	kg/m	mm	MPa	mm^2	$10^6 mm^4$	$10^6 mm^4$	$10^3 mm^3$	$10^3 mm^3$	mm	$10^6 mm^4$	$10^3 mm^3$	$10^3 mm^3$	mm	$10^3 mm^4$
130 x 5.0 CF	4.80	4.7	400	611	3.44	0.860	13.2	19.9	37.5	0.00112	0.479	0.718	1.36	4.50
100 x 8.0 CF	6.28	8.0	350	800	2.67	0.667	13.3	20.0	28.9	0.00427	1.07	1.60	2.31	17.1
6.0 CF	4.71	6.0	400	600	2.00	0.500	10.0	15.0	28.9	0.00180	0.600	0.900	1.73	7.20
5.0 CF	3.69	4.7	400	470	1.57	0.392	7.83	11.8	28.9	0.000865	0.368	0.552	1.36	3.46
4.0 CF	2.98	3.8	400	380	1.27	0.317	6.33	9.50	28.9	0.000457	0.241	0.361	1.10	1.83
90 x 6.0 CF	4.24	6.0	400	540	1.46	0.365	8.10	12.2	26.0	0.00162	0.540	0.810	1.73	6.48
75 x 5.0 CF	2.77	4.7	400	353	0.661	0.165	4.41	6.61	21.7	0.000649	0.276	0.414	1.36	2.60
4.0 CF	2.24	3.8	400	285	0.534	0.134	3.56	5.34	21.7	0.000343	0.181	0.271	1.10	1.37
65 x 5.0 CF	2.40	4.7	400	306	0.430	0.108	3.31	4.96	18.8	0.000562	0.239	0.359	1.36	2.25
4.0 CF	1.94	3.8	400	247	0.348	0.0870	2.68	4.01	18.8	0.000297	0.156	0.235	1.10	1.19
50 x 5.0 CF	1.84	4.7	400	235	0.196	0.0490	1.96	2.94	14.4	0.000433	0.184	0.276	1.36	1.73
4.0 CF	1.49	3.8	400	190	0.158	0.0396	1.58	2.38	14.4	0.000229	0.120	0.181	1.10	0.915

NOTES:
1. Steel grade C400L0 / C350L0 (for $t \leq 6.0$ mm f_y = 400 MPa and f_u = 450 MPa, and for $t > 6.0$ mm f_y = 350 MPa and f_u = 400 MPa).
2. Section properties are calculated in accordance with AS/NZS 4600.

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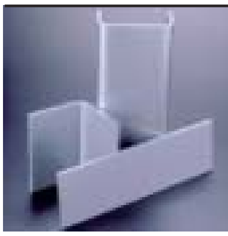

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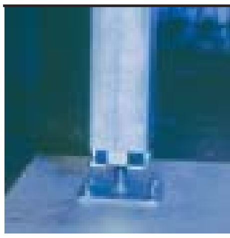

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