Received: 5 November 2015

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4 November 2015

Ms Melissa Guilfoyle Case Manager Anti-Dumping Commission 55 Collins Street Melbourne VIC 3000

By email: operations9@adcommision.gov.au

Dear Ms Guilfoyle,

Enquiry EX 0042 Supplementary Submissions – FOR PUBLICATION ON THE EPR

We act for Hi Vis Signs and Safety Pty Ltd ('Hi Vis').

We are instructed to provide this submission ('**Submission**') on behalf of our client in support of, and supplementary to, our client's exemption application ('**Exemption Application**') submitted to the Anti-Dumping Commission ('**Commission**') on 9 June 2015 which is the subject of the Commission's current exemption inquiry number EX0042 ('**Inquiry EX0042**').

1. Purpose of this Submission

- (a) The Exemption Application was made on the grounds set out in paragraphs 8(7)(b) and 10(8)(aa) of the Customs Tariff (Anti-Dumping) Act 1975 (Cth) ('Dumping Act') which provide that the Minister may exempt goods from the dumping and countervailing measures if satisfied that a tariff concession order ('TCO') in respect of the goods is in force, (referred to as 'Exemption Two').
- (b) The purpose of this Submission is to extend the grounds on which the Exemption Application was made to include 'Exemption One' as set out under paragraphs 8(7)(a) and 10(8)(a) of the Dumping Act which provides that the Minister may exempt goods from the dumping and countervailing measures if satisfied 'that like or directly competitive goods are not offered for sale in Australia to all purchasers on equal terms under like conditions having regard to custom and usage of trade'.

2. The dumping and countervailing measures from which we are seeking an exemption

Interim Dumping Duty ('**IDD**') and Interim Countervailing Duty ('**ICD**') were imposed on 3 July 2012, to goods which can generally be described as hollow structural sections ('**HSS**'), imported from China, Korea, Malaysia and Taiwan and keyed to certain tariff classifications under tariff

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heading '7306 – Other tubes, pipes and hollow profiles (for example open seam or welded, riveted or similarly closed), of iron or steel'. Details of these measures are set out the Australian Customs Dumping Duty Notice ('**ACDN**') 2012/31.

3. Details of the goods for which an exemption is sought

- (a) Hi Vis is an Australian company operating a sign manufacturing, construction and installation business within Australia. A significant part of the Hi Vis business is the supply of road signs to Government and to large industrial customers who use road signs to manage road usage and traffic on site.
- (b) Hi Vis imports steel posts used to erect road signs ('Hi Vis Goods'). The Hi Vis Goods generally fall within the description of HSS and are keyed to tariff classification 7306.30 and considered by the Department of Immigration and Border Protection ('Department') to be subject to the IDD and ICD measures set out in ACDN 2012/31 ('Dumping Measures').
- (c) Our client obtained a Tariff Advice (TA 21341400) on 15 June 2015 which confirmed the Department's view that the Hi Vis Goods are appropriately keyed to tariff heading 7306.30.
- (d) The Hi Vis Goods can be distinguished from other products entered under tariff heading 7306.30 because of the physical characteristics of the Hi Vis Goods which are designed for their particular application as road sign-posts. In accordance with the Roads and Maritime Services Post Design Standard ('RMS Standard') in Annexure A (or comparable Standards as applicable in each State or Territory), road signs, and specifically the sign-posts, are manufactured to conform to a standard height, size, visibility and frangibility. The specifications for the Hi Vis Goods are as follows:

Carbon steel road sign-posts having all of the following characteristics:

- (i) electric resistant welded pipe;
- (ii) cold drawn (manufacturing process);
- (iii) hot-dipped galvanised (zinc galvanised finish);
- (iv) carbon steel non alloy (materials);
- (v) C250 LO or lighter C350 LO materials
- (vi) circular hollow sections (otherwise generally described as pipes or tubes);
- (vii) with a cross section diameter of 60.3mm;
- (viii) cut to lengths of 3.2m, 3.25m or 3.9m;
- (ix) a wall thickness between 2.9 3.2mm;
- (x) manufactured to Australian Standard AS1163; 2009 (Cold-Formed structural steel hollow sections);
- (xi) finished by hot-dip galvanised (zinc) coating to Australian Standard 4680 (Hot-dip galvanized (zinc) coatings on fabricated ferrous articles) with an average zinc coating of 40 microns;
- (xii) with a tensile strength of 235 240 mpa; and

(xiii) ends drilled prior to hot-dipped galvanising

- (e) The RMS specifies the use of C250 LO or lighter C350 LO materials which are intended to deform on impact thereby minimising vehicle damage and occupant injuries. The charts in the RMS Standard (Annexure A), pages 4 – 6 set out the standard requirements for 1, 2 and 3 post signs in terms of frangible post size and frangible post spacing which ensure the sign-post bends or breaks off near the base upon impact with traffic.
- (f) The RMS Standard also requires that the road sign-posts are installed directly into the ground, with a concrete foundation in the ground. In order to comply with the relevant Australian Standards and manufacturers' directions for use, only steel tubes or pipes that have been hot-dip galvanised with zinc coating in accordance with Australian Standard AS4680 are sufficiently protected from corrosion to be used in such applications where the steel pipe is in contact with concrete or soil or underground (see for example Annexure B page 4 which states that in relation to DuraGal products, 'special corrosivity with high to very high corrosion rates occur underground...the selection of a coating system for these conditions is outside the scope of this guide').
- (g) In summary, sign-posts for road signs must:
 - (i) conform in shape, pre-drilling and size to the standard design that fits with the standard road signs approved in Australia;
 - (ii) have undergone hot-dip galvanised zinc coating to protect against corrosion in the ground or in concrete; and
 - (iii) be of a relatively low tensile strength in order to meet the requirements for frangible road sign-posts.

4. Additional grounds on which the exemption is sought

We submit that the grounds for Exemption One set out in paragraphs 8(7)(b) and 10(8)(aa) of the Dumping Act are established by the information provided with these submissions and in the Exemption Application. In particular it is submitted that;

- (a) local producers do not produce or offer for sale goods which are identical to the Hi Vis Goods; and
- (b) local producers do not produce or offer for sale goods which are like or directly competitive to the Hi Vis Goods.

5. Evidence that local producers do not offer for sale 'identical goods'

- (a) We submit Annexure C as further evidence that the exemption goods are not produced in Australia. Annexure C is a quote obtained from [Local Producer One] which states that the requested goods are not produced in Australia.
- (b) This is submitted in addition to the evidence previously submitted in the Exemption Application that Hi Vis has attempted to purchase the goods from Australian suppliers including OneSteel, Hunter Valley Steel and Southern Steel.
- (c) We submit Annexure D, the Austube Product Availability Guide which indicates on page 4 that identical goods, being hot-dipped galvanised tube with a cross section diameter of 60.3mm and a wall thickness of 2.9-3.1mm, are not offered for sale.

6. Are the goods offered for sale 'like goods or directly competitive'?

- (a) The goods which are available from local producers such as Austube Mills Pty Ltd ('Austube') have been identified from product catalogues provided by the local producers and quotes received from the local suppliers. We are instructed that the following goods offered for sale by Austube ('Austube Goods') are not like goods or directly competitive with the Hi Vis Goods:
 - (i) C350L0 DuraGal Plus;
 - (ii) C250L0 Hot-Dipped Galvanised in Medium Heavy Strength
- (b) The meaning of 'like goods' is considered in the Department's Trade Measures Issues Paper – The Goods and Like Goods – Certain Hollow Structural Sections from China and Malaysia Trade Measures Case 144. In the context of the Australian Customs Service Manual Vol.224, Section 4.2, states:

'In the context of like goods, identical goods are goods that are identical in physical characteristics, subject to variations in their presentation due to the need to adapt them to special conditions in the home or export market. If the goods are found to be identical, it is not necessary to further consider other factors such as channels of distribution, process of manufacturing etc. in determining the question of like goods.

If the goods are found not to be identical, it is necessary to determine whether the goods would still fall within the ambit of goods having characteristics closely resembling those of the goods under consideration. To determine whether the goods are goods having characteristics closely resembling those of the goods under consideration, Customs' practice is to have regard to the factors outlined below.

- (A) <u>Physical likeness</u>
 - Assess which physical characteristics are similar, and identify the extent of differences. Examples to consider:
 - o size
 - o Shape
 - Content
 - o weight
 - Appearance
 - o Taste
 - o grade
 - Standards
 - o Age
 - o strength
 - o Purity
 - Are the goods classified to a matching tariff classification?
- (B) <u>Commercial likeness</u>

Commercial likeness refers to attributes identifiable from market behaviour.

- Are the goods directly competitive in the market? e.g. do the goods compete in the same market sector? Within a market sector, are the goods similarly positioned?
- To what extent are participants in the supply chain willing to switch between sources of the goods and like goods? e.g. willingness of participants to switch between sources may suggest commercial interchangeability.
- How does price competition influence consumption? e.g. close price competition may indicate product differentiation is not recognised by the market.

- Are the distribution channels the same? How similar is the packaging used? Does different packaging reveal significant differences in the goods, or highlight different market sectors?
- (C) <u>Functional likeness</u>

Functional likeness refers to end-use. End-use will not of itself establish like goods, but may provide support to the assessment of physical and commercial likeness.

- Do the goods have the same end use? To what extent are the two products functionally substitutable? e.g. both a shovel and an earthmoving machine can move earth.
- To what extent are the goods capable of performing the same, or similar functions? e.g. an earthmoving machine is capable of moving earth more rapidly than a shovel.
- Do the goods have differential quality? Quality claims can be subjective. Objective evidence has higher probative value e.g. by standards, or the extent consumers are willing to use the goods to perform the required functions.
- Is consumer preference likely to change in the future? Consider consumer behaviour in other markets/ countries?

(D) <u>Production likeness</u>

Different production processes may produce identical goods. However, different production processes may be used to create different product characteristics. A comparison of production process will not of itself establish like goods, but may highlight differences or provide support to the assessment of other considerations.

- To what extent are the goods constructed of the same or similar materials?
- Have the goods undergone a similar manufacturing process? If different, what is the impact of those differences?
- Are there any patented processes or inputs involved?

(E) Other considerations

- Matters raised by interested parties,
- Matters that Customs identifies during the course of the investigation,
- How similar is the marketing of the goods?
- (c) Based on the criteria set out above, we submit that the local industry does not produce like or directly competitive. The following table sets out our detailed analysis of the relevant goods.

Criteria	Austube Goods	Analysis whether 'like goods'?	
Physical Likeness	Physical Likeness		
Assess which physical characteristics are similar, and identify the extent of differences. Examples to consider: o size o Shape o Content	 ATM Hot-Dipped Galvanised C250L0 Cross section diameter 60.3mm Wall thickness 3.6mm. The available wall thicknesses are Medium. 	The Austube C250L0 goods are not of the same wall thickness or tensile strength as the Hi Vis Goods. The Hi Vis Goods must be Light wall thickness. The tensile strength of the Hi Vis Goods is 235 – 240pMpa.	
 weight Appearance 	 Minimum length – 5 meters 	These are key physical characteristics which mean that the	

Criteria	Austube Goods	Analysis whether 'like goods'?
○ Taste	• Minimum tensile strength	Hi Vis Goods can be used as road
 o grade o Standards 	 – 320Mpa; Manufactured to AS/NZS 	sign-posts and are frangible.
• Age	1163, and 4792.	The Hi Vis Goods are not
 strength Purity 	 Manufactured to AS 1074 Steel tubes and tubulars 	are not intended to be used for
	for ordinary service.	ordinary service and intentionally
	 Information taken from pages 30, 32 and 34 of 	do not have the strength for such uses.
	the of Annexure E-	
	Austube Technical Product Manual).	In our view the Austube C250L0 Goods and the Hi Vis Goods are
		not like or directly competitive
	DuraGal Plus C350L0	based on the physical characteristics.
	• Cross section diameter	
	o Wall thickness 2.9mm	I he Austube C350L0 products are not hot-dipped galvanised and
	• Minimum Length 6.5m	therefore not suitable for
	 Finished with DuraGal Plus zinc coating 	applications where the posts will be installed in the ground, in contact
		with the soil or concrete. This is
		Guide (Annexure B). See for
		example page 4 and page 6 which
		DuraGal sections enter concrete
		footings or are below the surface of
		are common problem areas.
		On that basis we submit that the
		DuraGal Plus C350L0 Austube
		Goods and the Hi Vis Goods are
		goods'.
Are the goods classified to	We are unable to comment	Our client obtained a tariff advice
a matching tariff	on the tariff classification of	that the Hi Vis Goods are classified
Commercial Likeness		
Are the goods directly competitive in the market?	DuraGal Plus C350L0	The Hi Vis Goods are seam welded pipe from cold-rolled low-strength
e.g. do the goods compete	Can be used in a variety of	(235 MPA) steel, seam welded into
In the same market sector? Within a market sector, are	residential construction	circular section, cut to specific (short) lengths. pre-drilled and then
the goods similarly		hot-dip galvanised with 40um of
positioned?	 roof trusses; fencing: 	zinc) are not suitable for ANY of these applications.
	 verandas; 	
	 elevated flooring solutions: and 	The Hi Vis Goods are not of sufficient strength for use in these
	 shade structures. 	applications.
		In our view the Hi Vis Goods do not

Criteria	Austube Goods	Analysis whether 'like goods'?
	It is also commonly applied across a variety of other sectors including mining, commercial, engineering, manufacturing, agriculture and transport (See Austube and DuraGal Factsheet - Annexure F).	compete in the 'construction' market sector or any of the other sectors applicable to the Austube Goods. The Austube Goods cannot be used for road sign-posts as they do not comply with the MRS standard (or equivalent) in terms of being frangible, or conforming in size and shape to be fit for that purpose or resistant to corrosion.
	ATM Hot-Dipped Galvanised C250L0	On that basis we submit that the Austube Goods and the Hi Vis
	Can be used in:	Goods are not like goods based on commercial likeness.
	 General mechanical and low pressure reticulation Structural applications Steel tubes for ordinary service (minimum Yield strength of 250Mpa Minimum Tensile Strength 320MPa (see Annexures D and E). 	
To what extent are participants in the supply chain willing to switch between sources of the goods and like goods? e.g. willingness of participants to switch between sources may suggest commercial interchangeability.	Can the Hi Vis Goods be used for the typical uses of the Austube Goods? We understand from the technical information provided in the Annexures that the Hi Vis Goods are unsuitable for application in any of the same uses as the ATM Hot-Dipped Galvanised C250L0 or the DuraGal Plus C350L0. The Hi Vis Goods cannot be used interchangeably with the Austube Goods.	Can the Austube Goods be used as road sign-posts? We are instructed that Government contracts for supply of road signs require that the posts meet the MRS Standard or equivalent. Commercial contracts usually refer to these standards or otherwise require that goods of suitable quality and materials are used. We submit that there is no commercial interchangeability without breaching standards applicable to building and construction or safety and engineering standards applicable to the erection of road signs. On that basis the Austube Goods and the Hi Vis Goods are not like goods based on commercial likeness.
How does price competition influence consumption? e.g. close price competition may indicate product differentiation is not recognised by the market. Are the distribution	We understand from information provided by our client, and generally available in the market, that the Austube Goods finished with DuraGal Plus instead of hot-dipped galvanising are	We submit that the tubes finished with DuraGal Plus are significantly cheaper than hot dipped galvanised tubes of similar size and lengths because the market recognises the product differentiation.

Criteria	Austube Goods	Analysis whether 'like goods'?
channels the same?	significantly cheaper than the Austube hot-dipped galvanised products.	
	DuraGal Plus is inferior in corrosion resistance and the price differentiation is evidence of this being a different product. DuraGal Plus coated tubes cannot be installed underground or in contact with soil or concrete.(See Annexure B on page 4 and 6).	
How similar is the packaging used? Does different packaging reveal significant differences in the goods, or highlight different market sectors?	N/A	N/A
Functional Likeness	r	
Do the goods have the same end use? To what extent are the two products functionally substitutable? e.g. both a shovel and an earthmoving machine can move earth	 DuraGal Plus C350L0 Can be used in a variety of residential construction applications such as: roof trusses; fencing; verandas; elevated flooring solutions; and shade structures. It is also commonly applied across a variety of other sectors including mining, commercial, engineering, manufacturing, agriculture and transport (See Annexure F). ATM Hot-Dipped Galvanised C250L0 Can be used in: 	The Hi Vis Goods do not have any functional likeness to the Austube Goods. For that reason the Austube Goods and the Hi Vis Goods are not like goods based on functional likeness.
	 General mechanical and low pressure reticulation Structural applications Steel tubes for ordinary service (minimum Yield strength of 250Mpa Minimum Tensile 	

Criteria	Austube Goods	Analysis whether 'like goods'?
	Strength 320MPa (See Annexures D and E).	
To what extent are the goods capable of performing the same, or similar functions? e.g. an earthmoving machine is capable of moving earth more rapidly than a shovel.	As stated above.	As stated above.
Do the goods have differential quality? Quality claims can be subjective. Objective evidence has higher probative value e.g. by standards, or the extent consumers are willing to use the goods to perform the required functions	Austube Goods are manufactured to the following Standards: AS/NZS 1163 AS/NZS 4792. AS 1074 Steel tubes and tubulars for ordinary service. (See Annexure D).	 Hi Vis Goods are manufactured to: AS/NZS 1163; AS/NZS 4792; MRS/RTA Standards for Road Signs; and EN 12767 Passive Safety Support Structures for Road Equipment On that basis there are specific Standards which are key to the distinct quality of the Hi Vis Goods, and which are not also specifications of the Austube Goods. For this reason we submit that the objective Standards demonstrate that the goods are not like goods.
Is consumer preference likely to change in the future? Consider consumer behaviour in other markets/ countries?		Not considered likely to change.
Production likeness		
To what extent are the goods constructed of the same or similar materials?	The Austube Goods are manufactured with C350L0 Grade and C250L0 Grade steel, non-alloy. The C350L0 Goods are not hot-dipped galvanised.	The Production likeness of the C350L0 Goods is not alike because DuraGal Plus coating and galvanising process is different to the process of Hot-dip galvanising. The C250L0 products are constructed of similar materials.
Have the goods undergone a similar manufacturing process? If different, what is	We submit that the DuraGal Plus coating is not similar to the process of hot dip-	The impact of the difference between the hot-dip galvanising and coating with DuraGal Plus is

Criteria	Austube Goods	Analysis whether 'like goods'?
the impact of those differences?	galvanising.	 that: the DuraGal zinc coating is significantly thinner and less resistant to corrosion. As noted in the DuraGal Technical Guide DuraGal is not suitable for installation underground or where the tube will be in contact with cement or soil. Hot dip galvanising takes place after the sign-posts are drilled and cut to length which means that the surface area of the drill holes and cut edges is also coated with the zinc galvanising during the hot-dip process. DuraGal coating is applied to the Austube Goods without predrilling and cutting to length. The exposed surfaces are not protected from corrosion.
Other Considerations		
Matters raised by interested parties,	N/A	N/A
Matters that Customs identifies during the course of the investigation, How similar is the marketing of the goods?		

- 7. For these reasons we submit that the Hi Vis Goods and the Austube Goods are not 'like goods' or 'directly competitive' goods for the purposes of paragraphs 8(7)(a) and 10(8)(a) of the Dumping Act. In such circumstances we submit that the Commission should recommend to the Minister that an exemption to the Dumping Measures be granted to our client in respect of the Hi Vis Goods.
- 8. Finally, we request that in exercising its discretion to make a recommendation to the Minister the Commission have regard to the principle that it preferable not to impose a tariff if it serves no protective function for Australian industry¹. In this instance there can be no injury to local industry as the goods for which an exemption is sought, or sufficiently similar goods, cannot be produced locally and are not offered for sale by local producers.

Yours faithfully

Andrew Hudson Partner

¹ This is consistent with the second reading speech of the Honorable Mr. Beddall on the Customs Legislation (Tariff Concession and Anti-Dumping) Amendment Bill 1992 and subsequent decision of the Tribunal and the Federal Court including Seguin Moreau, Australia v CEO of Customs 1997) 77 FCR 410 and Brand Developers Aust Pty Ltd and CEO of Customs [2015] AATA 215.

Annexure A

Post Design Document for Steel Tube Sign Post Structure



Roads & Maritime Services

Product: Steel CHS Sign Post

Revision: 28 March 2014

Galvanised steel tube posts

The majority of road signs are erected on galvanised steel tube posts. Material is usually C250 LO and lighter weight C350 LO can be used. They are intended to deform on impact thereby minimising vehicle damage and occupant injuries.

The steel CHS multiple post sizing charts Figures 1, 2 and 3 show the post size (C250 grade steel) appropriate to the sign panel size and its mounting height. These figures also show the post sizes which are deemed to be frangible and are shown in the shaded area of the chart (unless noted otherwise). Refer notes on the post sizing charts for C350 grade steel posts and post spacing which allow multiple post sign structure to be deemed frangible.

The post sizes shown as frangible are based on the European Standard EN 12767 - Passive Safety of Support Structures for Road Equipment.

Example: A sign with an area of 3.5 square metres and a height to the centre of pressure of 1.8 metres could be supported by either:

- 1. a single 101.6 x 4.0 CHS C250 post
- 2. two 76.1 x 3.6 CHS C250 posts
- 3. three 60.3 x 3.6 CHS C250 posts

Galvanised pipes are used for longevity. The tubes shall be capped to minimise ingress of water and other matter which would prematurely corrode the post.

Footings

Small and medium signs have the support post planted directly in a concrete footing. The footings sizes are designed to match the strength of the tubes and the ground conditions.

The footings are designed so that movement within the soil will not be excessive, i.e. not more than 12 mm or 2 degrees of twist.

A range of options are given, to provide a match with post size and match footings to site location.

The footing diagram is shown in Figure 4. The footing diameter is shown for each post size.

The depths for each post size are also shown in Figure 4, giving either the:-

- **no path** depth, for rural or urban applications without a footpath, i.e. the top 150mm of soil does not provide reliable support or resistance, particularly when the soil is wet.
- **footpath** application depth, where the footing applicable is also substantially supported by a footpath of minimum 60mm concrete or 80mm bitumen, which also keeps the soil from getting too wet.

• The hole must be made with the surrounding soil undisturbed. It may be auger drilled, once the underground services have been located and ascertained that the operation will not damage or interfere with these services. Where the location of services is uncertain, an exploratory dig by hand is required.

The footing depths are given for soils of two strengths:

- **normal**, i.e. medium strength as defined by undisturbed loam, firm dry clay, fine dry sand or sandy clay etc
- **softer soils**, as defined by reactive clay, wet or loose sand, disturbed soil, back fill or made ground. Alternatively increase the depth by the amount of backfill (whichever is the lesser).

A single support tube is to have one 14mm diameter hole in which a pin is inserted to prevent rotation of the sign pipe. The post planting depth is 600mm, so the pin is 150mm below the surface. The pin is to be at least 60mm longer than the outside diameter of the tube.

In the small tube cases, the post goes a little deeper than the concrete.

The post is located centrally in the prepared hole. Small tubes are tapped down into the soil to fix vertically and hold it at the specified planting depth. While holding the post vertically, pour the concrete to fill the hole to ground level, trowel smooth and slope to shed water away from the post.

Wind loading

The type and size of a structure to support sign(s) is dependent on the size and positioning of the sign. The highest loading on a sign is usually wind loading. Australian Standard AS 1170.2 gives details.

Sign support basics

The RTA's standard sign arrangement requires the sign panels to be supported so that:

- A) maximum outreach from vertical support to the edge of the sign is 760 mm. Dual posts are positioned at b/5, ie 20% of width from the edge. Triple posts are positioned at b/6 or down to 15% of width from the edge. Some offset is permitted, but keep the load on each post within the post selection chart limit.
- B) maximum span between vertical supports is 2280 mm.
- C) each of the horizontal reinforcing channels on the rear of the panel is fastened to the supporting structure.
- D) where the outreach or span exceeds the limits, an additional vertical support shall be provided to bring the vertical spacing within limits.



Figure 1 – Single Post Selection Chart – Refer Notes 1 & 2 on page 6 for C350 steel posts and frangible post sizes



Figure 2 – Two Post Selection Chart – Refer Notes 1, 2, 3 & 4 on page 6 for C350 steel posts, frangible posts sizes and frangible post spacing





Notes for Figures 1, 2 and 3 (Steel tube sign post selection charts) are as follows:

Note I – Post sizes shown on the charts are for C250 LO grade galvanised steel Circular Hollow Sections (outside diameter shown). Refer table below for alternative specification of post diameter ie nominal bore size for C250 LO grade steel. Refer table below also for alternative post size in C350 LO grade steel.

Note 2 – Post sizes that are deemed to be frangible for a multiple post structure are shown in the shaded area of the charts, unless otherwise permitted by Note 4 below.

Note 3 – 76.1x3.6mm C250 (or 76.1x3.2mm C350) post is the maximum size deemed frangible where the post centres are less than 1.5m, except as permitted by Note 4.

Note 4 - 88.9x4.0mm C250 (or 88.9x3.2mm C350) post is the maximum size deemed frangible where the post centres are greater than 1.5 m.

STEEL TUBE SIGN POST TABLE –		
CORRESP	PONDING/EQUIVALENT PC	DST SIZES
C250 LO grade CHS post standard specification size (outside diameter)	C250 LO grade CHS post nominal bore size (inside diameter)	Corresponding C350 LO grade CHS post standard specification size (outside diameter)
114.3 x 4.5 CHS	100 NB Medium [4.5mm]	114.3 x 3.2 CHS
101.6 x 4.0 CHS	90 NB Medium [4.0mm]	101.6 x 3.2 CHS
88.9 × 4.0 CHS	80 NB Medium [4.0mm]	88.9 x 3.2 CHS
76.1 X 3.6 CHS	65 NB Medium [3.6mm]	76.1 X 3.2 CHS
60.3 X 3.6 CHS	50 NB Medium [3.6mm]	60.3 X 2.9 CHS



Figure 4 – Footing details for steel CHS sign post

Authorised by Manager Technology Standards (Road)

Date issued: 28/03/2014

----- END ------

REVISION REGISTER

Issue Date	Description of Revision	Authorised By
28/03/2014	Initial issue of steel CHS post sizing charts and footing details for multiple post structure	Manager, Technology Standards (Road)

Annexure B

Received: 5 November 2015

TECHNICAL OF CONTROL O

DURAGAL[®] EASY PAINTING & CORROSION PROTECTION GUIDE



DuraGal[®]

Easy Painting & Corrosion Protection Guide

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INTRODUCTION

Cost Effective High Tensile Steel Products with a Fully Prepared Surface

DuraGal steel hollow sections have been developed to provide cost effective corrosion resistance, as well as a smooth, easy to use surface finish.

The advantages of the DuraGal prepared surface are now available in a full range of DuraGal cold-formed open profiles - angles, channels and flats. Extending the DuraGal Family of Products[®].

Architecturally Decorative Finish which is Kind to the Environment

The steel surface, prepared in a closely controlled factory environment, eliminates or significantly reduces the need for messy open air blasting, chemical, hand or power tool cleaning and its effect on the environment.

DuraGal sections are mechanically cleaned to AS1627.4 Class 3 and then chemically cleaned prior to hot dip galvanising. A zinc coating weight of 100gms/m² (14.3 microns) is applied. A surface conversion coating is then applied to help prepare the surface for later painting and to assist prevent white rust during transport and storage. Then, in the case of equal angles (greater than 50 x 50), channels and flats, a clear barrier polymer coat is applied.

Cost Effective

The most cost effective way to use DuraGal products is unpainted, touching up any welds.

The Table on page 7, called "Corrosion life of Unpainted DuraGal in AS/NZS 2312 Atmospheric Environments", indicates which combinations of environment and expected life to first maintenance that unpainted DuraGal can cover. However, if painting is required the result is an even better surface protection.

By teaming the hot dip zinc coating with paint a synergistic effect occurs, ie the corrosion life of the duplex coating system is higher than the sum of the corrosion lives of the zinc and the paint

coatings used separately. Research has shown that the increase can be from 1.5 to 2.3 times the sum of the lives of the zinc coating and the paint system, used separately.

When superior corrosion life before first maintenance is required, the DuraGal hot dip galvanized coating will eliminate or considerably reduce the cost of surface preparation and may allow a more cost effective paint coating system to be used, reducing the cost of your project.

The total cost of a product fabricated from a DuraGal profile or hollow section can be considerably less than that of other steel shapes. There can be savings in both the cost of steel and the cost of applying the corrosion resistant coatings. The high tensile DuraGal shapes and hollow sections and their structural advantages can save steel and often dollars.

About This Guide

This guide is designed to cover, in a practical and concise form, paint systems for a wide range of environments, performance levels, pre-treatments and application methods.

On pages 22 to 27 of this guide you will find the recommended coating systems from several leading coatings manufacturers. These coatings manufacturers have carried out their own evaluation for the DuraGal Family of Products[®] and the exposure categories listed within AS/NZS 2312:1994.

For further information on the coatings listed, OneSteel recommends you contact the coatings manufacturer directly to discuss the details of your application, and obtain detailed data sheets on surface preparation, application and safe use of their products.

OneSteel Direct can assist you by providing the nearest location and contact details for the nominated coatings manufacturers listed in this guide.

Freecall:	1800 065 415
Freefax:	1800 800 744
e-mail:	onesteeldirect@onesteel.com

Atmospheric Environments

General

The following classifies atmospheric zones in Australia and New Zealand, which affect the corrosion of steel and the life of a coating system.

This information was taken from Section 2 of AS/NZS 2312:1994 (with some additions) and is included in this publication with the permission of Standards Australia.

When selecting an appropriate protective coating system, the overall atmospheric conditions in the location of the intended structure require consideration. A structure situated in an aggressive environment will require a much higher standard of corrosion protection than one in a benign environment. The environment can affect both the steel and the paint system. Of prime importance is the effect the environment has on the corrosion of steel.

The effect the environment has on the life of the paint system is also important. It should be appreciated that corrosive environments described do not necessarily affect coatings in the same way as they affect bare steel. Environments that would not be considered to be particularly corrosive to steel, such as hot dry climates with a high amount of ultraviolet (UV) radiation, can cause early breakdown of some coatings. Tropical environments, with high humidity, rainfall, and which promote mould and fungal growth, are far more aggressive to organic coatings than the corrosion rate would suggest. Furthermore, the colour of the paint may influence its performance in some environments.

In addition to climatic effects, the local environment effects (or microclimate) produced by the erection of a structure or installation of equipment need to be taken into account. Such on-site factors require additional consideration because a mildly corrosive atmosphere can be converted into an aggressive environment by microclimatic effects. A significant acceleration of corrosion rate can occur in the following circumstances:- (a) At locations where the metal surface remains damp for an extended period, such as where surfaces are not freely drained or are shaded from sunlight.

(b) On unwashed surfaces, ie surfaces exposed to atmospheric contaminants, notably coastal salts, but protected from cleansing rain.

(c) Where the surface is in contact with animal urine or faeces, prolonged intimate contact with very slightly contaminated hay or straw will rapidly remove the zinc coating and initiate rusting.

Other microclimatic effects which may accelerate the corrosion of the substrate or the deterioration of its protective coating include acidic or alkaline fallout, industrial chemicals and solvents, airborne fertilisers and chemicals, prevailing winds which transport contamination, hot or cold surfaces and surfaces exposed to abrasion and impact. These effects can outweigh those of the macroclimatic zones described below.

Microclimatic effects can make it very difficult, if not impossible, to predict accurately the aggressiveness of a given environment and a certain amount of educated judgement is required to assess its influence on the coating life.

Atmospheric Classifications

(a) Mild

A mild environment will corrode mild steel at a rate of up to 10 microns per year and includes all areas remote from the coast, industrial activity and the tropics. Sparsely settled regions such as outback Australia are typical examples, but the category also includes rural communities other than those on the coast. The only areas in New Zealand in this category are sheltered inland areas. Corrosion protection required for this category is minimal.

(b) Moderate

A moderate environment will cause a first year corrosion rate of mild steel of 10 microns to 25 microns and includes areas with light industrial pollution or very light marine influence, or both. Typical areas are suburbs of cities on sheltered bays such as Melbourne, Adelaide and Hobart (except those areas near the coast) and most inland cities. Most of New Zealand, other than sheltered inland areas and areas near the coast, is in this zone.

Corrosion protection requirements are moderate and do not call for special measures.

(c) Tropical

A tropical environment includes coastal areas of north Queensland, Northern Territory, north-west Western Australia, Papua New Guinea and the Pacific Islands, except where directly affected by salt spray. This is the only category that cannot be delineated by the corrosion rate. Although corrosivity is generally low in tropical regions, the aggressiveness of the environment to organic coatings means special protection is required.

(d) Industrial

Industrial environments will cause a first year corrosion rate of mild steel to be greater than 25 microns and can be greater than 50 microns per year. The only areas within this category are around major industrial complexes. There are only a few such regions in Australia and New Zealand, examples of which occur around Port Pirie, Newcastle and the geothermal areas of New Zealand. The pollution in these areas requires that coating systems be resistant to mild acid.

(e) Marine

Marine environments will cause a first year corrosion rate of 25 microns to 50 microns and include areas influenced to a moderate extent by coastal salts. The extent of the area varies considerably depending on factors such as winds, topography and vegetation. For sheltered areas, such as occur around Port Phillip Bay, it extends from about 100m from the beach to about 1km inland, but for most ocean front areas, such as occur along the south-western corner of Western Australia, the south-eastern coast of South Australia, the New South Wales and New Zealand coasts and the surf beach regions of Queensland, it generally extends from about 1km from the coast to about 10km inland and to about 50km inland in exceptional circumstances, depending on the conditions.

Much of Auckland, Wellington, Perth, the Gold Coast, Wollongong, Sydney and Newcastle are in this zone. Significant protection is essential, requiring a high performance coating system to give a long life.

(f) Severe Marine

Severe marine environments have high to very high corrosivity and will cause a one year corrosion rate of steel to be in excess of 50 microns. In Australia and New Zealand, such regions are found off-shore and on the coast. The extent to which such conditions extend inland depends on prevailing winds, extent of wave action and marine surf and land topography, but is generally from the beachfront to about 1km inland along the ocean coast. Around sheltered bays, the region extends inland about 100m. In high wind areas, this region may extend further inland. Special high performance coating systems are required in this region, and it should be recognised that salt deposition during surface preparation or coating applications will cause significant reduction in coating life. As far as possible, structures for these regions should be coated offsite.

Atmospheric classifications (c) and (d) should be considered as additive to the other classifications. Coatings selected for an industrial site in a severe marine environment in the tropics, for example, should be those which are recommended in each classification (c), (d) and (f), as far as possible. Industrial or tropical environments will dominate a moderate or mild environment however, and can be considered by themselves in such cases.

Areas of special corrosivity with high to very high corrosion rates occur underground, underwater, in splash zones and in chemical plants. For these areas, specific protection from the aggressive conditions is essential. The selection of a coating system for any of these conditions is outside the scope of this Guide. Consult your paint company or other expert.

WARNINGS ABOUT ESPECIALLY HARSH CORROSION CONDITIONS

General Warnings

Zinc is very susceptible to acid attack. Even very weak acid solutions will remove the zinc coating from steel very quickly resulting in rust forming after a very short time, often in much less than one year.

Soluble salts such as chlorides, nitrates and sulphates can form acidic salts when wet. The moisture can come from any moisture in the air, ie rain, dew, humidity, etc. In these circumstances suitable painting of the zinc coated product will dramatically increase the length of time before rust appears.

All paints will let small amounts of liquids through to the steel and after time corrosion will result. Generally the more coats and thus the thicker the paint, the longer it takes for rust to appear.

Some paints are better than others at resisting liquid penetration. Advice should be sought from your paint supplier or this company as to which is the best paint for any application that falls outside the cases listed elsewhere in this paint guide or discussed in this section.

Salt, Acid Rain, Farming, Animal Husbandry and Other Corrosion Causes

Soluble salts, such as chlorides, sulphates and nitrates deposited on steel surfaces in combination with moisture, cause accelerated corrosion of steel and zinc coated steel products. These salts are deposited by marine spray, acid rain, chemical spillage, animal urine and faeces, farm chemical over spay, aerial fertiliser and crop dusting over spray, other fallout from industrial and farm operations.

SPECIAL PRECAUTIONS need to be taken to protect steelwork that is exposed to salt contamination and is not frequently washed by rain (or regularly washed clean). Generally using paint systems suitable for protection in severe marine environments will be sufficient (see table 2). Soluble salts deposited in protected areas combine with moisture, commonly condensation in high humidity environments, to increase corrosion rates through ionic transfer or to form acids that attack the zinc. As mentioned above, accelerated corrosion can occur even if the sections are painted or powder coated.

Corrosion rates in these circumstances can be up to 4 times greater than expected. The failure mechanism requires the salts to be frequently replaced with fresh material and the soluble salt contaminated structural members to be regularly moistened. This includes areas around frequently open doors (and sometimes windows, ie any openings) in generally enclosed structures.

Some specific cases of general and accelerated corrosion contamination are:-

Salt Spray Contamination

- The most commonly known salt contaminant is salt spray from the sea, harbours, estuaries and coastal and inland salt water lakes. Advice on whether the surface being painted will be exposed to a marine or severe marine environment can be found in the "ATMOSPHERIC CLASSIFICATIONS" section earlier in this guide.

Steel components that are not regularly washed by rain or hosed down manually, in marine environments, can have an accelerated corrosion rate 4 times greater than normally exposed components. Rain or hosing washes off the soluble salts. For components in these severely corrosive areas always use paint systems recommended in this guide as suitable for severe marine environments (see Table 2).

Some typical areas of buildings that are attacked in this way are: -

- under the eaves.
- the under side of an elevated floor or verandah.
- under awnings, particularly fixed awnings.the underside of purlins or framework of
- verandahs or covered pergolas.
- the inside of open fronted farm machinery sheds.
- any steelwork close to frequently open doors and windows, or other openings.

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Accelerated Corrosion of Steelwork in Contact with Animal or Bird Urine and Faeces

Any zinc coated steelwork in contact with animal or bird urine or faeces will need painting. The paint systems recommended in this guide as suitable for severe marine environments will generally be satisfactory (see Table 2).

Even being in contact with straw or wood chip that is used to protect animals from hard floors can result in rapid corrosion. Common practice is to remove soiled and wet straw or woodchips every day, pushing the remaining old litter to the outside of stalls possibly up against galvanized steel framing, and replenishing the litter bed with fresh materials. Failure of the zinc coating can occur in as little as 12 months due to contact with contaminated litter, even though the contamination is not visible.

The need for painting can be eliminated by ensuring that any sections in direct contact with animal waste products are made from corrosion resistant materials. A common way of achieving this is to mount steel sections on concrete nib walls at least 150 mm above direct contact with the urine or faeces.

Accelerated Corrosion of the Inside of Poorly Ventilated Animal or Bird Shelters

Accelerated corrosion can occur in animal or bird sheds where dust or dirt can collect in or on purlins and girts. It is thought that gases and vapours from urine and faeces can form acids or increase corrosion rates through ionic transfer, in the humid atmosphere of closed animal sheds. The atmosphere in the sheds does not have to be highly corrosive at all times to accelerate corrosion.

The paint systems recommended in this guide as suitable for severe marine environments will generally be satisfactory (see Table 2).

Accelerated Corrosion from the Soot from Burning Sugar Cane

A farm machinery shed in Queensland showed red rust, on lightly galvanized sections (50 grams per square metre zinc coating weight), in one season. The paint systems recommended in this guide as suitable for severe marine environments will generally be satisfactory (see Table 2).

Accelerated Corrosion if the Structure is Being Regularly Dowsed with Highly Mineralised Water from Bores or Springs

Powder coated playground equipment showed red rust, in less that one year, at a north western WA sporting oval that was being irrigated every night.

The paint systems recommended in this guide as suitable for severe marine environments will generally be satisfactory (see Table 2).

Accelerated Corrosion of DuraGal Sections in contact with soil or concrete

Contact with moist acidic contaminants of any kind will cause accelerated corrosion of zinc. The point where DuraGal sections enter concrete footings or are below the surface of soil which gets wet at any time are common problem areas.

The moisture that wets the soil might be from animal urine, condensation in humid areas, wind blown spray near the sea or lakes, etc.

This problem is common enough for OneSteel to recommend that all DuraGal product/concrete junctions be painted and a barrier coat be applied to DuraGal Products that will be in contact with soil.

In frequently moist or marine environments use the systems recommended in Table 2 of this guide, for milder areas use those in Table 1.

An alternative to painting is to use epoxy or urethane compounds, tar epoxy substitutes, such as those suggested in the section on the "Protection of Bolts and Bolt Holes" in the "Recommended Paint Systems" section of this guide.

The paint should cover the DuraGal for at least 100 mm above and below the concrete junction. The concrete at the DuraGal/concrete junction should be sloped to encourage any moisture to drain away from the steel member.

To avoid contact with soil, ensure that any footings are at least 50 mm above the soil. In acid soil conditions, If there is any chance that the acid soil can splash up onto the DuraGal, the DuraGal should be painted, as above, anyway.



Easy Painting & Corrosion Protection Guide

Chemical Attack

Contact your paint manufacturer for suitable paint systems for these applications.

The paint system needs to be tailored for the precise combination of chemicals and the concentrations used. Only in this way can an effective, yet economical system be recommended

THE CORROSION LIFE OF DURAGAL

Corrosion life of Unpainted DuraGal in AS/NZS 2312 Atmospheric Environments

	Recommended Corrosion Protection System Options		
Atmospheric	Short Term	Medium Term	Long Term
Classification	2-5 Years	5-10 years	10 - 20 yrs
Mild	Suitable	Suitable	Suitable
Moderate	Suitable	Suitable	Suitable
Tropical*	Suitable	Suitable	Suitable
Industrial	Unsuitable	Unsuitable	Unsuitable
Marine	Suitable	Unsuitable	Unsuitable
Severe Marine	Unsuitable	Unsuitable	Unsuitable

* Not suitable when affected by salt spray

THE CORROSION LIFE OF DURAGAL

Corrosion Life of Unpainted DuraGal

The most economical way to use DuraGal is unpainted, touching up any welds and black steel attachments.

The corrosion life of unpainted DuraGal products will vary depending upon the exposure conditions. Both general environmental zones and local factors must be considered when evaluating corrosion life.

Some localised factors that can reduce corrosion life are: concentration of industry, fertilisers and insecticides, animal urine and faeces, abrasion or impact, condensation and exposure to wind borne salt (see previous pages for more details).

In Dry Interior and Protected Exterior Environments

These environments are generally less corrosive than the moderate classification in the following tables. Most environments are only mildly corrosive in the absence of rain, dew, humid conditions or strong liquid chemicals.

Conservatively, an adequate level of corrosion protection will be achieved if DuraGal fabrications are protected to the level set out in the appropriate part of Table 3.

In Wet or Damp Interior Environments

These environments are generally similar to tropical conditions in the following tables. For detailed advice on the coating systems to use see the appropriate part of Table 4.

In Exterior Atmospheric Environments

The table above sets out the corrosion life of unpainted DuraGal when exposed to exterior atmospheric conditions.

Typical Zinc Coating Weight on DuraGal Compared with Other Common Products

To give some guide to the corrosion life that can be expected from DuraGal, it is helpful to compare the typical weight of zinc applied to DuraGal with other common in-line galvanized structural products.

In-line Galvanized and Production Line Products		
DuraGal	100 to 160 g/m ²	
Z100 Purlins	45 to 65 g/m ²	
Sheeting, etc		
Z200	90 to 120 g/m ²	
Z275	125 to 165 g/m ²	
RHS & Pipe	300 to 600 g/m ²	

Batch Galvanized Products (From AS/NZS 4680 Table 1)							
		Minimum					
	Section	Average					
	Thickness	Coating Mass					
Hot Rolled	≤ 1.5mm	320 g/m ²					
Steel	> 1.5mm	390 g/m ²					
Structurals,	≤ 3 mm						
RHS and	> 3	500 g/m ²					
Pipe	≤ 6						
	≥ 6mm	600 g/m ²					

The thin, even hot dip zinc coating on DuraGal makes it an entirely different product to weld than batch hot dip galvanized steel. Normal welding rates are readily achievable. Advice on welding the product is available in the "DuraGal Easy Welding Guide".

Protection of the Bore of DuraGal Hollow Sections

A CIDECT investigation has shown that internal corrosion in hollow sections is not significant when they are sealed at both ends.

CIDECT is a world wide group of tube manufacturers carrying out research into the engineering performance of hollow sections and publishing the results. A series of design guides are available from the AISC.

Good fabrication techniques generally ensure the sealing of the bore of structural hollow sections. If, however, the bore is open to corrosion the bore may need protection and we offer the following suggestions: -

- Flat trapping the ends of the sections to seal off the inside.
- Seal with plugs, and if necessary, a sealing compound.
- Use internally painted DuraGal. Typically 30 microns of Zinc Phosphate primer on an AS 1627.4 class 3 blast. This product is not normally stocked and should be ordered from a mill rolling.
- Coat the bore with a corrosion protectant eg : an anti-corrosive paint; a petroleum based wax; fish oil, etc.
- Note ! The above suggestions do not eliminate the need to get "proper design advice" to meet the needs of your particular corrosion environment.

DuraGal[®]

Easy Painting & Corrosion Protection Guide WHITE RUST OR ZINC STORAGE STAIN

Avoiding White Rust or Zinc Storage Stain

DuraGal products, as well as Galtube and Tubeline Hot Dip Galvanized (HDG) are given a protective finish in the form of a zinc conversion coating and/or polymer coatings. One purpose of these coatings is to prevent the formation of white rust during packing, storage and transport.

Avoiding White Rust on DuraGal Channels, Flats and some Angles

DuraGal Profiles, (except for angles up to and including 50mm x 50mm), have been specifically treated to resist white rust by the application of a clear polymer barrier coating, typically 8 microns thick.

This coating is designed to provide packs of DuraGal Profiles with protection from white rust and atmospheric corrosion, in non-marine environments, for a period of 3 months.

If clear coated packs of DuraGal Profiles are to be stored outside for a total of more than 3 months, or if white rust has formed, the advice given below, for DuraGal hollow sections, can generally be followed with just one major modification -

Methylated spirits is the only solvent that should be used to clean clear coated DuraGal open Profiles.

Failure to follow this advice could reduce the adhesion, and thus the corrosion protection, of any additional paint coatings applied to the DuraGal sections.

Any clear coated DuraGal Profile product that has been stored out in the elements, and is going to exceed 3 months open air storage before being used, should be inspected for white rust. If white rust has formed it should be treated, dried and then stored as described in "Preventative Actions".

OneSteel cannot be held responsible for deterioration to galvanized DuraGal Profile products caused by unsuitable storage practices after the product has arrived at the customer's warehouse.

Avoiding White Rust on All DuraGal Hollow Sections and Angles 50mm x 50mm & Smaller

The packed product must be stored under clean, dry and ventilated conditions. This is especially important for smaller size hollow sections, as their physical size and pack configuration restricts natural ventilation.

Storage of packs of galvanized products under covers which restrict ventilation (eg tarps) is not recommended. Changes of temperature from day to night may cause condensation inside the bundles. This condensate will promote the forming of white rust.

Packs of product stored in the open or wet product stored anywhere will develop white rust. OneSteel's quality assurance program ensures that dry first grade product is delivered to Steel Distributors.

OneSteel cannot be held responsible for deterioration to galvanized hollow section products caused by poor transport or storage practices after the product has arrived at the customer's warehouse.

Preventative Actions

If it is necessary to store galvanized sections where they will get wet, either outside or undercover where wind driven rain or spray can enter through a leak, or an opening like a door or window, the product should be arranged so that water will easily run off and all surfaces of the sections are well ventilated. The most common way of achieving this is to stack on non-staining timbers, one end of the stack higher than the other. Each row of galvanized product must be separated by timbers, each item in each row separated by at least 5mm from the next item and open sections stored so that water cannot pool, ie for DuraGal angles, stack with the toes of the profile facing down.

A suitable non-staining timber is seasoned dressed pine. Galvanized sections should never be stored in contact with cardboard or other paper products, cinders, clinkers, unseasoned timbers, treated pine, anything even slightly acidic (pH less than 7) or very strong alkalis (pH greater than 12).

Remedial Treatment

DuraGal RHS packs, and packs of angles 50mm x 50mm and smaller, that become wet should immediately be separated. Each length should have the bulk of any water wiped off, and then be allowed to dry before being stored in a dry place or being stored as recommended in the previous section.

Very light wet storage stains (ie the surface is smooth without significant growth of oxide layer) do not reduce the protective properties of the coating and can be removed by rubbing with a rag soaked in methylated spirits.

Light white rust deposits may be removed by blasting with clean high pressure water, or careful abrasion with soft plastic scouring pads, followed by rinsing with clean water or rubbing with a kerosene or consumer grade rubbing alcohol soaked rag. Only if these methods do not work should steel wool or other harsh metallic scourers be used, as they can significantly reduce the thickness of the zinc coating and thus the corrosion protection provided.

White rust deposits that do not respond to the above methods may be removed by brush blasting, wire brushing or abrasion with a metallic scourer. The dust left on the section should be cleaned off with water or methylated spirits. The original bright, metallic galvanized surface cannot be restored by these treatments and the zinc thickness will probably be significantly reduced.

If the sections are to be painted the white rust can be partially removed by the appropriate method above and then completely removed by chemical treatment. Suggested solutions are 10% acetic acid or proprietary solutions such as Deoxidine 624 by Henkel Australia Pty. Ltd. Henkel recommends a dilute solution of 1 part Deoxidine 624 to 4 parts water.

WARNING !!! The above chemically treated surfaces must be chemically neutralised or rinsed to remove any traces of acid, and then painted immediately, certainly within 4 hours. In particular acetic acid treated surfaces must be carefully rinsed and dried to ensure no soluble salts are left on the surface. Soluble salts reduce paint adhesion.

If removing the white rust reduces the zinc thickness below the specified minimum, the coating can be repaired by application of two coats of zinc rich paint complying with AS2204 to a total thickness of 100 microns. When colour matching is required, Galmet DuraGal Silver paint may be applied over the zinc rich paint.

Warning to Powder Coaters

Bubbling of the coating may occur when trying to powder coat galvanized sections that have had heavy white rust removed.

This can occur at any spot where you can feel surface roughness after the white rust has been removed. There may be a black spot in the bottom of these holes.

This problem can often be overcome by wiping with a weak phosphoric acid solution and then rinsing in clean water and drying before coating.

PAINTING HINTS

SURFACE PREPARATION

A clean, dry surface is essential for satisfactory paint performance.

Degreasing

The preferred method of degreasing is to use aqueous mild alkaline detergent cleaners with high pressure water cleaners, water jetting or scrubbing equipment, followed by water rinsing.

The most common method of degreasing is by solvent washing, followed by wiping dry with clean rags.

Warning ! - Most solvents are not suitable for clear coated profiles. The recommended solvent for all DuraGal products, open profiles and hollow sections, is methylated spirits.

Wiping the tube or profile clean, after solvent washing, is critical. If this is not carried out thoroughly, solvent washing will simply spread any contamination over a wider area. This method is not seen as suitable for large areas (see clause 5.2 of AS/NZS 2312 and AS 1627.1).

Etching The Zinc Surface

If cold phosphating solutions are used, they can damage the zinc coating if left on too long. They should be thoroughly rinsed off with clean water to remove all acidic residues. These preparations are generally not recommended for use on DuraGal.

Note: Clear coated DuraGal Profiles should not be etch primed as this may affect the polymer coat, reducing resistance to corrosion and adhesion of the clear coat to the zinc coating. See table 3 (page 16) for basic primers.

Paint Preparation

Carefully read the Paint Manufacturer's "Instructions for Use" usually found on the paint can label or product data sheet.

Paint should be thoroughly mixed before use; either by paddle stirring or by "boxing" from one can to another. Manual shaking of the can is inadequate.

If thinning is necessary, use no more than the maximum recommended quantity of the Paint

Manufacturer's approved solvent. Over thinning is to be avoided as it lowers the solids content of the paint, reduces coating thickness and may produce runs and sags. The above applies particularly to spray application.

Two pack paint systems must be carefully mixed in the ratio specified by the Paint Manufacturer. Minor variations from the recommended component ratio can destroy the effectiveness of the coating.

Painting Conditions

Ideally, painting should be carried out on warm, dry days without frost or heavy dews. As a general rule paints should not be applied when the temperature of the surface to be painted is below 10° C or above 50° C.

In hot weather painting on the surfaces exposed directly to the sun may result in patchiness or blistering because of rapid loss of solvent. Painting, particularly of latex paints, should not be carried out in very cold conditions as poor film formation may result.

Conditions of very high humidity (above 85%) can cause "blooming" (whitening) of solvent based paints and poor adhesion of etch primers.

Paint Application

Film thickness for each coat of paint should be as recommended by the Paint Manufacturer.

Excessively thick or thin coats can lead to poor paint performance.

Paint Manufacturers' recommendations regarding drying times between coats should be adhered to.

The heavy zinc powder in zinc rich paints will rapidly settle out and frequent stirring is necessary.

Two pack materials should not be used past the recommended pot life. Also, mixed paint that has exceeded its pot life should not be added to freshly mixed material.

Quick Drying Finishes

The fabricator of steel products often has the need for a quick "dry to handle", one coat paint finish to decorate his product. The following list of Industrial Paints is offered as a basis for discussion with the Paint Manufacturer who can advise on the suitability of particular products.

Very Quick Drying Spraying Enamels

Dry to Handle 20-30 minutes.

Solvent Based Acrylic Clear Coatings

Prevent dulling of the bright DuraGal finish. Quick drying.

Hammer and Textured Finishes

One coat Quick Drying. Camouflage surface imperfections and minor damage.

Very Quick Dry Lacquers

Rapidly develop hard dry surface.

Recommended Paint Systems

The following tables (pages 15 to 22) are Design and substitution tables for painting DuraGal fabrications.

The design tables set out OneSteel's recommended treatment of the DuraGal surface, welds, cut ends, drilled holes.

The substitution tables should be used if you are already painting black steel, the design tables if the substitution tables do not show a substitute for your system, if you are using a paint system over jobbing hot-dip galvanized steel or if you need to select a system for a new project.

If you think your existing system is over specified, using the design tables might be cost effective.

The tables attempt to set out water borne and solvent based systems for both brush and spray application. Economical and effective systems could not be suggested using all water borne and solvent based systems. The recommended systems contained mixed systems where necessary. In particular it was not possible to recommend a water borne system for medium and long term protection of the weld areas of DuraGal fabrications and black attachments.

Corrosion Protection For DuraGal - Powder Coating

DuraGal is a prepared surface suitable for powder coating. See the "DuraGal Powder Coating Manual" for further information.

Painting Fabrications Welded from DuraGal with Black Steel Attachments

Painting the Black Steel Attachments and welds

Black steel has a surface layer of black mill scale (a form of oxide) which promotes rusting of the steel under normal exterior conditions. Painting over mill scale gives only medium term protection at best.

For long term protection it is necessary to shot or grit blast the steel down to a clean bright metal surface free from mill scale before applying the selected paint system.

It is of interest to note that an essential part of the DuraGal zinc coating process is that the steel surface is shot blasted and chemically cleaned to a surface equivalent to AS 1627.4 class 3, before the zinc coating is applied. DuraGal, as received by the user, is therefore a zinc protected, mill scale free steel surface immediately suitable for coating up to the level of Long Term Protection to AS/NZS 2312.

In considering the painting of a DuraGal/Black Steel composite fabrication, the decision regarding the performance required of the black steel component is therefore important.

Where the Black Steel component is a small part of the surface area of the total fabrication, say less than 5%, it may be treated the same as the weld area in a DuraGal to DuraGal fabrication.

If the black steel component is 5% of the total surface area or larger it should shot blast to AS 1627.4 Class $2^{1}/_{2}$ and then painted with a system from AS/NZS 2312 suitable for the design level of protection required and, If the DuraGal component of the fabrication is to be painted as well, compatible with the DuraGal paint system selected.

Only if it is not necessary, from a corrosion protection stand point, to paint the DuraGal component of the fabrication should consideration be given to not blasting the black steel to AS 1627.4 class $2^{1}/_{2}$, and then only if the fabrication is to be exposed to the lower end of the "corrosion environment / design life to first maintenance" spectrum.

It could be more cost effective to use attachments that have been hot dip galvanized, zinc plated or blasted and zinc rich primed, rather than black steel attachments.

Protection of Bolts and Bolt Holes

It is preferred that all bolts, nuts and washers used with DuraGal Profiles and hollow Sections should be hot dip Galvanized. Electroplated bolts, nuts and washers are available but AS 2312 says that they are rarely appropriate for exterior exposure conditions.

OneSteel recommends that the bolt holes be treated to stop rusting of the walls of the holes in the assembled joints. In all cases it is preferable that the bare walls of the holes be protected by a system appropriate for the exposure conditions to be experienced. The following are the recommended protection for:

a) Corrosion Environments Similar to Atmospheric Corrosion Classifications up to and Including AS/NZS 2312;1994 Tropical

It is preferable to prime the surface of the hole, but at the very least, assemble the joint with silicone sealant, in the hole, on the bolt and under both washers.

b) Corrosion Environments Similar to Atmospheric Corrosion Classifications up to and Including AS/NZS 2312;1994 Severe Marine

It is preferable to prime the surface of the hole using epoxy primers, but at the very least, assemble the joint with a corrosion resistant epoxy or urethane sealant, in the hole, on the bolt, under both washers and over the outside of the exposed fasteners.

The sealant used must be suitable to replace a tar epoxy system and last 25 years in a severe marine environment. Its features should include , but not be limited to the following :-

- Must provide excellent corrosion resistance.
- Provide long lasting flexibility with elasticity and impact resistance.
- Provide excellent adhesion.
- Enable exceptional hold up on edges, corners, welds, bolts, rivets, etc.

TABLE 1 **CORROSION PROTECTION FOR DURAGAL - DESIGN GUIDE**

Architectural Domestic and Factory Manufactured Items

For Atmospheric Classifications up	Part	Recommended Corrosion Protection Options Suitable for Atmospheric Classifications up to and Including AS/NZS 2312:1994 Tropical					
to & Including Tropical	to be Painted	Short Term Exterior Protection (from 2 to 5 years)	PRN *	Medium Term Exterior Protection (from 5 to 10 years)	PRN *	Long Term Exterior Protection (from 10 to 20 years)	PRN *
Using	Finish ^{Body &} Weld	Unpainted DuraGal		Unpainted DuraGal		Unpainted DuraGal	
Water- Borne Coatings Where Suitable	Weld Pre- Prep	Hand or power tool clean to class 1 or abrasive blast to class1. ¹ Water borne Acrylic latex zinc phosphate primer (35 to 50 microns DFT). 2 coats of acrylic latex gloss (each coat 35 to 50 microns DFT). ⁵	11 21	 Hand or power tool clean to class 1 or abrasive blast to class 1.¹ Epoxy mastic (150 to 200 micron DFT).⁵ <u>or</u> Power tool clean to class 2, or abrasive blast to class 2¹/₂¹ Chlorinated rubber zinc phos. primer (65 to 85 microns DFT). 2 coats of chlorinated rubber gloss (each coat 35 to 50 microns DFT).⁵ 	32 ? 25	Hand or power tool clean to class 1 or abrasive blast to class 1. ¹ Epoxy mastic (200 to 250 micron DFT). ^{4,5}	32
Using Mainly	Finish ^{Body &} Weld	Unpainted DuraGal		Unpainted DuraGal		Unpainted DuraGal	
Solvent Based _{Coatings}	Weld Pre- Prep	Hand or power tool clean to class 1 or abrasive blast to class1. ¹ Galvanized iron primer (30microns DFT). 2 coats of alkyd gloss (each coat 35 to 50 microns DFT). ⁵ or Epoxy zinc phosphate primer (35 to 50 microns DFT). 2 coats of Galmet DuraGal Silver Paint (each 35 to 50 Microns DET).	5 20 6	Hand or power tool clean to class 1 or abrasive blast to class 1. ¹ Epoxy mastic (150 to 200 micron DFT). ⁵ Or Power tool clean to class 2, or abrasive blast to class 2 ¹ / ₂ ¹ Chlorinated rubber zinc phos. primer (35 to 50 microns DFT). 2 coats of chlorinated rubber gloss (each coat 35 to 50 microns DFT). ⁵	32 ? 25	Hand or power tool clean to class 1 or abrasive blast to class 1. ¹ Epoxy mastic (200 to 250 micron DFT). ^{4,5}	32

Notes!! Additional protection is required for DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.

? There is no PRN number in AS/NZS 2312 for a chlorinated rubber primer.

1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation

* PRN - paint reference number (see Appendix C of AS/NZS 2312 :1994.) 4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.

5 To colur match the DuraGal finish overcoat with an aluminium pigmented paint. Galmet DuraGal Silver is generally suitable.
TABLE 2

CORROSION PROTECTION FOR DURAGAL - DESIGN GUIDE

Architectural Domestic and Factory Manufactured Items

For Atmospheric Classifications up	Part	Recommended Corrosion AS/NZS	Recommended Corrosion Protection Options Suitable for Atmospheric Classifications up to and Including AS/NZS 2312:1994 Marine (Those suitable for Severe Marine denoted ²)										
to & Including Marine (Some suitable for severe marine)	to be Painted	Short Term Exterior Protection (from 2 to 5 years)	PRN *	Medium Term Exterior Protection (from 5 to 10 years)	PRN *	Long Term Exterior Protection (from 10 to 20 years)	PRN *						
^{Using} Water- Borne	Finish Body & Weld	Clean & degrease with mild alkaline degreaser or methylated spirits. 2 coats of flat, satin or gloss acrylic self priming emulsion (each 30 to 40 microns DFT). ³ 2 nd coat optional depending on location and colour	21	Clean & degrease with mild alkaline degreaser or methylated spirits. Water bourne 2-pack epoxy ZP primer (35 to 50 microns DFT). MIO water bourne epoxy (100 To 125 microns DFT). If a finish colour is required, 1or 2 coats of a water based self priming acrylic (each 30 to 40 microns DFT). ²	21	 Clean & degrease with mild alkaline degreaser or methylated spirits. Water bourne 2-pack epoxy ZP primer (35 to 50 microns DFT). MIO water bourne epoxy (100 To 125 microns DFT). If a finish colour is required, 1or 2 coats of a water based self priming acrylic (each 30 to 40 microns DFT). 	6 13 21						
Coatings Where Suitable	Weld Pre- Prep	Hand or power tool clean to class 1 or abrasive blast to class 1. ¹ Epoxy mastic (150 to 200 micron DFT). ²	32	Hand or power tool clean to class 1 or abrasive blast to class 1. ¹ Epoxy mastic (150 to 200 micron DFT). ²	32	Hand or power tool clean to class 1 or abrasive blast to class 1. ¹ Epoxy mastic. (150 to 200 micron DFT)	32						
Using Mainly Solvent Based Coatings	Finish Body & Weld	Clean & degrease with mild alkaline degreaser or methylated spirits. Galvanized iron primer (30 microns DFT). 2 coats of alkyd enamel (each 35 to 50 microns DFT). ² 2 nd coat optional depending on location and colour	10 20	Clean & degrease with mild alkaline degreaser or methylated spirits. 2-pack epoxy system (35 to 50 microns DFT). 2 coats of a 2-pack acrylic or polyurethane gloss (each 40 to 50 microns DFT). ²	6 33 or 26	 Clean & degrease with mild alkaline degreaser or methylated spirits. 2-pack epoxy system (125 to 150 microns DFT). 2 coats of a 2-pack acrylic or polyurethane gloss (each 40 to 50 microns DFT). ² (check with your paint supplier for suitability of their system over DuraGal & DuraGal Profile surfaces.) 	6 33 or 26						
	Weld Pre- Prep	Hand or power tool clean to class 1 or abrasive blast to class 1. ¹ Epoxy mastic (150 to 200 micron DFT). ²	32	Hand or power tool clean to class 1 or abrasive blast to class 1. ¹ Epoxy mastic (150 to 200 micron DFT). ²	32	Hand or power tool clean to class 1 or abrasive blast to class 1. ¹ Epoxy mastic (150 to 200 micron DFT). $\frac{\text{or}}{\text{Abrasive blast to class 2}^{1}/_{2}^{1}$ Epoxy mastic (225 to 300 microns DFT). ^{2,4}	32 32						

Notes !! Additional protection is required for DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.

- * PRN paint reference number (see Appendix C of AS/NZS 2312 :1994.)
- ? There is no PRN number in AS/NZS 2312 for a chlorinated rubber primer.
- 1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.

3 Not suitable for severe marine exposure to AS/NZS 2312. To be acceptable for this exposure level a water based acrylic latex (galvanized iron) primer should be applied prior to the finish coats.

- 2 These systems suitable for use in AS/NZS 2312:1994 Severe Marine atmospheric classisifications (see table 3.1 AS/ NZS 2312)
- 4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.

TABLE 3 CORROSION PROTECTION FOR DURAGAL - DESIGN GUIDE

	Part to be Painted	Point of Sale Decoration for Factory Manufactured Items	PRN *	Protection for Dry Mild Internal Environments in Buildings	PRN *
Using Water-Borne	Finish Body & Weld	Clean & degrease with mild alkaline degreaser or methylated spirits. 2 coats of acrylic latex gloss. (each coat 35 to 50 microns DFT)	21	Unpainted DuraGal	
Coatings Where Suitable	Weld Pre- Prep	Nothing or dress to improve appearance. or Hand or power tool clean to class 1 or abrasive blast to class1. ¹ Water borne Acrylic latex zinc phos. primer . (35 to 50 microns DFT)	11	Hand or power tool clean to class 1 or abrasive blast to class1. ¹ Water borne Acrylic latex zinc phosphate primer . (35 to 50 microns DFT) 2 coats of acrylic latex gloss. (each coat 35 to 50 microns DFT) ⁵	11 21
Using Mainly Solvent	Finish Body & Weld	Clean & degrease with mild alkaline degreaser or methylated spirits. Galvanized iron primer (30 microns DFT) 2 coats of alkyd enamel gloss. (each coat 35 to 50 microns DFT)	20	Unpainted DuraGal	
Based Coatings	Weld Pre- Prep	Nothing or dress to improve appearance. or Hand or power tool clean to class 1 or abrasive blast to class 1. ¹		Hand or power tool clean to class 1 or abrasive blast to class1. ¹ Galvanized iron primer (30 microns DFT) 2 coats of alkyd enamel gloss. (each coat 35 to 50 microns DFT) ⁵	5 20

TABLE 4 CORROSION PROTECTION FOR DURAGAL - DESIGN GUIDE

	Part to	Protection for Wet (no salt, ch	t Internal Environ	ments in Buildings chemicals)	Protection for Harsh Wet Internal Environments in Buildings (Atmosphere includes salt, chlorine &/or other acidic chemicals)					
	be Painted	Short Term Protection (2 to 5 years)	Medium Term Protection (5 to 10 years)	Long Term Protection (10 to 15 years)	Short Term Protection (2 to 5 years)	Medium Term Protection (5 to 10 years)	Long Term Protection (10 to 15 years)			
Using Water- Borne	Finish Body & Weld									
Coatings Where Suitable	Weld Pre- Prep	To achieve suita Use the AS/NZS 2	able protection for t 312 recommended	his environment, I corrosion systems	To achieve suitable protection for this environment, Use the AS/NZS 2312 recommended corrosion systems					
Using Mainly Solvent	Finish Body & Weld	suitable for atmos	spheric classificatio see Table 1	ns up to Tropical -	suitable for atmospheric classifications up to Severe Marine - see Table 2					
Based Coatings	Weld Pre- Prep									

Notes!! Additional protection is required for DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.

* PRN - paint reference number (see Appendix C of AS/NZS 2312 :1994.) ? There is no PRN number in AS/NZS 2312 for a chlorinated rubber primer.

1994.) 4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat
 primer. should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.

1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation

5 To colur match the DuraGal finish overcoat with an aluminium pigmented paint. Galmet DuraGal Silver is generally suitable.

Selected Paint System for	Black	Steel		Recommended Equivalent Corros	osion	
	PRN *	AS 2312 System Ref. No.	Part to be Painted	Protection System for DuraGal	PRN *	
Hand or Power Tool Clean, Class 1. ¹			Body	Unpainted DuraGal ⁴		
Alkyd Primer (35 to 50 microns DFT)	5	SP1 - A	Weld	Hand or power tool clean, class 1. ¹ Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT) ^{3,4}	?,7	
Hand or Power Tool Clean, Class 1.1			Body	Unpainted DuraGal ⁴		
Epoxy Mastic (100 to 125 microns DFT)	32	SP3 - A	Weld	Hand or Power Tool Clean, Class 1. ¹ Epoxy Mastic (150 to 200 microns DFT) ^{3,4}	32	
Hand or Power Tool Clean, Class 1. ¹ Alkyd Primer (35 to 50 microns DFT) Alkyd U/coat (35 to 50 microns DFT) Alkyd Gloss (35 to 50 microns DFT)	5 18 20	SP4 - A	Body	DuraGal, Solvent Cleaned with Clean Rag Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT) Alkyd Gloss (35 to 50 microns DFT)	?,7 20	
, , , , , , , , , , , , , , , , , , ,			Weld	Hand or Power Tool Clean, Class 1. ¹ Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT)	?,7	
				Alkyd Undercoat (35 to 50 microns DFT) Alkyd Gloss (35 to 50 microns DFT)	18 20	
Hand or Power Tool Clean, Class 1. ¹ Alkyd Primer (35 to 50 microns DFT) 2 coats of Alkyd Gloss (each 35 to 50 microns DFT)	5 20 20	SP5 - A	Body	DuraGal, Solvent Cleaned with Clean Rag Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT) Alkyd Gloss (35 to 50 microns DFT) ^{3,}	?,7 20	
			Weld	Hand or Power Tool Clean, Class 1. ¹ Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT) 2 Coats of Alkyd Gloss (Each 35 to 50 microns DFT)	?,7 20	
Hand or Power Tool Clean, Class 1. ¹ Alkyd Primer (35 to 50 microns DFT) 2 Coats of Acrylic Gloss Latex (Each 35 to 50 microns DFT)	5 21	SP5 - D	Body	DuraGal, Solvent Cleaned with Clean Rag Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT 2 Coats of Acrylic Latex Gloss (Each 35 to 50	?,7 21	
			Weld	Microns DF1) Hand or Power Tool Clean, Class 1. ¹ Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT) 2 Coats of Acrylic Latex Gloss (Each 35 to 50	?,7 21	
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Inorganic Zinc Silicate (65 to 75 Microns DET)	1	MP1 - A	Body	DuraGal, Solvent Cleaned with Clean Rag Epoxy Mastic (150 to 200 microns DFT)	32	
,			Weld	Hand or Power Tool Clean, Class 1. ¹ Epoxy Mastic (200 to 250 microns DFT) ⁵	32	

Notes !! Additional protection is required for Unpainted DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.

- * PRN paint reference number (see Appendix C of AS/NZS 2312 :1994.)
- ? There is no PRN number in AS/NZS 2312 for a Chlorinated rubber primer.
- 1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.
- 2 If the weld area needs to be colour matched with the DuraGal finish, use an aluminium pigmented coating of the paint type listed. Galmet DuraGal Silver paint is generally suitable as an additional coat applied to the above systems.
- 3 Where a decorative finish is required on the Duragal body, apply one or two coats of gloss acrylic latex. Where maximum resistance to wear, abrasion or general chemical attack is required apply finish coats of two pack polyurethane. DuraGal must not be "white rusted" and will also require solvent cleaning with clean rags before application of the decorative coating. "White rust " must be mechanically or chemically removed before solvent cleaning and painting. See the DuraGal painting guide for more information on surface preparation.

Continued

Selected Paint System for Black	<pre> Stee </pre>			Recommended Equivalent	
	PRN *	AS 2312 System Ref. No.	Part to be Painted	Corrosion Protection System for DuraGal	PRN *
Abrasive Blast, Class 2 ¹ / ₂ . ¹ High-Build Epoxy (200 to 250 Microns DFT)	13	MP1 - C	Body Weld	DuraGal, Solvent Cleaned with Clean Rag High-Build Epoxy (200 to 250 Microns DFT) Hand or Power Tool Clean, Class 1. ¹ Epoxy Mastic (150 to 200 microns DFT)	13 32
				High-Build Epoxy (200 to 250 Microns DFT)	13
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Inorganic Zinc Silicate (65 to 75 microns DFT) 2 Coats of Acrylic Latex (Each 35 to 50	1 21	MP2 - A	Body	DuraGal, Solvent Cleaned with Clean Rag Epoxy Mastic (150 to 200 microns DFT) 2 Coats of Acrylic Latex (Each 35 to 50 Microns DFT)	32 21
Microns DFT)			Weld	Hand or Power Tool Clean, Class 1. ¹ Epoxy Mastic (200 to 250 microns DFT) ⁵ 2 Coats of Acrylic Latex (Each 35 to 50 Microns DFT)	32 21
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Inorganic Zinc Silicate (65 to 75 Microns DFT)	1	MP3 - A	Body	DuraGal, Solvent Cleaned with Clean Rag Epoxy Mastic (150 to 200 microns DFT) Alkyd Gloss (35 to 50 Microns DFT)	32 20
Vinyl Primer (25 to 35 Microns DFT) Alkyd Gloss (35 to 50 Microns DFT)	7 20		Weld	Hand or Power Tool Clean, Class 1. ¹ Epoxy mastic (200 to 250 microns DFT) ⁵ Alkyd Gloss (35 to 50 Microns DFT)	32 20
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Inorganic Zinc Silicate (65 to 75 microns DFT) High-Build Epoxy (100 to 125 Microns DFT)	1 13	MP5 - A	Body	DuraGal, Solvent Cleaned with Clean Rag Epoxy Mastic (150 to 200 microns DFT) High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Epoxy Gloss (40 to 50 Microns DFT)	32 13 24
Two-Pack Epoxy Gloss (40 to 50 Microns DFT)	24		Weld	Hand or Power Tool Clean, Class 1. ¹ Epoxy Mastic (200 to 250 microns DFT) ⁵ High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Epoxy Gloss (40 to 50 Microns DFT)	32 13 24
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Inorganic Zinc Silicate (65 to 75 microns DFT) High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Acrylic Gloss (40 to 50 Microns	1 13 33	MP5 - B	Body	DuraGal, Solvent Cleaned with Clean Rag Epoxy Mastic (150 to 200 microns DFT) High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Acrylic Gloss (40 to 50 Microns DFT)	32 13 33
DFT)			Weld	Hand or Power Tool Clean, Class 1. ¹ Epoxy Mastic (200 to 250 microns DFT) ⁵ High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Acrylic Gloss (40 to 50 Microns DFT)	32 13 33

Notes!! Additional protection is required for Unpainted DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.

- * PRN paint reference number (see Appendix C of AS/NZS 2312 :1994.)
- ? There is no PRN number in AS/NZS 2312 for a Chlorinated rubber primer.

1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.

2 If the weld area needs to be colour matched with the DuraGal finish, use an aluminium pigmented coating of the paint type listed. Galmet DuraGal Silver paint is generally suitable as an additional coat applied to the above systems.

3 Where a decorative finish is required on the Duragal body, apply one or two coats of gloss acrylic latex. Where maximum resistance to wear, abrasion or general chemical attack is required apply finish coats of two pack polyurethane. DuraGal must not be "white rusted" and will also require solvent cleaning with clean rags before application of the decorative coating. "White rust " must be mechanically or chemically removed before solvent cleaning and painting. See the DuraGal painting guide for more information on surface preparation.

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Selected Paint Syster	n for	Black		Recommended Equivalent Corrosion				
Steel	PRN	AS 2312	Part to	Protection System for DuraGal	PRN			
	*	System Ref No	be Painted		*			
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Inorganic Zinc Silicate (65 to 75 microns DFT)	1	MDC D	Body	DuraGal, Solvent Cleaned with Clean Rag Epoxy Mastic (150 to 200 microns DFT) High-Build Epoxy (100 to 125 Microns DFT)	32 13			
Microns DFT) Two-Pack Polyurethane Gloss (40 to 50 Microns DFT)	13 26	MP5 - D	Weld	Hand or Power Tool Clean, Class 1. 1 Epoxy Mastic (200 to 250 microns DFT) 5 High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Polyurethane Gloss (40 to 50 Microns DFT)	26 32 13 26			
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Two-Pack Epoxy Primer (35 to 50 microns DFT)	6	MP5 - I	Body	DuraGal, Solvent Cleaned with Clean Rag High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Epoxy Gloss (40 to 50 Microns DFT)	13 24			
High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Epoxy Gloss (40 to 50 Microns DFT)	13 24		Weld	Hand or Power Tool Clean, Class 1. ¹ Epoxy mastic (150 to 200 microns DFT) High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Epoxy Gloss (40 to 50 Microns DFT)	32 13 24			
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Two-Pack Epoxy Primer (35 to 50 microns DFT)	6	MP5 - J	Body	DuraGal, Solvent Cleaned with Clean Rag High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Acrylic Gloss (40 to 50 Microns DFT)	13 33			
High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Acrylic Gloss (40 to 50 Microns DFT)	13 33		Weld	Hand or Power Tool Clean, Class 1. ¹ Epoxy mastic (150 to 200 microns DFT) High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Acrylic Gloss (40 to 50 Microns DFT)	32 13 33			
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Two-Pack Epoxy Primer (35 to 50 microns DFT)	6	MP5 - K	Body	DuraGal, Solvent Cleaned with Clean Rag High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Polyurethane Gloss (40 to 50 Microns DFT)	13 26			
High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Polyurethane Gloss (40 to 50 Microns DFT)	13 26		Weld	Hand or Power Tool Clean, Class 1. ¹ Epoxy mastic (150 to 200 microns DFT) High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Polyurethane Gloss (40 to 50 Microns DFT)	32 13 26			
Hand or Power Tool Clean, Class 1, or abrasive Blast Class 1. ¹		MP8 - A	Body	DuraGal, Solvent Cleaned with Clean Rag Epoxy Mastic (150 to 200 microns DFT)	32			
Epoxy Mastic (125 to 175 microns DFT)	32		Weld	Hand or Power Tool Clean, Class 1. ¹ Epoxy Mastic (150 to 200 microns DFT)	32			

Notes !! Additional protection is required for Unpainted DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.

- * PRN paint reference number (see Appendix C of AS/NZS 2312 :1994.)
- ? There is no PRN number in AS/NZS 2312 for a Chlorinated rubber primer.

1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.

2 If the weld area needs to be colour matched with the DuraGal finish, use an aluminium pigmented coating of the paint type listed. Galmet DuraGal Silver paint is generally suitable as an additional coat applied to the above systems.

3 Where a decorative finish is required on the Duragal body, apply one or two coats of gloss acrylic latex. Where maximum resistance to wear, abrasion or general chemical attack is required apply finish coats of two pack polyurethane. DuraGal must not be "white rusted" and will also require solvent cleaning with clean rags before application of the decorative coating. "White rust " must be mechanically or chemically removed before solvent cleaning and painting. See the DuraGal painting guide for more information on surface preparation.

Continued

Selected Paint Syster	m for	Black		Recommended Equivalent Corrosion				
Steel	PRN	AS 2312	Part to	Protection System for DuraGal	PRN			
	*	System	be	2	*			
		Ref. No.	Painted					
Abrasive Blast, Class 2 ¹ / ₂ . ¹			Body	DuraGal, Solvent Cleaned with Clean Rag				
Inorganic Zinc Silicate (65 to	1			Epoxy Mastic (150 to 200 microns DFT)	32			
75 microns DFT)				High-Build Epoxy (125 to 150 Microns DFT)	13			
High-Build Epoxy (125 to 150	13	MP9 - A	Weld	Hand or Power Tool Clean, Class 1.				
Microns DFI)				Epoxy Mastic (200 to 250 microns DFT)	32			
				High-Build Epoxy (125 to 150 Microns DFT)	13			
Abrasive Blast, Class 2 /2.			Body	DuraGal, Solvent Cleaned with Clean Rag				
Inorganic Zinc Silicate (70 to	1			Epoxy Mastic (150 to 200 microns DFT)	32			
85 microns DF1)	40	LP1 - A		2 coats of High-Build Epoxy (Each 250 to 300 Microns	13			
2 Coats of High-Build Epoxy	13		14/-1-1					
(Each 100 to 125 Microns			Weld	Class 2 / ₂ Blast the Weld	22			
DFT)				Epoxy Mastic (200 to 250 microns DFT)	3∠ 12			
				2 coats of High-Build Epoxy (Each 100 to 125 milcrons	13			
Abreative Pleast Clease 2 ¹ / or			Dealer	DFT)				
Abrasive Blast, Class 2 /2 01			воау	DuraGal, Solvent Cleaned with Clean Rag	12			
Two Dock Epoxy Primor (65	6			Z COALS OF HIGH-DUILU EPOXY / WILC (EACH TOO TO 125 Mioropa DET)	15			
to 75 Microps DET)	U	I D1 - I	Wold	Close $2^{1/2}$ Plast the Weld ¹				
2 Costs of High-Build Epoxy /	13		weiu	Enovy Mastic (150 to 200 microns DET)	32			
MIO (Each 100 to 125	15			2 Coats of High-Build Epoxy / MIO (Each 100 to 125	13			
Microns DFT)				Microns DET)	10			
Abrasive Blast Class $2^{1}/_{2}$			Body	DuraGal, Solvent Cleaned with Clean Bag				
Inorganic Zinc Silicate (70 to	1		Bouy	Epoxy Mastic (150 to 200 microns DET)	32			
85 microns DFT)				High-Build Epoxy / MIO (175 to 200 Microns DFT)	13			
High-Build Epoxy / MIO (175	13	LP2 - A	Weld	Class $2^{1}/_{2}$ Blast the Weld ¹				
to 200 Microns DFT)			mona	Epoxy Mastic (200 to 250 microns DFT) ⁵	32			
,				High-Build Epoxy / MIO (175 to 200 Microns DFT)	13			
Abrasive Blast, Class $2^{1}/_{2}$, ¹			Body	DuraGal, Solvent Cleaned with Clean Rag				
Inorganic Zinc Silicate (70 to	1		Douy	Epoxy Mastic (150 to 200 microns DFT)	32			
85 microns DFT)				High-Build Epoxy (175 to 200 Microns DFT)	13			
High-Build Epoxy (175 to 200	13	LP2 - C	Weld	Class 2 ¹ / ₂ Blast the Weld ¹				
Microns DFT)				Epoxy Mastic (200 to 250 microns DFT) ⁵	32			
, , , , , , , , , , , , , , , , , , ,				High-Build Epoxy (175 to 200 Microns DFT)	13			

Notes !! Additional protection is required for Unpainted DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.

- * PRN paint reference number (see Appendix C of AS/NZS 2312 :1994.)
- ? There is no PRN number in AS/NZS 2312 for a Chlorinated rubber primer.
- 1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.
- 2 If the weld area needs to be colour matched with the DuraGal finish, use an aluminium pigmented coating of the paint type listed.
- Galmet DuraGal Silver paint is generally suitable as an additional coat applied to the above systems . 3 Where a decorative finish is required on the Duragal body, apply one or two coats of gloss acrylic latex. Where maximum resistance to wear, abrasion or general chemical attack is required apply finish coats of two pack polyurethane. DuraGal must not be "white rusted" and will also require solvent cleaning with clean rags before application of the decorative coating. "White rust " must be mechanically or chemically removed before solvent cleaning and painting. See the DuraGal painting guide for more information on surface preparation.

Continued

Selected Paint System	for B	lack		Recommended Equivalent Corrosio	n
Steel	PRN *	AS 2312 System Ref. No.	Part to be Painted	Protection System for DuraGal	PRN *
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Inorganic Zinc Silicate (70 to 85 microns DFT) High-Build Epoxy (125 to 150	1 13	LP4 - A	Body	DuraGal, Solvent Cleaned with Clean Rag Epoxy Mastic (150 to 200 microns DFT) High-Build Epoxy (150 to 200 Microns DFT) Acrylic Latex (35 to 50 Microns DFT)	32 13 21
Microns DFT) Acrylic Latex (35 to 50 Microns DFT)	21		Weld	Class 2 ¹ / ₂ Blast the Weld ¹ Epoxy Mastic (200 to 250 microns DFT) ⁵ High-Build Epoxy (150 to 200 Microns DFT) Acrylic Latex (35 to 50 Microns DFT)	32 13 21
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Inorganic Zinc Silicate (70 to 85 microns DFT) High-Build Epoxy (150 to 200	1	LP6 - A	Body	DuraGal, Solvent Cleaned with Clean Rag Epoxy Mastic (150 to 200 microns DFT) High-Build Epoxy (150 to 200 Microns DFT) Two-Pack Acrylic Gloss (40 to 50 Microns DFT)	32 13 33
Microns DFT) Two-Pack Acrylic Gloss (40 to 50 Microns DFT)	33		Weld	Class 2 ¹ / ₂ Blast the Weld ¹ Epoxy Mastic (200 to 250 microns DFT) ⁵ High-Build Epoxy (150 to 200 Microns DFT) Two-Pack Acrylic Gloss (40 to 50 Microns DFT)	32 13 33
Abrasive Blast, Class 2 ¹ / ₂ . ¹ Inorganic Zinc Silicate (70 to 85 microns DFT) High-Build Epoxy (150 to 200	1 13	LP6 - B	Body	DuraGal, Solvent Cleaned with Clean Rag Epoxy Mastic (150 to 200 microns DFT) High-Build Epoxy (150 to 200 Microns DFT) Two-Pack Polyurethane Gloss (40 to 50 Microns DFT)	32 13 26
Microns DFT) Two-Pack Polyurethane Gloss (40 to 50 Microns DFT)	26		Weld	Class 2 ¹ / ₂ Blast the Weld ¹ Epoxy Mastic (200 to 250 microns DFT) ⁵ High-Build Epoxy (150 to 200 Microns DFT) Two-Pack Polyurethane Gloss (40 to 50 Microns DFT)	32 13 26

Notes !! Additional protection is required for Unpainted DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.

- * PRN paint reference number (see Appendix C of AS/NZS 2312 :1994.)
- ? There is no PRN number in AS/NZS 2312 for a Chlorinated rubber primer.
- 1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.

2 If the weld area needs to be colour matched with the DuraGal finish, use an aluminium pigmented coating of the paint type listed. Galmet DuraGal Silver paint is generally suitable as an additional coat applied to the above systems.

- 3 Where a decorative finish is required on the Duragal body, apply one or two coats of gloss acrylic latex. Where maximum resistance to wear, abrasion or general chemical attack is required apply finish coats of two pack polyurethane. DuraGal must not be "white rusted" and will also require solvent cleaning with clean rags before application of the decorative coating. "White rust " must be mechanically or chemically removed before solvent cleaning and painting. See the DuraGal painting guide for more information on surface preparation.
- 4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.

The coatings manufacturers listed on the following pages have carried out their own evaluation for the DuraGal Family of Products[®] and the atmospheric exposure categories listed within AS/NZS 2312:1994.

For further information on the coatings listed, OneSteel recommends you contact the coatings manufacturer directly to discuss the details of your application, and obtain detailed data sheets on surface preparation, application and safe use of their products.

OneSteel Direct can assist you by providing the nearest location and contact details for the nominated coatings manufacturers listed in this guide.

OneSteel Direct

Freecall:1800 065 415Freefax:1800 800 744e-mail:onesteeldirect@onesteel.com

Akzo Nobel

Surface Preparation: Refer to manufacturer's data sheets.

Note1: For specifications refer to Akzo Nobel personnel

Note2: Please refer to manufacturer's data sheets for detailed information on safety requirements, application and paint properties.

AS/NZS 2312	Weld Coat	DFT	Primer	DFT	Intermediate Coat	DFT	Top Coat	DFT	Total film	Coating System Type
Exposure	and cut edges	micron		micron		micron	-	micron	thickness	
Mild *										
Short Term	Interzinc 352	30	Interprime 741	10	-	-	Interlac 645	50	60	Vinyl/Alkyd
Medium Term	Interzinc 352	50	Interprime 741	10	-	-	Interfine 629	75	85	Vinyl/Two pack acrylic
Long Term	Interzinc 42	50	Intergard 269	40	-	-	Interfine 629	75	115	Epoxy/Two pack acrylic
Moderate *										
Short Term	Interzinc 352	30	Interprime 741	10	Interlac 645	50	Interlac 645	50	110	Vinyl/Alkyd
Medium Term	Interzinc 352	30	Intergard 269	40	Interplus 356	75	Interfine 629	75	190	Epoxy/Two pack acrylic
Long Term	Interzinc 42	50	Intergard 269	40	Interplus 356	75	Interfine 629	75	190	Epoxy/Two pack acrylic
Tropical *										
Short Term	Interzinc 42	50	Intergard 269	40	-	-	Interfine 629	75	115	Epoxy/Two pack acrylic
Medium Term	Interzinc 42	50	Intergard 269	40	Interplus 356	75	Interfine 629	75	190	Epoxy/Two pack acrylic
Long Term	Interzinc 42	50	Intergard 269	40	Interplus 356	75	Interfine 629	75	190	Epoxy/Two pack acrylic
Industrial										
Short Term	Interzinc 42	50	Intergard 269	40	Integard 475 HS	125	Interfine 629	75	240	Epoxy/Two pack acrylic
Medium Term	Interzinc 42	50	Intergard 269	40	Integard 475 HS	125	Interfine 629	75	240	Epoxy/Two pack acrylic
Long Term	Interzinc 42	50	Intergard 269	40	Integard 475 HS	125	Interfine 629	75	240	Epoxy/Two pack acrylic
Marine										
Short Term	Interzinc 42	50	Intergard 269	40	Integard 475 HS	125	Interfine 629	75	240	Epoxy/Two pack acrylic
Medium Term	Interzinc 42	50	Intergard 269	40	Integard 475 HS	125	Interfine 629	75	240	Epoxy/Two pack acrylic
Long Term	Interzinc 42	50	Intergard 269	40	Integard 475 HS	125	Interfine 629	75	240	Epoxy/Two pack acrylic
Severe marine										
Short Term	Interzinc 52	50	Intergard 269	40	Integard 475 HS	125	Interfine 629	75	240	Epoxy/Two pack acrylic
Medium Term	Interzinc 52	50	Intergard 269	40	Integard 475 HS	200	Interfine 629	75	315	Epoxy/Two pack acrylic
Long Term	Interzinc 52	50	Intergard 269	40	Integard 475 HS	200	Interfine 629	75	315	Epoxy/Two pack acrylic
* Coatings gene	ally not required f	for these at	mospheric exposures	- refer to th	e table on page 7 of t	this auide				

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February 2001

Ameron Coatings

Surface Preparation: Refer to manufacturer's data sheets.

Note1: For additional corrosion protection of DuraGal sections without barrier polymer coating, an application of Ameron Multietch 302 may be beneficial. Contact Ameron for details. **Note2:** Please refer to manufacturer's data sheets for detailed information on safety requirements, application and paint properties.

AS/NZS 2312	Weld Coat and	DFT	First Coat	DFT	Second Coat	DFT	Third	DFT	Total DFT	Coating System Type
Exposure	cut edges	micron		micron		micron	Coat	micron	micron	
Mild *										
Short Term	Zinc rich 311	50	Amercoat 148K	50	Amercoat 5401	50	-	-	100	Galv' iron primer/Gen purpose enamel
Medium Term	Zinc rich 311	50	Amercoat 148K	50	Amercoat 5401	50	-	-	100	Galv' iron primer/Gen purpose enamel
Long Term	Zinc rich 311	50	Amercoat 148K	50	Amercoat 5401	50	-	-	100	Galv' iron primer/Gen purpose enamel
Moderate *										
Short Term	Zinc rich 311	50	Amercoat 148K	50	Amercoat 5401	100	-	-	150	Galv' iron primer/Gen purpose enamel
Medium Term	Zinc rich 311	50	Amercoat 148K	50	Amercoat 5401	100	-	-	150	Galv' iron primer/Gen purpose enamel
Long Term	Zinc rich 311	50	Ameron 783	25	Ameron Iso Free 977	75	-	-	100	Modified resin primer/Two pack acrylic
Tropical *										
Short Term	Amercoat 68K	25-50	Ameron 783	25	Ameron Iso Free 977	75	-	-	100	Modified resin primer/Two pack acrylic
Medium Term	Amercoat 68K	25-50	Amercoat CC24	75	Ameron Iso Free 977	75	-	-	150	Two pack epoxy/Two pack acrylic
Long Term	Amercoat 68K	25-50	Amercoat CC24	100-125	Ameron Iso Free 977	75	-	-	175-200	Two pack epoxy/Two pack acrylic
Industrial										
Short Term	Amercoat 68K	25-50	Amercoat CC24	75	Ameron Iso Free 977	50-75	-	-	125-150	Two pack epoxy/Two pack acrylic
Medium Term	Amercoat 68K	25-50	Amercoat CC24	75	Ameron Iso Free 977	75	-	-	150	Two pack epoxy/Two pack acrylic
Long Term	Amercoat 68K	25-50	Amercoat CC24	125	Ameron Iso Free 977	75	-	-	200	Two pack epoxy/Two pack acrylic
Marine										
Short Term	Amercoat 68K	25-50	Amercoat CC24	75	Ameron Iso Free 977	50	-	-	125	Two pack epoxy/Two pack acrylic
Medium Term	Amercoat 68K	25-50	Amercoat CC24	100	Ameron Iso Free 977	75	-	-	175	Two pack epoxy/Two pack acrylic
Long Term	Amercoat 68K	25-50	Amercoat CC24	125	Ameron Iso Free 977	75	-	-	200	Two pack epoxy/Two pack acrylic
Severe Marine										
Short Term	Amercoat 68K	25-50	Amercoat CC24	125	Ameron Iso Free 977	75	-	-	200	Two pack epoxy/Two pack acrylic
Medium Term	Amercoat 68K	25-50	Ferroclad EX316	125	Ferroclad EX316	125	-	-	250	Micaceous iron oxide epoxy
Long Term	Amercoat 68K	25-50	Ferroclad EX316	125	Ferroclad EX316	125	-	-	250	Micaceous iron oxide epoxy
* Coatings gener	ally not required for	or these a	atmospheric exposu	ıres – refer	to the table on page 7 of	f this guide				
1										

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Dulux

(Dulux, an Orica business)

Surface Preparation: Refer to manufacturer's data sheets. Any welds or cut edges should be power or hand tool cleaned to AS1627.7 Class2 **Note1:** For specifications refer to Orica personnel

Note2: Please refer to manufacturer's data sheets for detailed information on safety requirements, application and paint properties.

AS/NZS 2312	Weld Coat	DFT	First Coat	DFT	Second Coat	DFT	Third Coat	DFT	Total DFT	Coating System Type
Exposure	and cut edges	micron		micron		micron		micron	micron	
Mild *										
Short Term	Zinc Rich 1P	50-60	Gal Iron Primer	20-25	Weathershield X10	25-35	-	-	45-60	Galvanised Iron Primer/ Acrylic
Medium Term	Zinc Rich 1P	50-60	Gal Iron Primer	20-25	Weathershield X10	25-35	-	-	45-60	Galvanised Iron Primer/ Acrylic
Long Term	Zinc Rich 1P	50-60	Duremax GPE	100-150	Luxathane	50-60	-	-	150-210	Epoxy/urethane
Moderate *										
Short Term	Zinc Rich 1P	50-60	Duremax GPE	100-150	Luxathane	50-60	-	-	150-210	Epoxy/urethane
Medium Term	Zinc Rich 1P	50-60	Duremax GPE	100-150	Luxathane	50-60	-	-	150-210	Epoxy/urethane
Long Term	Zinc Rich 1P	50-60	Durebild STE	150-200	Luxathane	50-60	-	-	200-260	Epoxy/urethane
Tropical *										
Short Term	Zinc Rich 1P	50-60	Duremax GPE	100-150	Luxathane	50-60	-	-	150-210	Epoxy/urethane
Medium Term	Zinc Rich 1P	50-60	Durebild STE	150-200	Luxathane	50-60	-	-	200-260	Epoxy/urethane
Long Term	Zinc Rich 1P	50-60	Durebild STE	150-200	Luxathane	50-60	-	-	200-260	Epoxy/urethane
Industrial										
Short Term	Zinc Rich 1P	50-60	Durebild STE	150-200	Luxathane	50-60	-	-	200-260	Epoxy/urethane
Medium Term	Zinc Rich 1P	50-60	Durebild STE	150-200	Luxathane	50-60	-	-	200-260	Epoxy/urethane
Long Term	Zincanode 402	75	Durebild STE	150-200	Weathermax HBR	80-120	-	-	230-320	Epoxy/urethane
Marine										
Short Term	Zincanode 402	75	Durebild STE	150-200	Weathermax HBR	80-120	-	-	230-320	Epoxy/urethane
Medium Term	Zincanode 402	75	Durebild STE	150-200	Weathermax HBR	80-120	-	-	230-320	Epoxy/urethane
Long Term	Zincanode 402	75	Durebild STE	150-200	Weathermax HBR	80-120	-	-	230-320	Epoxy/urethane
Severe marine										
Short Term	Zincanode 402	75	Durebild STE	150-200	Weathermax HBR	80-120	-	-	230-320	Epoxy/urethane
Medium Term	Zincanode 402	75	Durebild STE	150-200	Weathermax HBR	80-120	-	-	230-320	Epoxy/urethane
Long Term	Zincanode 402	75	Durebild STE	150-200	Weathermax HBR	80-120	-	-	230-320	Epoxy/urethane
* Coatings gene	rally not required	for these a	atmospheric expos	ures - refe	er to the table on page	7 of this g	uide.			

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Jotun

Surface Preparation: Refer to manufacturer's data sheets.

Note1: Contact Jotun Personnel for coating specifications

Note2: Please refer to manufacturer's data sheets for detailed information on safety requirements, application and paint properties.

AS/NZS 2312	Weld Coat	DFT	First Coat	DFT	Second Coat	DFT	Third Coat	DFT	Total DFT	Coating System Type
Exposure	and cut edges	micron		micron		micron		micron	micron	
Mild *										
Short Term	Penguard Special	50	Penguard Special	50	Jotacote 371	40	-	-	90	Epoxy/Catalysed Acrylic
Medium Term	Penguard Special	50	Penguard Special	50	Jotacote 371	40	-	-	90	Epoxy/Catalysed Acrylic
Long Term	Penguard Special	50	Penguard Special	50	Jotacote 371	40	-	-	90	Epoxy/Catalysed Acrylic
Moderate *										
Short Term	Penguard Special	50	Penguard Special	50	Jotacote 371	40	-	-	90	Epoxy/Catalysed Acrylic
Medium Term	Penguard Special	50	Penguard Special	50	Jotacote 371	40	-	-	90	Epoxy/Catalysed Acrylic
Long Term	Penguard Special	50	Penguard Special	50	Jotacote 371	40	-	-	90	Epoxy/Catalysed Acrylic
Tropical *										
Short Term	Penguard Special	50	Penguard Special	50	Jotacote 371	40	-	-	90	Epoxy/Catalysed Acrylic
Medium Term	Penguard Special	50	Penguard Special	50	Jotacote 371	40	-	-	90	Epoxy/Catalysed Acrylic
Long Term	Penguard Special	50	Penguard Special	50	Jotacote 371	40	-	-	90	Epoxy/Catalysed Acrylic
Industrial										
Short Term	Jotacote 605	75	Jotacote 605	100	-	-	-	-	100	Ероху
Medium Term	Penguard Special	75	Penguard Special	75	Jotacote 371	40	-	-	115	Epoxy/Catalysed Acrylic
Long Term	Jotacote 605	100	Jotacote 605	100	Jotacote 371	40	-	-	140	Epoxy/Catalysed Acrylic
Marine										
Short Term	Jotacote 605	75	Jotacote 605	100	-	-	-	-	100	Ероху
Medium Term	Penguard HB	75	Penguard HB	75	Jotacote 371	40	-	-	115	Epoxy/Catalysed Acrylic
Long Term	Penguard Special	75	Penguard Special	75	Hardtop AS	40	-	-	115	Epoxy/Polyurethane
Severe marine										
Short Term	Jotamastic 87	100	Jotamastic 87	150	-	-	-	-	150	Epoxy Mastic
Medium Term	Penguard Special	75	Penguard Special	100	Imperite 300	40	-	-	140	Epoxy/Polyurethane
Long Term	Jotacote 605	100	Jotacote 605	150	Imperite 300	40	-	-	190	Epoxy/Polyurethane
* Coatings gener	rally not required for t	these atmo	ospheric exposures - r	efer to the	table on page 7	of this gui	de.			

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Wattyl Protective Coatings

Surface Preparation: Refer to manufacturer's data sheets.

Note1: For specifications refer to Wattyl personnel

Note2: Please refer to manufacturer's data sheets for detailed information on safety requirements, application and paint properties.

AS/NZS 2312	Weld Coat &	DFT	First Coat	DFT	Intermediate Coat	DFT	Topcoat	DFT	Total	Coating System Type
Exposure	cut edges	micron		micron		micron		micron	DFT micron	
Mild *										
Short Term	Galvit E90 LV	50	Killrust Gal Iron Primer*	30	Killrust Gloss Enamel*	35	Killrust Gloss Enamel*	35	100	Single pack
Medium Term	Galvit EP100	50	Sigma EP Primer*	75	•	-	Paracryl IFC*	50	125	Two pack epoxy/catalysed acrylic
Long Term	Galvit EP100	50	Sigma EP Primer*	50	Sigmacover CM*	75	Paracryl IFC*	50	175	Two pack epoxy/catalysed acrylic
Moderate *										
Short Term	Galvit EP100	50	Killrust Gal Iron Primer*	30	Killrust Gloss Enamel*	35	Killrust Gloss Enamel*	35	100	Single pack
Medium Term	Galvit EP100	50	Sigma EP Primer*	75	-	-	Paracryl IFC*	50	125	Two pack epoxy/catalysed acrylic
Long Term	Galvit EP100	50	Sigma EP Primer*	50	Sigmacover CM*	75	Paracryl IFC*	50	175	Two pack epoxy/catalysed acrylic
Tropical *										
Short Term	Galvit EP100	50	Killrust Gal Iron Primer*	30	Killrust Gloss Enamel*	35	Killrust Gloss Enamel*	35	100	Single pack
Medium Term	Galvit EP100	50	Sigma EP Primer*	75	-	-	Paracryl IFC*	50	125	Two pack epoxy/catalysed acrylic
Long Term	Galvit EP100	50	Sigma EP Primer*	50	Sigmacover CM*	75	Paracryl IFC*	50	175	Two pack epoxy/catalysed acrylic
Industrial										
Short Term	Galvit EP100	50	Killrust Gal Iron Primer	30	Killrust Gloss enamel	35	Killrust Gloss Enamel	35	100	Single pack
Medium Term	Galvit EP100	50	Sigma EP Primer	75	-	-	Paracryl IFC	50	125	Two pack epoxy/catalysed acrylic
Long Term	Galvit EP100	50	Sigma EP Primer	50	Sigmacover CM	75	Paracryl IFC	50	175	Two pack epoxy/catalysed acrylic
Marine										
Short Term	Galvit EP100	50	Sigma EP Primer	75	-	-	Paracryl IFC	50	125	Two pack epoxy/catalysed acrylic
Medium Term	Galvit EP100	50	Sigma EP Primer	75	-	-	Paracryl IFC	50	125	Two pack epoxy/catalysed acrylic
Long Term	Galvit EP100	50	Sigma EP Primer	50	Sigmacover CM	75	Paracryl IFC	50	175	Two pack epoxy/catalysed acrylic
Severe marine										
Short Term	Galvit EP100	50	Sigma EP Primer	50	Sigmacover CM	75	Paracryl IFC	50	175	Two pack epoxy/catalysed acrylic
Medium Term	Galvit EP100	50	Sigma EP Primer	50	Sigmacover CM	100	Paracryl IFC	50	200	Two pack epoxy/catalysed acrylic
Long Term	Galvit EP100	50	Sigma EP Primer	50	Sigmacover CM	150	Paracryl IFC	50	250	Two pack epoxy/catalysed acrylic
* Coatings gener	rally not required	for these a	tmospheric exposures - re	fer to the ta	able on page 7 of this gui	de.				

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Annexure C

Quote provided by 'Local Producer One'

Dated: 27 October 2015.

Goods: 50 LITE Gal Pipe 3.9mtr, Drilling 4 holes to RTA Spec²

Country of production: Quote includes the following text:

"HOT DIPPED GAL PIPE IS NO LONGER MANUFACTURED IN AUSTRALIA, MOST LIKELY SOURCE WOULD BE FROM UNITED ARAB EMIRATES OR THAILAND. THE MILL OF CHOICE DEPENDS ON BEST POSSIBLE LEAD TIME AT PLACEMENT OF ORDER"

Quote provided by 'Local Producer Two'

Dated: 3 November 2015.

Goods: 50 NB LIGHT GALV PIPE P/E (I), 3900mm

Cut and Drill 4 x Holes

Country of origin: Thailand or United Arab Emirates:

² RTA Spec is a reference to the RMS Standard or equivalent.

Annexure D

Pipe and tube structural products

Effective from: 4 September 2015 Cancels previous guide dated: 20 July 2015 Applicable for Australia and New Zealand



Pipe and tube structural products

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Medium - DuraPrimed^{Red}

Plain ends, screwed one end and screwed both ends

Designation $d_o t$ (mm)	Nominal size DN	DuraPrimed PE C250L0	DuraPrimed SOE C250L0	DuraPrimed SBE C250L0
		6.5 Metres		
33.7 x 3.2	25 M	<i>✓</i>	<i>✓</i>	R
42.4 x 3.2	32 M	<i>✓</i>	<i>✓</i>	R
48.3 x 3.2	40 M	<i>√</i>	✓	R
60.3 x 3.6	50 M	<i>✓</i>	<i>✓</i>	R
76.1 x 3.6	65 M	<i>✓</i>	-	-
88.9 x 4.0	80 M	1	-	-
114.3 x 4.5	100 M	1	-	-

Pack size	DuraPrimed PE, SOE and SBE
Lns	kg/m
91	2.41
61	3.10
61	3.57
37	5.03
37	6.43
19	8.37
19	12.2

Cells are ex-stock items.

 \checkmark

R

Cells are available ex-rolling only.

M Cells are ex-rolling and require MOQ.

Specifications: Dual Specified - AS 1074 and AS/NZS 1163 C250L0.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

Extra Light - clear, oiled, hot-dip gal and DuraGalPlus - plain ends

Designation d _o t (mm)	Nominal size DN	Clear C350L0	Oiled C350L0	Hot-dip gal C350L0	DuraGal ^{Plus} C350L0
		6.5 Metr	es		
33.7 x 2.0	25 XL	Μ	-	-	1
42.4 x 2.0	32 XL	Μ	-	-	1
48.3 x 2.3	40 XL	Μ	-	-	М
60.3 x 2.3	50 XL	R	-	-	✓
76.1 x 2.3	65 XL	Μ	-	-	Μ
88.9 x 2.6	80 XL	Μ	-	Μ	Μ
101.6 x 2.6	90 XL	Μ	-	Μ	-
114.3 x 3.2	100 XL	Μ	-	М	-
139.7 x 3.0	125 XL	-	М	М	-
165.1 x 3.0	150 XL	-	М	М	-

Pack size	Clear DuraGal ^{Plus} Oiled	Hot-dip gal
Lns	kg	/m
91	1.56	1.62
61	1.99	2.07
61	2.61	2.70
37	3.29	3.40
37	4.19	4.33
19	5.53	5.75
19	6.35	6.64
19	8.77	9.05
10	10.1	10.5
10	12.0	12.4

Light - clear, oiled and hot-dip gal - plain ends

Designation d _o t (mm)	Nominal size DN	Clear C350L0	Oiled C350L0	Hot-dip gal C350L0	DuraGal ^{Plus} C350L0
		6.5 Metr	es		
33.7 x 2.6	25 L	<i>✓</i>	-	-	Μ
42.4 x 2.6	32 L	<i>✓</i>	-	-	Μ
48.3 x 2.9	40 L	<i>✓</i>	-	-	Μ
60.3 x 2.9	50 L	<i>✓</i>	-	-	Μ
76.1 x 3.2	65 L	М	-	-	М
88.9 x 3.2	80 L	<i>√</i>	-	М	М
101.6 x 3.2	90 L	Μ	-	М	Μ
114.3 x 3.6	100 L	<i>✓</i>	-	Μ	Μ
139.7 x 3.5	125 L	-	1	М	-
165.1 x 3.5	150 L	-	M	M	-

Pack size	Clear Oiled	Hot-dip gal
Lns	kg	/m
91	1.99	2.05
61	2.55	2.63
61	3.25	3.33
37	4.11	4.21
37	5.75	5.89
19	6.76	6.92
19	7.77	8.02
19	9.83	10.0
10	11.8	12.1
10	13.9	14.4

Cells are ex-stock items.

✓ R

Μ

Cells are available ex-rolling only.

Cells are ex-rolling and require MOQ.

Specifications: AS/NZS 1163 C350L0.

Hot-dip gal - Section 2 AS/NZS 4792 HDG 300. DuraGal^{Plus} - Section 3 AS/NZS 4792 ZB 100/100.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

Medium - clear and oiled - plain ends

Designation d _o t (mm)	Nominal size DN	Clear C250L0	Oiled C250L0
	6.5 Metr	es	
33.7 x 3.2	25 M	<i>√</i>	-
42.4 x 3.2	32 M	\checkmark	-
48.3 x 3.2	40 M	<i>✓</i>	-
60.3 x 3.6	50 M	<i>✓</i>	-
76.1 x 3.6	65 M	\checkmark	-
88.9 x 4.0	80 M	<i>✓</i>	-
101.6 x 4.0	90 M	<i>√</i>	-
114.3 x 4.5	100 M	✓	-
*139.7 x 5.0	125 M	-	1
*165.1 x 5.0	150 M	-	✓

Medium - hot-dip gal - plain ends

Designation d _o t (mm)	Nominal size DN	Hot-dip gal C250L0
	6.5 Metres	
60.3 x 3.6	50 M	М
76.1 x 3.6	65 M	М
88.9 x 4.0	80 M	М
101.6 x 4.0	90 M	М
114.3 x 4.5	100 M	М
*139.7 x 5.0	125 M	М
*165.1 x 5.0	150 M	М



Cells are ex-stock items.

Cells are available ex-rolling only. Cells are ex-rolling and require MOQ.

pecifications: Dual Specified - AS 1074 and AS/NZS

Specifications: Dual Specified - AS 1074 and AS/NZS 1163 C250L0. Hot-dip gal - AS/NZS 4792 HDG 300. * AS/NZS 1163 C250LO

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

Pack size	Clear Oiled
Ins	kg/m
91	2.41
61	3.10
61	3.57
37	5.03
37	6.43
19	8.37
19	9.63
19	12.2
10	16.6
10	19.7

Pack size	Hot-dip gal
Ins	kg/m
37	5.14
37	6.56
19	8.53
19	9.81
19	12.4
10	16.9
10	20.0

Heavy - clear and oiled - plain ends

Designation d _o t (mm)	Nominal size DN	Clear C250L0	Oiled C250L0
	6.5 Metr	es	
33.7 x 4.0	25 H	~	-
42.4 x 4.0	32 H	~	-
48.3 x 4.0	40 H	~	-
60.3 x 4.5	50 H	\checkmark	-
76.1 x 4.5	65 H	~	-
88.9 x 5.0	80 H	✓	-
101.6 x 5.0	90 H	✓	-
114.3 x 5.4	100 H	 Image: A second s	-
*139.7 x 5.4	125 H	-	\checkmark
*165.1 x 5.4	150 H	-	<i>✓</i>

Heavy - hot-dip gal - plain ends

Designation d _o t (mm)	Nominal size DN	Hot-dip gal C250L0
	6.5 Metres	
42.4 x 4.0	32 H	Μ
48.3 x 4.0	40 H	Μ
60.3 x 4.5	50 H	М
76.1 x 4.5	65 H	М
88.9 x 5.0	80 H	Μ
101.6 x 5.0	90 H	М
114.3 x 5.4	100 H	Μ
*139.7 x 5.4	125 H	Μ
*165.1 x 5.4	150 H	Μ

Extra Heavy - clear - plain ends

Designation d _o t (mm)	Nominal size DN	Clear C250L0
	6.5 Metres	
48.3 x 5.4	40 XH	1
60.3 x 5.4	50 XH	<i>✓</i>
76.1 x 5.9	65 XH	~
88.9 x 5.9	80 XH	<i>√</i>

Cells are ex-stock items.

✓ R

Μ

Cells are available ex-rolling only.

Cells are ex-rolling and require $\ensuremath{\mathsf{MOQ}}\xspace.$

Specifications: Dual Specified - AS 1074 and AS/NZS 1163 C250L0. Hot-dip gal - AS/NZS 4792 HDG 300. * AS/NZS 1163 C250L0.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

Pack size	Clear
Ins	kg/m
91	2.94
61	3.80
61	4.38
37	6.19
37	7.93
19	10.3
19	11.9
19	14.5
10	17.9
10	21.3

Pack size	Hot-dip gal
Ins	kg/m
61	3.87
61	4.46
37	6.30
37	8.07
19	10.5
19	12.1
19	14.7
10	18.1
10	21.6

Pack size	Clear
Lns	kg/m
61	5.71
37	7.31
37	10.2
19	12.1

Effective from: 4 September 2015 | Cancels previous guide dated: 20 July 2015 | Applicable for Australia and New Zealand

SHS - DuraPrimed and DuraGalPlus

Designation d b t (mm)	DuraPrimed C350L0	DuraGal ^{Plus} C350L0
25 x 25 x 1.6	1	1
2.0	1	1
2.5	1	1
3.0	<i>✓</i>	Μ
30 x 30 x 1.6	<i>√</i>	1
2.0	1	1
2.5	1	1
3.0	М	М
35 x 35 x 1.6	1	1
2.0	1	1
2.5	1	1
3.0	<i>√</i>	М
40 x 40 x 1.6	<i>√</i>	1
2.0	<i>√</i>	1
2.5	1	1
3.0	<i>√</i>	1
4.0	<i>√</i>	1
50 x 50 x 1.6	1	<i>√</i>
2.0	1	1
2.5	1	<i>√</i>
3.0	1	<i>√</i>
4.0	1	<i>√</i>
5.0	1	<i>√</i>
*6.0	<i>√</i>	-

Pack si	All listed	
All listed	IIIIISIICS	
6.5m	8.0m	kg/m
100	-	1.12
100	-	1.36
100	-	1.64
100	-	1.89
-	100	1.38
-	100	1.68
-	100	2.03
-	64	2.36
-	100	1.63
-	100	1.99
-	64	2.42
-	64	2.83
-	81	1.88
-	81	2.31
-	64	2.82
-	64	3.30
-	49	4.09
-	64	2.38
-	64	2.93
-	49	3.60
-	49	4.25
-	36	5.35
-	30	6.39
-	25	7.32



Cells are ex-stock items.

Cells are available ex-rolling only.

Cells are ex-rolling and require MOQ.

Specifications: AS/NZS 1163 - C350L0 AS/NZS 1163 - C450L0 supplied as C450PLUS DuraGal^{Plus} - Section 3 AS/NZS 4792 ZB 100/100.

*50 x 50 x 6 is supplied as Oiled.

C450PLUS equivalent sections for DuraPrimed and DuraGal^{Plus} surface finish may be available ex rolling subject to mill limitations.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

SHS - DuraPrimed, oiled and DuraGalPlus

Designation	DuraPrimed	DuraPrimed	Oiled	DuraGal ^{Plus}	DuraGal ^{Plus}		Pack si	ze (Ins)	All listed
(mm)	C350L0	C450PLUS	C450PLUS	C350L0	C450PL05	All listed finishes			
							8.0m	12.0m	kg/m
65 x 65 x 1.6	-	R	-	-	1		49	-	3.13
2.0	R	1	-	R	1		42	-	3.88
2.5	R	1	-	R	1		42	-	4.78
3.0	R	1	-	R	1		36	-	5.66
4.0	R	✓	-	R	1		30	-	7.25
5.0	R	1	-	-	Μ		25	-	8.75
6.0	-	✓	-	-	-		20	-	10.1
75 x 75 x 2.0	-	Μ	-	-	1		36	-	4.50
2.5	R	✓	-	R	1		30	30	5.56
3.0	R	1	-	R	1		30	25	6.60
3.5	-	1	-	-	1		25	20	7.53
4.0	R	1	-	R	1		25	15	8.49
5.0	R	1	-	-	1		20	16	10.3
6.0	R	1	-	-	Μ		16	12	12.0
89 x 89 x 2.0	-	-	-	R	1		20	-	5.38
3.5	R	1	-	R	1		20	16	9.07
5.0	R	1	-	-	1		16	12	12.5
6.0	R	1	-	-	-		12	9	14.7
100 x 100 x 2.0	-	М	-	-	1		20	20	6.07
2.5	-	М	-	-	Μ		20	-	7.53
3.0	R	1	-	R	1		20	16	8.96
4.0	R	1	-	R	1		16	12	11.6
5.0	R	1	-	-	1		12	9	14.2
6.0	R	1	-	-	М		12	9	16.7
8.0	-	-	М	-	-		-	6	21.4
9.0	R	-	1	-	-		9	6	23.5
10.0	-	-	М	-	-		-	6	25.6
125 x 125 x 4.0	-	✓	-	-	-		12	9	14.8
5.0	-	✓	-	-	-		12	9	18.2
6.0	-	✓	-	-	-		9	6	21.4
8.0	-	-	М	-	-		-	4	27.7
9.0	R	-	1	-	-		8	4	30.6
10.0	-	-	М	-	-		-	4	33.4

Cells are ex-stock items.

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R M Cells are available ex-rolling only.

Cells are ex-rolling and require MOQ.

Specifications: All sections to AS/NZS 1163 - C450L0 supplied as C450PLUS as marked. DuraGal^{Plus} - Section 3 AS/NZS 4792 ZB 100/100.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

SHS - DuraPrimed and oiled

Designation d b t (mm)	DuraPrimed C350L0	DuraPrimed C450PLUS	Oiled C450PLUS
150 x 150 x 5.0	-	1	-
6.0	-	1	-
8.0	-	-	Μ
9.0	R	-	~
10.0	-	-	Μ

Designation d b t	Oiled C450PLUS
(mm)	
200 x 200 x 5.0	\checkmark
6.0	\checkmark
8.0	Μ
9.0	 Image: A set of the set of the
10.0	 Image: A start of the start of
12.5	 Image: A set of the set of the
16.0	Μ
250 x 250 x 5.0	Μ
6.0	✓
8.0	Μ
9.0	✓
10.0	Μ
12.5	<i>✓</i>
16.0	Μ
300 x 300 x 8.0	<i>✓</i>
10.0	<i>✓</i>
12.5	<i>✓</i>
16.0	<i>✓</i>
350 x 350 x 8.0	Μ
10.0	<i>✓</i>
12.5	1
16.0	
400 x 400 x 10.0	✓
12.5	✓
16.0	<i>✓</i>

~
R
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Cells are ex-stock items.

Cells are available ex-rolling only.

Cells are ex-rolling and require MOQ.

Specifications: All sections to AS/NZS 1163 - C450L0 supplied as C450PLUS as marked.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

Pack si	All listed		
All listed	IIIIsnes		
8.0m	12.0m	kg/m	
9	6	22.1	
6	6	26.2	
6	4	33.9	
6	4	37.7	
2	4	41.3	

Pack si	All listed	
All listed	nnisnes	
8.0m	12.0m	kg/m
6	4	29.9
6	4	35.6
4	2	46.5
4	2	51.8
-	1	57.0
-	1	69.4
-	1	85.5
-	2	37.8
4	2	45.0
4	2	59.1
2	2	65.9
-	2	72.7
-	1	89.0
-	1	111
-	1	71.6
-	- 1	
-	1	109
-	1	136
-	1	84.2
-	1	104
-	1	128
-	1	161
-	1	120
-	1	148
-	1	186

RHS - DuraPrimed and DuraGalPlus

Designation d b t (mm)	DuraPrimed C350L0	DuraGal ^{Plus} C350L0
50 x 25 x 1.6	<i>✓</i>	1
2.0	✓	1
2.5	\checkmark	1
3.0	\checkmark	1
65 x 35 x 2.0	\checkmark	1
2.5	\checkmark	1
3.0	\checkmark	1
4.0	\checkmark	М
75 x 25 x 1.6	Μ	М
2.0	R	М
2.5	<i>√</i>	М

Pack si	All listed	
All listed		
8.0m	12.0m	kg/m
96	-	1.75
96	-	2.15
72	-	2.62
60	-	3.07
54	-	2.93
54	-	3.60
45	-	4.25
35	-	5.35
65	-	2.38
65	-	2.93
48	-	3.60

Cells are ex-stock items.

Cells are available ex-rolling only.

Cells are ex-rolling and require MOQ.

Specifications: AS/NZS 1163 - C350L0 AS/NZS 1163 - C450L0 supplied as C450PLUS as marked DuraGal^{Plus} - Section 3 AS/NZS 4792 ZB 100/100.

Standard lengths are 8 metres.

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C450PLUS equivalent sections for DuraPrimed and DuraGal^{Plus} surface finish may be available ex rolling subject to mill limitations.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

RHS - DuraPrimed, oiled and DuraGalPlus

Designation	DuraPrimed	DuraPrimed	Oiled	DuraGal ^{Plus}	DuraGal ^{Plus}	F	Pack s	ize (Ins)	All listed
(mm)	CSOULU	C450PL05	C450PLUS	CSSOLU	C450PL05	A	ll listec	l finishes	
						8.Or	n	12.0m	kg/m
75 x 50 x 1.6	-	М	-	-	1	54		54	3.01
2.0	R	1	-	R	1	42		42	3.72
2.5	R	1	-	R	1	42		24	4.58
3.0	R	1	-	R	1	35		24	5.42
4.0	R	1	-	R	1	28		24	6.92
5.0	R	1	-	-	Μ	24		20	8.35
6.0	-	1	-	-	-	20		16	9.67
100 x 50 x 1.6	-	М	-	-	1	32		32	3.64
2.0	R	1	-	R	1	32		32	4.50
2.5	R	1	-	R	1	32		24	5.56
3.0	R	1	-	R	1	32		24	6.60
3.5	-	М	-	-	Μ	24		18	7.53
4.0	R	1	-	R	1	24		20	8.49
5.0	R	1	-	-	1	18		15	10.3
6.0	R	1	-	-	-	15		12	12.0
102 x 76 x 3.5	-	1	-	-	-	12		-	9.06
5.0	-	✓	-	-	-	12		-	12.5
6.0	-	1	-	-	-	12		-	14.7
125 x 75 x 2.0	-	М	-	-	-	24		-	6.07
2.5	-	Μ	-	-	Μ	20		20	7.53
3.0	R	1	-	R	1	20		15	8.96
4.0	R	✓	-	R	1	15		15	11.6
5.0	R	✓	-	-	1	15		12	14.2
6.0	R	1	-	-	-	12		6	16.7
127 x 51 x 3.5	-	М	-	-	-	12		-	9.07
5.0	-	М	-	-	-	8		-	12.5
6.0	-	М	-	-	-	8		-	14.7
150 x 50 x 2.0	-	Μ	-	R	1	21		21	6.07
2.5	-	R	-	-	1	21		18	7.53
3.0	R	1	-	R	1	21		15	8.96
4.0	R	1	-	R	✓	15		15	11.6
5.0	R	1	-	-	1	15		9	14.2
6.0	R	1	-	-	-	15		9	16.7
150 x 100 x 4.0	-	1	-	-	-	12		9	14.8
5.0	-	1	-	-	-	12		8	18.2
6.0	-	1	-	-	-	9		6	21.4
8.0	-	-	М	-	-	-		4	27.7
9.0	R	-	1	-	_	6		4	30.6
152 x 76 x 5.0	-	-	1	-	-	8		8	16.5
6.0	_	-	1	-	_	8		8	19.4

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Cells are ex-stock items.

Cells are available ex-rolling only.

Cells are ex-rolling and require MOQ.

Specifications: AS/NZS 1163 - C450L0 supplied as C450PLUS as marked. DuraGal^{Plus} - Section 3 AS/NZS 4792 ZB 100/100.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

RHS - DuraPrimed and oiled

Designation d b t (mm)	DuraPrimed C350L0	DuraPrimed C450PLUS	Oiled C450PLUS	Oiled C450PLUS		
200 x 100 x 4.0	-	<i>✓</i>	-	-		
5.0	-	<i>√</i>	-	-		
6.0	-	<i>√</i>	-	-		
8.0	-	-	Μ	-		
9.0	R	-	1	-		
250 x 150 x 5.0	-	-	-	1		
6.0	-	-	-	√		
8.0	-	-	-	Μ		
9.0	-	-	-	1		
10.0	-	-	-	Μ		
12.5	-	-	-	1		
16.0	-	-	-	Μ		
300 x 200 x 6.0	-	-	-	1		
8.0	-	-	-	1		
9.0	-	-	-	Μ		
10.0	-	-	-	1		
12.5	-	-	-	1		
16.0	-	-	-	Μ		
350 x 250 x 8.0	-	-	-	1		
10.0	-	-	-	Μ		
12.5	-	-	-	Μ		
16.0	-	-	-	Μ		
400 x 200 x 8.0	-	-	-	Μ		
10.0	-	-	-	1		
12.5	-	-	-	1		
16.0	-	-	-	Μ		
400 x 300 x 8.0	-	-	-	Μ		
10.0	-	-	-	Μ		
12.5	-	-	-	М		
16.0	-	-	-	М		

Pack si	All listed	
All listed		
8.0m	12.0m	kg/m
8	6	17.9
8	6	22.1
8	4	26.2
6	4	33.9
6	4	37.7
6	4	29.9
6	4	35.6
4	2	46.5
4	2	51.8
-	2	57.0
-	1	69.4
-	1	85.5
2	1	45.0
2	1	59.1
-	2	65.9
1	1	72.7
-	1	89.0
-	1	111
-	2	71.6
-	1	88.4
-	1	109
-	1	136
-	2	71.6
-	1	88.4
-	1	109
-	1	136
-	1	84.2
-	1	104
-	1	128
-	1	161

✓ Cells are ex-stock items.

R Cells are available ex-rolling only.

M Cells are ex-rolling and require MOQ.

Specifications: AS/NZS 1163 - C450L0 supplied as C450PLUS as marked.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

Building Products - DuraGal^{Plus} ZB135/135

Designation d b t (mm)	DuraGal ^{Plus} ZB135/135 C450PLUS	
8.0 Me	tres	
90 x 90 x 2.0	~	
100 x 50 x 1.6	~	
2.0	1	
150 x 50 x 2.0	1	
3.0	R	

Specifications: AS/NZS 1163 - C450L0 supplied as C450PLUS. DuraGal^{Plus} - Section 3 AS/NZS 4792 ZB 135/135

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

DuraGal^{Clear}

Designation d b t (mm)	DuraGal ^{Clear} C450PLUS
8.0 Me	tres
75 x 50 x 1.6	М
100 x 50 x 1.6	М
2.0	М
150 x 50 x 2.0	R
3.0	М
65 x 65 x 2.0	Μ
2.5	Μ
4.0	Μ
75 x 75 x 2.0	Μ
2.5	М
4.0	М
89 x 89 x 3.5	М
90 x 90 x 2.0	1
2.5	М
100 x 100 x 3.0	М
5.0	М

Specifications: AS/NZS 1163 - C450L0 supplied as C450PLUS.

DuraGal^{Clear} products are Hot-dip gal to Section 3 AS/NZS 4792 ZB 100/100 with a minimum average zinc coating of $100g/m^2$ on both internal and external surfaces.

DuraGalClear products are suitable for powder coating in accordance with AS 4506.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

Cells are ex-stock items.

1

R M Cells are available ex-rolling only.

Cells are ex-rolling and require MOQ.

Pack size	DuraGal ^{Plus} ZB135/135
Lns	kg/m
20	5.45
32	3.64
32	4.50
21	6.07
21	8.96

Pack size	DuraGal ^{Clear}
Lns	kg/m
54	3.01
32	3.64
32	4.50
21	6.07
21	8.96
42	3.88
42	4.78
30	7.25
36	4.50
30	5.56
25	8.49
20	9.07
20	5.45
20	6.74
20	8.96
12	14.2

Silo - DuraPrimed and DuraGalPlus

Designation d b t (mm)	DuraGal ^{Plus} C450PLUS
75 x 64 x 2.5	М
3.0	✓

Pack size		DuraPrimed DuraGal ^{Plus}
8m	12m	kg/m
36	36	4.75
36	24	5.56

Cells are ex-stock items.

1

R M Cells are available ex-rolling only.

Cells are ex-rolling and require MOQ.

Specifications: AS/NZS 1163 - C450L0 supplied as C450PLUS as marked.

For non standard length, please calculate using the MOQ tonnes.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

Rail - DuraPrimed and DuraGalPlus

Designation d b t (mm)	DuraPrimed C350	DuraGal ^{Plus} C350
53 x 35 x 1.6	-	R
60 x 48x 2.0	-	Μ
66 x 44 x1.6	-	R
75 x 40 x 1.6	-	Μ
75 x 40 x 2.0	-	Μ
97 x 40 x 2.0	-	Μ
115 x 42 x 2.0	Μ	R
115 x 42 x 2.5	М	R
120 x 48 x 2.0	-	М



Cells are ex-stock items.

Cells are available ex-rolling only.

Cells are ex-rolling and require MOQ.

Specifications: AS1450 - C350

DuraGalPlus - Section 3 AS/NZS 4792 ZB 100/100

For non standard length, please calculate using the MOQ tonnes.

For MOQ items the actual delivery quantity will be to the nearest pack or part pack (whichever is greater) as close to being within the +/-10% volume tolerance as possible.

Pack size		DuraPrimed DuraGal ^{Plus}
6.1m	8.0m	kg/m
-	48	1.77
-	36	3.08
-	30	2.23
-	20	2.39
-	20	2.97
21	21	3.66
21	21	4.27
21	21	5.30
18	18	4.53

Notations and Abbreviations

Standard Surface Finishes	Description
DuraPrimed	DuraPrimed products are primer painted for protection during storage and handling.
DuraGal ^{Plus}	DuraGal ^{Plus} products are Hot-dip gal to Section 3 AS/NZS 4792 ZB 100/100 with a minimum average zinc coating of 100g/m ² on both the internal and external surfaces.
DuraGal ^{Plus} ZB 135/135	DuraGal ^{Plus} products are Hot-dip gal to Section 3 AS/NZS 4792 ZB 135/135 with a minimum average zinc coating of 135g/m ² on both the internal and external surfaces.
DuraGal ^{Clear}	DuraGal ^{Clear} products are Hot-dip gal to Section 3 AS/NZS 4792 ZB 100/100 with a minimum average zinc coating of 100g/m ² on both internal and external surfaces. Ideal for powder coating.
Hot-dip gal	Hot-dip gal pipe has a minimum galvanized coating mass of 300g/m ² both inside and out to AS/NZS 4792 HDG 300 Section 2.
Oiled	Oiled products have a light protective oil coating and comes standard on selected products.
Clear	Clear products are coated with a temporary rust preventative.

Non-Standard Surface Finishes	Description
NOPC	No oil or paint coating and no end code. Available on request ex-rolling only and may be subject to MOQ.
LiteOil	Available on selected sections on request and may be subject to MOQ.

Grades	Description
C250L0	Cold-formed Grade C250 hollow section to AS/NZS 1163 with L0 properties
C350L0	Cold-formed Grade C350 hollow section to AS/NZS 1163 with L0 properties
C450L0	Cold-formed Grade C450 hollow section to AS/NZS 1163 with L0 properties
C450PLUS	C450PLUS properties which satisfies AS/NZS 1163 Grades C350L0 and C450L0
AS 1450	Steel tubes for mechanical purposes

Order Quantity	Description
Minimum Order Quantity (MOQ)	Minimum order quantity is subject to change. Refer to our Sales Representative for current applicable minimum order quantity.
Non-Standard Lengths	For non-standard lengths please refer to your Sales Representative for availability and minimum order requirements. The quantity supplied in non-standard mill lengths can vary from -10 to +10% and may include part packs.

Abbreviation	Description
b	Width of section
CHS	Circular Hollow Section
d	Depth of section
DN	Nominal diameter
d _o	Outside diameter of a Circular Hollow Section (CHS)
Н	Неаvy
L	Light
Lns	Lengths per pack
LO	Guaranteed impact performance at zero degrees celcius

Abbreviation	Description
Μ	Medium
PE	Plain Ends
RHS	Rectangular Hollow Section
SBE	Screwed Both Ends
SHS	Square Hollow Section
SOE	Screwed One End
t	Thickness of section
ХН	Extra Heavy
XL	Extra Light



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This publication has been prepared as a guide only to assist anyone that may specify or use the products described in this publication. Accordingly, while Austube Mills has endeavoured to ensure that all information provided in this publication is accurate and up-to-date, the following must be noted: this publication does not take into account any individual circumstances and is therefore not a substitute for informed or professional individual advice; the specifications and technical data relating to the products described in this publication are approximate and subject to change without notice, and users should check the currency of the information before relying upon it; and unless required by law, Austube Mills does not accept any responsibility for any loss, damage or consequence resulting from the contents of this publication or from any omission of information in this publication. © Copyright Austube Mills Pty Ltd. DuraGal, Duragal Ultra, the Austube Mills logo and the Australian Map of tubes are registered trade marks of Austube Mills Pty Ltd. September 2015. TS2681.

Annexure E

Received: 5 November 2015



PRODUCT MANUAL PIPE & TUBE + PROFILES





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Product availability & other information – As the section, grade and finish of all products are subject to continuous improvement, reference should be made to the ATM *PRODUCT AVAILABILITY GUIDE* (PAG) for information on the <u>availability</u> of <u>listed sections</u> and associated <u>finishes</u>. The PAG is found at www.austubemills.com.

Australian Tube Mills A.B.N. 21123 666 679. PO Box 246 Sunnybank, Queensland 4109 Australia Telephone +617 3909 6600 Facsimile +617 3909 6660 E-mail info@austubemills.com Internet www.austubemills.com **Build** with Product Manual: Pipe & Tube + Profiles AUGUST 2013 (i) **AustubeMills Standards** PART 1 PART 2 PART 3 PART 4 PART 5 PART 6 PART 7 PART 8 General Information Pipe & Tube Products Other Tube Products Profiles Steel Grades Mill Coatings Mill Processing Fabrication

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Product Manual: Pipe & Tube + Profiles

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Product availability & other information – As the section, grade and finish of all products are subject to continuous improvement, reference should be made to the ATM *PRODUCT AVAILABILITY GUIDE* (PAG) for information on the <u>availability</u> of <u>listed sections</u> and associated <u>finishes</u>. The PAG is found at www.austubemills.com.

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Product Manual: Pipe & Tube + Profiles

Queensland Distributors

Bluescope Distribution – Bundaberg

Address: 21 Charlie Triggs Crescent Bundaberg QLD 4670 Phone: 07 4131 4200 Fax: 07 4131 4211

Bluescope Distribution – Cairns Address: 163 Spence Street Cairns QLD 4870 Phone: 07 4048 9400 Fax: 07 4048 9419

Bluescope Distribution – Gladstone

Address: 4 Neil Street Callemondah QLD 4680 Phone: 07 4979 6400 Fax: 07 4979 6794

Bluescope Distribution – Mackay Address: 42 Commercial Avenue Mackay QLD 4740 Phone: 07 4968 1666 Fax: 07 4952 2689

Bluescope Distribution – Mt Isa Address: Cnr. Davis and Richardson Road Mt Isa QLD 4825 Phone: 07 4747 2833 Fax: 07 4747 2844

Bluescope Distribution – Northgate Address: 920 Nudgee Road Northgate QLD 4013 Phone: 07 3622 9222 Fax: 07 3622 9333

Bluescope Distribution – Toowoomba Address: 340-360 Anzac Avenue Toowoomba QLD 4350 Phone: 07 4614 2000 Fax: 07 4614 2044

Bluescope Distribution – Townsville Address: 646 Ingram Road Bohle QLD Phone: 07 4729 3939 Fax: 07 4755 3999

CMC Coil Steels – Toowoomba

Address: Cnr Enterprise & Carroll Streets Toowoomba QLD 4350 Phone: 07 4634 5177 Fax: 07 4634 5188 CMC Coil Steels – Townsville Address: 33-43 Kelli Street Bohle QLD 4818 Phone: 07 4774 5880 Fax: 07 4774 5883

CMC Coil Steels – Yatala Address: Cnr Business & Freight Streets Yatala QLD 4207 Phone: 07 3380 3380 Fax: 07 3380 3381

Metaland – Atherton Metaland Address: 99 Grove Street Atherton QLD 4883 Phone: 07 4091 2982 Fax: 07 4091 3140

Metaland – Brendale Address: 40 Kremzow Road Brendale QLD 4500 Phone: 07 3889 7575 Fax: 07 3889 7785

Metaland – Bundaberg Address: 79 Princess Street Bundaberg QLD 4670 Phone: 07 4132 8888 Fax: 07 4153 1415

Metaland – Corradini Metaland Address: 123-129 Lannercost Street Ingham QLD 4850 Phone: 07 4776 5225 Fax: 07 4776 3572

Metaland – Currumbin Address: 7 Queensbury Avenue Currumbin QLD 4223 Phone: 07 5534 6333 Fax: 07 5534 6337

Metaland – Dalby Address: Warrego Highway Dalby QLD 4405 Phone: 07 4669 8133 Fax: 07 4669 8144

Metaland – Emerald

Address: 10 Hicks Street Emerald QLD 4720 Phone: 07 4982 2488 Fax: 07 4982 3257

Metaland – Gold Coast

Address: 2 Distribution Avenue Molendinar QLD 4214 Phone: 07 5597 6822 Fax: 07 5597 7109

Metaland – Hervey Bay Address: 28-30 Boat Harbour Drive Hervey Bay QLD 4655 Phone: 07 4124 1266 Fax: 07 4124 0273

Metaland – High Country Ent. Metaland Address: Bacon Street Moranbah QLD 4744 Phone: 07 4941 7135

Fax: 07 4941 7365 Metaland – IBS Engineering Metaland Address: 33-35 Palmerston Drive Innisfail QLD 4860

Phone: 07 4043 8300 Fax: 07 4061 1214

Metaland – Ipswich Address: 3 Cooney Street Ipswich QLD 4305 Phone: 07 3281 1356 Fax: 07 3282 8235

Metaland - Mackay

Address: 107 Archibold Štreet Mackay Mail Centre QLD 4740 Phone: 07 4952 4642 Fax: 07 4952 4877

Metaland – MacKenzies Metaland Address: 22 Lagoon Street Goondiwindi QLD 4390 Phone: 07 4671 4033 Fax: 07 4671 4034

Metaland – Pilcher's Metaland Address: 56 Powell Street Bowen QLD 4805 Phone: 07 4786 1044 Fax: 07 4786 3091 Metaland – Sunshine Coast

Address: 62 Enterprise Street Kunda Park QLD 4556 Phone: 07 5476 5366 Fax: 07 5476 5741

Metaland – Metaland Woree Address: 11 Southgate Close Woree QLD 4868 Phone: 07 4054 0111 Fax: 07 4054 0100

Metaland – Yatala Address: 5 Business Street Yatala QLD 4207 Phone: 07 3382 7111 Fax: 07 3382 7337

Metalcorp Steel – Acacia Ridge Address: 103 Ingram Road Acacia Ridge QLD 4110 Phone: 07 3452 3888 Fax: 07 3452 3899

Metalcorp Steel – Bundaberg Address: 21 Charlie Triggs Crescent Bundaberg QLD 4670 Phone: 07 4131 4200 Fax: 07 4131 4211

Metalcorp Steel – Capalaba Address: 21 Smith Street Capalaba QLD 4157 Phone: 07 3843 8200 Fax: 07 3843 8210

Metalcorp Steel – Charters Towers Address: Hugh Quinn Crescent Charters Towers QLD 4820 Phone: 07 4761 5000 Fax: 07 4761 5005

Metalcorp Steel – Emerald Address: 79-81 Mcauley & Kyle Roads Emerald QLD 4720 Phone: 07 4983 7333 Fax: 07 4983 7344

Metalcorp Steel – Kawana Address: 15 Main Street Kawana Waters QLD 4575 Phone: 07 5437 1240 Fax: 07 5437 1244

Metalcorp Steel - Kingaroy

Address: Stolzenberg Road Kingaroy QLD 4610 Phone: 07 4164 0600 Fax: 07 4164 0611

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Metalcorp Steel – Oxley

Address: 2145 Ipswich Road Oxley QLD 4075 Phone: 07 3716 3177 Fax: 07 3716 3188

Metalcorp Steel – Rockhampton

Address: 22 McLaughlin Street North Rockhampton QLD 4701 Phone: 07 4924 3233 Fax: 07 4924 3244

Metalcorp Steel – Roma

Address: Mitchell Road Roma QLD 4455 Phone: 07 4624 3400 Fax: 07 4622 5264

Metalcorp Steel – Toowoomba Address: 58 Carrington Road Toowoomba QLD 4350

Phone: 07 4616 1333 Fax: 07 4634 7555

Metalcorp Steel – Townsville Address: 487 Woolcock Street Garbutt QLD 4818

Address: 487 Woolcock Street Garbutt QLD 4818 Phone: 07 4762 7233 Fax: 07 4725 5011

Metalcorp Steel – Warwick

Address: 149 McEvoy Street Warwick QLD 4320 Phone: 07 4667 5080 Fax: 07 4667 5088

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Queensland Distributors

Metalcorp Steel – Woodridge

Address: 84-86 Compton Road Woodridge QLD 4114 Phone: 07 3884 9999 Fax: 07 3884 9950

OneSteel Metalcentre – Cairns

Address: Cnr. Buchan & Kenny Street Cairns QLD 4870 Phone: 07 4035 4677 Fax: 07 4035 4438

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Address: Bensted Street Clinton Industrial Estate Gladstone QLD 4680 Phone: 07 4972 8033 Fax: 07 4972 8066

OneSteel Metalcentre – Mount Isa

Address: 45 Commercial Road Mount Isa QLD 4825 Phone: 07 4743 4089 Fax: 07 4749 1856

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Southern Queensland Steel – Brisbane

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Southern Queensland Steel - Mackay

Address: 42A Commercial Avenue Mackay QLD 4270 Phone: 1300 778 335 Phone: 0432 755 580 Fax: 07 3271 9100

Southern Queensland Steel – Maroochydore

Address: 20 Runway Drive Marcoola QLD 4564 Phone: 07 5458 8288 Fax: 07 5458 8299

Southern Queensland Steel – Toowoomba

Address: Suites 3-4/17 Enterprise Street Toowoomba QLD 4350 Phone: 07 4529 9292 Phone: 1300 778 335 Fax: 07 4633 0918

Southern Queensland Steel – Townsville

Address: 27-41 Toll Street Bohle QLD 4818 Phone: 07 4401 6380 Phone: 1300 778 335 Fax: 07 4774 7304

Tonkin Steel – Atherton

Address: Cnr Albrecht St & Maxwell Cres Atherton QLD 4883 Phone: 07 4095 4855 Fax: 07 4095 4854

Tonkin Steel – Cairns

Address: Dutton Street Cairns QLD 4870 Phone: 07 4051 7488 Fax: 07 4051 2684

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Address: 772-778 Ingham Road Bohle QLD 4818 Phone: 07 4755 5555 Fax: 07 4755 5556

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Bluescope Distribution – Coffs Harbour

Address: 25 Wingara Drive Boambee Industrial Estate NSW 2450 Phone: 02 6648 7388

Bluescope Distribution – Dubbo Address: 82 Fitzrov Street Dubbo NSW 2830

Phone: 02 6841 2800 Fax: 02 6882 7767

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Bluescope Distribution – Tamworth Address: 32 Hume Street West Tamworth NSW 2340

Phone: 02 6755 3222 Fax: 02 6765 6262

Bluescope Distribution – Wagga Wagga

Address: Dobney Avenue Wagga Wagga NSW 2650 Phone: 02 6932 3599 Fax: 02 6925 3874

Bluescope Distribution – Wodonga

Address: Kane Road Wodonga VIC 3690 Phone: 02 6022 9588 Fax: 02 6022 9599

CMC Coil Steels

Address: 8 Stout Road Mt Druitt NSW 2770 Phone: 02 9670 9914 Fax: 02 9670 9978

Horan Steel – Sydney

Address: 165 Newton Road Wetherill Park NSW 2164 Phone: 02 9203 1111 Fax: 02 9725 3871 Horan Steel – Newcastle

Address: 24 Spit Island Close Steel River Industrial Estate Mayfield West NSW 2304 Phone: 02 4967 9888 Fax: 02 4967 9800

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Metaland – Bega Address: Ridge Street Bega NSW 2550 Phone: 02 6492 2777 Fax: 02 6492 1771

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Metaland – Central Coast - Charmhaven Address: 4 O'hart Close Charmhaven NSW 2263 Phone: 02 4392 4477 Fax: 02 4392 4699

Metaland – Cooma Steel Metaland Address: Snowy Mtns Highway Cooma NSW 2630 Phone: 02 6452 1934 Fax: 02 6452 1934

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Fax: 03 5881 7601 Metaland – Gunnedah

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Metaland – Leeton Address: Canal Street & Market Road Leeton NSW 2705 Phone: 02 6953 2833 Fax: 02 6953 3487

Metaland – Lismore Address: 39-41 Habib Drive Lismore NSW 2480 Phone: 02 6621 8722 Fax: 02 6621 8497

Metaland – Moree Address: 41-45 Greenbah Road Moree NSW 2400 Phone: 02 6752 2627 Fax: 02 6752 4624

Metaland – Orange Address: Stephen Place Orange NSW 2800 Phone: 02 6362 4211

Fax: 02 6361 4602 Metaland – Parkes Address: 1a East Street Parkes NSW 2870

Phone: 02 6862 3011 Fax: 02 6862 3048 Metaland – Penrith

Address: 50-58 Jack Williams Drive Penrith NSW 2750 Phone: 02 4729 1797 Fax: 02 4729 1798

Metaland – Richards Metaland

Address: Morath Street Narrabri NSW 2390 Phone: 02 6792 1429 Fax: 02 6792 4233

Metaland - Sable Engineering & Metaland

Address: 23 Yarrawonga Street Macksville NSW 2447 Phone: 02 6568 2014 Fax: 02 6568 2742

Metaland – Silverwater Address: 62-70 Silverwater Road Silverwater NSW 2128 Phone: 02 9748 2487 Fax: 02 9748 2866

Metaland – Smeaton Grange

Address: 85 Hartley Road Smeaton Grange NSW 2567 Phone: 02 4647 8211 Fax: 02 4647 7288

Metaland – St Leonards Address: 2/205 Pacific Highway St Leonards NSW 2065 Phone: 02 8436 4382 Fax: 02 9439 6824

Metaland – Tamarang Engineering Metaland

Address: Cnr. Station & Nowland Street Quirindi NSW 2343 Phone: 02 6746 1266 Fax: 02 6746 2488

Metaland – Tamworth

Address: 12 Denison Street Tamworth NSW 2340 Phone: 02 6762 1823 Fax: 02 6762 8823

Metaland – Taree Address: 8 Elizabeth Avenue Taree NSW 2430

Address: 8 Elizabeth Avenue Taree NSW 2430 Phone: 02 6552 4899 Fax: 02 6552 7235

Metaland – Tumut Metaland Address: 84 Adelong Street Tumut NSW 2720 Phone: 02 6947 3620 Fax: 02 6947 3854

Metaland – Wagga Wagga Address: 11 Saxon Street Wagga Wagga NSW 2650

Phone: 02 6925 1109 Fax: 02 6925 1401

Metalcorp Steel – Albury

Address: Cnr. Catherine Crescent & Wagga Road Albury NSW 2640 Phone: 02 6025 7211 Fax: 02 6058 5477

Metalcorp Steel – Armidale

Address: 284 Mann Street Armidale NSW 2350 Phone: 02 6774 8610 Fax: 02 6774 8611

Metalcorp Steel – Auburn

Address: Manchester Road West Auburn NSW 2144 Phone: 02 9714 8092 Fax: 02 9714 8036

Metalcorp Steel – Bathurst

Address: 16 Kirkcaldy Street Bathurst NSW 2795 Phone: 02 6330 9333 Fax: 02 6330 9334

Metalcorp Steel – Coffs Harbour Address: 2 Isles Drive Coffs Harbour NSW 2450

Phone: 02 6648 7111 Fax: 02 6648 7117

Metalcorp Steel – Dubbo

Address: Mitchell Highway Dubbo NSW 2830 Phone: 02 6841 2155 Fax: 02 6841 2166

Metalcorp Steel – Gosford Address: 322 Manns Road West Gosford NSW 2250 Phone: 02 4328 7455

Metalcorp Steel – Lismore

Address: 25 Krauss Avenue South Lismore NSW 2480 Phone: 02 6626 4166 Fax: 02 6626 4160

Metalcorp Steel – Mildura

Address: Grace Crescent Buronga NSW 2739 Phone: 03 5051 6381 Fax: 03 5051 6397

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New South Wales Distributors

Metalcorp Steel – Motto Farm

Address: 329 Pacific Highway Heatherbrae NSW 2322 Phone: 02 4980 7411 Fax: 02 4980 7422

Metalcorp Steel – Orange

Address: 23 Leewood Drive Orange NSW 2800 Phone: 02 6392 8566 Fax: 02 6392 8577

Metalcorp Steel - Penrith

Address: 19-23 Leland Street Penrith NSW 2750 Phone: 02 4723 7810 Fax: 02 4723 7822

Metalcorp Steel – Port Macquarie

Address: 8 - 12 Acacia Avenue Port Macquarie NSW 2444 Phone: 02 6589 4900 Fax: 02 6581 0760

Metalcorp Steel – St Marys

Address: 107 Dunheved Circuit St Marys NSW 2760 Phone: 02 8808 2555 Fax: 02 8808 2599

Metalcorp Steel – Tamworth

Address: 32 Hume Street Tamworth NSW 2340 Phone: 02 6755 3222 Fax: 02 6755 3201

Metalcorp Steel – Wagga Wagga

Address: 55 Dobney Avenue Wagga Wagga NSW 2650 Phone: 02 6932 3500 Fax: 02 6932 3501

Metalcorp Steel – West Gosford

Address: 322 Manns Road West Gosford NSW 2250 Phone: 02 4328 7455 Fax: 02 4328 7466

OneSteel Metalcentre – Coffs Harbour

Address: Cnr. Isles Drive & Elswick Street Coffs Harbour NSW 2450 Phone: 02 6652 3744 Fax: 02 6652 4226

OneSteel Metalcentre – Dubbo

Address: 30 Cobborah Road Dubbo NSW 2830 Phone: 02 6882 6655 Fax: 02 6884 1759

OneSteel Metalcentre – Tamworth

Address: 26-30 Goonan Street Tamworth NSW 2340 Phone: 02 6765 4044 Fax: 02 6765 2552

OneSteel Steel & Tube – Newcastle

Address: Industrial Drive Mayfield NSW 2304 Phone: 02 4967 0900

OneSteel Steel & Tube – Sydney

Address: 372-374 Victoria Street Wetherill Park NSW 2164 Phone: 02 9203 2222

OneSteel Steel & Tube – Wollongong Address: Five Islands Road Unanderra NSW 2526 Phone: 02 4271 1788

Southern Steel Supplies – Dubbo Address: 3 Richard Ryan Place Dubbo NSW 2830

Phone: 02 6882 1500 Fax: 02 6882 1502

Southern Steel Supplies - Newcastle

Address: 127 Glenwood Drive Thornton NSW 2322 Phone: 02 4966 8000 Fax: 02 4966 8888

Southern Steel Supplies – Sydney

Address: Bullecourt & Horsley Roads Milperra NSW 2214 Phone: 02 9792 2433 Fax: 02 9792 2973

Southern Steel Supplies - Tamworth

Address: 6A Wirraway St Tamworth NSW 2340 Phone: 02 6765 2288 Fax: 02 6765 4222

Southern Steel Supplies – Wollongong

Address: 499 Princes Highway Fairymeadow NSW 2519 Phone: 02 4284 4733 Fax: 02 4283 5017

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Victorian Distributors

Bluescope Distribution – Albury

Address: Cnr. Catherine Crescent & Hume Highway Lavington VIC 2641 Phone: 02 6058 5488 Fax: 02 6058 5499

Bluescope Distribution – Ballarat Address: Creswick Road Ballarat VIC 3353

Phone: 03 5320 7855 Fax: 03 5320 7866

Bluescope Distribution – Bendigo Address: 15 – 35 Fairview Road Kangaroo Flat VIC 3555 Phone: 03 5448 3811 Fax: 03 5434 9844

Bluescope Distribution – Geelong Address: Cnr. Point Henry & Portarlington Road Moolap VIC 3221 Phone: 03 5277 1559 Fax: 03 5277 1520

Bluescope Distribution – Horsham Address: 140 Stawell Road Horsham VIC 3400 Phone: 03 5362 5333

Fax: 03 5362 5322 **Bluescope Distribution – Mildura** Address: Grace Crescent Buronga VIC 2739 Phone: 03 5051 6388

Bluescope Distribution - Morwell

Phone: 03 5134 6266 Fax: 03 5128 5833

Bluescope Distribution – Portland

Address: 24 Portland - Nelson Road Portland VIC 3305 Phone: 03 5522 4255 Fax: 03 5527 1003

Bluescope Distribution – Shepparton

Address: 56-60 Florence Street Shepparton VIC 3630 Phone: 03 5821 1688 Fax: 03 5833 4455

Bluescope Distribution – Westall Address: 16-24 Westall Road Westall VIC 3169 Phone: 03 9549 2666 Fax: 03 9547 5776

G.A.M. Steel - Derrimut Address: 557 Mt Derrimut Road Derrimut VIC 3030 Phone: 03 8368 1555 Fax: 03 8368 1500

Metaland – Bendigo Address: Craig Street Long Gully VIC 3550 Phone: 03 5442 2288 Fax: 03 5441 4062

Metaland – Breakwater Metaland Address: 44-46 Leather Street Breakwater VIC 3219 Phone: 03 5248 6384 Fax: 03 5248 8015

Metaland – Camerons Metaland Address: Cnr. Doveton & Eyre Streets Ballarat VIC 3350 Phone: 03 53374424 Fax: 03 5333 4934

Metaland – Donald Steel Metaland Address: Racecourse Road Donald VIC 3480 Phone: 03 5497 1738 Fax: 03 5497 1862

Metaland – Echuca Metaland Address: 16-18 Hovell Street Echuca VIC 3564 Phone: 03 5482 1505 Fax: 03 5482 6541

Metaland – Horsham Address: 68 Hamilton Road Horsham VIC 3400 Phone: 03 5382 4411

Fax: 03 5382 0613 Metaland – Mildura Address: 436-444 Benetook Avenue Mildura VIC 3502 Phone: 03 5023 5944

Metaland – Morwell Address: Lot 26 Kirwin Road Morwell VIC 3840

Phone: 03 5134 5111 Fax: 03 5133 9688

Metaland - Piera Metaland Address: 17-23 Darcy Street Colac VIC 3249 Phone: 03 5231 3882 Fax: 03 5232 1865

Metaland – Shepparton Address: 74-80 Florence Street Shepparton VIC 3630 Phone: 03 5821 7300 Fax: 03 5821 8975

Metaland - Swan Hill Metaland Address: 223-225 Sea Lake Road Swan Hill VIC 3585 Phone: 03 5032 3203 Fax: 03 5032 3583

Metaland - Walkers Metaland Address: Cnr. Coleraine & Cavendish Roads Hamilton VIC 3300 Phone: 03 5551 2788 Fax: 03 5571 2943

Metaland – Warrnambool Address: 8-12 Strong Street Warrnambool VIC 3280 Phone: 03 5561 1622 Fax: 03 5561 1661

Metalcorp Steel - Ballarat Address: Creswick Road Ballarat VIC 3350 Phone: 03 5320 7833 Fax: 03 5320 7866

Metalcorp Steel – Bendigo Address: 117 Hattam Street Golden Square VIC 3555 Phone: 03 5434 9860 Fax: 03 5434 9854

Metalcorp Steel – Dandenong Address: 503 Hammond Road Dandenong VIC 3175 Phone: 03 9768 1200 Fax: 03 9768 1210

Metalcorp Steel – Geelong

Address: 51 Cowie Street North Geelong VIC 3215 Phone: 03 5247 4100 Fax: 03 5272 2330

Metalcorp Steel – Horsham Address: 140 Stawell Road Horsham VIC 3400 Phone: 03 5362 5333 Eax: 03 5362 5322

Metalcorp Steel - Portland Address: 24 Portland Nelson Road Portland VIC 3305 Phone: 03 5522 4254 Fax: 03 5523 6818

Metalcorp Steel – Shepparton Address: 56-60 Florence Street Shepparton VIC 3630 Phone: 03 5821 1688 Fax: 03 5822 2983

Metalcorp Steel – Warrnambool Address: Cnr. Dickson & Watson Streets Warrnambool VIC 3280 Phone: 03 5562 7211 Fax: 03 5559 4277

Metalcorp Steel - Westall Address: 16-24 Westall Road Clayton South VIC 3169 Phone: 03 8543 3678 Fax: 03 9547 5422

Metalcorp Steel – Wodonga Address: 3 Kane Road Wodonga VIC 3690

OneSteel Steel & Tube – Geelong Address: Cnr. Broderick & Heales Roads Corio VIC 3214 Phone: 03 5274 1414 Fax: 03 5275 0321

Address: 1257-1259 Ferntree Gully Road Scoresby VIC 3179

Surdex Steel – Albury

Address: 25 Phoenix Place Albury NSW 2640 Phone: 02 6041 9400 Fax: 02 6041 3865

Surdex Steel - Bendigo Address: 3 Craig Street Long Gully VIC 3550 Phone: 03 5442 6226 Fax: 03 5442 6227

Surdex Steel – Brunswick Address: 26 Edward Street Brunswick VIC 3056 Phone: 03 9387 8000 Fax: 03 9387 0601

Surdex Steel – Campbellfield Address: 204 Barry Road Campbellfield VIC 3061 Phone: 03 9357 8000 Fax: 03 9357 9441

Surdex Steel - Dandenong Address: 46 Brooks Drive Dandenong South VIC 3175 Phone: 03 9213 5100 Fax: 03 9706 9020

Surdex Steel - Geelong Address: 56 Weddell Road North Geelong VIC 3215 Phone: 03 5277 1555 Fax: 03 5277 1558

Surdex Steel – Keysborough Address: 581 Chandler Road Keysborough VIC 3173 Phone: 03 9798 1177 Fax: 03 9706 3083

Surdex Steel - Morwell Address: 8 Surdex Drive Morwell VIC 3840 Phone: 03 5135 3500 Fax: 03 5135 3544

Surdex Steel – Shepparton Address: 27 Hawkins Road Shepparton VIC 3630 Phone: 03 5831 2700 Fax: 03 5831 4944

Surdex Steel - Warrnambool

Address: 8 Braithwaite Street Warrnambool VIC 3280 Phone: 03 5561 7888 Fax: 03 5561 7822

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Standards

PART 4 Profiles

PART 5 **Steel Grades**

PART 6 Mill Coatings

PART 7 Mill Processing

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Phone: 02 6022 9588 Fax: 02 6024 7967

OneSteel Steel & Tube – Melbourne Phone: 03 9212 7800

Fax: 03 9764 1456

Fax: 03 5051 6399 Address: Lot 4 Jones Road Morwell VIC 3840

Western Australian Distributors

Bluescope Distribution – Albany

Address: 62 Chester Pass Road Albany WA 6330 Phone: 08 9841 9700 Fax: 08 9841 9711

Bluescope Distribution – Bunbury Address: 69 Craigie Street Bunbury WA 6230 Phone: 08 9724 5220 Fax: 08 9724 5266

Bluescope Distribution – Esperance Address: 26 Woods Street Esperance WA 6450 Phone: 08 9072 3100 Fax: 08 9072 3175

Bluescope Distribution – Geraldton Address: 9 Beaver Street Geraldton WA 6530 Phone: 08 9921 9300 Fax: 08 9921 9310

Bluescope Distribution – Kalgoorlie Address: 45 Great Eastern Highway Kalgoorlie WA 6430 Phone: 08 9024 1388 Fax: 08 9024 1399

Bluescope Distribution – Kewdale Address: 9 Bradford Street Kewdale WA 6105 Phone: 08 6250 1000 Fax: 08 6250 1111

CMC Coil Steels

CMC Coil Steels Plate and Long Products Perth 1270 Abernethy Road Hazelmere WA 6055 Phone: +618 9359 8900 Fax: +618 9359 8999

Metalcorp Steel - Balcatta Address: 184 Balcatta Road Balcatta WA Phone: 08 9229 4460 Fax: 08 9229 4499 Email:david.larchet@bluescopesteel.com

Metalcorp Steel - Kewdale

Address: 497 Abernethy Road Kewdale WA 6105 Phone: 08 9251 2500 Fax: 08 9251 2511 Email:aunther.werner@bluescopesteel.com Metaland – Frank Weston & Co Metaland Address: Sales Street Narrogin WA 6312 Phone: 08 9881 1075 Fax: 08 9881 3181

Midalia Steel – Bibra Lake Address: 20 Port Kembla Bibra Lake WA 6163 Phone: 08 9459 9466 Fax: 08 9459 9866

Midalia Steel – Albany Address: 115 Chester Pass Road Albany WA 6330 Phone: 08 9841 1799 Fax: 08 9842 1482

Midalia Steel – Broome Address: 3 Archer Street Heavy Industrial Area Broome WA 6725 Phone: 08 9192 5888 Fax: 08 9192 5777

Midalia Steel – Bunbury Address: 5 Zaknic Place Bunbury WA 6230 Phone: 08 9791 3944 Fax: 08 9791 3844

Midalia Steel – Busselton Address: 104 Strelly Street Busselton WA 6280 Phone: 08 9752 4900 Fax: 08 9752 4933

Midalia Steel – Esperance Address: 5 Scanlon Street Esperance WA 6450 Phone: 08 9071 5326 Fax: 08 9071 2666

Midalia Steel – Karratha

Address: Cnr. Cowle & Coolawanyah Roads Karratha WA 6714 Phone: 08 9144 1944 Fax: 08 9144 1966

Midalia Steel - Maddington

Address: 9 Malcolm Road Maddington WA 6109 Phone: 08 9459 9466 Fax: 08 9459 9866 Midalia Steel – Mandurah Address: 30-32 Panton Road Mandurah WA 6210 Phone: 08 9581 9811 Fax: 08 9581 9822

Midalia Steel – Merredin Address: Barrack Street East Merredin WA 6415 Phone: 08 9041 3300 Fax: 08 9041 3322

Midalia Steel – Midvale Address: 34 Farrall Road Midvale WA 6056 Phone: 08 9250 2005 Fax: 08 9250 2525

Midalia Steel – Moora Address: 153 Gardiner Street Moora WA 6510 Phone: 08 9651 1610 Fax: 08 9651 1623

Midalia Steel – Northam Address: Cnr. Great Eastern Highway & Old York Road Northam WA 6401 Phone: 08 9622 2211 Fax: 08 9622 2288

Midalia Steel - Wagin

Address: Lot 430 Tudhoe Street Wagin WA 6315 Phone: 08 9861 1317 Fax: 08 9861 1361

Midalia Steel - Welshpool

Address: 49 Pilbara Street Welshpool WA 6106 Phone: 08 9333 4444 Fax: 08 9458 8076

Midalia Steel – Lansdale

Address: 10 Rogers Way Lansdale WA 6065 Phone: 08 9409 7788 Fax: 08 9309 3221

OneSteel Metalcentre – Bunbury

Address: 7 Richter Road Bunbury WA 6230 Phone: 08 9725 4199 Fax: 08 9725 4086

OneSteel Metalcentre – Geraldton

Address: 89 Flores Road Geraldton WA 6530 Phone: 08 9921 4533 Fax: 08 9921 7133

OneSteel Metalcentre – Kalgoorlie Address: Cnr. Great Eastern Highway & Atbara Street Kalgoorlie WA 6430 Phone: 08 9021 4488 Fax: 08 9021 7602

OneSteel Metalcentre – Karratha

Address: Cnr. Cowle & Coolawanyah Roads Karratha WA 6714 Phone: 08 9144 0111 Fax: 08 9185 3663

OneSteel Metalcentre – Port Hedland

Address: Lot 5271 Munda Way Port Hedland WA 6721 Phone: 08 9140 2822 Fax: 08 9172 1004

OneSteel Steel & Tube – Perth

Address: Lot 302 Spearwood Avenue Bibra Lake WA 6163 Phone: 08 9418 9877

Southern Steel (WA)

Address: Lot 1039 1&2 Hoyle Road (cnr Armstrong Rd) Hope Valley WA 6165 Phone: 08 9419 5386 Fax: 08 9419 3907

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South Australian Distributors

Bluescope Distribution – Ottoway

Address: 301 Grand Junction Road Ottoway SA 5013 Phone: 08 830 13801 Fax: 08 8301 3888

Brice Metals – Adelaide

Address: 522 Cross Keys Road Cavan SA 5094 Phone: 08 8405 7111 Fax: 08 8347 1883

CMC Coil Steels Adelaide

Address: 13 - 21 Martin Ave Gillman SA 5013 Phone: 08 8240 0900 Fax: 08 8240 0955

Metaland – Nuriootpa

Address: 121 Greenock Road Nuriootpa SA 5355 Phone: 08 8562 4100 Fax: 08 8562 3472

Metaland – Minlaton Engineering Metaland

Address: 39 Maitland Road Minlaton SA 5575 Phone: 08 8853 2226 Fax: 08 8853 2265

Metaland – Mount Gambier

Address: Jubilee Highway West Mt Gambier SA 5290 Phone: 08 8725 7500 Fax: 08 8725 0259

Metaland – Port Adelaide

Address: 13 Webb Street Port Adelaide SA 5015 Phone: 08 8300 3444 Fax: 08 8300 3445

Metaland – Port Lincoln

Address: 6 - 8 Verran Terrace Port Lincoln SA 5606 Phone: 08 8682 3377 Fax: 08 8682 5316

Metaland – Riverland Steel Metaland

Address: Old Sturt Highway Berri SA 5343 Phone: 08 8582 2144 Fax: 08 8582 3242

Metaland – Sharman Engineering Metaland

Address: Powerline Road Long Plains SA 5501 Phone: 08 8527 2218 Fax: 08 8527 2405

Metaland – Whyalla

Address: 172 Lacey Street Whyalla SA 5600 Phone: 08 8645 0633 Fax: 08 8645 7280

Metalcorp Steel – Elizabeth

Address: Cnr. Wiley Street & Phillip Highway Elizabeth SA 5112 Phone: 08 8307 4311 Fax: 08 8307 4322

Metalcorp Steel – Ottoway

Address: 285 Grand Junction Road Ottoway SA 5013 Phone: 08 8301 3777 Fax: 08 8301 3888

OneSteel Steel & Tube – Adelaide

Address: 13 Webb Street Port Adelaide SA 5015 Phone: 08 8300 3333 Fax: 08 8300 3366

Tasmanian Distributors

Bluescope Distribution – Burnie

159A Bass Highway Cooee TAS 7321 Phone: 03 6434 4253 Fax: 03 6434 4266

Bluescope Distribution – Hobart Address: 68 Mornington Road Mornington TAS 7018 Phone: 03 6211 4330

Fax: 03 6244 7013 Bluescope Distribution – Launceston

Address: Lot 5 Murphy Street Launceston TAS 7250 Phone: 03 6324 1250 Fax: 03 6334 2961

Metaland – Burnie Address: Bass Highway Somerset TAS 7322

Phone: 03 6435 1500 Fax: 03 6435 1468 Metaland – Derwent Park

Address: 61 Sunderland Street Moonah TAS 7009 Phone: 03 6272 2877 Fax: 03 6272 0977

Metaland – Kings Meadow Address: 345 Hobart Road Launceston TAS 7249 Phone: 03 6344 9714 Fax: 03 6344 9402

OneSteel Metalcentre – Hobart Address: 67 Lampton Avenue Moonah TAS 7009 Phone: 03 6272 6931 Fax: 03 6273 1027

OneSteel Metalcentre – Kings Meadow Address: 345 Hobart Road Launceston TAS 7249 Phone: 03 6344 5311 Fax: 03 6344 9402

Northern Territory Distributors

Bluescope Distribution – Darwin

Address: 50 O'Sullivan Circuit East Arm NT 0822 Phone: 08 8984 2600 Fax: 08 8984 2699

CMC Coil Steels – Darwin

Address: Lot 1036 Berrimah Road Berrimah NT 0828 Phone: 08 8947 2444 Fax: 08 8947 5158

Metaland – Hohns Sheet Metal Metaland

Address: 32 Crawford Street Katherine NT 0850 Phone: 08 8972 2633 Fax: 08 8972 3454

OneSteel Steel & Tube – Darwin

Address: Lot 889 Stuart Highway Berrimah NT 0828 Phone: 08 8935 0350 Fax: 08 8935 0380

Southern Steel – Darwin Address: 3847 Marjorie Street Pinelands NT 0828 Phone: 08 8932 7135 Fax: 08 8931 4180

Aust. Capital Territory Distributors

Bluescope Distribution – Fyshwick Address: 29 Tennant St Fyshwick ACT 2609

Metalcorp Steel – Fyshwick Address: 29 Tennant St Fyshwick ACT 2609

OneSteel Metalcentre – Canberra Address: John's Place Hume ACT 2620 Phone: 02 6260 1249 Fax: 02 6260 1317

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New Zealand Distributors

Asmuss South Island (Christchurch)

Address: 67 Vickerys Road Sockburn Christchurch Phone: +64 3 348 3417 Fax: +64 3 348 0503

Asmuss South Island (Dunedin)

Address: 3 White Street Dunedin Phone: +64 3 477 2323 Fax: +64 3 477 2321

Asmuss South Island (Nelson)

Address: 8 Saxton Road West Stoke Nelson Phone: +64 3 538 0351 Fax: +64 3 538 0349

Fletcher EasySteel (Auckland)

Address: 575 Great South Road Penrose Auckland Phone: +64 9 525 9400 Fax: +64 9 525 9401

Fletcher EasySteel (Christchurch)

Address: 55 Lunns Road, Middleton Christchurch Phone: +64 3 348 8479 Fax: +64 3 343 0320

Fletcher EasySteel (Dunedin)

Address: 26 Orari Street Phone: +64 3 456 1750 Fax: +64 3 455 6538

Fletcher EasySteel (Hamilton)

Address: Ellis Street, Frankton Hamilton Phone: +64 7 847 8189 Fax: +64 7 847 8445

Fletcher EasySteel (Invercargill)

Address: 54 Tweed Street Invercargill Phone: +64 3 218 2986 Fax: +64 3 218 2318

Fletcher EasySteel (Hawkes Bay)

Address: Corner Omahu & Wilson Roads Hawkes Bay Phone: +64 6 873 9036 Fax: +64 6 879 6880

Fletcher EasySteel (Nelson)

Address: 42 Beach Road Richmond Nelson Phone: +64 3 544 3117 Fax: +64 3 544 3118

Fletcher EasySteel (New Plymouth)

Address: 50 Corbett Rd, Bell Block New Plymout Phone: +64 6 755 0946 Fax: +64 6 755 2099

Fletcher EasySteel (Palmerston North)

Address: 120 Kaimanawa Street Kelvin Grove Palmerston North Phone: +64 6 354 2622 Fax: +64 6 354 2623

Fletcher EasySteel (Rotorua) Address: Tallyho Street

Phone: +64 7 348 3039 Fax: +64 7 347 7353

Fletcher EasySteel (Tauranga)

Address: 99 Aviation Avenue Mt Maunganui Tauranga Phone: +64 7 572 9700 Fax: +64 7 572 9707

Fletcher EasySteel (Wellington)

Address: Burnham Street Petone Phone: +64 4 568 4189 Fax: +64 4 570 8473

Fletcher EasySteel (Whangarei)

Address: 33 Rewarewa Road Whangarei Phone: +64 9 438 4819 Fax: +64 9 438 4589

HJ Asmuss (Auckland)

Address: 6 Gabador Place Mt Wellington Auckland Phone: +64 9 573 0099 / Freephone: 0800 276 877 Fax: +64 9 573 5590

HJ Asmuss (Mt Maunganui)

Address: 40 Portside Drive Mt Maunganui Phone: +64 7 574 6774 Fax: +64 7 574 6775

Steel & Tube Distribution - Whangarei

Address: Cnr Hewlett Street & Fraser Crescent, Whangarei Phone: +64 9 438 3999 Fax: +64 9 438 3990

Steel & Tube Distribution – North Harbour

Address: 5 Ride Way, North Harbour Industrial Estate, Albany Phone: +64 9 415 3490 Fax:+64-9 415 3405

Steel & Tube Distribution – Auckland

Address: 68 Stonedon Drive, East Tamaki Phone: +64 9 273 7610 Fax: +64 9 273 1470

Steel & Tube Distribution – Hamilton

Address: 40 Northway Street, Te Rapa. Phone: +64 7 850 7640 Fax: +64 7 849 7407

Steel & Tube Distribution – Mt Maunganui

Address: 28c Jean Batten Drive, Mt Maunganui. Phone: +64 7 572 7065 Fax: +64 7 571 2172

Steel & Tube Distribution – Rotorua

Address: Cnr View Road & 24 Hyland Crescent, Rotorua. Phone: +64 7 348 0449 Fax: +64 7 348 0442

Steel & Tube Distribution – New Plymouth

Address: Centennial Drive, New Plymouth. Phone: +64 6 751 0340 Fax: +64 6 751 1762

Steel & Tube Distribution - Napier

Address: 15 Ford Street, Onekawa. Phone: +64 6 843 9196 Fax: +64 6 843 2224

Steel & Tube Distribution - Palmerston North

Address: Malden Street, Palmerston North. Phone: +64 6 356 5252 Fax: +64 6 356 5247

Steel & Tube Distribution – Wellington

Address: Hautonga Street, Petone. Phone: +64 4 568 5109 Fax: +64 4 568 8308

Steel & Tube Distribution – Nelson

Address: Cnr Carkeek & Graham Streets, Nelson. Phone: +64 3 548 2209 Fax: +64 3 548 0626

Steel & Tube Distribution – Christchurch Address: 375 Blenheim Road, Christchurch. Phone: +64 3 343 7999

Fax: +64 3 348 4167 Steel & Tube Distribution – Timaru

Address: 9 Meadows Road, Washdyke. Phone: +64 3 688 2085 Fax: +64 3 688 2084

Steel & Tube Distribution – Dunedin

Address: Cnr Willis & Tewsley Streets, Dunedin. Phone: +64 3 477 9655 Fax: +64 3 477 9646

Steel & Tube Distribution – Invercargill

Address: Bond Street, Invercargill. Phone: +64 3 218 2803 Fax: +64 3 218 9131

Steel & Tube Piping Systems – Auckland

Address: 124 Hugo Johnston Drive, Penrose, Auckland. Phone: +64 9 276 2770 Fax: +64 9 276 2775

Steel & Tube Piping Systems - New Plymouth

Address: De Havilland Drive, Bell Block, New Plymouth. Phone: +64 6 755 0055 Fax: +64 6 755 1628

Steel & Tube Piping Systems – Wellington Address: 17 Hautonga Street, Petone.

Phone: +64 4 576 8990 Fax: +64 4 576 8993

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New Zealand Distributors

Steel & Tube Piping Systems – Christchurch

Address: 65 Treffers Road, Christchurch. Phone: +64 3 348 7631 Fax +64 3 348 6075

Steel Traders (Lower Hutt) A division of H.J. Asmuss & Co. Ltd Address: 11-13 Gough Street Seaview Wellington Phone: +64 9 939 6699 / Freephone: 0800 893 337 Fax: +64 9 939 6600

Stewart Steel

Address: 85 Falsgrave Street, Christchurch. Tel: +64 3 365 0079 Fax: +64 3 365 7576

Vulcan Steel Ltd (Tauranga)

Address: 5 c Jean Batten Dve Mt Maunganui Phone: +64 7 572 7028 Fax: +64 7 572 7029

Vulcan Steel Ltd (Whangarei)

Address: 110 Lower Port Road, Whangarei Phone: +64 9 438 8526 Fax: +64 9 438 8523

Vulcan Steel Ltd (Invercargill)

Address: 77 Bond St Invercargill Phone: +64 3 211 0375 Fax: +64 3 211 0374

Vulcan Steel Ltd (Nelson)

Address: 23 Low St Port Nelson Phone: +64 3 545 8852 Fax: +64 3 545 8853

Vulcan Steel Ltd (Auckland)

Address: 29 Neales Rd East Tamaki Phone: +64 9 273 7214 Fax: +64 9 273 7219

Vulcan Steel Ltd (Palmerston North)

Address: 52-60 Makomako Rd Palmerston North Tel: +64 6 354 7763 Fax: +64 6 354 7764

Vulcan Steel Ltd (Christchurch)

Address: 15 Kilronan Pl Sockburn Christchurch Phone: +64 3 343 3960 Fax: +64 3 343 3961 Vulcan Steel Ltd (Dunedin)

Address: 7 Birch St Dunedin Phone: +64 3 471 8852 Fax: +64 3 471 8853

Australian Tub	e Mills A.B.N. 21 123 666 679. PC	O Box 246 Sunnybank, Queensla	and 4109 Australia Telephone +	-617 3909 6600 Facsimile +6 ⁻	17 3909 6660 E-mail info@aus	stubemills.com Internet www.a	ustubemills.com
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Product Manual: Pipe & Tube + Profiles

References, Specifications & Standards

Australian Standards	
AS 1074	Steel tubes and tubulars for ordinary service
AS 3990*	Mechanical equipment – Steelwork
AS 4041	Pressure piping
AS 4100	Steel structures
AS 4100–Supplement 1*	Steel structures – Commentary
AS 4118.2.1	Fire sprinkler systems – Part 2.1: Piping – General



Joint Australian & New Zea	aland Standards
AS/NZS 1163	Cold-formed structural steel hollow sections
AS/NZS 1554.1	Structural steel welding, Part 1: Welding of steel structures
AS/NZS 1554.5	Structural steel welding, Part 5: Welding of steel structures subject to high levels of fatigue loading
AS/NZS 2312	Guide to the Protection of structural steel against atmospheric corrosion by the use of protective coatings
AS/NZS 4496	Recommended practice for the colour coding of steel products
AS/NZS 4600	Cold-formed steel structures
AS/NZS 4791	Hot-dip galvanized (zinc) coatings on ferrous open sections, applied by an in-line process
AS/NZS 4792	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialised process

New Zealand Standards	
NZS 3404*	Steel structures standard
Joint Australian and Inte	ernational Organisation for Standardisation (ISO)
AS ISO 7.1	Pipe threads where pressure-tight joints are made on the threads, Part 1: Dimensions, tolerances, and designation
AS ISO 7.2	Pipe threads where pressure-tight joints are made on the threads, Part 2: Verification by means of limit gauges.

Notes:

1. * For information only - not specifically referred to in this publication.

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End Colour Coding Chart as per AS/NZS 4496





1. As per AS/NZS 4496:1997 Recommended practice for colour coding of steel products.

2. * Refers to Structural CHS Grade C350L0 up to and including 165.1 mm OD only. Otherwise no end colour coding.

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Product Manual: Pipe & Tube + Profiles

Dimensional Tolerances compliant with AS/NZS 1163: 2009 Cold-formed structural steel hollow sections

Dimension/Parameter	Tolerance	Dimension/Parameter	Tolerance
Cross-section – Variation in CHS outside diameter	\pm 1%, with a minimum of ± 0.5 mm and a maximum of ± 10 mm	Cross-section – RHS/SHS corner radius	(a) Maximum outside radius $(r_{ext}) = 3t$ (b) Minimum outside radius $(r_{ext}) = 1.5t$ (for RHS/SHS with equivalent perimeter equal to 50 x 50 or less) = 1.8t (for RHS/SHS with equivalent perimeter greater than 50 x 50) where t is the section thickness in mm.
Cross-section – Variation in RHS/SHS outside dimensions $t \rightarrow t \rightarrow$	\pm 1%, with a minimum of ± 0.5 mm	Member – Twist (RHS/SHS)	Maximum value of V (see diagram) = 2 mm + 0.5 mm per metre length
Cross-section – Thickness (t)	 CHS - For d_o ≤ 406.4 mm: ±10% For d_o > 406.4 mm: ±10% with a max of ±2 mm RHS/SHS: ± 10% 	Member – Straightness Δ→	Maximum value of Δ (see diagram) = 0.20% of total length for CHS = 0.15% of total length for RHS and SHS The straightness tolerance applies to straightness in any one plane.
Out-of-roundness (o)	o = 2% for hollow sections having a diameter to thickness ratio not exceeding 100, and where $o = \frac{d_{o_{max}} - d_{o_{min}}}{d_{o}} \times 100$	Member – Mass of Hollow Section Length	Not less than 0.96 times the nominal mass
Concavity (x_1) or Convexity (x_2) \downarrow side dimension <i>b</i> or <i>d</i> \downarrow side dimension <i>b</i> or <i>d</i> \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow	(x_1) or $(x_2) \le$ greater of 0.8% of side dimension and 0.5mm	Member – Length	+ 25 mm - 0 mm + 50 mm - 0 mm Newcastle & Somerton Mills
Squareness of sides	90°±1°		·



Notes:

- 1. If tighter tolerances are required, they must be specified at the time of order (conditions apply).
- 2. Where AS/NZS 1163 tolerance provisions do not affect the size range supplied by ATM, they have not been included in the table.
- All external dimensions are to be measured at a distance of at least d_o, b or d or 100mm from the end of the hollow section.
- 4. See Clause 8 of AS/NZS 1163 for methods of measuring manufacturing tolerances.

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Product Manual: Pipe & Tube + Profiles

Notations & Abbreviations

Abbreviation	Description
A _e	effective area of cross-section
Ag	gross area of a cross-section
b	width of section
С	torsional modulus for a cross-section; or Compact section (in bending)
C250L0	cold-formed Grade C250 hollow section to AS/NZS 1163 with L0 properties
C350L0	cold-formed Grade C350 hollow section to AS/NZS 1163 with L0 properties
C450L0	cold-formed Grade C450 hollow section to AS/NZS 1163 with L0 properties
C450L0PLUS®	cold-formed hollow section which satisfies AS/NZS 1163 Grades C350L0 and C450L0
CHS	Circular Hollow Section(s)
d	depth of section
d _o	outside diameter of a Circular Hollow Section (CHS)
DN	nominal size (as noted in AS 1074)
ERW	Electric Resistance Welding
f _u	tensile strength used in design, as defined in AS 4100
fy	yield stress used in design, as defined in AS 4100
1	second moment of area of a cross-section
I _u	/ about the cross-section u-axis (Silo section)
l _v	/ about the cross-section v-axis (Silo section)
I _w	warping constant for a cross-section (~0 for hollow sections)
I _x	I about the cross-section major principal x-axis
l _y	I about the cross-section minor principal y-axis
J	torsion constant for a cross-section

Abbreviation	Description
<i>k</i> _f	form factor for members subject to axial compression
LO	Impact properties (as required by AS/NZS 1163 at 0 degrees Celcius)
Ν	Non-compact section (in bending)
n	axis through the opposite corners of a SHS
RHS	Rectangular Hollow Section(s)
r	radius of gyration
ľ _x	radius of gyration about the major principal x-axis
r _y	radius of gyration about the minor principal y-axis
S	plastic section modulus; or Slender section (in bending)
S _x	(plastic) S about the cross-section major principal x-axis
Sy	(plastic) S about the cross-section minor principal y-axis
SHS	Square Hollow Section(s)
t	wall thickness
u	rectangular (abscissa) axis value for u-v co-ordinate system for SiloTube section
V	rectangular (ordinate) axis value for u-v co-ordinate system for SiloTube section
Х	major principal axis value
У	minor principal axis value
Ζ	elastic section modulus
Ze	effective section modulus
Z _{ex}	$Z_{\rm e}$ about the cross-section major principal x-axis
Z _{ey}	$Z_{\rm e}$ about the cross-section minor principal y-axis
Zn	Z about the n-axis through the opposite corners of a SHS
Z _x	Z about the cross-section major principal x-axis
Zy	Z about the cross-section minor principal y-axis
λ _e	plate element slenderness





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Product Manual: Pipe & Tube + Profiles



Raw Material Handling

1.0 - 1.5 metre wide rolls of steel coil are processed to make welded steel tube. Each coil weighs anywhere from 18 to 27 tonnes. After careful inspection and measurement to ensure the material is correct, the coils are placed in a storage area.

The coil ends are prepared for the start of the milling process by uncoiling and levelling. The edges are trimmed and the flat steel is then slit into the required widths to suit different products.

They are then recoiled and the trimmed edges plus offcuts are collected for recycling as scrap metal.

Pre-mill Preparation

A fully computerised production log schedule selects which coils will be processed through the mill. At this stage, information on the coils and mults (i.e. slit sub-multiples of the coil) is entered into a computer system so that the end product can be traced for quality control purposes.

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Mill Entry

Selected mults are taken from storage to meet production demands. Lengths are joined by a combination guillotine/ welding process. This does not halt production because a looper (or accumulator) allows a loop of steel strip to feed the mill while the joining operation takes place.

Cold Forming and Welding

A long series of forming rolls forms the flat steel into tube. The steel is not heated and this gradual cold forming process enhances the strength of the steel and allows for very tight dimensional tolerances.

When the edges of the tube are pushed together by squeeze rolls, they are welded using Electric Resistance Welding (ERW).

The external weld flash is removed by special scarfing tools and the pipe is cooled uniformly in a cooling trough.

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Eddy Current Testing

Weld quality is absolutely vital to the quality of the end products, its integrity is checked continuously (by our eddy current testing system) and any tube that does not conform is marked and rejected.

Sizing and Shaping

The tube then enters the sizing and shaping mill where rolls turn it into products such as square and rectangular hollow sections or other Australian Tube Mills' products such as StockRail.

Painstaking measurement takes place throughout the process to make sure the product conforms with specifications.

Protective Painting

These sections are then cleaned and degreased before entering the in-line painting process. When required, this patented in-line Primer painting process took over 20 years to fully develop and offers excellent protection for steel products during transport, handling and fabrication. The various colours also make for easy identification of the products.

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Cut-off and Bundling

After paint finishing, the product passes through an electronically controlled cut-off machine. Cut to specified lengths, the products then change direction and go through a run-out process en route to the bundler.

After a rigorous visual and dimensional inspection, most lengths of product go to the next step, those that have been ear-marked for rejection pass to one side. Tube products are then end faced to remove any jagged edges left by the cut off machine.

The bundler is a very complex process that sorts the product into pre-specified packs, wraps them with steel strap for transport and then removes them to the warehouse area.

The ends of the products are colour coded to identify wall thickness. Barcoded identification tags are also attached at this point.

Despatch

After weighing, they are put in the warehouse or are taken away for other operations, such as galvanizing. Packs are lifted onto semi-trailer transporters for despatch to our distribution network throughout Australia, New Zealand, the Pacific Rim and South-East Asia.

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Notes:

Disclaimer – Whilst every care has been taken in the preparation of this information, Australian Tube Mills, and its agents accept no liability for the accuracy of the information supplied. The company expressly disclaims all and any liability to any person whether a purchaser of any product, or otherwise in respect of anything done or omitted to be done and the consequences of anything done or omitted to be done, by any such person in reliance, whether in whole or in part upon the whole or any part of this publication.

Product availability & other information – As the section, grade and finish of all products are subject to continuous improvement, reference should be made to the ATM *PRODUCT AVAILABILITY GUIDE* (PAG) for information on the <u>availability</u> of <u>listed sections</u> and associated <u>finishes</u>. The PAG is found at: www.austubernills.com.

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Product Manual: Pipe & Tube + Profiles

CHS/Pipe to AS/NZS 1163 - C250L0 - Specifications

Technical Specifications

Australian Standards

CHS/Pipe to Grade C250L0 is manufactured and tested to comply with the requirements of the following specifications:

- AS 1074 Steel tubes and tubulars for ordinary service.
- AS/NZS 1163 Cold-formed structural steel hollow sections (Grade C250L0).
- AS/NZS 4792 Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialised process (Section 2).

Mechanical Properties

CHS/Pipe to Grade C250L0 has the following mechanical properties:

→ Minimum Yield Strength	250 MPa
→ Minimum Tensile Strength	320 MPa
\rightarrow Minimum Elongation in 5.65 $\sqrt{S_o}$	

$d_{o/t} \le 15$	$15 < d_o/t \le 30$	$d_{o/t} > 30$
18%	20%	22%

➡ L0 guaranteed impact properties at 0°C to AS/NZS 1163

Tolerances

Tolerances for CHS/Pipe to Grade C250L0 are compliant with AS/NZS 1163. See Dimensional Tolerances in Part 1 for more information.

Supply Conditions

DuraPrimed (DP) Finish

CHS/Pipe to Grade C250L0 with a DuraPrimed finish is supplied in the following surface colours: DuraPrimed^{Red}
 Clear
 This DuraPrimed finish is applied in-line using a patented process and is supplied in the following coating thicknesses:
 DuraPrimed^{Red} & Clear_____Target 12 microns with average at 8-10 microns

Note: Non-standard finishes, such as NOPC and LiteOil, are available if ordered prior to rollings. Conditions apply and subject to mill acceptance.

See the ATM Product Availability Guide for further information on availability.

HotDipGal Finish

→ Galvanized (Hot-dip)

CHS/Pipe to Grade C250L0 with HotDipGal finish is galvanized and tested to meet the requirements of Section 2 of AS/NZS 4792.

Minimum coating mass ______ 300 g/m² each side The coating adherence of the galvanizing is satisfactory for the pipe to be bent to a radius 6 times the diameter of the pipe up to 60.3mm OD in accordance with AS/NZS 4792. See the ATM Product Availability Guide for further information on availability.

End Finish (Mill Processing)

Plain and Threaded Ends with/without Sockets. Refer to Mill Processing (Part 7) of this product manual for end finish details.

See the ATM Product Availability Guide for further information on availability.

Standard Lengths

Standard length for CHS/Pipe to Grade C250L0: → (DN 20 – DN 150 CHS) ______6.5 m Grade C250L0 Extra Heavy Pipe is also available on request.

May exclude some wall thicknesses and finishes. Contact your Australian Tube Mills representative or refer to the ATM Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of CHS/Pipe to Grade C250L0 are available (conditions apply). Check with your distributor for details.

Minimum Length:

→ (DN 20 – DN 100, excl. DN 90) DP	_4.2 m
→ (DN 90, DN 125 – DN 150) DP	_5.3 m
→ (DN 20 – DN 100, excl. DN 90) HotDipGal	_5.0 m
→ (DN 90, DN 125 – DN 150) HotDipGal	_5.3 m

Maximum Length:

→ (DN 20 – DN 40) DP	_8.0 m
→ (DN 50 – DN 100) DP	12.0 m
→ (DN 90, DN 125 – DN 150) DP	12.2 m
→ (DN 20 – DN 100) HotDipGal	_7.2 m
→ (DN 125 – DN 150) HotDipGal	12.0 m
Note: Contact your Australian Tube Mills represent	ntative
for lengths outside this range.	

Thickness

CHS/Pipe to Grade C250L0 are available in medium (M), heavy (H) and extra heavy (XH) wall thickness. These thicknesses are identified by the following end colour codes:

→ Medium (M)	Blue
→ Heavy (H)	Red
→ Extra Heavy (XH)	No Colour



General Description

Manufacturing Process

CHS/Pipe to Grade C250L0, for general mechanical and low pressure reticulation and structural applications, is manufactured by cold-forming and high frequency Electric Resistance Welding (ERW) of steel strip. The cold-forming process enhances the strength, hardness and surface finish of the pipe and produces tube to tight dimensional tolerances.

Further Information

For further information refer to the Australian Tube Mills: → Product Availability Guide (PAG),

(www.austubemills.com)





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Dimensions and Ratios											P	Properties for Design to AS 4100						
[Desi	ignatior	Nominal Mass Surface Area		d	Gross Section Area	_	About a	ny axis		Torsion Constant	Torsion Modulus	Form Factor	About an	y axis			
do		t		Size	per m	per m	per t	<u>u_o</u> t	Ag	1	Z	S	r	J	С	k _f	Compactness	Ze
mm		mm		DN	kg/m	m²/m	m²/t	1	mm ²	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³		(C,N,S)	10 ³ mm ³
165.1	х	5.4	CHS	150 H	21.3	0.519	24.4	30.6	2710	8.65	105	138	56.5	17.3	209	1.00	С	138
		5.0	CHS	150 M	19.7	0.519	26.3	33.0	2510	8.07	97.7	128	56.6	16.1	195	1.00	С	128
139.7	Х	5.4	CHS	125 H	17.9	0.439	24.5	25.9	2280	5.14	73.7	97.4	47.5	10.3	147	1.00	С	97.4
		5.0	CHS	125 M	16.6	0.439	26.4	27.9	2120	4.81	68.8	90.8	47.7	9.61	138	1.00	С	90.8
114.3	Х	5.4	CHS	100 H	14.5	0.359	24.8	21.2	1850	2.75	48.0	64.1	38.5	5.49	96.1	1.00	С	64.1
		4.5	CHS	100 M	12.2	0.359	29.5	25.4	1550	2.34	41.0	54.3	38.9	4.69	82.0	1.00	С	54.3
101.6	Х	5.0	CHS	90 H	11.9	0.319	26.8	20.3	1520	1.77	34.9	46.7	34.2	3.55	69.9	1.00	С	46.7
		4.0	CHS	90 M	9.63	0.319	33.2	25.4	1230	1.46	28.8	38.1	34.5	2.93	57.6	1.00	С	38.1
88.9	Х	5.9	CHS	80 XH	12.1	0.279	23.1	15.1	1540	1.33	30.0	40.7	29.4	2.66	59.9	1.00	С	40.7
		5.0	CHS	80 H	10.3	0.279	27.0	17.8	1320	1.16	26.2	35.2	29.7	2.33	52.4	1.00	С	35.2
		4.0	CHS	80 M	8.38	0.279	33.3	22.2	1070	0.963	21.7	28.9	30.0	1.93	43.3	1.00	С	28.9
76.1	Х	5.9	CHS	65 XH	10.2	0.239	23.4	12.9	1300	0.807	21.2	29.1	24.9	1.61	42.4	1.00	С	29.1
		4.5	CHS	65 H	7.95	0.239	30.1	16.9	1010	0.651	17.1	23.1	25.4	1.30	34.2	1.00	С	23.1
		3.6	CHS	65 M	6.44	0.239	37.1	21.1	820	0.540	14.2	18.9	25.7	1.08	28.4	1.00	С	18.9
60.3	Х	5.4	CHS	50 XH	7.31	0.189	25.9	11.2	931	0.354	11.8	16.3	19.5	0.709	23.5	1.00	С	16.3
		4.5	CHS	50 H	6.19	0.189	30.6	13.4	789	0.309	10.2	14.0	19.8	0.618	20.5	1.00	С	14.0
		3.6	CHS	50 M	5.03	0.189	37.6	16.8	641	0.259	8.58	11.6	20.1	0.517	17.2	1.00	С	11.6
48.3	Х	4.0	CHS	40 H	4.37	0.152	34.7	12.1	557	0.138	5.70	7.87	15.7	0.275	11.4	1.00	С	7.87
		3.2	CHS	40 M	3.56	0.152	42.6	15.1	453	0.116	4.80	6.52	16.0	0.232	9.59	1.00	С	6.52
42.4	Х	4.0	CHS	32 H	3.79	0.133	35.2	10.6	483	0.0899	4.24	5.92	13.6	0.180	8.48	1.00	С	5.92
		3.2	CHS	32 M	3.09	0.133	43.1	13.3	394	0.0762	3.59	4.93	13.9	0.152	7.19	1.00	С	4.93
33.7	Х	4.0	CHS	25 H	2.93	0.106	36.1	8.43	373	0.0419	2.49	3.55	10.6	0.0838	4.97	1.00	С	3.55
		3.2	CHS	25 M	2.41	0.106	44.0	10.5	307	0.0360	2.14	2.99	10.8	0.0721	4.28	1.00	С	2.99
26.9	Х	4.0	CHS	20 XH	2.26	0.0845	37.4	6.73	288	0.0194	1.45	2.12	8.22	0.0389	2.89	1.00	С	2.12
		3.2	CHS	20 H	1.87	0.0845	45.2	8.41	238	0.0170	1.27	1.81	8.46	0.0341	2.53	1.00	С	1.81
		2.6	CHS	20 M	1.56	0.0845	54.2	10.3	198	0.0148	1.10	1.54	8.64	0.0296	2.20	1.00	С	1.54



Notes:

- For Grade C250L0: f_y = 250 MPa and f_u = 320 MPa; f_y = yield stress used in design; f_u = tensile strength used in design; as defined in AS 4100.
- C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
- Grade C250L0 to AS/NZS 1163 is cold-formed and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. Grade C250L0: M = Medium; H = Heavy; XH = Extra Heavy.
- LiteOil and NOPC are available in all sections on request and subject to confirmation.
- 6 Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated grades, finishes, and standard lengths. The PAG can be found at www.austubernills.com.



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CHS/Pipe to AS/NZS 1163 – C250L0 – Mass & Bundling calculated in accordance with AS/NZS 1163

	DimensionsBundling															Mass												
					Du	n dia Diara											DuraPrimed						HotDipGal					
Des	signatic	n	Nominal		Bu	inale Dimer	isions (mm)		Len	gths P	er Bur	ndle	Metr	es Per	Bund	le	Non	ninal	Ma	iss Pei	Bund	dle	Nominal N			Mass Per Bundle		
do	t		0120	6	.5	8.0	9.0	12.0									Ma	ass		tonr	nes		Ma	ISS	tonnes			
mm	mm		DN	W	κН	WхH	WхН	WхН	6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0
26.9 >	(2.6	CHS	20 M	350	306	-	-	-	127	-	-	-	825.5	-	-	-	1.56	642	1.29	-	-	-	1.60	624	1.32	-	-	-
	3.2	CHS	20 H	350	306	-	-	-	127	-	-	-	825.5	-	-	-	1.87	535	1.54	-	-	-	1.92	522	1.58	-	-	-
	4.0	CHS	20 XH	350	306	-	-	-	127	-	-	-	825.5	-	-	-	2.26	443	1.86	-	-	-	2.30	434	1.90	-	-	-
33.7 >	(3.2	CHS	25 M	371	326	-	-	-	91	-	-	-	591.5	-	-	-	2.41	415	1.42	-	-	-	2.46	406	1.46	-	-	-
	4.0	CHS	25 H	371	326	-	-	-	91	-	-	-	591.5	-	-	-	2.93	341	1.73	-	-	-	2.99	335	1.77	-	-	-
42.4 >	(3.2	CHS	32 M	382	336	-	-	-	61	-	-	-	396.5	-	-	-	3.09	323	1.23	-	-	-	3.17	316	1.26	-	-	-
	4.0	CHS	32 H	382	336	-	-	-	61	-	-	-	396.5	-	-	-	3.79	264	1.50	-	-	-	3.86	259	1.53	-	-	-
48.3 >	3.2	CHS	40 M	435	383	-	-	-	61	-	-	-	396.5	-	-	-	3.56	281	1.41	-	-	-	3.64	274	1.45	-	-	-
	4.0	CHS	40 H	435	383	-	-	-	61	-	-	-	396.5	-	-	-	4.37	229	1.73	-	-	-	4.45	225	1.77	-	-	-
60.3 >	3.6	CHS	50 M	422	374	-	-	-	37	-	-	-	240.5	-	-	-	5.03	199	1.21	-	-	-	5.14	195	1.24	-	-	-
	4.5	CHS	50 H	422	374	-	-	-	37	-	-	-	240.5	-	-	-	6.19	161	1.49	-	-	-	6.30	159	1.51	-	-	-
	5.4	CHS	50 XH	422	374	-	-	-	37	-	-	-	240.5	-	-	-	7.31	137	1.76	-	-	-	7.41	135	1.78	-	-	-
76.1 >	3.6	CHS	65 M	533	472	-	-	-	37	-	-	-	240.5	-	-	-	6.44	155	1.55	-	-	-	6.57	152	1.58	-	-	-
	4.5	CHS	65 H	533	472	-	-	-	37	-	-	-	240.5	-	-	-	7.95	126	1.91	-	-	-	8.08	124	1.94	-	-	-
	5.9	CHS	65 XH	533	472	-	-	-	37	-	-	-	240.5	-	-	-	10.2	97.9	2.46	-	-	-	10.3	96.7	2.49	-	-	-
88.9 >	< 4.0	CHS	80 M	445	397	-	-	-	19	-	-	-	123.5	-	-	-	8.38	119	1.03	-	-	-	8.54	117	1.05	-	-	-
	5.0	CHS	80 H	445	397	-	-	-	19	-	-	-	123.5	-	-	-	10.3	96.7	1.28	-	-	-	10.5	95.2	1.30	-	-	-
	5.9	CHS	80 XH	445	397	-	-	-	19	-	-	-	123.5	-	-	-	12.1	82.8	1.49	-	-	-	12.2	81.7	1.51	-	-	-
101.6 >	< 4.0	CHS	90 M	508	454	-	-	-	19	-	-	-	123.5	-	-	-	9.63	104	1.19	-	-	-	9.81	102	1.21	-	-	-
	5.0	CHS	90 H	508	454	-	-	-	19	-	-	-	123.5	-	-	-	11.9	84.0	1.47	-	-	-	12.1	82.7	1.49	-	-	-
114.3 >	< 4.5	CHS	100 M	572	510	-	-	-	19	-	-	-	123.5	-	-	-	12.2	82.1	1.50	-	-	-	12.4	80.7	1.53	-	-	-
	5.4	CHS	100 H	572	510	-	-	-	19	-	-	-	123.5	-	-	-	14.5	69.0	1.79	-	-	-	14.7	68.0	1.82	-	-	-
139.7 >	< 5.0	CHS	125 M	699	382	-	-	-	13	-	-	-	84.5	-	-	-	16.6	60.2	1.40	-	-	-	16.9	59.3	1.43	-	-	-
	5.4	CHS	125 H	699	382	-	-	-	13	-	-	-	84.5	-	-	-	17.9	55.9	1.51	-	-	-	18.1	55.1	1.53	-	-	-
165.1 >	< 5.0	CHS	150 M	660	451	-	-	-	10	-	-	-	65	-	-	-	19.7	50.7	1.28	-	-	-	20.0	49.9	1.30	-		-
	5.4	CHS	150 H	660	451	-	-	-	10	-	-	-	65	-	-	-	21.3	47.0	1.38	-	-	-	21.6	46.4	1.40	-	-]	-



Notes:

Grade C250L0: M = Medium; H = Heavy; XH = Extra Heavy.
 See also notes for Section Properties for this product



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 PART 4 Profiles
 PART 5 Steel Grades
 PART 6 Mill Coatings
 PART 7 Mill Processing
 PART 8 Fabrication

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Product Manual: Pipe & Tube + Profiles

CHS to AS/NZS 1163 – C350L0 – Specifications

Technical Specifications

Australian Standards

CHS to Grade C350L0 is manufactured and tested to comply with the requirements of the following specifications: → AS/NZ 1163 – Cold formed structural steel hollow sections (Grade C350L0).

→ AS/NZS 4792 – Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process (Section 2 or 3 or 4).

Mechanical Properties

CHS to Grade C350L0 has the following mechanical							
properties:							
→ Minimum Yield Strength	350 MPa						
→ Minimum Tensile Strength	430 MPa						
\rightarrow Minimum Elongation in 5.65 \sqrt{S}							

<i>d₀/t</i> ≤15	$15 < \frac{d_o}{t} \le 30$	<i>d_o/t</i> >30
16%	18%	20%

→ L0 guaranteed impact properties at 0°C to AS/NZ 1163.

Tolerances

Tolerances for CHS to Grade C350L0 are compliant with AS/NZS 1163. See Dimensional Tolerances in Part 1 for more information

Supply Conditions

DuraPrimed (DP) Finish

CHS to Grade C350L0 with a DuraPrimed finish is supplied in the following surface colour:

→ Clear

This DuraPrimed finish is applied in-line using a patented process and is supplied in the following coating thicknesses: → Clear Target 12 microns with â√e0amaiecants

Note: Non-standard finishes, such as NOPC and LiteOil. are available if ordered prior to rollings. Conditions apply and subject to mill acceptance. See the ATM Product Availability Guide for further information on availability.

DuraGal[®] Finish

CHS to Grade C350L0 with DuraGal® finish is manufactured from in-line galvanizing hollow sections that has the following external coating thickness: → Minimum coating mass 100 g/m² AS/NZS 4792 II G 100 \rightarrow Designated as See the ATM Product Availability Guide for further information on availability.

DuraGal^{Plus} Finish

CHS to Grade C350L0 with DuraGal^{Plus} finish is manufactured using steel strip that has the following coating thickness: \rightarrow Minimum coating mass 100 g/m² each side AS/NZS 4792 ZB 100/100 → Designated as See the ATM Product Availability Guide for further information on availability.

HotDipGal Finish

→ Galvanized (Hot-dip) CHS to Grade C350L0 with HotDipGal finish is manufactured and tested to meet the requirements of Section 2 of AS/NZS 4792.

 \rightarrow Minimum coating mass 300 g/m² each side → Designated as AS/NZS 4792 HDG 300 The coating adherence of the galvanizing is satisfactory for the CHS to be bent to a radius 6 times the diameter of the CHS up to 60.3 mm OD in accordance with AS/NZS 4792.

See the ATM Product Availability Guide for further information on availability.

End Finish (Mill Processing)

 \rightarrow Plain Ends as standard.

→ Swaged Ends available for 20-50 NB in Extra Light and Light (excl. 20L).

Refer to Mill Processing (Part 7) of this Product Manual for end finish details.

See the ATM Product Availability Guide for further information on availability.

Standard Lengths

Standard length for CHS to Grade C350L0: → See following Mass & Bundling Tables Contact your Australian Tube Mills representative or refer to the ATM Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of CHS to Grade C350L0 are available (conditions apply). Check with your distributor for details.

Minimum Length:

→ (26.9 OD – 114.3 OD, excl 101.6 OD) DP	4.2 m
→ (101.6 OD, 139.7 OD – 165.1 OD) DP	_5.3 m
→ (26.9 OD – 114.3 OD, excl. 101.6 OD) DuraGal ^{Plus}	4.2 m
→ (26.9 OD – 114.3 OD, excl. 101.6 OD) HotDipGal	_5.0 m
→ (101.6 OD, 139.7 OD – 165.1 OD) HotDipGal_	_5.3 m

Maximum Length:

→ (26.9 OD – 48.3 OD) DP	8.0 m
→ (60.3 OD – 114.3 OD, excl. 101.6 OD) DP	12.0 m
→ (88.9 OD – 165.1 OD) DP	12.2 m
→ (26.9 OD – 48.3 OD) DuraGal ^{Plus}	8.0 m
→ (60.3 OD – 114.3 OD) DuraGal ^{Plus}	12.0 m
→ (26.9 OD – 114.3 OD) HotDipGal	7.2 m
→ (139.7 OD – 165.1 OD) HotDipGal	12.2 m
Note: Contact your Australian Tube Mills repres	entative
for lengths outside this range.	

Thickness

CHS to Grade C350L0 are available in 2.0 mm to 12.7 mm wall thickness. Sections with 165.1 mm OD and less are identified by the following end colour codes: N Extra Lindat

→ Extra Light	Green

→ Light Yellow

Otherwise no end colour coding applies.



General Description

Manufacturing Process

CHS to Grade C350L0, for general structural and mechanical applications, is manufactured by coldforming and high frequency Electric Resistance Welding (ERW) of high strength steel strip. The cold-forming process enhances the strength, hardness and surface finish of the pipe and produces tube to tight dimensional tolerances.

Further Information

For further information refer to the Australian Tube Mills: → Product Availability Guide (PAG) (www.austubemills.com)



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Product Manual: Pipe & Tube + Profiles

CHS to AS/NZS 1163 – C350L0 – Section Properties calculated in accordance with AS/NZS 1163 & AS 4100

	Dimensions and Ratios									Р	Properties for Design to AS 4100						
Designation		1	Nominal	Mass	External Surface Area		d	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus	Form Factor	About any axis	
d _o	t		Size	per m	per m	per t		Ag	1	Z	S	r	J	С	k _f	Compactness	Ze
mm	mm		DN	kg/m	m²/m	m²/t		mm ²	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³		(C,N,S)	10 ³ mm ³
508.0	x 12.7	CHS		155	1.60	10.3	40.0	19800	606	2390	3120	175	1210	4770	1.00	Ν	3060
	9.5	CHS		117	1.60	13.7	53.5	14900	462	1820	2360	176	925	3640	1.00	Ν	2170
	6.4	CHS		79.2	1.60	20.2	79.4	10100	317	1250	1610	177	634	2500	0.857	Ν	1300
457.0	x 12.7	CHS		139	1.44	10.3	36.0	17700	438	1920	2510	157	876	3830	1.00	Ν	2510
	9.5	CHS		105	1.44	13.7	48.1	13400	334	1460	1900	158	669	2930	1.00	Ν	1790
	6.4	CHS		71.1	1.44	20.2	71.4	9060	230	1010	1300	159	460	2010	0.904	Ν	1090
406.4	x 12.7	CHS		123	1.28	10.4	32.0	15700	305	1500	1970	139	609	3000	1.00	С	1970
	9.5	CHS		93.0	1.28	13.7	42.8	11800	233	1150	1500	140	467	2300	1.00	Ν	1450
	6.4	CHS		63.1	1.28	20.2	63.5	8040	161	792	1020	141	322	1580	0.960	N	893
355.6	x 12.7	CHS		107	1.12	10.4	28.0	13700	201	1130	1490	121	403	2260	1.00	С	1490
	9.5	CHS		81.1	1.12	13.8	37.4	10300	155	871	1140	122	310	1740	1.00	N	1130
	6.4	CHS		55.1	1.12	20.3	55.6	7020	107	602	781	123	214	1200	1.00	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	С	1230
	9.5	CHS		73.7	1.02	13.8	34.1	9380	116	717	939	111	232	1430	1.00	С	939
	6.4	CHS		50.1	1.02	20.3	50.6	6380	80.5	497	645	112	161	994	1.00	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	С	862
	9.3	CHS		60.5	0.858	14.2	29.4	7710	67.1	492	647	93.3	134	983	1.00	С	647
	6.4	CHS		42.1	0.858	20.4	42.7	5360	47.7	349	455	94.3	95.4	699	1.00	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	N	312
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	С	365
	6.4	CHS		33.6	0.688	20.5	34.2	4280	24.2	221	290	75.2	48.4	442	1.00	С	290
	4.8	CHS		25.4	0.688	27.1	45.6	3230	18.6	169	220	75.8	37.1	339	1.00	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	С	185
	6.4	CHS		25.6	0.529	20.7	26.3	3260	10.7	127	168	57.3	21.4	254	1.00	С	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	С	128



Notes:

- 1. For Grade C350L0: $f_y = 350$ MPa and $f_u = 430$ MPa; $f_y =$ yield stress used in design; f_u = tensile strength used in design; as defined in AS 4100.
- 2. C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
- Grade C350L0 to AS/NZS 1163 is cold-formed and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. Grade C350L0: XL = Extra Light; L = Light.
- LiteOil and NOPC are available in all sections on request and subject to confirmation.
- 6 Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated, grades, finishes, and standard lengths. The PAG can be found at www.austubemills.com.



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Product Manual: Pipe & Tube + Profiles

'n	PART 2	PART 3	PART 4	PART 5	PART 6	PART 7	PART 8
	Pipe & Tube Products	Other Tube Products	Profiles	Steel Grades	Mill Coatings	Mill Processing	Fabrication

	Dimensions and Ratios										Р	Properties for Design to AS 4100						
ſ	Desi	gnatior		Nominal	Mass	Exte Surfac	ernal e Area	Ь	Gross Section Area		About a	any axis		Torsion Constant	Torsion Modulus	Form Factor	orm Factor About any axis	
d _o		t		Size	per m	per m	per t	<u> </u>	Ag	I	Z	S	r	J	С	k _f	Compactness	Z _e
mm		mm		DN	kg/m	m²/m	m²/t		mm ²	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³		(C,N,S)	10 ³ mm ³
165.1	х	3.5	CHS	150 L	13.9	0.519	37.2	47.2	1780	5.80	70.3	91.4	57.1	11.6	141	1.00	Ν	86.6
		3.0	CHS	150 XL	12.0	0.519	43.2	55.0	1530	5.02	60.8	78.8	57.3	10.0	122	1.00	Ν	71.9
139.7	Х	3.5	CHS	125 L	11.8	0.439	37.3	39.9	1500	3.47	49.7	64.9	48.2	6.95	99.5	1.00	Ν	63.7
		3.0	CHS	125 XL	10.1	0.439	43.4	46.6	1290	3.01	43.1	56.1	48.3	6.02	86.2	1.00	Ν	53.3
114.3	Х	3.6	CHS	100 L	9.83	0.359	36.5	31.8	1250	1.92	33.6	44.1	39.2	3.84	67.2	1.00	С	44.1
		3.2	CHS	100 XL	8.77	0.359	41.0	35.7	1120	1.72	30.2	39.5	39.3	3.45	60.4	1.00	Ν	39.5
101.6	Х	3.2	CHS	90 L	7.77	0.319	41.1	31.8	989	1.20	23.6	31.0	34.8	2.40	47.2	1.00	С	31.0
		2.6	CHS	90 XL	6.35	0.319	50.3	39.1	809	0.991	19.5	25.5	35.0	1.98	39.0	1.00	Ν	25.1
88.9	Х	3.2	CHS	80 L	6.76	0.279	41.3	27.8	862	0.792	17.8	23.5	30.3	1.58	35.6	1.00	С	23.5
		2.6	CHS	80 XL	5.53	0.279	50.5	34.2	705	0.657	14.8	19.4	30.5	1.31	29.6	1.00	С	19.4
76.1	Х	3.2	CHS	65 L	5.75	0.239	41.6	23.8	733	0.488	12.8	17.0	25.8	0.976	25.6	1.00	С	17.0
		2.3	CHS	65 XL	4.19	0.239	57.1	33.1	533	0.363	9.55	12.5	26.1	0.727	19.1	1.00	С	12.5
60.3	Х	2.9	CHS	50 L	4.11	0.189	46.1	20.8	523	0.216	7.16	9.56	20.3	0.432	14.3	1.00	С	9.56
		2.3	CHS	50 XL	3.29	0.189	57.6	26.2	419	0.177	5.85	7.74	20.5	0.353	11.7	1.00	С	7.74
48.3	Х	2.9	CHS	40 L	3.25	0.152	46.7	16.7	414	0.107	4.43	5.99	16.1	0.214	8.86	1.00	С	5.99
		2.3	CHS	40 XL	2.61	0.152	58.2	21.0	332	0.0881	3.65	4.87	16.3	0.176	7.30	1.00	С	4.87
42.4	Х	2.6	CHS	32 L	2.55	0.133	52.2	16.3	325	0.0646	3.05	4.12	14.1	0.129	6.10	1.00	С	4.12
		2.0	CHS	32 XL	1.99	0.133	66.8	21.2	254	0.0519	2.45	3.27	14.3	0.104	4.90	1.00	С	3.27
33.7	Х	2.6	CHS	25 L	1.99	0.106	53.1	13.0	254	0.0309	1.84	2.52	11.0	0.0619	3.67	1.00	С	2.52
		2.0	CHS	25 XL	1.56	0.106	67.7	16.9	199	0.0251	1.49	2.01	11.2	0.0502	2.98	1.00	С	2.01
26.9	Х	2.3	CHS	20 L	1.40	0.0845	60.6	11.7	178	0.0136	1.01	1.40	8.74	0.0271	2.02	1.00	С	1.40
		2.0	CHS	20 XL	1.23	0.0845	68.8	13.5	156	0.0122	0.907	1.24	8.83	0.0244	1.81	1.00	С	1.24



Notes:

- 1. For Grade C350L0: $f_y = 350$ MPa and $f_u = 430$ MPa; $f_y =$ yield stress used in design; $f_u =$ tensile strength used in design; as defined in AS 4100.
- 2. C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
- Grade C350L0 to AS/NZS 1163 is cold-formed and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. Grade C350L0: XL = Extra Light; L = Light.
- LiteOil and NOPC are available in all sections on request and subject to confirmation.
- 6 Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated, grades, finishes, and standard lengths. The PAG can be found at www.austubemills.com.



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Product Manual: Pipe & Tube + Profiles
CHS to AS/NZS 1163 – C350L0 – Mass & Bundling calculated in accordance with AS/NZS 1163

	Dim	ension	s					Bun	dling								Mass											
					_												Dur	aPrime	ed/Dura	Gal®/D	uraGa	al ^{Plus} /			HotDip	Gal		
De	esignat	ion	Nominal		В	undle Dime	ensions (m	m)	Lend	aths P	er Bu	ndle	Metr	es Pe	r Bun	dle	Non	ninal	Ma	iss Pe	r Bun	dle	Nor	ninal	Mas	ss Per	Bund	lle
do	t		Size	f	3.5	8.0	9.0	12.0	Ì	5							Ma	ass		ton	nes		Ma	ass		tonr	ies	
-0			DN	\M/	у Ц	W v H	W v H	W v H	6.5	80	9.0	12.0	6.5	8.0	9.0	12.0	ka/m	m/t	6.5	8.0	0.0	12.0	ka/m	m/t	6.5	8.0	9.0	12.0
00.0		01.10		050	× 11	VV X II	VV A 11	W X II	107	0.0	9.0	12.0	0.5	0.0	5.0	12.0	1.00	014	1.01	0.0	3.0	12.0	1.00	704	1.05	0.0	3.0	12.0
26.9	x 2.0	CHS	20 XL	350	306	-	-	-	127	-	-	-	825.5	-	-	-	1.23	814	1.01	-	-	-	1.28	784	1.05	-	-	-
00.7	2.3	CHS	20 L	350	306	-	-	-	127	-	-	-	825.5	-	-	-	1.40	/1/	1.15	-	-	-	1.44	694	1.19	-	-	-
33.7	x 2.0	CHS	25 XL	3/1	326	-	-	-	91	-	-	-	591.5	-	-	-	1.50	640	0.925	-	-	-	1.62	616	0.960	-	-	-
10.1	2.6	CHS	25 L	3/1	326	-	-	-	91	-	-	-	591.5	-	-	-	1.99	501	1.18	-	-	-	2.05	487	1.21	-	-	-
42.4	X 2.0	CHS	32 XL	382	330	-	-	-	01	-	-	-	390.5	-	-	-	1.99	202	1.01	-	-	-	2.07	483	0.820	-	-	-
40.0	2.0		32 L	382	330	-	-	-	01	-	-	-	390.5	-	-	-	2.00	392	1.01	-	-	-	2.03	301	1.04	-	-	-
48.3	X 2.3	CHS	40 XL	430	383	-	-	-	01	-	-	-	390.5	-	-	-	2.01	383	1.03	-	-	-	2.70	3/1	1.07	-	-	-
<u> </u>	2.9	CHS	40 L	430	383	-	-	-	01	-	-	-	390.5	-	-	-	3.20	308	1.29	-	-	-	3.33	300	1.32	-	-	-
00.3	X Z.J	CHS	50 XL	422	374	-	-	-	3/	-	-	-	240.5	-	-	-	3.29	304	0.791	-	-	-	3.40	294	1.01	-	-	-
70.1	2.9	CHS	SU L	422	470	-	-	-	3/	-	-	-	240.5	-	-	-	4.11	244	1.01	-	-	-	4.21	237	1.01	-	-	-
/0.1	X Z.J	CHS		533	472	-	-	-	3/	-	-	-	240.5	-	-	-	4.19	239	1.01	-	-	-	4.33	231	1.04	-	-	-
00.0	3.2	CHS	00 L	233	4/2	-	-	-	3/	-	-	-	240.5	-	-	-	5.75	1/4	1.38	-	-	-	5.89	170	1.42	-	-	-
88.9	X 2.0	CHS	80 XL	445	397	-	-	-	19	-	-	-	123.5	-	-	-	0.03	101	0.083	-	-	-	5.70	1/0	0.703	-	-	-
101.0	3.2	CHS	80 L	440	397	-	-	-	19	-	-	-	123.5	-	-	-	0.70	148	0.835	-	-	-	0.92	144	0.800	-	-	-
101.0	X Z.0	CHS	90 XL	508	404	-	-	-	19	-	-	-	123.5	-	-	-	0.30	100	0.784	-	-	-	0.03	100	0.807	-	-	-
114.0	0.Z	CHS	90 L	500	404 510	-	-	-	10	-	-	-	123.0	-	-	-	0.77	129	1.09	-	-	-	7.90	120	0.902			-
114.5	X 3.2		100 AL	572	510	-	-	-	10	-	-	-	123.0	-	-	-	0.11	100	1.00	-	-	-	0.90	00.6	1.11	-	-	-
120.7	<u> </u>	CHS	100 L	600	200	-	-	-	19	-	-	-	123.3 04 E	-	-	-	9.00	00.0	0.055	-	-	-	10.0	99.0	0.076			-
139.7	入 3.U ス に	СП0	120 AL	600	202	-	-	-	10	-	-	-	04.3	-	-	-	10.1	90.9	0.000	-	-	-	10.4	90.4	1.02	-	-	-
165.1	0.0 v 20	000	150 VI	660	JOZ 151	-	-	-	10	-	-	-	65	-	-	-	12.0	00.1	0.993	-	-	-	12.0	00.2 01 0	0.700			-
105.1	x 3.0	CHS	150 AL	000	401	-	-	-	10	-	-	-	00	-	-	-	12.0	71 7	0.780	-	-	-	14.0	70.0	0.799	-		-
	3.0	СПЭ	100 L	000	431	-	-	-	10				00			-	13.9	11.7	0.907	-	-	-	14.3	10.2	0.920	-		



Notes:

1. Grade C350L0: XL = Extra Light; L = Light.

2. See also Notes for Section Properties for this product.



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CHS to AS/NZS 1163 – C350L0 – Mass & Bundling calculated in accordance with AS/NZS 1163

	Dime	nsions	S					Βι	ındlir	ng							Mass											
_																			DuraPi	rimed					HotD	ipGal		
Des	signatic	n	Nominal Size		Bundle Dir	nensions (i	mm)		Ler	ngths F	Per Bur	ndle	Me	etres P	er Bun	dle	Non	ninal	N	lass P	er Bur	dle	Non	ninal	M	ass Pe	er Bund	dle
do	t		0126	6.5	8.0	9.0	12	.0									Ma	ass		tor	nnes		Ma	ass		ton	ines	
mm	mm		DN	WхH	WхH	WхH	W >	άн	6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0
168.3 x	4.8	CHS					168	168				1				12	19.4	51.7				0.232						
	6.4	CHS					168	168				1				12	25.6	39.1				0.307						
	7.1	CHS					168	168				1				12	28.2	35.4				0.339						
219.1 x	4.8	CHS					219	219				1				12	25.4	39.4				0.304						
	6.4	CHS					219	219				1				12	33.6	29.8				0.403						
	8.2	CHS					219	219				1				12	42.6	23.4				0.512						
273.1 x	4.8	CHS					273	273				1				12	31.8	31.5				0.381						
	6.4	CHS					273	273				1				12	42.1	23.8				0.505						
	9.3	CHS					273	273				1				12	60.5	16.5				0.726						
	12.7	CHS					273	273				1				12	81.6	12.3				0.979					-	
323.9 ×	6.4	CHS					324	324				1				12	50.1	20.0				0.601						
	9.5	CHS					324	324				1				12	73.7	13.6				0.884						
	12.7	CHS					324	324				1				12	97.5	10.3				1.17						
355.6 x	6.4	CHS					356	356				1				12	55.1	18.1				0.661						
	9.5	CHS					356	356				1				12	81.1	12.3				0.973						
	12.7	CHS					356	356				1				12	107	9.31				1.29						
406.4 x	6.4	CHS					406	406				1				12	63.1	15.8				0.758						
	9.5	CHS					406	406				1				12	93.0	10.8				1.12						
	12.7	CHS					406	406				1				12	123	8.11				1.48						
457.0 x	6.4	CHS					457	457				1				12	71.1	14.1				0.853						
	9.5	CHS					457	457				1				12	105	9.54				1.26						
	12.7	CHS					457	457				1				12	139	7.19				1.67						
508.0 x	6.4	CHS					508	508				1				12	79.2	12.6				0.950						
	9.5	CHS					508	508				1				12	117	8.56				1.40						
	12.7	CHS					508	508				1				12	155	6.45				1.86						



Notes:

- Grade C350L0: XL = Extra Light; L = Light.
 See also Notes for Section Properties for this product
- 2. See also Notes for Section Properties for this product.



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Product Manual: Pipe & Tube + Profiles

RHS to AS/NZS 1163 – C350L0 – Specifications

Technical Specifications

Australian Standards

RHS to Grade C350L0 is manufactured and tested to comply with the requirements of the following specifications:

- → AS/NZS 1163 Cold-formed structural steel hollow sections (Grade C350L0).
- → AS/NZS 4792 Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process (Section 3 or 4).

Mechanical Properties

RHS to Grade C350L0 has the following mechanical properties:

→ Minimum Yield Strength	350 MPa
→ Minimum Tensile Strength	430 MPa
\rightarrow Minimum Elongation in 5.65 $\sqrt{S_{o}}$	

$\left(b_{/t}, d_{/t}\right) \le 15$	$15 < \left(b_{t}, d_{t} \right) \le 30$	$(b_{\mathcal{A}}, d_{\mathcal{A}}) > 30$
12%	14%	16%

→ L0 guaranteed impact properties at 0°C to AS/NZS 1163

Tolerances

Tolerances for RHS to Grade C350L0 are compliant with AS/NZS 1163. See Dimensional Tolerances in Part 1 for more information.

Supply Conditions

DuraPrimed (DP) Finish

RHS to Grade C350L0 with DuraPrimed finish is supplied in the following surface colours: → DuraPrimed^{Blue}

This DuraPrimed finish is applied in-line using a patented process and is supplied in the following coating thicknesses:

→ DuraPrimed^{Blue} Target 12 microns with average at 8-10 microns Note: Non-standard finishes, such as NOPC and LiteOil, are available if ordered prior to rollings. Conditions apply and subject to mill acceptance.

See the ATM Product Availability Guide for further information on availability.

DuraGal® Finish

RHS to Grade C350L0 with DuraGal® finish is manufactured from in-line galvanising hollow sections that has the following external coating thickness: → Minimum coating mass 100 g/m² AS/NZS 4792 ILG 100 → Designated as See the ATM Product Availability Guide for further information on availability.

DuraGal^{Plus} Finish

RHS to Grade C350L0 with DuraGal^{Plus} finish is manufactured using steel strip that has the following coating thickness:

→ Minimum coating mass 100 g/m² each side AS/NZS 4792 ZB 100/100 \rightarrow Designated as See the ATM Product Availability Guide for further information on availability.

Oiled Finish

Oiled tubular products use a robust oil coating which is adequate for seaborne transport. See the ATM Product Availability Guide for further information on availability.

End Finish (Mill Processing)

 \rightarrow Plain Ends only

Standard Lengths

Standard lengths for RHS to Grade C350L0:

→ See following Mass & Bundling Tables. Contact your Australian Tube Mills representative or refer to the ATM Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of RHS to Grade C350L0 are available (conditions apply). Check with your distributor for details.

Minimum Length:

→ (50x20 RHS) DuraGal ^{Plus} /DP	_4.5 m
→ (50x25 – 75x25 RHS) DuraGal ^{Plus} /DP	_4.2 m
→ (65x35 – 75x25 RHS) DuraGal ^{Plus} /DP	_4.5 m

Maximum Length:

→ (50x20 RHS) DuraGal ^{Plus} /DP	9.0 m
→ (50x25 RHS) DuraGal ^{Plus} /DP	8.0 m
→ (65x35 – 75x25 RHS) DuraGal ^{Plus} /DP	12.2 m
Note: Contact your Australian Tube Mills represe	ntative
for lengths outside this range.	

Thickness

PART 5

Steel Grades

RHS to Grade C350L0 is available in 1.6 mm to 4.0 mm wall thicknesses. These thicknesses are identified by the following end colour codes:

→ 1.6 mm	_ Purple
→ 2.0 mm	Yellow
→ 2.5 mm	Pink
→ 3.0 mm	Blue
→ 4.0 mm	Green
→ 5.0 mm	Orange

PART 6

Mill Coatings



General Description

Manufacturing Process

RHS to Grade C350L0, for manufacturing, general fabrication and lighter structural applications, is manufactured by cold-forming and high frequency Electric Resistance Welding (ERW) of higher strength steel strip. The cold-forming process enhances the strength, hardness and surface finish of the tube and produces RHS to tight dimensional tolerances.

Further Information

For further information refer to the Australian Tube Mills: → Product Availability Guide (PAG)

(www.austubemills.com.au)

PART 7

Mill Processing



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PART 4

Profiles



PART 3 **Pipe & Tube Products** Other Tube Products

Build with

Standards

PART 2

Product Manual: Pipe & Tube + Profiles

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PART 8

Fabrication

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Product Manual: Pipe & Tube + Profiles

RHS to AS/NZS 1163 – C350L0 – Section Properties calculated in accordance with AS/NZS 1163 & AS 4100

	Dimensions and Ratios										Properties												erties fo	or Desi	sign to AS 4100				
		Desigr	nation		Mass	Exte	ernal face	h 2t	d 2t	Gross Section		About	x-axis			About y	/-axis		Torsion Constant	Torsion Modulus	Form Factor		About x-ax	is		About y-a:	xis		
	d	b	t		per m	per m	pert	t	<u>t</u>	Area A _g	$I_{\rm x}$	Z _x	S _x	r _x	l _y	Zy	Sy	r _y	J	С	k _f	$\lambda_{\rm e}$	Compact- ness	Z _{ex}	$\lambda_{\rm e}$	Compact- ness	Z _{ey}		
	mm	mm	mm		kg/m	m²/m	m²/t			mm ²	10 ⁶ mm ⁴	10 ³ mm ³	³ 10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³			(C,N,S)	10 ³ mm ³		(C,N,S)	10 ³ mm ³		
Γ	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	С	10.1	33.1	Ν	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	С	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	С	6.81	53.1	S	2.22		
	65 x	35 x	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	С	13.3	16.9	С	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	С	11.0	23.3	С	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	С	9.45	28.4	С	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	С	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	С	5.86	17.4	С	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	С	5.11	21.3	С	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	С	4.26	27.2	С	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	С	3.53	34.6	Ν	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	С	5.16	17.4	С	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	С	4.51	21.3	С	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	С	3.78	27.2	С	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	С	3.14	34.6	N	1.54		



Notes:

- 1. For Grade C350L0: f_y = 350 MPa and f_u = 430 MPa; f_y = yield stress used in design; f_u = tensile strength used in design; as defined in AS 4100.
- 2. C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
- Grade C350L0 to AS/NZS 1163 is cold-formed, and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. LiteOil and NOPC are available in all sections on request and subject to confirmation.
- Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated grades, finishes, and standard lengths. The PAG can be found at www.austubemills.com

ADDITIONAL NOTES:

(A) <u>THE ABOVE IS THE STANDARD GRADE FOR THE LISTED PRODUCTS</u>. SEE THE FOLLOWING TABLE FOR THESE SECTIONS LISTED IN NON-STANDARD C450PLUS.

(B) SEE THE FOLLOWING TABLE FOR OTHER SIZES IN ATM'S LARGER RANGE OF C450PLUS PRODUCTS.





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Product Manual: Pipe & Tube + Profiles

RHS to AS/NZS 1163 – C350L0 – Mass & Bundling calculated in accordance with AS/NZS 1163

Dimensions									Bun	dling														M	ass		
Designation	Bundle	Config	uration ((mm)			Bund	le Dime	ensio	ns (mr	ר)				Ler	ngths			Met	res		Non	ninal	N	Aass Pe	Bundle	e
d b t	6.5	8.0	9.0	12.0	6	6.5	8	.0		9.0		12	2.0		Per I	Bundle	e		Per B	undle		Ma	ass		ton	nes	
mm mm mm	W x H W	хН	WхН	W x H	W	хН	W	хН	W	х Н	,	w >	κн	6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0
50 x 20 x 1.6 RHS	8	12					400	240							96	ò			768			1.63	615		1.25		
2.0 RHS	8	12					400	240							96	6			768			1.99	502		1.53		
2.5 RHS	6	12					300	240							72	2			576			2.42	412		1.40		
3.0 RHS	6	12					300	240							72	2			576			2.83	353		1.63		
50 x 25 x 1.6 RHS	8	12					400	300							96	6			768			1.75	571		1.35		
2.0 RHS	8	12					400	300							96	6			768			2.15	465		1.65		
2.5 RHS	6	12					300	300							72	2			576			2.62	382		1.51		
3.0 RHS	6	10					300	250							60)			480			3.07	326		1.47		
65 x 35 x 2.0 RHS	6	9					390	315							54	4			432			2.93	341		1.27		
2.5 RHS	6	9					390	315							54	4			432			3.60	278		1.56		
3.0 RHS	5	9					325	315							45	5			360			4.25	236		1.53		
4.0 RHS	5	7					325	245							35	5			280			5.35	187		1.50		
75 x 25 x 1.6 RHS	5	13					375	325							65	5			520			2.38	420		1.24		
2.0 RHS	5	13					375	325							65	5			520			2.93	341		1.53		
2.5 RHS	4	12					300	300							48	3			384			3.60	278		1.38		



Notes:

1. See also Notes for Section Properties for this product



ADDITIONAL NOTES:

(A) <u>THE ABOVE IS THE STANDARD GRADE FOR THE LISTED PRODUCTS</u>. SEE THE FOLLOWING TABLE FOR THESE SECTIONS LISTED IN NON-STANDARD C450PLUS.

(B) SEE THE FOLLOWING TABLE FOR OTHER SIZES IN ATM'S LARGER RANGE OF C450PLUS PRODUCTS.



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Product Manual: Pipe & Tube + Profiles

RHS to AS/NZS 1163 – C450PLUS[®] – Specifications

Technical Specifications

Australian Standards

RHS to Grade C450PLUS is manufactured and tested to comply with the requirements of the following specifications:

- → AS/NZS 1163 Cold-formed structural steel hollow sections (Grades C350L0 and Grade C450L0).
- → AS/NZS 4792 Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process (Section 3 or 4).

Mechanical Properties

RHS to Grade C450PLUS has the following mechanical properties:

→ Minimum Yield Strength	450 MPa
→ Minimum Tensile Strength	500 MPa
\rightarrow Minimum Elongation in 5.65 $\sqrt{S_o}$	

$\left(b_{\hat{\mathcal{I}}}, d_{\hat{\mathcal{I}}}\right) \le 15$	$15 < (b_{\hat{\mathcal{I}}}, d_{\hat{\mathcal{I}}}) \le 30$	$(b_{\Lambda}, d_{\Lambda}) > 30$
12%	14%	16%

→ L0 guaranteed impact properties at 0°C to AS/NZS 1163.

Tolerances

Tolerances for RHS to Grade C450PLUS are compliant with AS/NZS 1163. See Dimensional Tolerances in Part 1 for more information

Supply Conditions

DuraPrimed (DP) Finish

RHS to Grade C450PLUS with DuraPrimed finish is supplied in the following surface colours:

→ DuraPrimed^{Blue}

This DuraPrimed finish is applied in-line using a patented process and is supplied in the following coating thicknesses:

→ DuraPrimed^{Blue}

Target 12 microns with average at 8-10 microns Note: Non-standard finishes, such as NOPC and LiteOil. are available if ordered prior to rollings. Conditions apply and subject to mill acceptance.

See the ATM Product Availability Guide for further information on availability.

DuraGal[®] Finish

RHS to Grade C450PLUS with DuraGal® finish is manufactured from in-line galvanising hollow sections that has the following external coating thickness: → Minimum coating mass 100 g/m² → Designated as AS/NZS 4792 ILG 100 See the ATM Product Availability Guide for further information on availability.

DuraGal^{Plus} Finish

RHS to Grade C450PLUS with DuraGalPlus finish is manufactured using steel strip that has the following coating thickness:

→ Minimum coating mass 100 g/m² each side \rightarrow Designated as AS/NZS 4792 ZB 100/100 See the ATM Product Availability Guide for further information on availability.

Oiled Finish

Oiled tubular products use a robust oil coating which is adequate for seaborne transport. See the ATM Product Availability Guide for further information on availability.

End Finish (Mill Processing)

→ Plain Ends only.

Standard Lengths

Standard lengths for RHS to Grade C450PLUS: → See following Mass & Bundling Tables Contact your Australian Tube Mills representative or refer to the ATM Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of RHS to Grade C450PLUS are available (conditions apply). Check with your distributor for details.

Minimum Length:

→ (50x20 RHS) DP	4.5 m
→ (50x25 RHS) DP	4.2 m
→ (65x35, 75x25 – 150x50 RHS) DP	4.5 m

Maximum Length:

> (50x20 RHS) DP	9.0 m
> (50x25 RHS) DP	8.0 m
→ (65x35 – 150x50 RHS) DP	12.2 m

Note: Contact your Australian Tube Mills representative for lengths outside this range.

Thickness

RHS to Grade C450PLUS is available in 1.6 mm to 16.0mm wall thicknesses. These thicknesses are identified by the following end colour codes:

→ 1.6 mm	Purple
→ 1.8 mm	Brown
→ 2.0 mm	Yellow
→ 2.5 mm	Pink
→ 3.0 mm	Blue
→ 3.5 mm	Grey
→ 4.0 mm	Green
→ 5.0 mm	Orange
→ 6.0 mm	Cream
→ 8.0 mm	Red
→ 9.0 mm	Purple
→ 10.0 mm	Yellow
→ 12.5 mm	Blue
→ 16.0 mm	Grey



General Description

Manufacturing Process

RHS to Grade C450PLUS, for general fabrication and structural applications, is manufactured by cold-forming and high frequency Electric Resistance Welding (ERW) of higher strength steel strip. The cold-forming process enhances the strength, hardness and surface finish of the tube and produces RHS to tight dimensional tolerances.

Further Information

For further information refer to the Australian Tube Mills: → Product Availability Guide (PAG) (www.austubemills.com.au)



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Product Manual: Pipe & Tube + Profiles

RHS to AS/NZS 1163 – C450PLUS® – Section Properties calculated in accordance with AS/NZS 1163 & AS 4100

		Dimens	sions	an	d Rat	tios							P	ropert	ies						Pro	operties fo	r Desi	gn to	AS 4100	
	Desigr	nation	Mas	ss	Exte Surfa Are	rnal ace ea	b-2t	d-2t	Gross Section Area		About	x-axis			About	/-axis		Torsion Constant	Torsion Modulus	Form Factor		About x-axis			About y-ax	is
d	b	t	per		per m	pert	t	t	Ag	l _x	$Z_{\rm x}$	S _x	r _x	I_y	Zy	Sy	r _y	J	С	k _f	λ_{e}	Compactness	Z _{ex}	λ_{e}	Compactne	SS Z _{ey}
mm	mm	mm	kg/r	n	m²/m	m²/t			mm ²	10 ⁶ mm ⁴	10 ³ mm ³	³ 10 ³ mm ³	mm	10 ⁶ mm ⁴	¹ 10 ³ mm ³	10 ³ mm ³	³ mm	10 ⁶ mm ⁴	10 ³ mm ³			(C,N,S)	10 ³ mm ³		(C,N,S)	10 ³ mm ³
400	x 300 x	16.0 RHS	5 16	1	1.33	8.27	16.8	23.0	20500	453	2260	2750	149	290	1940	2260	119	586	3170	1.00	22.5	С	2750	30.9	Ν	2230
		12.5 RHS	5 12	8	1.35	10.5	22.0	30.0	16300	370	1850	2230	151	238	1590	1830	121	471	2590	0.996	29.5	С	2230	40.2	S	1580
		10.0 RHS	S 10	4	1.36	13.0	28.0	38.0	13300	306	1530	1820	152	197	1320	1500	122	384	2130	0.877	37.6	Ν	1600	51.0	S	1120
		8.0 RHS	5 84.	2	1.37	16.2	35.5	48.0	10700	251	1260	1490	153	162	1080	1220	123	312	1750	0.715	47.6	S	1140	64.4	S	800
400	x 200 x	16.0 RHS	5 13	6	1.13	8.33	10.5	23.0	17300	335	1670	2140	139	113	1130	1320	80.8	290	2000	1.00	14.1	С	2140	30.9	Ν	1300
		12.5 RHS	5 10	9	1.15	10.6	14.0	30.0	13800	277	1380	1740	141	94.0	940	1080	82.4	236	1650	0.996	18.8	С	1740	40.2	S	936
		10.0 RHS	S <u>88</u> .	4	1.16	13.1	18.0	38.0	11300	230	1150	1430	143	78.6	786	888	83.6	194	1370	0.855	24.1	С	1430	51.0	S	658
		8.0 RHS	5 71.	6	1.17	16.3	23.0	48.0	9120	190	949	1170	144	65.2	652	728	84.5	158	1130	0.745	30.9	N	1150	64.4	S	464
350	x 250 x	16.0 RHS	5 13	6	1.13	8.33	13.6	19.9	17300	283	1620	1990	128	168	1340	1580	98.5	355	2230	1.00	18.3	C	1990	26.7	С	1580
		12.5 RHS	5 10	9	1.15	10.6	18.0	26.0	13800	233	1330	1620	130	139	1110	1290	100	287	1840	1.00	24.1	C	1620	34.9	N	1200
		10.0 RHS	5 88.	4	1.16	13.1	23.0	33.0	11300	194	1110	1330	131	116	927	1060	101	235	1520	0.943	30.9	N	1320	44.3	S	865
		8.0 RHS	5 71.	6	1.17	16.3	29.3	41.8	9120	160	914	1090	132	95.7	766	869	102	191	1250	0.833	39.2	N	928	56.0	S	614
300	x 200 x	16.0 RHS	5 11	1 (0.931	8.42	10.5	16.8	14100	161	1080	1350	107	85.7	857	1020	78.0	193	1450	1.00	14.1	C	1350	22.5	C	1020
		12.5 RHS	S <u>89</u> .	0 0	0.946	10.6	14.0	22.0	11300	135	899	1110	109	72.0	720	842	79.7	158	1210	1.00	18.8	<u> </u>	1110	29.5	C	842
		10.0 RHS	5 72.	7 0).957	13.2	18.0	28.0	9260	113	754	921	111	60.6	606	698	80.9	130	1010	1.00	24.1	<u> </u>	921	37.6	N	628
		8.0 RHS	59.	1 (0.966	16.3	23.0	35.5	7520	93.9	626	757	112	50.4	504	574	81.9	106	838	0.903	30.9	N	746	47.6	S	447
		6.0 RHS	<u>3 45.</u>	0 0).974	21.7	31.3	48.0	5730	73.0	487	583	113	39.3	393	443	82.8	81.4	651	0.753	42.0	S	474	64.4	S	288
250	x 150 x	16.0 RHS	S <u>85</u> .	5 0	0.731	8.55	7.38	13.6	10900	80.2	641	834	85.8	35.8	478	583	57.3	88.2	836	1.00	9.89	<u> </u>	834	18.3	<u> </u>	583
		12.5 RHS	69.	4 ().746	10.8	10.0	18.0	8840	68.5	548	695	88.0	30.8	411	488	59.0	73.4	710	1.00	13.4	С	695	24.1	С	488
		10.0 RHS	57.	0 0).757	13.3	13.0	23.0	7260	58.3	466	582	89.6	26.3	351	409	60.2	61.2	602	1.00	17.4	C	582	30.9	N	404
		9.0 RHS	51.	8 0	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	19.7	C	533	34.6	N	352
		8.0 RHS	6 46.	5 0).766	16.5	16.8	29.3	5920	48.9	391	482	90.8	22.2	296	340	61.2	50.5	504	1.00	22.5	С	482	39.2	N	299
		6.0 RHS	6 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	0.843	30.9	N	368	53.2	S	191
		5.0 RHS	5 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	0.762	37.6	N	275	64.4	S	144

General Information

Pipe & Tube Products

Other Tube Products



Notes:

- 1. For C450PLUS: $f_v = 450$ MPa and $f_u = 500$ MPa; $f_{\rm v}$ = yield stress used in design; $f_{\rm u}$ = tensile strength used in design; as defined in AS 4100 - see Steel Grades (Part 5) of this Product Manual for a definition of C450PLUS.
- 2. C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100)
- 3. C450PLUS designed as Grade C450L0 to AS/NZS 1163 is cold-formed, and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. LiteOil and NOPC are available in all sections on request and subject to confirmation.
- 5. Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- 6. Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated grades, finishes, and standard lengths. The PAG can be found at www.austubemills.com



Mill Processing

Fabrication

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Profiles

Steel Grades

Mill Coatings

		Din	nensi	ons a	ind Ra	tios							Р	roperti	ies						Pro	operties for	r Desig	gn to <i>i</i>	AS 4100	
	Desig	nation		Mass	Exte Sur	ernal face rea	b-2t	d-2t	Gross Section Area		About	x-axis			About y	-axis		Torsion Constant	Torsion Modulus	Form Factor	. <u> </u>	About x-axis			About y-ax	.is
d	b	t		perm	per m	per t	t	t	Ag	l _x	Z_x	S _x	r _x	l _y	Zy	Sy	r _y	J	С	k _f	λ_{e}	Compactness	Z _{ex}	λ _e C	compactness	Z _{ey}
mm	mm	mm		kg/m	m²/m	m²/t			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	³ mm	10 ⁶ mm ⁴	10 ³ mm ³			(C,N,S)	10 ³ mm ³		(C,N,S)	10 ³ mm ³
200	x 100 x	10.0	RHS	41.3	0.557	13.5	8.00	18.0	5260	24.4	244	318	68.2	8.18	164	195	39.4	21.5	292	1.00	10.7	С	318	24.1	С	195
		9.0	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	12.2	С	293	27.1	С	180
		8.0	RHS	33.9	0.566	16.7	10.5	23.0	4320	20.9	209	267	69.5	7.05	141	165	40.4	18.1	250	1.00	14.1	С	267	30.9	Ν	163
		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	0.967	19.7	С	210	42.0	S	110
		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	0.855	24.1	С	179	51.0	S	82.2
		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	0.745	30.9	Ν	144	64.4	S	58.0
152	x 76 x	6.0	RHS	19.4	0.430	22.2	10.7	23.3	2470	6.91	90.9	116	52.9	2.33	61.4	71.5	30.7	5.98	108	1.00	14.3	С	116	31.3	Ν	70.2
		5.0	RHS	16.4	0.435	26.4	13.2	28.4	2090	6.01	79.0	99.8	53.6	2.04	53.7	61.6	31.2	5.13	94.3	1.00	17.7	С	99.8	38.1	Ν	55.2
150	x 100 x	10.0	RHS	33.4	0.457	13.7	8.00	13.0	4260	11.6	155	199	52.2	6.14	123	150	38.0	14.3	211	1.00	10.7	С	199	17.4	С	150
		9.0	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	12.2	С	185	19.7	С	140
		8.0	RHS	27.7	0.466	16.8	10.5	16.8	3520	10.1	134	169	53.5	5.36	107	128	39.0	12.1	182	1.00	14.1	С	169	22.5	С	128
		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	19.7	С	134	30.9	Ν	101
		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	24.1	С	115	37.6	Ν	78.5
		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	0.903	30.9	N	93.2	47.6	S	55.9
150	x 50 x	6.0	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	С	91.2	30.9	Ν	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	С	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	С	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	С	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	С	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
127	x 51 x	6.0	RHS	14.7	0.330	22.5	6.50	19.2	1870	3.28	51.6	68.9	41.9	0.761	29.8	35.8	20.2	2.20	54.9	1.00	8.72	С	68.9	25.7	С	35.8
		5.0	RHS	12.5	0.335	26.7	8.20	23.4	1590	2.89	45.6	59.9	42.6	0.679	26.6	31.3	20.6	1.93	48.6	1.00	11.0	С	59.9	31.4	N	30.6
		3.5	RHS	9.07	0.341	37.6	12.6	34.3	1150	2.20	34.7	44.6	43.7	0.526	20.6	23.4	21.3	1.44	37.2	0.905	16.9	С	44.6	46.0	S	18.5
125	x 75 x	6.0	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	С	84.2	25.3	С	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	С	72.7	30.9	Ν	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	С	60.3	39.2	Ν	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
102	x 76 x	6.0	RHS	14.7	0.330	22.5	10.7	15.0	1870	2.52	49.4	61.9	36.7	1.59	42.0	50.5	29.2	3.38	69.8	1.00	14.3	С	61.9	20.1	С	50.5
		5.0	RHS	12.5	0.335	26.7	13.2	18.4	1590	2.22	43.5	53.7	37.3	1.41	37.0	43.9	29.7	2.91	61.2	1.00	17.7	С	53.7	24.7	С	43.9
		3.5	RHS	9.07	0.341	37.6	19.7	27.1	1150	1.68	33.0	39.9	38.2	1.07	28.2	32.6	30.5	2.14	46.1	1.00	26.4	С	39.9	36.4	Ν	29.8



Notes:

- 1. For C450PLUS: $f_y = 450$ MPa and $f_u = 500$ MPa; $f_y =$ yield stress used in design; $f_u =$ tensile strength used in design; as defined in AS 4100 – see Steel Grades (Part 5) of this Product Manual for a definition of C450PLUS.
- C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
- C450PLUS designed as Grade C450L0 to AS/NZS 1163 is cold-formed, and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. LiteOil and NOPC are available in all sections on request and subject to confirmation.
- 5. Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated grades, finishes, and standard lengths. The PAG can be found at www.austubemills.com



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RHS to AS/NZS 1163 – C450PLUS® – Section Properties calculated in accordance with AS/NZS 1163 & AS 4100

			Dir	nensi	ons a	ind Ra	tios							P	roperti	ies						Pro	operties fo	or Des	ign t	o AS 4100)
		Desigr	nation		Mass	Exte Surl Ar	ernal face ea	b-2t	d-2t	Gross Section Area		About	x-axis			About	y-axis		Torsion Constant	Torsion Modulus	Form About x-axis					About y-a	xis
C	b	b	t		porm	per m	per t	t	t	A_{g}	$I_{\rm x}$	$Z_{\rm x}$	S _x	r _x	I_y	Zy	Sy	r _y	J	С	k _f	λ_{e}	Compactness	S Z _{ex}	$\lambda_{\rm e}$	Compactne	SS Z _{ey}
m	m	mm	mm		kg/m	m²/m	m²/t			mm ²	10 ⁶ mm ⁴	10 ³ mm ³	³ 10 ³ mm ³	³ mm	10 ⁶ mm ⁴	10 ³ mm ³	³ 10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³			(C,N,S)	10 ³ mm	3	(C,N,S)	10 ³ mm
10	20 x	50 x	6.0	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	С	45.3	19.7	С	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	С	39.8	24.1	С	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	С	33.4	30.9	Ν	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	С	29.9	35.6	Ν	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	С	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	6 24.1	С	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	Ν	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	Ν	12.5	81.2	S	5.19
7	6 x	38 x	4.0	RHS	6.23	0.211	33.9	7.50	17.0	793	0.527	13.9	18.1	25.8	0.176	9.26	11.1	14.9	0.466	16.6	1.00	10.1	С	18.1	22.8	С	11.1
			3.0	RHS	4.90	0.218	44.4	10.7	23.3	625	0.443	11.7	14.8	26.6	0.149	7.82	9.09	15.4	0.373	13.6	1.00	14.3	С	14.8	31.3	Ν	8.92
			2.5	RHS	4.15	0.219	52.8	13.2	28.4	529	0.383	10.1	12.7	26.9	0.129	6.81	7.81	15.6	0.320	11.8	1.00	17.7	С	12.7	38.1	Ν	7.00
7	5х	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	С	28.1	14.1	С	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	С	24.9	17.4	С	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	С	21.1	22.5	С	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	С	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	С	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	Ν	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	Ν	8.26	60.2	S	5.01
7	5 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	Ν	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	-91	L8:31	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	0,74€	18,3	$\left \left d \right \right $	6.81	60.2	S	2.02
6	5 x	35 x	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	9.06	1Le/1	-13.3	19.1	С	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	13.0	SLC	11.0	26.4	С	7.11
			2.5	RHS	3.60	0.191	53.1	12.0	24.0	459	0.244	7.52	9.45	23.1	p.0926	5.29	6.13	14.2	Q.223	9.10	1.00	16.1	С	9.45	32.2	Ν	5.95
			2.0	RHS	2.93	0.193	65.8	15.5	30.5	374	0.204	6.28	7.80	28,4	875910	4.44	5.0Z	14.4	0.184	7.62	0.985	20.8	С	7.80	40.9	S	4.37
5	0 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	13:56	9.69	0.0964	5.18	1.00	8.50	С	5.86	19.7	С	3.56
			2.5	RHS	2.62	0.141	54.0	8.00	18.0	334	Ø.Ø989	3.95	\$ 5.11	17,2	0.0328	2.62	3.12	9.91	0.0843	4.60	1.00	10.7	С	5.11	24.1	С	3.12
			2.0	RHS	2.15	0.143	66,6	10,5	23.0	274	¢. 08 38	\$.35	4.26	17.5	0.0281	2.25	2.62	10.1	0.0706	3.92	1.00	14.1	С	4.26	30.9	Ν	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	С	3.53	39.2	Ν	1.92
5	0 x	20 x	3.0	RHS	(2.83	0.130	45.8	4.68	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	С	5.16	19.7	С	2.63
			2.5	RHS	242	b.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	С	4.51	24.1	С	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	С	3.78	30.9	Ν	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	С	3.14	39.2	Ν	1.44



Notes:

- For C450PLUS: f_y = 450 MPa and f_u = 500 MPa; f_y = yield stress used in design; f_u = tensile strength used in design; as defined in AS 4100 – see Steel Grades (Part 5) of this Product Manual for a definition of C450PLUS.
- C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
- C450PLUS designed as Grade C450L0 to AS/NZS 1163 is cold-formed, and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. LiteOil and NOPC are available in all sections on request and subject to confirmation.
- Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated grades, finishes, and standard lengths. The PAG can be found at www.austubemills.com
- NOTE: Grey shaded listings are for C450L0 which is a non-standard grade – availability is subject to minimum order criteria. The standard grade for shaded listings is AS/ NZS 1163 – C350L0. Please refer to earlier tables for design values associated with this as a standard grade. See the ATM PAG for further information on grades and availability.



Australian Tube Mills A.B.N. 21123 666 679. PO Box 246 Sunnybank, Queensland 4109 Australia Telephone +617 3909 6600 Facsimile +617 3909 6660 E-mail info@austubemills.com Internet www.austubemills.com **Build** with Product Manual: Pipe & Tube + Profiles **AustubeMills** AUGUST 2013 2-25 **Standards** PART 1 PART 2 PART 3 PART 4 PART 5 PART 6 PART 7 PART 8 **General Information Pipe & Tube Products** Other Tube Products Profiles Steel Grades Mill Coatings Mill Processing Fabrication

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Product Manual: Pipe & Tube + Profiles

RHS to AS/NZS 1163 – C450PLUS® – Mass & Bundling calculated in accordance with AS/NZS 1163

	Dime	nsion	s							l	Bundli	ng												М	ass		
	Desig	gnation		Bun	dle Confi	guration	(mm)		Bundl	le Dime	ensions (mm)				Length	าร		Me	tres		Nor	ninal		Mass Pe	r Bundl	le
d	b	t		6.5	8.0	9.0	12.0	6.5	8	.0	9.0		12.0		P	er Bun	dle		Per B	lundle		Ma	ass		ton	nes	
mm	mm	mm		W×Η	W x H	W x H	W x H	W x H	W >	хН	W x	H W	/ x ł	ł	6.5	8.0 9.	.0 12.	0 6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0
50	x 20	x 1.6	RHS		8 12				400	240						96			768			1.63	_615	3	1.25		
		2.0	RHS		8 12				400	240						96			768		Γ	1.99	502	7	1.53		
		2.5	RHS		6 12				300	240						72		-	576		$\langle \rangle$	2.42	412	-	1.40		
		3.0	RHS		6 12				300	240						72		21	576		1/1	2.83	353-	7	1.63		
50	x 25	x 1.6	RHS		8 12				400	300			_	- 1		96		FT	768	Nr	-71	1.75	571		1.35		
		2.0	RHS		8 12				400	300			Γ	\sum		96		J.	268			2.15	465		1.65		
		2.5	RHS		6 12				300	300	$ \longrightarrow $		15	, <	11-	72/			576			2.62	382		1.51		
		3.0	RHS		6 10			\square	1300	250	()	$ +\rangle$	$\langle $	4	s L-	60			480			3.07	326		1.47		
65	x 35	x 2.0	RHS		6 9		55	PIN	39Q	1312	\mathcal{V}	[]	70			54			432			2.93	341		1.27		
		2.5	RHS		6 9		21		390	31/51						54			432			3.60	278		1.56		
		3.0	RHS		5 9				325	315						45			360			4.25	236		1.53		
		4.0	RH\$	\cap	5 7	100	$\underline{\mathcal{D}}$	-	325	245						35			280			5.35	187		1.50		
75	x 25	x 1,6	RH\$	$\sum D$	5 13	7			375	325						65			520			2.38	420		1.24		
		2.0	RHS	$ \leq $	5 13				375	325						65			520			2.93	341		1.53		
		2.5	RAS		4 12				300	300						48			384			3.60	278		1.38		
75	x 50	x 1.6	RHS		6 9		6 9		450	450		45	0 45	50		54	54		432		648	3.01	332		1.30		1.95
		2.0	RHS		6 7		6 7		450	350		45	0 35	50		42	42	2	336		504	3.72	269		1.25		1.87
		2.5	RHS		6 7				450	350						42			336			4.58	218		1.54		
		3.0	RHS		5 7		4 6		375	350		30	0 30	00		35	24		280		288	5.42	184		1.52		1.56
		4.0	RHS		4 7		4 6		300	350		30	0 30	00		28	24		224		288	6.92	145		1.55		1.99
		5.0	RHS		4 6				300	300						24			192			8.35	120		1.60		
		6.0	RHS		4 5				300	250				_		20	_	_	160			9.67	103		1.55		
76	x 38	x 2.5	RHS		4 5				304	190						20		_	160			4.15	241		0.664		
		3.0	RHS		4 5				304	190						20			160			4.90	204		0.785		
		4.0	RHS		4 4				304	152						16	_		128			6.23	161		0.797		
100	x 50	x 1.6	RHS		4 8		4 8		400	400		40	0 40	00		32	32		256		384	3.64	275		0.931		1.40
		2.0	RHS		4 8		4 8		400	400		40	0 40	00		32	32		256		384	4.50	222		1.15		1.73
		2.5	RHS		4 8		4 6		400	400		40	0 30	00		32	24	•	256		288	5.56	180		1.42		1.60
		3.0	RHS		4 8		4 6		400	400		40	0 30	00		32	24	·	256		288	6.60	152		1.69		1.90
		3.5	RHS		4 6		3 6		400	300		30	0 30	00		24	18		192		216	7.53	133		1.45		1.63
		4.0	RHS		4 6		3 6		400	300		30	0 30	00		24	18		192		216	8.49	118		1.63		1.83
		5.0	RHS		3 6		3 5		300	300		30	0 25	0		18	15)	144		180	10.3	96.9		1.49		1.86
		6.0	RHS		35		3 4		300	250		30	0 20	0		15	12	!	120		144	12.0	83.1		1.44		1.73



Notes:

- 1. See also Notes for Section Properties for this product
- NOTE: Grey shaded listings are for C450L0 which is a non-standard grade – availability is subject to minimum order criteria. The standard grade for the shaded listings is AS/NZS 1163 – C350L0. Please refer to earlier tables for design values associated with this as a standard grade. See the ATM PAG for further information on grades and availability.





	Dimer	nsion	s							l	Bundling												М	ass		
	Desig	nation		Bun	dle Confi	guration (mm)		Bund	e Dime	nsions (mm)			L	ength	IS		Metr	res		Non	ninal		Mass Pe	r Bundl	е
d	b	t		6.5	8.0	9.0	12.0	6.5	8	.0	9.0	12	2.0	Per	Bung	dle		Per Bu	undle		Ma	ass		ton	nes	
mm	mm	mm		WхH	W x H	WхH	WхH	W x H	W :	ĸН	W x H	W	хН	6.5 8	0 9.	.0 12.0	6.5	8.0	9.0 1	2.0	kg/m	m/t	6.5	8.0	9.0	12.0
102 >	76	x 3.5	RHS		3 4				306	304				1	2			96			9.07	110		0.870		
		5.0	RHS		3 3				306	228				9)			72			12.5	79.9		0.901		
		6.0	RHS		3 2				306	152				6	3			48			14.7	68.2		0.704		
125 >	75	x 2.0	RHS		4 6				500	450				2	4			192			6.07	165		1.17		
		2.5	RHS		4 6		4 5		500	450		500	375	2	4	20		192	2	40	7.53	133		1.45		1.81
		3.0	RHS		4 5		4 5		500	375		500	375	2	0	20		160	2	40	8.96	112		1.43		2.15
		4.0	RHS		3 5		3 5		375	375		375	375	1	5	15		120	1	30	11.6	86.0		1.40		2.09
		5.0	RHS		3 5		3 3		375	375		375	225	1	5	9		120	1	38	14.2	70.2		1.71		1.54
		6.0	RHS		3 4		3 2		375	300		375	150	1	2	6		96	7	2	16.7	59.7		1.61		1.21
127 >	51	x 3.5	RHS		3 4				381	204				1	2			96			9.07	110		0.870		
		5.0	RHS		2 4				254	204				8	3			64			12.5	79.9		0.801		
		6.0	RHS		2 4				254	204				8	3			64			14.7	68.2		0.939		
150 >	50	x 2.0	RHS		3 7		3 7		450	350		450	350	2	1	21		168	2	52	6.07	165		1.02		1.53
		2.5	RHS		38				450	400				2	4			192			7.53	133		1.45		
		3.0	RHS		3 7		3 5		450	350		450	250	2	1	15		168	1	30	8.89	112		1.49		1.60
		4.0	RHS		3 5		3 5		450	250		450	250	1	5	15		120	1	30	11.6	86.0		1.40		2.09
		5.0	RHS		3 5		3 3		450	250		450	150	1	5	9		120	1	28	14.2	70.2		1.71		1.54
		6.0	RHS		3 5		3 3		450	250		450	150	1	5	9		120	1	28	16.7	59.7		2.01		1.81
150 >	100	x 4.0	RHS		3 4		3 3		450	400		450	300	1	2	9		96	1	28	14.8	67.7		1.42		1.59
		5.0	RHS		3 4		2 4		450	400		300	400	1	2	8		96	6	6	18.2	55.0		1.74		1.74
		6.0	RHS		3 3		2 3		450	300		300	300	9)	6		72	- 7	2	21.4	46.6		1.54		1.54
		8.0	RHS		2 3		2 2		300	300		300	200	6	3	4		48	4	8	27.7	36.1		1.33		1.33
		9.0	RHS		2 3		2 2		300	300		300	200	6	3	4		48	4	8	30.6	32.7		1.47		1.47
		10.0	RHS				2 2					300	200			4			4	8	33.4	29.9				1.60
152 >	76	x 5.0	RHS		2 3		2 3		304	228		304	228	6	3	6		48	7	2	16.4	60.8		0.789		1.18
		6.0	RHS		2 3		2 3		304	228		304	228	6	3	6		48	7	2	19.4	51.6		0.930		1.40
200 >	100	x 4.0	RHS		2 4		2 3		400	400		400	300	8	3	6		64	7	2	17.9	55.8		1.15		1.29
		5.0	RHS		2 4		2 3		400	400		400	300	8	3	6		64	7	2	22.1	45.3		1.41		1.59
		6.0	RHS		2 4		2 2		400	400		400	200	8	3	4		64	4	8	26.2	38.2		1.67		1.26
		8.0	RHS		2 3		2 2		400	300		400	200	6	6	4		48	4	8	33.9	29.5		1.63		1.63
		9.0	RHS		2 3		2 2		400	300		400	200	6	6	4		48	4	8	37.7	26.6		1.81		1.81
1		10.0	RHS				1 2					200	200			2			2	4	41.3	24.2				0.990



Notes:

1. See also Notes for Section Properties for this product.

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RHS to AS/NZS 1163 – C450PLUS® – Mass & Bundling calculated in accordance with AS/NZS 1163

Dimensions							Bundling												Μ	ass		
Designation	Bur	idle Confi	iguration	(mm)		Bundle Dime	ensions (mm)			Len	aths			Me	tres		Nor	ninal		Mass Pe	r Bund	e
d b t	6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0		Per B	undle			Per E	Bundle		Ma	ass		ton	nes	
mm mm mm	W x H	WxH	W x H	W x H	W x H	W x H	W x H	W x H	6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0
250 x 150 x 5.0 RHS		2 3		2 2		500 450		500 300		6		4		48		48	29.9	33.4		1.44		1.44
6.0 RHS		2 2		2 2		500 300		500 300		4		4		32		48	35.6	28.1		1.14		1.71
8.0 RHS		2 2		1 2		500 300		250 300		4		2		32		24	46.5	21.5		1.49		1.12
9.0 RHS		2 2		1 2		500 300		250 300		4		2		32		24	51.8	19.3		1.66		1.24
10.0 RHS				1 2				250 300				2				24	57.0	17.6				1.37
12.5 RHS				1 2				250 300				2				24	69.4	14.4				1.67
16.0 RHS				1 1				250 150				1				12	85.5	11.7				1.03
300 x 200 x 6.0 RHS				2 1				600 200				2				24	45.0	22.2				1.08
8.0 RHS				2 1				600 200				2				24	59.1	16.9				1.42
10.0 RHS				2 1				600 200				2				24	72.7	13.8				1.74
12.5 RHS				1 1				300 200				1				12	89.0	11.2				1.07
16.0 RHS				1 1				300 200				1				12	111	9.04				1.33
350 x 250 x 8.0 RHS				2 1				700 250				2				24	71.6	14.0				1.72
10.0 RHS				1 1				350 250				1				12	88.4	11.3				1.06
12.5 RHS				1 1				350 250				1				12	109	9.21				1.30
16.0 RHS				1 1				350 250				1				12	136	7.36				1.63
400 x 200 x 8.0 RHS				1 2				400 400				2				24	71.6	14.0				1.72
10.0 RHS				1 1				400 200				1				12	88.4	11.3				1.06
12.5 RHS				1 1				400 200				1				12	109	9.21				1.30
16.0 RHS				1 1				400 200				1				12	136	7.36				1.63
400 x 300 x 8.0 RHS				1 1				400 300				1				12	84.2	11.9				1.01
10.0 RHS				1 1				400 300				1				12	104	9.61				1.25
12.5 RHS				1 1				400 300				1				12	128	7.80				1.54
16.0 RHS				1 1				400 300				1				12	161	6.21				1.93



Notes:

1. See also Notes for Section Properties for this product.



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Product Manual: Pipe & Tube + Profiles

SHS to AS/NZS 1163 – C350L0 – Specifications

Technical Specifications

Australian Standards

SHS to Grade C350L0 is manufactured and tested to comply with the requirements of the following specifications:

- AS/NZS 1163 Cold-formed structural steel hollow sections (Grade C350L0)
- AS/NZS 4792 Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process (Section 3 or 4).

Mechanical Properties

SHS to Grade C350L0 has the following mecha properties:	anical
→ Minimum Yield Strength	350 MPa
→ Minimum Tensile Strength	430 MPa
→ Minimum Elongation in $5.65\sqrt{S_o}$	

$\left(b_{/t}, d_{/t}\right) \le 15$	$15 < \left(b_{/t}, d_{/t} \right) \le 30$	$(b_{f}, d_{f}) > 30$
12%	14%	16%

→ L0 guaranteed impact properties at 0°C to AS/NZS 1163

Tolerances

Tolerances for SHS to Grade C350L0 are compliant with AS/NZS 1163. See Dimensional Tolerances in Part 1 for more information.

Supply Conditions

DuraPrimed (DP) Finish

SHS to Grade C350L0 with DuraPrimed finish is supplied in the following surface colours:

→ DuraPrimed^{Blue}

This DuraPrimed finish is applied in-line using a patented process and is supplied in the following coating thicknesses:

DuraPrimed^{Blue} _____ Target 12 microns with average at 8-10 microns

Note: Non-standard finishes, such as NOPC and LiteOil, are available if ordered prior to rollings. Conditions apply and subject to mill acceptance. See the ATM Product Availability Guide for further

information on availability.

DuraGal[®] Finish

SHS to Grade C350L0 with DuraGal[®] finish is manufactured from in-line galvanizing hollow sections that have the following external coating thickness:
Minimum coating mass ______ 100 g/m² each side
Designated as ______ AS/NZS 4792 ILG 100
See the ATM Product Availability Guide for further information on availability.

DuraGal^{Plus} Finish

SHS to Grade C350L0 with DuraGal^{Plus} finish is manufactured using steel strip that has the following coating thickness:

Minimum coating mass ______ 100 g/m² each side
 Designated as ______ AS/NZS 4792 ZB 100/100
 See the ATM Product Availability Guide for further information on availability.

Oiled Finish

Oiled tubular products use a robust oil coating which is adequate for seaborne transport.

See the ATM Product Availability Guide for further information on availability.

End Finish (Mill Processing)

→ Plain Ends only.

Standard Lengths

Standard lengths for SHS to Grade C350L0: → See the folllowing Mass & Bundling Tables Contact your Australian Tube Mills representative or refer to the ATM Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of SHS to Grade C350L0 are available (conditions apply). Check with your distributor for details.

Minimum Length:

→ (20x20 – 40x40 SHS) DuraGal ^{Plus} /DP	4.2 m
→ (50x50 SHS) DuraGal ^{Plus} /DP	4.5 m

Maximum Length:

→ (20x20 – 50x50 SHS) DuraGal ^{Plus} /DP	_8.0 m
→ (50x50 SHS) DuraGal ^{Plus} /DP	12.2m
Note: Contact your Australian Tube Mills represen	ntative
for lengths outside this range.	

Thickness

_ . .

SHS to Grade C350L0 is available in 1.6 mm to 5.0 mm wall thicknesses. These thicknesses are identified by the following end colour codes:

→ 1.6 mm	Purple
→ 1.8 mm	Brown
→ 2.0 mm	Yellow
→ 2.5 mm	Pink
→ 3.0 mm	Blue
→ 4.0 mm	Green
→ 5.0 mm	Orange



General Description

Manufacturing Process

SHS to Grade C350L0, for manufacturing, general fabrication and lighter structural applications, is manufactured by cold-forming and high frequency Electric Resistance Welding (ERW) of higher strength steel strip. The cold-forming process enhances the strength, hardness and surface finish of the tube and produces SHS to tight dimensional tolerances.

Further Information

For further information refer to the Australian Tube Mills: → Product Availability Guide (PAG)

(www.austubemills.com)





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Product Manual: Pipe & Tube + Profiles

		Di	mensi	ons and	Ratios							Properties for Design to AS 4100							
	Desig	Ination		Mass	Exte Surf	rnal ace	h 2t	Gross Section		Abou	it x-, y- and	n-axis		Torsion Constant	Torsion Modulus	Form Factor	At	pout x and y	-axis
d	b	t		m	Ar per m	ea per t	<u>t</u>	Area A _g	l _x	Z _x	Zn	S _x	r _x	J	С	k _f	λ _e	Compact- ness	Z _{ex}
mm	mm	mm		kg/m	m²/m	m²/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
50	x 50	x 6.0	SHS	7.32	0.174	23.8	6.33	932	0.275	11.0	9.45	14.5	17.2	0.518	17.7	1.00	7.49	С	14.5
		5.0	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	С	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	С	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	С	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	С	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	С	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	Ν	5.10
40	x 40	x 4.0	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	С	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	С	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	С	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	С	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	С	3.41
35	x 35	x 3.0	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	С	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	С	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	С	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	С	2.57
30	x 30	x 3.0	SHS	2.36	0.110	46.5	8.00	301	0.0350	2.34	1.87	2.96	10.8	0.0615	3.58	1.00	9.47	С	2.96
		2.5	SHS	2.03	0.111	54.8	10.0	259	0.0316	2.10	1.65	2.61	11.0	0.0540	3.20	1.00	11.8	С	2.61
		2.0	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	С	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	С	1.84
25	x 25	x 3.0	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	С	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	С	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	С	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	С	1.24
20	x 20	x 2.0	SHS	1.05	0.0731	69.7	8.00	134	0.00692	0.692	0.554	0.877	7.20	0.0121	1.06	1.00	9.47	С	0.877
		1.6	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	С	0.751

ADDITIONAL NOTES:

(A) <u>THE ABOVE IS THE STANDARD GRADE FOR THE LISTED PRODUCTS</u>. SEE THE FOLLOWING TABLE FOR THESE SECTIONS LISTED IN NON-STANDARD C450PLUS.

(B) SEE THE FOLLOWING TABLE FOR OTHER SIZES IN ATM'S LARGER RANGE OF C450PLUS PRODUCTS.



Notes:

- 1. For Grade C350L0: f_y = 350 MPa and f_u = 430 MPa; f_y = yield stress used in design; f_u = tensile strength used in design; as defined in AS 4100.
- C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
- Grade C350L0 to AS/NZS 1163 is cold-formed, and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. LiteOil and NOPC are available in all sections on request and subject to confirmation.
- 5. Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated grades, finishes, and standard lengths. The PAG can be found at www.austubemills.com





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Product Manual: Pipe & Tube + Profiles

SHS to AS/NZS 1163 – C350L0 – Mass & Bundling calculated in accordance with AS/NZS 1163

		Di	mer	nsions	5									Bunc	lling													M	ass		
		D	esig	nation		Bun	dle Cor	figuration	(mm)			Bundl	e Dime	ension	s (mm)				Len	aths			Ме	tres		Nom	inal	Ν	/ass Pe	r Bundl	e
	d		b	t		6.5	8.0	9.0	12.0	6	6.5	8.	0	ç	0.0		12.0		Per E	Bundle	е		Per B	undle		Ма	SS		ton	nes	
	mm		mm	mm		W x H	W×I	н	WхH	W	хН	W >	άн	W	хН	N	√хН	6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0
ľ	20	х	20	x 1.6	SHS	12 8				240	160							96				624				0.873	1150	0.545			
				2.0	SHS	12 8				240	160							96				624				1.05	953	0.655			
ĺ	25	х	25	x 1.6	SHS	10 10				250	250							100				650				1.12	890	0.731			
				2.0	SHS	10 10				250	250							100				650				1.36	733	0.886			
				2.5	SHS	10 10				250	250							100				650				1.64	610	1.07			
				3.0	SHS	10 10				250	250							100				650				1.89	529	1.23			
ĺ	30	х	30	x 1.6	SHS		10 1	0				300	300						100				800			1.38	727		1.10		
				2.0	SHS		10 1	0				300	300						100				800			1.68	596		1.34		
				2.5	SHS		10 1	0				300	300						100				800			2.03	492		1.63		
				3.0	SHS		8	3				240	240						64				512			2.36	423		1.21		
ſ	35	х	35	x 1.6	SHS		10 1	0				350	350						100				800			1.63	615		1.30		
				2.0	SHS		10 1	0				350	350						100				800			1.99	502		1.59		
				2.5	SHS		8	3				280	280						64				512			2.42	412		1.24		
				3.0	SHS		8	3				280	280						64				512			2.83	353		1.45		
ſ	40	х	40	x 1.6	SHS		9 9	9				360	360						81				648			1.88	533		1.22		
				2.0	SHS		9 9	9				360	360						81				648			2.31	434		1.49		
				2.5	SHS		8	3				320	320						64				512			2.82	355		1.44		
				3.0	SHS		8	3				320	320						64				512			3.30	303		1.69		
				4.0	SHS		7	7				280	280						49				392			4.09	244		1.60		
	50	х	50	x 1.6	SHS		8	3				400	400						64				512			2.38	420		1.22		
				2.0	SHS		8	3				400	400						64				512			2.93	341		1.50		
				2.5	SHS		7	7				350	350						49				392			3.60	278		1.41		
				3.0	SHS		7	7				350	350						49				392			4.25	236		1.66		
				4.0	SHS		6	3				300	300						36				288			5.35	187		1.54		
				5.0	SHS		6	5				300	250						30				240			6.39	156		1.53		
				6.0	SHS		5	5				250	250						25				200			7.32	137		1.46		

SHS 0 SHS SHS 0 SHS SHS SHS SHS SHS SHS

Notes:

1. See also Notes for Section Properties for this product.

ADDITIONAL NOTES:

(A) THE ABOVE IS THE STANDARD GRADE FOR THE LISTED PRODUCTS.

SEE THE FOLLOWING TABLE FOR THESE SECTIONS LISTED IN NON-STANDARD C450PLUS.

(B) SEE THE FOLLOWING TABLE FOR OTHER SIZES IN ATM'S LARGER RANGE OF C450PLUS PRODUCTS. Australian Tube Mills A.B.N. 21 123 666 679. PO Box 246 Sunnybank, Queensland 4109 Australia Telephone +61 7 3909 6600 Facsimile +61 7 3909 6660 E-mail info@austubemills.com Internet www.austubemills.com

Build with Product Manual: Pipe & Tube + Profiles **AustubeMills** AUGUST 2013 2-35 **Standards** PART 1 PART 2 PART 3 PART 4 PART 5 PART 6 PART 7 PART 8 **General Information Pipe & Tube Products** Other Tube Products Profiles Steel Grades Mill Coatings Mill Processing Fabrication



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Product Manual: Pipe & Tube + Profiles

SHS to AS/NZS 1163 – C450PLUS® – Specifications

Technical Specifications

Australian Standards

SHS to C450PLUS is manufactured and tested to comply with the requirements of the following specifications:

- AS/NZS 1163 Cold-formed structural steel hollow sections (Grades C350L0 and Grade C450L0).
- AS/NZS 4792 Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialised process (Section 3 or 4).

Mechanical Properties

SHS to Grade C450PLUS has the following mechanical properties:

→ Minimum Yield Strength	450 MPa
→ Minimum Tensile Strength	500 MPa
\rightarrow Minimum Elongation in 5.65 $\sqrt{S_{o}}$	

$\left(b_{\hat{\mathcal{A}}}, d_{\hat{\mathcal{A}}}\right) \le 15$	$15 < \left(b_{t}, d_{t}\right) \le 30$	$(b_{\Lambda}, d_{\Lambda}) > 30$
12%	14%	16%

→ L0 guaranteed impact properties at 0°C to AS/NZS 1163.

Tolerances

Tolerances for SHS to Grade C450PLUS are compliant with AS/NZS 1163. See Dimensional Tolerances in Part 1 for more information.

Supply Conditions

DuraPrimed (DP) Finish

SHS to Grade C450PLUS with DuraPrimed finish is supplied in the following surface colours:

→ DuraPrimed^{Blue}

This DuraPrimed finish is applied in-line using a patented process and is supplied in the following coating thicknesses:

→ DuraPrimed^{Blue}

_____ Target 12 microns with average at 8-10 microns Note: Non-standard finishes, such as NOPC and LiteOil, are available if ordered prior to rollings. Conditions apply and subject to mill acceptance.

See the ATM Product Availability Guide for further information on availability.

DuraGal[®] Finish

SHS to Grade C450PLUS with DuraGal® finish is manufactured from in-line galvanising hollow sections that has the following external coating thickness: → Minimum coating mass ______100 g/m² → Designated as ______ AS/NZS 4792 ZB 100/100 See the ATM Product Availability Guide for further information on availability.

DuraGal^{Plus} Finish

SHS to Grade C450PLUS with DuraGal^{Plus} finish is manufactured using steel strip that has the following coating thickness:

Minimum coating mass ______ 100 g/m² each side
 Designated as ______ AS/NZS 4792 ZB 100/100
 See the ATM Product Availability Guide for further information on availability.

Oiled Finish

Oiled tubular products use a robust oil coating which is adequate for seaborne transport. See the ATM Product Availability Guide for further information on availability.

End Finish (Mill Processing)

→ Plain Ends only.

Standard Lengths

Standard lengths for SHS to Grade C450PLUS:

→ See following Mass & Bundling Tables

Contact your Australian Tube Mills representative or refer to the ATM Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of SHS to Grade C450PLUS are available (conditions apply). Check with your distributor for details.

Minimum Length:

→ (20x20 – 40x40 SHS) DuraGal ^{Plus} /DP	4.2 m
> (50x50 – 100x100 SHS) DuraGal ^{Plus} /DP	_4.5 m
> (125x125 – 200x200 SHS) DuraGal ^{Plus} /DP	_5.3 m

Maximum Length:

→ (20x20 – 40x40 SHS) DuraGal ^{Plus} /DP	8.0 m
→ (50x50 – 200x200 SHS) DuraGal ^{Plus /} DP	12.2 m
Note: Contact your Australian Tube Mills	
representative for lengths outside this range.	

Thickness

SHS to Grade C450PLUS is available in 1.6 mm to 16.0mm wall thicknesses. These thicknesses are identified by the following end colour codes:

→ 1.6 mm	Purple
→ 1.8 mm	Brown
→ 2.0 mm	Yellow
→ 2.5 mm	Pink
→ 3.0 mm	Blue
→ 3.5 mm	Grey
→ 4.0 mm	Green
→ 5.0 mm	Orange
→ 6.0 mm	Cream
→ 8.0 mm	Red
→ 9.0 mm	Purple
→ 10.0 mm	Yellow
→ 12.5 mm	Blue
 → 12.5 mm → 16.0 mm 	Blue Grey



General Description

Manufacturing Process

SHS to Grade C450PLUS, for general fabrication and structural applications, is manufactured by cold-forming and high frequency Electric Resistance Welding (ERW) of higher strength steel strip. The cold-forming process enhances the strength, hardness and surface finish of the tube and produces SHS to tight dimensional tolerances.

Further Information

For further information refer to the Australian Tube Mills:

Product Availability Guide (PAG) (www.austubemills.com.au)





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Product Manual: Pipe & Tube + Profiles

SHS to AS/NZS 1163 – C450PLUS® – Section Properties calculated in accordance with AS/NZS 1163 & AS 4100

Dimensi	ions ar	nd Ratio	os					Pro		Properties for Design to AS 4100						
Designation	Mass	Ext Su	ternal rface	b-2t	Gross Section		Abou	t x, y and n	-axis		Torsion Constant	Torsion Modulus	Form Factor		About x-and y-axis	
d b t	per m	per m	pert	t	Area A _g	I _x	Z _x	Zn	S _x	r _x	J	С	k _f	λ_{e}	Compactness	Z _{ey}
mm mm mm	kg/m	m²/m	m²/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
400 x 400 x 16.0 SHS	186	1.53	8.23	23.0	23700	571	2850	2140	3370	155	930	4350	1.00	30.9	Ν	3320
12.5 SHS	148	1.55	10.5	30.0	18800	464	2320	1720	2710	157	744	3520	0.994	40.2	S	2310
10.0 SHS	120	1.56	13.0	38.0	15300	382	1910	1400	2210	158	604	2890	0.785	51.0	S	1650
350 x 350 x 16.0 SHS	161	1.33	8.27	19.9	20500	372	2130	1610	2530	135	614	3250	1.00	26.7	С	2530
12.5 SHS	128	1.35	10.5	26.0	16300	305	1740	1300	2040	137	493	2650	1.00	34.9	Ν	1900
10.0 SHS	104	1.36	13.0	33.0	13300	252	1440	1060	1670	138	401	2180	0.904	44.3	S	1350
8.0 SHS	84.2	1.37	16.2	41.8	10700	207	1180	865	1370	139	326	1790	0.715	56.0	S	971
300 x 300 x 16.0 SHS	136	1.13	8.33	16.8	17300	226	1510	1160	1810	114	378	2310	1.00	22.5	С	1810
12.5 SHS	109	1.15	10.6	22.0	13800	187	1240	937	1470	116	305	1900	1.00	29.5	С	1470
10.0 SHS	88.4	1.16	13.1	28.0	11300	155	1030	769	1210	117	250	1570	1.00	37.6	Ν	1080
8.0 SHS	71.6	1.17	16.3	35.5	9120	128	853	628	991	118	203	1290	0.840	47.6	S	768
250 x 250 x 16.0 SHS	111	0.931	8.42	13.6	14100	124	992	774	1210	93.8	212	1530	1.00	18.3	С	1210
12.5 SHS	89.0	0.946	10.6	18.0	11300	104	830	634	992	95.7	173	1270	1.00	24.1	С	992
10.0 SHS	72.7	0.957	13.2	23.0	9260	87.1	697	523	822	97.0	142	1060	1.00	30.9	N	811
9.0 SHS	65.9	0.961	14.6	25.8	8400	79.8	639	477	750	97.5	129	972	1.00	34.6	N	699
8.0 SHS	59.1	0.966	16.3	29.3	7520	72.3	578	429	676	98.0	116	878	1.00	39.2	N	586
6.0 SHS	45.0	0.974	21.7	39.7	5730	56.2	450	330	521	99.0	88.7	681	0.753	53.2	S	380
200 x 200 x 16.0 SHS	85.5	0.731	8.55	10.5	10900	58.6	586	469	728	73.3	103	914	1.00	14.1	С	728
12.5 SHS	69.4	0.746	10.8	14.0	8840	50.0	500	389	607	75.2	85.2	772	1.00	18.8	С	607
10.0 SHS	57.0	0.757	13.3	18.0	7260	42.5	425	324	508	76.5	70.7	651	1.00	24.1	С	508
9.0 SHS	51.8	0.761	14.7	20.2	6600	39.2	392	297	465	77.1	64.5	599	1.00	27.1	С	465
8.0 SHS	46.5	0.766	16.5	23.0	5920	35.7	357	268	421	77.6	58.2	544	1.00	30.9	N	415
6.0 SHS	35.6	0.774	21.8	31.3	4530	28.0	280	207	327	78.6	44.8	425	0.952	42.0	S	272
5.0 SHS	29.9	0.779	26.0	38.0	3810	23.9	239	175	277	79.1	37.8	362	0.785	51.0	S	207
150 x 150 x 10.0 SHS	41.3	0.557	13.5	13.0	5260	16.5	220	173	269	56.1	28.4	341	1.00	17.4	С	269
9.0 SHS	37.7	0.561	14.9	14.7	4800	15.4	205	159	248	56.6	26.1	316	1.00	19.7	С	248
8.0 SHS	33.9	0.566	16.7	16.8	4320	14.1	188	144	226	57.1	23.6	289	1.00	22.5	С	226
6.0 SHS	26.2	0.574	22.0	23.0	3330	11.3	150	113	178	58.2	18.4	229	1.00	30.9	Ν	175
5.0 SHS	22.1	0.579	26.2	28.0	2810	9.70	129	96.2	151	58.7	15.6	197	1.00	37.6	N	135



Notes:

- For C450PLUS: f_y = 450 MPa and f_u = 500 MPa; f_y = yield stress used in design; f_u = tensile strength used in design; as defined in AS 4100. See Steel Grades (Part 5) of this Product Manual for a definition of C450PLUS.
- C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
- C450PLUS designed as Grade C450L0 to AS/NZS 1163 is cold-formed, and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. LiteOil and NOPC are available in all sections on request and subject to confirmation.
- 5. Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated grades, finishes, and standard lengths. The PAG can be found at www.austubemills.com



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	Build with Standards		Al	JGUST 2013 2-39			
PART 1	PART 2	PART 3	PART 4	PART 5	PART 6	PART 7	PART 8
General Information	Pipe & Tube Products	Other Tube Products	Profiles	Steel Grades	Mill Coatings	Mill Processing	Fabrication

		Din	nensi	ons an	d Ratio	os					Prop	Properties for Design to AS 4100							
	Desig	nation		Mass	Ext Su	ernal rface	b-2t	Gross Section		Abou	t x, y and n	-axis		Torsion Constant	Torsion Modulus	Form Factor		About x-and y-axis	
d	b	t		per m	per m	per t	t	Area A _g	l _x	Z _x	Zn	S _x	r _x	J	С	k _f	λ_{e}	Compactness	Ze
mm	mm	mm		kg/m	m²/m	m²/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
125 >	(125 x	: 10.0	SHS	33.4	0.457	13.7	10.5	4260	8.93	143	114	178	45.8	15.7	223	1.00	14.1	С	178
		9.0	SHS	30.6	0.461	15.1	11.9	3900	8.38	134	106	165	46.4	14.5	208	1.00	16.0	С	165
		8.0	SHS	27.7	0.466	16.8	13.6	3520	7.75	124	96.8	151	46.9	13.3	192	1.00	18.3	С	151
		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	25.3	С	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	30.9	Ν	101
		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	39.2	Ν	73.2
100 ×	(100 x	10.0	SHS	25.6	0.357	14.0	8.00	3260	4.11	82.2	68.1	105	35.5	7.50	130	1.00	10.7	С	105
		9.0	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	12.2	С	98.6
		8.0	SHS	21.4	0.366	17.1	10.5	2720	3.66	73.2	58.6	91.1	36.7	6.45	114	1.00	14.1	С	91.1
		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	19.7	С	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	С	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	Ν	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 >	(90 x	2.5	SHS	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
89 >	(89 x	6.0	SHS	14.7	0.330	22.5	12.8	1870	2.06	46.4	36.4	56.7	33.2	3.55	71.8	1.00	17.2	С	56.7
		5.0	SHS	12.5	0.335	26.7	15.8	1590	1.82	40.8	31.5	49.2	33.8	3.06	62.8	1.00	21.2	С	49.2
		3.5	SHS	9.07	0.341	37.6	23.4	1150	1.38	31.0	23.3	36.5	34.6	2.25	47.2	1.00	31.4	N	35.8
		2.0	SHS	5.38	0.349	64.9	42.5	686	0.858	19.3	14.0	22.3	35.4	1.33	29.0	0.704	57.0	S	15.7
75 >	(75 x	6.0	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	С	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	С	33.6
		4.0	SHS	8.49	0.283	33.3	16.8	1080	0.882	23.5	18.1	28.2	28.6	1.48	36.1	1.00	22.5	С	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	С	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
65 >	65 x	6.0	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	С	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	С	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	С	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	С	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. For C450PLUS: $f_y = 450$ MPa and $f_u = 500$ MPa; $f_y =$ yield stress used in design; $f_u =$ tensile strength used in design; as defined in AS 4100. See Steel Grades (Part 5) of this Product Manual for a definition of C450PLUS.
- C = Compact Section; N = Non-Compact Section;
 S = Slender Section (as defined in AS 4100).
- C450PLUS designed as Grade C450L0 to AS/NZS 1163 is cold-formed, and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. LiteOil and NOPC are available in all sections on request and subject to confirmation.
- 5. Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated grades, finishes, and standard lengths. The PAG can be found at www.austubernills.com



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Product Manual: Pipe & Tube + Profiles

SHS to AS/NZS 1163 – C450PLUS® – Section Properties calculated in accordance with AS/NZS 1163 & AS 4100

		Dir	nensi	ons an	d Ratic	os					Pro		Properties for Design to AS 4100						
	Desig	nation		Mass	Ext Sur	ernal rface	b-2t	Gross Section		Abou	ut x, y and n	ı-axis		Torsion Constant	Torsion Modulus	Form Factor		About x-and y-axis	
d	b	t		perm	per m	per t	t	Allea	l _x	Z _x	Zn	S _x	r _x	J	С	k _f	λ_{e}	Compactness	Ze
mm	mm	mm		kg/m	m²/m	m²/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
50 >	50 x	6.0	SHS	7.32	0.174	23.8	6.33	932	0.275	11.0	9.45	14.5	17.2	0.518	17.7	1.00	8.50	С	14.5
		5.0	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	С	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	С	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	С	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	С	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	392) [A	4.74
40 ×	40 x	4.0	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	IC	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	1215.2 L	Me	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	С	4.13
		1.6	SHS	1.88	0.155	82.3	23.0	239	0.0579	2.90	2,15	A 3.41	15.6	0.0927	4.36	1.00	30.9	N	3.37
35 ×	35 x	3.0	SHS	2.83	0.130	45.8	9.67	361	-0.0595	3.40	2.67	4.23	12.84	0.102	5.18	1.00	13.0	С	4.23
		2.5	SHS	2.42	0.131	54.2	12.0	309	10.0529	\$.02	2.83	3.69	13.1	0.0889	4.58	1.00	16.1	С	3.69
		2.0	SHS	1.99	0.133	_\ 66.8(15:5	254	40:0451	2.58	1.95	3.09	13.3	0.0741	3.89	1.00	20.8	С	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 >	30 x	3.0	ŞHŞ	(2.36	0.1701	46.5	8.00	301	0.0350	2.34	1.87	2.96	10.8	0.0615	3.58	1.00	10.7	С	2.96
		2.5	SHR	2.03	0,111	-54.8	10.0	259	0.0316	2.10	1.65	2.61	11.0	0.0540	3.20	1.00	13.4	С	2.61
		2.0	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	С	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	С	1.84
25 ×	25 x	3.0	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	С	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	С	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	С	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	С	1.24
20 >	20 x	2.0	SHS	1.05	0.0731	69.7	8.00	134	0.00692	0.692	0.554	0.877	7.20	0.0121	1.06	1.00	10.7	С	0.877
		1.6	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	С	0.751



Notes:

- For C450PLUS: f_y = 450 MPa and f_u = 500 MPa; f_y = yield stress used in design; f_u = tensile strength used in design; as defined in AS 4100. See Steel Grades (Part 5) of this Product Manual for a definition of C450PLUS.
- 2. C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
- C450PLUS designed as Grade C450L0 to AS/NZS 1163 is cold-formed, and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. LiteOil and NOPC are available in all sections on request and subject to confirmation.
- Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- Refer to the Australian Tube Mills Product Availability Guide (PAG) for information on the availability of these products and associated grades, finishes, and standard lengths. The PAG can be found at www.austubemills.com
- NOTE: Grey shaded listings are for C450L0 which is a non-standard grade – availability is subject to minimum order criteria. The standard grade for the shaded listings is AS/NZS 1163 – C350L0. Please refer to earlier tables for design values associated with this as a standard grade. See the ATM PAG for further information on grades and availability.



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Product Manual: Pipe & Tube + Profiles

SHS to AS/NZS 1163 – C450PLUS® – Mass & Bundling calculated in accordance with AS/NZS 1163

	Dimensi	ons		Bundling														Mass										
	Designat	tion	Bu	ndle Co	nfiguration	Bundle Dimensions (mm)					ו)		Lengths			;		Me	tres		Non	ninal	Mass Per Bundle					
d	b	t	6.5	8.0	9.0	12.0	6.	.5	8	.0	:	9.0		12.0		Per Bundle				Per B	lundle		Ma	ass	tonnes			
mm	mm i	mm	WхН	W x	н wхн	WхH	W >	κН	W	хН	W	х Н	W	/ x ŀ	1 6	.5 8.	0 9.0	12.0	6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0
20 >	(20 x	1.6 SHS	12 8				240	160							9	6			624				0.873	1150	0.545			
		2.0 SHS	12 8				240	160							9	6			624				1.05	953	0.655			
25 >	(25 x	1.6 SHS	10 10)			250	250							1(00			650				1.12	890	0.731			
		2.0 SHS	10 10)			250	250							1(00			650				1.36	733	0.886			
		2.5 SHS	10 10)			250	250							1(00			650				1.64	610	1.07			
	:	3.0 SHS	10 10)			250	250							1(00			650				1.89	529	1.23			
30 >	(30 x	1.6 SHS	;	10 1	0				300	300						10)0			800		_	1.38	727	5	1.10		
	:	2.0 SHS	;	10 1	0				300	300						10	00			800		$ [\rangle \rangle$	1,68	596	-	1.34		
	1	2.5 SHS	;	10 1	0				300	300						10	00		\square	800	D)	ID'	2.03	492		1.63		
	:	3.0 SHS	;	8	8				240	240						-6	4			-512	h		2.36	423		1.21		
35 >	35 x	1.6 SHS	;	10 1	0				350	350			-	, T	F) (16	$\langle 0 \rangle$		IL	1,800	10		1.63	615		1.30		
	1	2.0 SHS	;	10 1	0				350	350	5			\sum	4	< ∖tc		/	\sim	800			1.99	502		1.59		
	1	2.5 SHS	;	8	8			_	280	~28Þ	111		\ L	7/1	$\left \right $	6	4			512			2.42	412		1.24		
		3.0 SHS	;	8	8			3/1	280	128Q	111		15	-0		6	4			512			2.83	353		1.45		
40 >	(40 x	1.6 SHS	;	9	9 7	(\cap)			-360	\$60	TL	_				8	1			648			1.88	533		1.22		
	1	2.0 SHS		91	3 1 1				360	-360						8	1			648			2.31	434		1.49		
	1	2.5-SH\$		8	ANIC	10	1 -	1	320	320						6	4			512			2.82	355		1.44		
	;	3.0 SMS	111	8/ \	8 1				320	320						6	4			512			3.30	303		1.69		
		4.0\\$A		1	7				280	280						4	9			392			4.09	244		1.60		
50 >	(50 x	1.6 \SHS		8	8				400	400						6	4			512			2.38	420		1.22		
	1	2.0 SHS	;	8	8				400	400			_			6	4	_		512			2.93	341		1.50		
		2.5 SHS	;	7	7				350	350						4	9			392			3.60	278		1.41		
	;	3.0 SHS	;	7	7				350	350						4	9			392			4.25	236		1.66		
		4.0 SHS	;	6	6				300	300						3	6			288			5.35	187		1.54		
	-	5.0 SHS	;	6	5				300	250						3	0			240			6.39	156		1.53		
		6.0 SHS	5	5	5				250	250						2	5			200			7.32	137		1.46		



Notes:

- 1. See also Notes for Section Properties for this product
- NOTE: Grey shaded listings are for C450L0 which is a non-standard grade – availability is subject to minimum order criteria. The standard grade for the shaded listings is AS/NZS 1163 – C350L0. Please refer to earlier tables for design values associated with this as a standard grade. See the ATM PAG for further information on grades and availability.



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PART 1 PART 2 PART 3 PART 4 PART 5 PART 6 PART 7 PART 8 General Information Pipe & Tube Products Other Tube Products Profiles Steel Grades Mill Coatings Mill Processing Fabrication

D	ime	nsion	s								E	Bundling										Mass						
	Desig	gnation		Bun	dle Cor	figuration	(mm)		Bundle Dimensions (mm)							Lend	gths		Me	etres		Non	ninal	Mass Per Bundle				
d	b	t		6.5	8.0	9.0	12.0		6.5	8.	0	9.0	12	2.0	I	Per Bundle			Per B	Bundle		Ma	ass	tonnes				
mm	mm	mm		W x H	W×I	H W x H	W x	H١	W x H	W ×	сH	W x H	W :	κН	6.5	8.0	9.0 12	2.0 6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0	
65 x	65	x 1.6	SHS		7	7				455	455					49			392			3.13	319		1.23			
		2.0	SHS		7	3				455	390					42			336			3.88	258		1.30			
		2.5	SHS		7 (5				455	390					42			336			4.78	209		1.61			
		3.0	SHS		6	3				390	390					36			288			5.66	177		1.63			
		4.0	SHS		6	5				390	325					30			240			7.23	138		1.74			
		5.0	SHS		5	5				325	325					25			200			8.75	114		1.75			
		6.0	SHS		5 4	4				325	260					20			160			10.1	98.6		1.62			
75 x	75	x 2.0	SHS		6	3				450	450					36			288			4.50	222		1.30			
		2.5	SHS		6	5	6	5		450	375		450	375		30	3	0	240		360	5.56	180		1.34		2.00	
		3.0	SHS		6	5	5	5		450	375		375	375		30	2	25	240		300	6.60	152		1.58		1.98	
		3.5	SHS		5	5	5	4		375	375		375	300		25	2	20	200		240	7.53	133		1.51		1.81	
		4.0	SHS		5	5	5	3		375	375		375	225		25	1	5	200		180	8.49	118		1.70		1.53	
		5.0	SHS		5 4	4	5	3		375	300		375	225		20	1	5	160		180	10.3	96.9		1.65		1.86	
		6.0	SHS		4 4	4				300	300					16			128			12.0	83.1		1.54			
89 x	89	x 2.0	SHS		5 4	4				445	356					20			160			5.38	186		0.861			
		3.5	SHS		5 4	4	4	4		445	356		356	356		20	1	6	160		192	9.07	110		1.45		1.74	
		5.0	SHS		4 4	4	4	3		356	356		356	267		16	1	2	128		144	12.5	79.9		1.60		1.80	
		6.0	SHS		4	3	3	3		356	267		267	267		12		9	96		108	14.7	68.2		1.41		1.58	
90 x	90	x 2.0	SHS		5 4	4				450	360					20			160			5.45	184		0.871			
		2.5	SHS		5 4	4				450	360					20			160			6.74	148		1.08			
100 x	100	x 2.0	SHS		5 4	4	5	4		500	400		500	400		20	2	20	160		240	6.07	165		0.972		1.46	
		2.5	SHS		5 4	4				500	400					20			160			7.53	133		1.20			
		3.0	SHS		5 4	4	4	4		500	400		400	400		20	1	6	160		192	8.89	112		1.42		1.71	
		4.0	SHS		4 4	4	4	3		400	400		400	300		16	1	2	128		144	11.6	86.0		1.49		1.67	
		5.0	SHS		4	3	3	3		400	300		300	300		12		9	96		108	14.2	70.2		1.37		1.54	
		6.0	SHS		4	3	3	3		400	300		300	300		12		9	96		108	16.7	59.7		1.61		1.81	
		8.0	SHS				3	2					300	200				6			72	21.4	46.8				1.54	
		9.0	SHS		3 3	3	3	2		300	300		300	200		9		6	72		72	23.5	42.5		1.69		1.69	
		10.0	SHS				3	2					300	200				6			72	25.6	39.1				1.84	
125 x	125	x 4.0	SHS		4 :	3	3	3		500	375		375	375		12		9	96		108	14.8	67.7		1.42		1.59	
		5.0	SHS		4	3	3	3		500	375		375	375		12		9	96		108	18.2	55.0		1.74		1.96	
		6.0	SHS		3	3	3	2		375	375		375	250		9		6	72		72	21.4	46.6		1.54		1.54	
		8.0	SHS				2	2					250	250				4			48	27.7	36.1				1.33	
		9.0	SHS		4	2	2	2		500	250		250	250		8		4	64		48	30.6	32.7		1.96		1.47	
		10.0	SHS				2	2					250	250				4			48	33.4	29.9				1.60	



Notes:



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^{1.} See also Notes for Section Properties for this product.

SHS to AS/NZS 1163 – C450PLUS® – Mass & Bundling calculated in accordance with AS/NZS 1163

	Dime	nsions												Bun	dling											Mass						
	Desig	nation		Bundle Configuration (mm)							Bundle Dimensions (mm)								Len	aths			Ме	tres		Non	ninal	Mass Per Bundle				
d	b	t		6.5	8.0		9.0	12	.0		6.5	ε	8.0		9.0	1	2.0		Per Bundle				Per B	lundle		Ma	ass	tonnes				
mm	mm	mm		W x H	Wx	нν	WхН	W >	сH	W	х Н	W	хН	W	х Н	W	хН	6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0	kg/m	m/t	6.5	8.0	9.0	12.0	
150	x 150	x 5.0 S	HS		3	3		3	2			450	450			450	300		9		6		72		72	22.1	45.3		1.59		1.59	
		6.0 S	HS		3	2		3	2			450	300			450	300		6		6		48		72	26.2	38.2		1.26		1.88	
		8.0 S	HS					2	2							300	300				4				48	33.9	29.5				1.63	
		9.0 S	HS		3	2		2	2			450	300			300	300		6		4		48		48	37.7	26.6		1.81		1.81	
		10.0 S	HS					2	1							300	150				2				24	41.3	24.2				0.99	
200	x 200	x 5.0 S	HS		3	2		2	2			600	400			400	400		6		4		48		48	29.9	33.4		1.44		1.44	
		6.0 S	HS		2	2		2	2			400	400			400	400		4		4		32		48	35.6	28.1		1.14		1.71	
		8.0 S	HS					2	1							400	200				2				24	46.5	21.5				1.12	
		9.0 S	HS		2	2		2	1			400	400			400	200		4		2		32		24	51.8	19.3		1.66		1.24	
		10.0 S	HS					2	1							400	200				2				24	57.0	17.6				1.37	
		12.5 S	HS					2	1							400	200				2				24	69.4	14.4				1.67	
		16.0 S	HS					1	1							200	200				1				12	85.5	11.7				1.03	
250	x 250	x 6.0 S	HS		2	2		2	1			500	500			500	250		4		2		32		24	45.0	22.2		1.44		1.08	
		8.0 S	HS		2	2		2	1			500	500			500	250		4		2		32		24	59.1	16.9		1.89		1.42	
		9.0 S	HS		2	1		2	1			500	250			500	250		2		2		16		24	65.9	15.2		1.05		1.58	
		10.0 S	HS					2	1							500	250				2				24	72.7	13.8				1.74	
		12.5 S	HS					1	1							250	250				1				12	89.0	11.2				1.07	
		16.0 S	HS					1	1							250	250				1				12	111	9.04				1.33	
300	x 300	x 8.0 S	HS					1	1							300	300				1				12	71.6	14.0				0.86	
		10.0 S	HS					1	1							300	300				1				12	88.4	11.3				1.06	
		12.5 S	HS					1	1							300	300				1				12	109	9.21				1.30	
		16.0 S	HS					1	1							300	300				1				12	136	7.36				1.63	
350	x 350	x 8.0 S	HS					1	1							350	350				1				12	84.2	11.9				1.01	
		10.0 S	HS					1	1							350	350				1				12	104	9.61				1.25	
		12.5 S	HS					1	1							350	350				1				12	128	7.80				1.54	
		16.0 S	HS					1	1							350	350				1				12	161	6.21				1.93	
400	x 400	x 10.0 S	HS					1	1							400	400				1				12	120	8.35			1	1.44	
		12.5 S	HS					1	1							400	400				1				12	148	6.76				1.77	
		16.0 S	HS					1	1							400	400				1				12	186	5.38				2.23	



Notes:

1. See also Notes for Section Properties for this product.



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Product Manual: Pipe & Tube + Profiles



General Information

Pipe & Tube Products

Build with

Standards

PART 3 Other Tube Products PART 4 Profiles

PART 5 Steel Grades

PART 6 Mill Coatings

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Product Manual: Pipe & Tube + Profiles

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Silo Section to C450PLUS®	
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Section Properties	3-5
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Notes:

Disclaimer – Whilst every care has been taken in the preparation of this information, Australian Tube Mills, and its agents accept no liability for the accuracy of the information supplied. The company expressly disclaims all and any liability to any person whether a purchaser of any product, or otherwise in respect of anything done or omitted to be done, by any such person in reliance, whether in whole or in part upon the whole or any part of this publication.

Product availability & other information – As the section, grade and finish of all products are subject to continuous improvement, reference should be made to the ATM *PRODUCT AVAILABILITY GUIDE* (PAG) for information on the <u>availability of listed sections</u> and associated <u>finishes</u>. The PAG is found at: www.austubemills.com.

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Product Manual: Pipe & Tube + Profiles
Silo Section to C450PLUS[®] – Specifications

Technical Specifications

Australian Standards

Silo Section to C450PLUS is manufactured and tested to comply with the requirements of the following specifications:

- → AS/NZS 1163 Cold-formed Structural Steel Hollow Sections (Grades C350L0 and Grade C450L0).
- → AS/NZS 4792 Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process (Section 3 or 4).

Mechanical Properties

Silo Section to C450PLUS has the following me properties:	chanical				
→ Minimum Yield Strength	450 MPa				
→ Minimum Tensile Strength	500 MPa				
\rightarrow Minimum Elongation in 5.65 $\sqrt{S_o}$ 16%					
→ L0 guaranteed impact properties at 0°C to AS/NZS 1163					

Tolerances

Tolerances for Silo Section to C450PLUS are compliant with AS/NZS 1163

See Dimensional Tolerances in Part 1 for more information.

Supply Conditions

DuraPrimed (DP) Finish

Silo Section to C450PLUS with DuraPrimed finish is supplied in the following surface colour: → DuraPrimed^{Blue}

This DuraPrimed finish is applied in-line using a patented process and is supplied in the following coating thicknesses:

→ DuraPrimed^{Blue} Target 12 microns with average at 8-10 microns

Note: Non-standard finishes, such as NOPC and LiteOil, are available if ordered prior to rollings. Conditions apply and subject to mill acceptance. See the ATM Product Availability Guide for further information on availability.

DuraGal[®] Finish

Silo Section to C450PLUS with DuraGal® finish is manufactured from in-line galvanising hollow sections that have the following external coating thickness:						
→ Minimum coating mass	100 g/m ²					
→ Designated as	AS/NZS 4792 ILG 100					
See the ATM Product Availability information on availability.	Guide for further					

DuraGal^{Plus} Finish

Silo Section to C450PLUS with DuraGal^{Plus} finish is manufactured using steel strip that has the following coating thickness:

 \rightarrow Minimum coating mass 100 g/m² each side \rightarrow Designated as AS/NZS 4792 ZB 100/100

See the ATM Product Availability Guide for further information on availability.

End Finish (Mill Processing)

→ Plain Ends only.

PART 3

Other Tube Products

Standard Lengths

Standard length for Silo Section to C450PLUS:

→ See the following Mass & Bundling Table

Contact your Australian Tube Mills representative or refer to the ATM Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of Silo Section to C450PLUS are available (conditions apply). Check with your distributor for details.

Minimum Length:

(75x64) DuraGalPlus/DP	4.5 m
	-

Maximum Length:

→ (75x64) DuraGal^{Plus}/DP 12.2 m Note: Contact your Australian Tube Mills representative for lengths outside this range.

Thickness

 \rightarrow

Silo Section to C450PLUS is available in 2.5 and 3.0 mm wall thickness. These thicknesses are identified by the following end colour codes:

→ 2.5 mm_	Pink
🛛 3.0 mm	 Blue



General Description

Manufacturing Process

Silo Section to C450PLUS is manufactured by coldforming and high frequency Electric Resistance Welding (ERW) of higher strength steel strip.

The unique shape of Silo Section to C450PLUS follows the contour of typical grain silos and provides a practical and economical solution for silo base ring sections and support legs.

Silo Section to C450PLUS is also suitable for a wide range of mechanical and structural applications.

Further Information

For further information refer to the Australian Tube Mills

→ Product Availability Guide (PAG) (www.austubemills.com)

PART 7

Mill Processing



PART 6

Mill Coatings

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PART 4

Profiles

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General

ART 1	
Information	

PART 2 **Pipe & Tube Products**

Build with

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PART 5

Steel Grades

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PART 8

Fabrication

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Product Manual: Pipe & Tube + Profiles

Silo Section to C450PLUS[®] – Section Properties calculated in accordance with AS/NZS 1163 & AS 4100

Dir	Dimensions and Ratios Properties							Properties for Design to AS 4100																
	Desi	gnatio	on	Mass	Gross Section														Torsion Constant	Form Factor	About	u-axis	About	v-axis
d		b	t	per m	Area A _g	u _c	Vc	l _u	Z _u min	Z _u max	r _u	l _v	Z _v min	Z _v max	r _v	l _x	l _y	Alpha	J	k _f	Compact- ness	Z_{eu}	Compact- ness	Z _{ev}
mm	ı r	nm	mm	kg/m	mm ²	mm	mm	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 ⁶ mm ⁴	10 ⁶ mm ⁴	Deg.	10 ⁶ mm ⁴		(C,N,S)	10 ³ mm ³	(C,N,S)	10 ³ mm ³
75	Х	64 >	< 3.0	5.55	707	27.8	31.9	0.440	10.2	13.8	24.9	0.401	11.1	14.4	23.8	0.530	0.310	39.9	0.573	1.00	Ν	14.7	Ν	15.0
			2.5	4.66	593	27.8	31.9	0.374	8.68	11.7	25.1	0.342	9.44	12.3	24.0	0.451	0.265	39.9	0.493	1.00	N	10.2	N	10.3



Notes:

- 1. For C450PLUS: $f_y = 450 \text{ MPa}$
- and $f_u = 500$ MPa; $f_y =$ yield stress used in design; $f_u =$ tensile strength used in design; as defined in AS 4100 – see Steel Grades (Part 5) of this Product Manual for a definition of C450PLUS.
- C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
- C450PLUS designed as Grade C450L0 to AS/NZS 1163 is cold-formed, and is therefore allocated the CF residual stresses classification in AS 4100.
- 4. LiteOil and NOPC are available in all sections on request and subject to confirmation.
- Information on standard lengths for these products are listed in the following Mass & Bundling tables.
- REFER to the Australian Tube Mills PRODUCT AVAILABILITY GUIDE (PAG) for information on the availability of these products and associated grades, finishes, and standard lengths. The PAG can be found at www.austubemills.com

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Product Manual: Pipe & Tube + Profiles

Silo Section to C450PLUS® – Mass & Bundling calculated in accordance with AS/NZS 1163

D	imensio	ons	Bundling									Mass									
I	Designati	on	Bu	ndle Configura	dle Configuration Bundle Dimensions (mm)					Nominal Mass Ma			Mass Per Bundle								
d	b	t	6.5 m	8.0 m	12.0 m	6.5 m	8.0	m	12	.0 m	Leng		Junule	INCL	esreib	unule	NOTIN	ai iviass		tonnes	
mm	mm	mm	W x H	W x H	W x H	W x H	W x	άН	W	х Н	6.5 m	8.0 m	12.0 m	6.5 m	8.0 m	12.0 m	kg/m	m/t	6.5 m	8.0 m	12.0 m
75	x 64	x 2.5	-	6 6	-	-	350	385		-	-	36	-	-	288	-	4.66	215	-	1.34	-
		3.0	-	6 6	-	-	350	385		-	-	36	-	-	288	-	5.55	180	-	1.60	-



Notes: 1. See also Notes for Section Properties for this product.



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Product Manual: Pipe & Tube + Profiles

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Notes:

Disclaimer – Whilst every care has been taken in the preparation of this information, Australian Tube Mills, and its agents accept no liability for the accuracy of the information supplied. The company expressly disclaims all and any liability to any person whether a purchaser of any product, or otherwise in respect of anything done or omitted to be done and the consequences of anything done or omitted to be done, by any such person in reliance, whether in whole or in part upon the whole or any part of this publication.

Product availability & other information – As the section, grade and finish of all products are subject to continuous improvement, reference should be made to the ATM *PRODUCT AVAILABILITY GUIDE* (PAG) for information on the <u>availability</u> of <u>listed sections</u> and associated <u>finishes</u>. The PAG is found at: www.austubernills.com.

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Product Manual: Pipe & Tube + Profiles

Profiles Angles – Equal Angles – Specifications

Technical Specifications

Australian Standards

Equal Angles are manufactured and tested to comply with the requirements of the following specifications:

- ATM Technical Specification TS100 DuraGal^{Ultra} Profiles – Angles, Channels and Flats.
- AS/NZS 4791 Hot-dipped (zinc) coatings on ferrous hollow sections, applied by an in-line process

and various other Australian and National Standards listed in TS100.

ATM Specification TS100 is available from www.austubemills.com

Mechanical Properties

Equal Angles have the following mechanical properties for section thickness (*t*):

→ Minimum Yield Strength:

Actual Thickness (mm)	Actual Thickness Grade (mm)					
t≤2.5	C350L0	350				
$2.5 < t \le 6$	C450L0	450				
<i>t</i> > 6	C400L0	400				

\rightarrow Minimum Tensile Strength:

Actual Thickness (mm)	Grade	Minimum Tensile Strength (MPa)
t ≤2.5	C350L0	400
2.5 < <i>t</i> ≤6	C450L0	500
<i>t</i> > 6	C400L0	450

→ Minimum Elongation in 5.65 $\sqrt{S_o}$:

Actual Thickness (mm)	Grade	Minimum Elongation		
t≤2.5	C350L0	20%		
$2.5 < t \le 6$	C450L0	16%		
<i>t</i> > 6	C400L0	16%		

L0 indicates that Profiles have Charpy V-notch impact properties at 0° as specified in TS100. Table 10.4.1 of AS4100 Steel Structures permits L0 grades to have the following minimum permissible service temperature:

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

See TS100 for further details.

Tolerances

Tolerances for Equal Angles are compliant with ATM Technical Specification TS100.

Supply Conditions

DuraGal^{Ultra®} Finish

End Finish (Mill Processing)

→ Plain Ends only.

Standard Lengths

Standard lengths for Equal Angles: ⇒ See following Mass & Bundling Tables Contact your Australian Tube Mills representative or refer to the ATM Profiles Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of Equal Angles are available (conditions apply).

Minimum Length:

→ All sizes	5.0 m
Maximum Length:	
→ All sizes	13.0 m

Notes:

- 1. Contact your Australian Tube Mills representative for lengths outside this range.
- 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.
- 3. Off-line cutting facilities are not available for Equal Angles.

Thickness

Equal Angles are available in 2.5 to 8.0 mm thickness. These thicknesses are identified by ends which are colour coded as specified in Table 8 of AS/NZS 4496.



3) DuraGal^{Ultra*}

General Description

Manufacturing Process

Equal Angles are produced by cold-forming low carbon steel strip and coated in-line applying a hot-dip zinc aluminium coating. This product is intended for general engineering and structural uses.

Further Information

For further information refer to the following publications available from www.austubemills.com:

ATM Technical Specification TS100 DuraGal^{Ultra®}
 Profiles – Angles, Channels, and Flats
 Profiles Product Availability Guide for further details.

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Product Manual: Pipe & Tube + Profiles

Profiles Angles – Equal Angles – Dimensions & Full Section Properties

About principal x- and y-axes

	Dimensions											Se	ction P	roperties				
Leg	Designa Size	ation Nominal Thickness	Mass per m	Actual Thickness	Inside Corner Radius	Co	ordinates of Centroid		Full Area of Section		About	x-axis			Ab	out y-axis		
b ₁	b ₂			t	r	$y_1=y_4\\$	$\mathbf{x}_2 = \mathbf{x}_3$	X 5	A _f	l _x	$Z_{x1} = Z_{x4}$	S _x	r _x	l _y	$Z_{y2}=Z_{y3}$	Z _{y5}	Sy	r _y
mm	mm	mm	kg/m	mm	mm	mm	mm	mm	mm ²	10 ⁶ mm⁴	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
		6.0 CA	13.6	6.0	8.0	106	53.2	51.3	1740	6.36	59.9	91.6	60.5	1.51	28.3	29.4	44.3	29.5
		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
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. Based on nominal thickness (t), Equal Angles are supplied in the following steel grades (see Specifications of TS100 for further details):
 - C450L0 for 2.5mm < t ≤ 6.0mm
 - C400L0 for t > 6.0 mm • C350L0 for *t* ≤ 2.5 mm
- 2. Full section properties are calculated in accordance with AS/NZS 4600.
- 3. For information on standard lengths for these products see following Mass & Bundling Tables.
- 4. Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Product Manual: Pipe & Tube + Profiles



PART 1 General Information

PART 2 Pipe & Tube Products

Build with

Standards

PART 3 Other Tube Products

Profiles

PART 5 Steel Grades

PART 6

Mill Coatings

PART 7 Mill Processing

PART 8 Fabrication

Profiles Angles – Equal Angles – Dimensions & Full Section Properties

About non-principal n- and p-axes

	Dimensions							Section Properties						
Leg	Designa Size	ation Nominal Thickness	Mass per m	Actual Thickness	Inside Corner Radius	Co-ord o Cent	linates f rroid	Full Area of Section		About n	on-principal n-	and p-axes		Product of 2nd Moment of Area
b ₁	b ₂			t	ri	$p_{\rm B} = n_{\rm L}$	$p_{\rm T} = n_{\rm R}$	A _f	$I_{\rm n} = I_{\rm p}$	$Z_{nB} = Z_{pL}$	$Z_{nT} = Z_{pR}$	$S_n = S_p$	$r_{\rm n} = r_{\rm p}$	I _{np}
mm	mm	mm	kg/m	mm	mm	mm	mm	mm ²	10 ⁶ mm⁴	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm⁴
150 x	150 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
		6.0 CA	13.6	6.0	8.0	40.4	110	1740	3.93	97.4	35.9	64.8	47.6	- 2.42
		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 x	125 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 x	100 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
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:

- Based on nominal thickness (t), Equal Angles are supplied in the following steel grades (see Specifications of TS100 for further details):
- C450L0 for 2.5mm < t ≤ 6.0mm
- C400L0 for t > 6.0 mm
- C350L0 for t ≤ 2.5 mm
- 2. Full section properties are calculated in accordance with AS/NZS 4600.
- 3. For information on standard lengths for these products see following Mass & Bundling Tables.
- Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Profiles Angles – Equal Angles – Section Properties for Member Stability

About principal x- and y-axes

	Designation		Mass per m	Torsion Constant	Cooordinate of Shear Centre	Polar Radius of Gyration about the Shear Centre	Monosymmetry Section Constant
Leg b1	Size b ₂	Nominal Thickness		J	X _o	r _{o1}	β _y
mm	mm	mm	kg/m	10 ³ mm ⁴	mm	mm	mm
150 x	150 x	8.0 CA	18.0	49.0	51.6	84.3	206
		6.0 CA	13.6	20.8	52.0	84.9	208
		5.0 CA	10.8	10.1	52.2	85.2	209
125 x	125 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 x	100 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:

- Based on nominal thickness (t), Equal Angles are supplied in the following steel grades (see Specifications of TS100 for further details):
- C450L0 for 2.5 mm < t ≤ 6.0 mm
- C400L0 for t > 6.0 mm
- C350L0 for $t \le 2.5 \text{ mm}$
- 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. *B* is zero for equal angles.
- 4. $l_{\rm w}$ 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.
- Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Product Manual: Pipe & Tube + Profiles

PART 2	PART 3	PART 4	PART 5	PART 6	PART 7	PART 8
Pipe & Tube Products	Other Tube Products	Profiles	Steel Grades	Mill Coatings	Mill Processing	Fabrication

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Product Manual: Pipe & Tube + Profiles

Profiles Angles – Equal Angles – Mass & Bundling

Nominal Size		Nominal Thickness	Mass per Metre	Metres per Tonnes	No. of lengths per pack	Arrangement of Pack	Overall Bundle Dimesions	Total Metres per pack	Total Weight per Pack
mm	mm	mm		kg/t	m/t	Cols x Rows	W x H (mm)	m	tonnes
					6.0 Metre S	tandard Lengths			
30	30	2.5	1.06	948	80	4 x 20	170 x 85	480	0.507
40	40	2.5 4.0	1.43 2.20	698 455	60 39	3 x 20 3 x 13	170 x 92 170 x 92	360 234	0.516 0.514
45	45	2.5 4.0	1.62 2.50	617 401	54 36	3 x 18 3 x 12	191 x 89 191 x 90	324 216	0.525 0.539
					9.0 Metre S	tandard Lengths			
50	50	2.5 4.0 5.0 6.0	1.81 2.79 3.42 4.21	553 358 298 238	33 27 24 21	3 x 11 3 x 9 3 x 8 3 x 7	212 x 69 212 x 78 212 x 82 212 x 85	297 243 216 189	0.537 0.679 0.738 0.795
65	65	4.0 5.0 6.0	3.69 4.52 5.62	271 221 178	22 22 18	2 x 11 2 x 11 2 x 9	184 x 99 184 x 112 184 x 112	198 198 162	0.730 0.895 0.910
75	75	4.0 5.0 6.0 8.0	4.29 5.26 6.56 8.59	233 190 152 116	22 22 18 18	2 x 11 2 x 11 2 x 9 2 x 9	212 x 106 212 x 119 212 x 119 212 x 119 212 x 143	198 198 162 162	0.849 1.04 1.06 1.39
90	90	5.0 8.0	6.37 10.50	157 95.4	22 18	2 x 11 2 x 9	255 x 130 255 x 153	198 162	1.26 1.70
					12.0 Metre S	Standard Lengths			
100	100	6.0 8.0	8.92 11.7	112 85.2	16 14	2 x 8 2 x 7	283 x 129 283 x 138	192 168	1.71 1.97
125	125	4.0 5.0 8.0	7.27 8.95 14.9	138 112 67.2	20 18 12	2 x 10 2 x 9 2 x 6	354 x 136 354 x 141 354 x 144	240 216 144	1.74 1.93 2.14
150	150	5.0 6.0 8.0	10.8 13.6 18.0	92.6 73.4 55.5	18 18 12	2 x 9 2 x 9 2 x 6	424 x 159 424 x 172 424 x 162	216 216 144	2.33 2.94 2.59



Notes:

1. Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Product Manual: Pipe & Tube + Profiles



PART 1 General Information

PART 2 Pipe & Tube Products

Build with

Standards

PART 3 Other Tube Products PART 4 Profiles

PART 5 Steel Grades

PART 6 Mill Coatings

PART 7 Mill Processing

PART 8 Fabrication

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Product Manual: Pipe & Tube + Profiles

Profiles Angles – Unequal Angles – Specifications

Technical Specifications

Australian Standards

Unequal Angles are manufactured and tested to comply with the requirements of the following specifications:

- ATM Technical Specification TS100 DuraGal^{Ultra®} Profiles – Angles, Channels and Flats.
- AS/NZS 4791 Hot-dipped (zinc) coatings on ferrous hollow sections, applied by an in-line process

and various other Australian and national Standards listed in TS100.

ATM Specification TS100 is available from www.austubemills.com

Mechanical Properties

Unequal Angles have the following mechanical properties for section thickness (*t*):

 \rightarrow Minimum Yield Strength (f_{y}):

Actual Thickness (mm)	Grade	Minimum Yield Strength (MPa)		
t≤2.5	C350L0	350		
$2.5 < t \le 6$	C450L0	450		
<i>t</i> > 6	C400L0	400		

 \rightarrow Minimum Tensile Strength (f_{ij}):

Actual Thickness (mm)	Grade	Minimum Tensile Strength (MPa)
t≤2.5	C350L0	400
2.5 < <i>t</i> ≤6	C450L0	500
t > 6	C400L0	450

→ Minimum Elongation in 5.65 $\sqrt{S_o}$:

Actual Thickness (mm)	Grade	Minimum Elongation
t≤2.5	C350L0	20%
2.5 < <i>t</i> ≤ 6	C450L0	16%
<i>t</i> > 6	C400L0	16%

L0 indicates that Profiles have Charpy V-notch impact properties at 0° as specified in TS100. Tables 10.4.1 of AS4100 Steel Structures permits L0 grades to have the following minimum permissible service temperatures:

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

See TS100 for further details.

Tolerances

Tolerances for Unequal Angles are compliant with ATM Technical Specification TS100.

Supply Conditions

DuraGal^{Ultra®} Finish

nequal Angles are manufactured from in-line							
alvanizing cold-formed open sections that have the							
ollowing coating thickness of zinc aluminium:							
→ Minimum (av) coating mass _	75 g/m ²						
> Designated as	_ AS/NZS 4791 ILG 75						

Standard Lengths

Standard lengths for Unequal Angles: ⇒ See following Mass & Bundling Tables Contact your Australian Tube Mills representative or refer to the ATM Profiles Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of Unequal Angles are available (conditions apply).

Minimum Length:

\rightarrow All sizes		
Maximum	Length:	
→ All sizes		

Notes:

- Contact your Australian Tube Mills representative for lengths outside this range.
- 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.
- 3. Off-line cutting facilities are not available for Unequal Angles.

Thickness

Unequal Angles are available in 4.0 to 8.0 mm thickness. These thicknesses are identified by ends which are colour coded as specified in Table 8 of AS/NZS 4496.



5.0 m

13.0 m

General Description

Manufacturing Process

Unequal Angles are produced by cold-forming low carbon steel strip and coated in-line applying a hot-dip zinc aluminium coating. This product is intended for general engineering and structural uses.

Further Information

For further information refer to the following publications available from www.austubemills.com:

 ATM Technical Specification TS100 DuraGal^{Ultra®} Profiles – Angles, Channels, and Flats
 Profiles Product Availability Guide for further details.

End Finish (Mill Processing)





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Product Manual: Pipe & Tube + Profiles

Profiles Angles – Unequal Angles – Dimensions & Full Section Properties

About principal x- and y-axes

				D	imensions						
Designa	tion Nominal	Mass per m	Actual Thickness	Inside Corner Radius	er C		Coordinates of Centroid				
b_1 b_2	Thickness		t	ri	y 1	y 4	<i>x</i> ₂	<i>x</i> ₃	<i>x</i> ₅	α	
mm mm	mm	kg/m	10³mm⁴	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														
D	esigna)	ation	Mass per m	Full Area of Section		,	About x-axis					About	t y-axis		
Leg b ₁	Size b2	Nominal Thickness		A _t	l _x	<i>Z</i> _{<i>x</i>1}	Z_{x4}	S _x	r _x	l _y	Z_{y2}	Z_{y3}	Z_{y5}	Sy	r _x
mm	mm	mm	kg/m	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	mm			
150 x 1	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 7	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 7	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 5	0 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:

- Based on nominal thickness (t), Unequal Angles are supplied in the following steel grades (see Specifications of TS100 for further details):
- C450L0 for 2.5 mm < t ≤ 6.0mm
- C400L0 for t > 6.0 mm
- C350L0 for $t \le 2.5$ mm
- 2. Full section properties are calculated in accordance with AS/NZS 4600.
- 3. For information on standard lengths for these products see following Mass & Bundling Tables.
- Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Profiles Angles – Unequal Angles – Dimensions & Full Section Properties

About non-principal n- and p-axes

	Dimensions								Section Properties										
Leg S b1	esignat Size b ₂ 1	tion Nominal Fhickness	on Mass per Coordinates of Centroid metre lominal ickness			oid	Full About n-axis Area of Section			About p-axis				Product of 2nd Moment of Area					
				p_B	p_t	n_L	n _R	A _f	I _n	z _{nB}	z _{nT}	S _n	<i>r</i> _n	I _p	$Z_{\rm pL}$	$Z_{\rm pR}$	Sp	r _p	I _{np}
mm	mm	mm	kg/m	mm	mm	mm	mm	mm ²	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	mm	10 ⁶ mm ⁴
150 x 1	00 x	8.0 CA 6.0 CA	14.9 11.3	49.0 48.2	101 102	23.5 22.7	76.5 77.3	1890 1440	4.46 3.42	91.0 71.1	44.2 33.6	79.1 60.3	48.5 48.8	1.65 1.27	70.1 56.1	21.5 16.4	38.1 28.9	29.5 29.8	- 1.66 - 1.28
125 x 7	'5 x	8.0 CA 6.0 CA	11.7 8.92	43.2 42.3	81.8 82.7	17.5 16.7	57.5 58.3	1490 1140	2.43 1.87	56.2 44.3	29.7 22.7	52.4 40.1	40.3 40.6	0.687 0.535	39.2 32.0	11.9 9.18	21.4 16.2	21.4 21.7	- 0.791 - 0.613
100 x 7	'5 x	8.0 CA 6.0 CA	10.2 7.74	32.5 31.7	67.5 68.3	19.6 18.8	55.4 56.2	1290 986	1.31 1.02	40.3 32.1	19.4 14.9	35.0 26.9	31.8 32.1	0.643 0.502	32.8 26.7	11.6 8.93	20.8 15.9	22.3 22.6	- 0.575 - 0.446
75 x 50) x	6.0 CA 5.0 CA 4.0 CA	5.38 4.34 3.54	25.7 24.8 24.4	49.3 50.2 50.6	12.7 12.0 11.7	37.3 38.0 38.3	686 553 451	0.393 0.323 0.266	15.3 13.0 10.9	7.98 6.43 5.26	14.2 11.5 9.43	23.9 24.2 24.3	0.144 0.119 0.0983	11.4 9.86 8.44	3.87 3.12 2.57	6.97 5.56 4.54	14.5 14.6 14.8	- 0.151 - 0.120 - 0.0991



Notes:

- Based on nominal thickness (t), Unequal Angles are supplied in the following steel grades (see Specifications of TS100 for further details):
- C450L0 for 2.5mm < t ≤ 6.0 mm
- C400L0 for t > 6.0 mm
- C350L0 for $t \le 2.5$ mm
- 2. Full section properties are calculated in accordance with AS/NZS 4600.
- 3. For information on standard lengths for these products see following Mass & Bundling Tables.
- Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Product Manual: Pipe & Tube + Profiles

Profiles Angles – Unequal Angles – Section Properties for Member Stability

About principal x- and y-axes

Desig	nation	Mass per m	Torsion Constant Coordinate of Shear Centre		Polar Radius of Gyration Monosymmetry Sect about the Shear Centre		Section Constant	
Leg Size b ₁ b ₂	Nominal Thickness		J	x _o	y _o	r _{o1}	β _γ	β_y
mm mm	mm	kg/m	10³mm⁴	mm	mm	mm	mm	mm
150 x100 x	8.0 CA	14.9	40.7	35.4	32.4	74.2	78.6	161
	5.0 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:

- Based on nominal thickness (t), Unequal Angles are supplied in the following steel grades (see Specifications of TS100 for further details):
- C450L0 for 2.5 mm < t ≤ 6.0 mm
- C400L0 for t > 6.0 mm
- C350L0 for $t \le 2.5$ mm
- 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. Iw 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.
- Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Product Manual: Pipe & Tube + Profiles

Profiles Angles – Unequal Angles – Mass & Bundling

Nomin	al Size	Nominal Thickness	Mass per Metre	Metres per Tonne	No. of lengths per pack	Arrangement of Pack	Overall Bundle Dimensions	Total Metres per pack	Total Weight per Pack
mm	mm	mm		kg/t	m/t	Cols x Rows	W x H (mm)	m	tonnes
					9.0 Metre S	tandard Lengths			
75	50	4.0 5.0 6.0	3.54 4.34 5.38	282 231 186	22 22 18	2 x 11 2 x 11 2 x 9	197 x 94 200 x 106 199 x 106	198 198 162	0.701 0.859 0.872
					12.0 Metre S	Standard Lengths			
100	75	6.0 8.0	7.74 10.2	129 98.4	16 16	2 x 8 2 x 8	261 x 117 264 x 137	192 192	1.49 1.95
125	75	6.0 8.0	8.92 11.7	122 85.2	16 14	2 x 8 2 x 7	311 x 120 312 x 129	192 168	1.71 1.97
150	100	6.0 8.0	11.3 14.9	88.7 67.2	16 12	2 x 8 2 x 6	376 x 140 374 x 137	192 144	2.16 2.14



Notes:

 Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Product Manual: Pipe & Tube + Profiles

Profiles Channels – Specifications

Technical Specifications

Australian Standards

Channels are manufactured and tested to comply with the requirements of the following specifications:

- ATM Technical Specification TS100 DuraGal^{Ultra®} Profiles – Angles, Channels and Flats.
- AS/NZS 4791 Hot-dipped (zinc) coatings on ferrous hollow sections, applied by an in-line process

and various other Australian and national Standards listed in TS100.

ATM Specification TS100 is available from www.austubemills.com

Mechanical Properties

Channels have the following mechanical properties for section thickness (*t*):

 \rightarrow Minimum Yield Strength (f_y):

Actual Thickness (mm)	Grade	Minimum Yield Strength (MPa)
t≤2.5	C350L0	350
$2.5 < t \le 6$	C450L0	450
<i>t</i> > 6	C400L0	400

\rightarrow Minimum Tensile Strength (f_u):

Actual Thickness (mm)	Grade	Minimum Tensile Strength (MPa)
t ≤2.5	C350L0	400
2.5 < <i>t</i> ≤6	C450L0	500
<i>t</i> > 6	C400L0	450

→ Minimum Elongation in 5.65 $\sqrt{S_o}$:

Actual Thickness (mm)	Grade	Minimum Elongation
t≤2.5	C350L0	20%
$2.5 < t \le 6$	C450L0	16%
<i>t</i> > 6	C400L0	16%

L0 indicates that Profiles have Charpy V-notch impact properties at 0° as specified in TS100. Tables 10.4.1 of AS4100 Steel Structures permits L0 grades to have the following minimum permissible service temperatures:

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

See TS100 for further details.

Tolerances

Tolerances for Channels are compliant with ATM Technical Specification TS100.

Supply Conditions

DuraGal^{Ultra®} Finish

Channels manufactured from in-line galvanizing coldformed open sections that have the following coating thickness of zinc aluminium:

Minimum (av) coating mas	ss /5 g/m²
→ Designated as	AS/NZS 4791 ILG 75

End Finish (Mill Processing)

 \rightarrow Plain Ends only.

Standard Lengths

Standard lengths for Channels: ⇒ See following Mass & Bundling Tables Contact your Australian Tube Mills representative or refer to the ATM Profiles Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of Channels are available (conditions apply).

Minimum Length:

→ All sizes	_ 5.0 m
Maximum Length:	
→ All sizes	13.0 m

Notes:

- 1. Contact your Australian Tube Mills representative for lengths outside this range.
- 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.
- 3. Off-line cutting facilities are not available for Channels.

Thickness

Channels are available in 4.0 to 8.0 mm thickness. These thicknesses are identified by ends which are colour coded as specified in Table 8 of AS/NZS 4496.



3) DuraGal^{Ultra®}

General Description

Manufacturing Process

Channels are produced by cold-forming low carbon steel strip and coated in-line applying a hot-dip zinc aluminium coating. This product is intended for general engineering and structural uses.

Further Information

For further information refer to the following publications available from www.austubemills.com:

➢ ATM Technical Specification TS100 DuraGal^{Ultra®} Profiles – Angles, Channels, and Flats

→ Profiles Product Availability Guide for further details.



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Product Manual: Pipe & Tube + Profiles

Profiles Channels – Dimensions & *Full* Section Properties

About principal x- and y-axes

Dimensions							Section Properties									
Designation d b _f Nominal		Mass per metre	Actual Thickness	Inside Corner Radius	Depth Between Flanges	Coord of Centroid	Full Area of Section	Full About x-axis ea of ection				About y-axis				
	Thickness		t	r	d - 2t	XL	A _f	l _x	Z _x	S _x	r _x	I _y	$Z_{\rm yR}$	$Z_{\rm yL}$	Sy	ry
mm mm	mm	kg/m	mm	mm	mm	mm	mm ³	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
300 x 90 x	8.0 CC 6.0 CC	28.5 21.6	8.0 6.0	8.0 8.0	284 288	20.3 19.5	3630 2750	44.2 34.0	294 227	359 275	110 111	2.44 1.89	35.0 26.8	120 96.6	62.1 47.1	25.9 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 5.0 CC	15.5 12.4	6.0 4.7	8.0 4.0	188 191	18.8 18.1	1970 1580	11.2 9.18	112 91.8	135 109	75.5 76.4	1.00 0.812	17.9 14.3	53.4 44.9	31.8 25.3	22.6 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:

- Based on nominal thickness (t), Channels are supplied in the following steel grades (see Specifications of TS100 for further details):
- C450L0 for 2.5 mm < t ≤ 6.0 mm
- C400L0 for t > 6.0 mm
- C350L0 for $t \le 2.5$ mm

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

- 3. For information on standard lengths for these products see following Mass & Bundling Tables.
- Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Product Manual: Pipe & Tube + Profiles

Profiles Channels – Section Properties for Member Stability

About principal x- and y-axes

Designa	Designation Mass per r		Torsion Constant	Warping Constant	Coordinate of Shear Centre	Polar Radius of Gyration about the Shear Centre	Monosymmetry Section Constant	
d b _f T	Nominal Fhickness		J	I _w	xo	r _{ot}	β _y	
mm mm	mm	kg/m	10³mm⁴	10³mm⁴	mm	mm	mm	
300 x 90 x	8.0 CC 6.0 CC	28.5 21.6	77.4 33.0	37.7 29.6	43.4 44.0	122 123	338 340	
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 5.0 CC	15.5 12.4	223.7 11.6	6.78 5.52	40.2 40.6	89.0 89.7	217 218	
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:

- Based on nominal thickness (t), Channels are supplied in the following steel grades (see Specifications of TS100 for further details):
- C450L0 for 2.5mm < t ≤ 6.0 mm
- C400L0 for t > 6.0 mm
- C350L0 for $t \le 2.5 \text{ mm}$
- 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. B_x is zero for channels.
- Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Product Manual: Pipe & Tube + Profiles

Profiles Channels – Mass & Bundling

Nominal Size		Nominal Thickness	Mass per Metre	Metres per Tonnes	No. of lengths per pack	Arrangement of Pack	Overall Bundle Dimensions	Total Metres per pack	Total Weight per Pack					
mm	mm	mm	kg/m	m/t		Cols x Rows	W x H (mm)	m	tonnes					
	9.0 Metre Standard Lengths													
75	40	4.0	4.25	236	18	3 x 6	237 x 136	162	0.688					
100	50	4.0	5.59	179	18	3 x 6	312 x 166	162	0.905					
125	65	4.0	7.23	138	18	3 x 6	387 x 211	162	1.17					
12.0 Metre Standard Lengths														
150	75	5.0	10.5	95.1	12	2 x 6	313 x 244	144	1.51					
180	75	5.0	11.6	86.0	12	2 x 6	373 x 244	144	1.67					
200	75	5.0	12.4	80.9	12	2 x 6	413 x 244	144	1.78					
		6.0	15.5	64.6	12	2 x 6	420 x 247	144	2.23					
230	75	6.0	16.9	59.2	12	2 x 6	480 x 247	144	2.43					
250	90	6.0	19.2	52.0	8	2 x 4	520 x 194	96	1.85					
300	90	6.0	21.6	46.3	6	1 x 6	314 x 292	72	1.56					
		8.0	28.5	35.1	6	1 x 6	316 x 298	72	2.05					



Notes:

 Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Product Manual: Pipe & Tube + Profiles

Profiles Flats – Specifications

Technical Specifications

Australian Standards

Flats are manufactured and tested to comply with the requirements of the following specifications:

- ➢ ATM Technical Specification TS100 DuraGal^{Ultra®} Profiles – Angles, Channels and Flats.
- AS/NZS 4791 Hot-dipped (zinc) coatings on ferrous hollow sections, applied by an in-line process

and various other Australian and national Standards listed in TS100.

ATM Specification TS100 is available from www.austubemills.com

Mechanical Properties

Flats have the following mechanical properties for section thickness (*t*):

 \rightarrow Minimum Yield Strength (f_y):

Actual Thickness (mm)	Grade	Minimum Yield Strength (MPa)
$t \leq 6$	C400L0	400
<i>t</i> > 6	C350L0	350

\rightarrow Minimum Tensile Strength (f_u):

Actual Thickness (mm)	Grade	Minimum Tensile Strength (MPa)			
$t \leq 6$	C400L0	450			
<i>t</i> > 6	C350L0	400			

→ Minimum Elongation in $5.65\sqrt{S_o}$:

Actual Thickness (mm)	Grade	Minimum Elongation			
$t \leq 6$	C400L0	20%			
<i>t</i> > 6	C350L0	20%			

➡ L0 indicates that Profiles have Charpy V-notch impact properties at 0° as specified in TS100. Tables 10.4.1 of AS4100 Steel Structures permits L0 grades to have the following minimum permissible service temperatures:

Actual Thickness (mm)	Lowest One Day Mean Ambient Temperature (°C)
$t \leq 6$	-30
6 < <i>t</i> ≤ 10	-20

See TS100 for further details.

Tolerances

Tolerances for Flats are compliant with ATM Technical Specification TS100.

Supply Conditions

DuraGal^{Ultra®} Finish

Flats are manufactured from in-line galvanizing coldformed open sections that have the following coating thickness of zinc aluminium:

→ Minimum (av) coating mass	75 g/m ²
→ Designated as	AS/NZS 4791 ILG 75

End Finish (Mill Processing)

Plain Ends only.

Standard Lengths

Standard lengths for Flats:

See following Mass & Bundling Tables Contact your Australian Tube Mills representative or refer to the ATM Profiles Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of Flats are available (conditions apply).

Minimum Length:

\rightarrow All sizes	5.8 m

Maximum Length:

> All sizes,	4 & 5 mm thick	6.2 m
	6 & 8 mm thick	6.5 m

Notes:

- 1. Contact your Australian Tube Mills representative for lengths outside this range.
- 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.
- 3. Off-line cutting facilities are not available for Flats.

Thickness

Flats are available in 4.0 to 8.0 mm thickness. These thicknesses are identified by ends which are colour coded as specified in Table 8 of AS/NZS 4496.



3) DuraGal^{Ultra®}

General Description

Manufacturing Process

Flats are produced by cold-forming low carbon steel strip and coated in-line applying a hot-dip zinc aluminium coating. This product is intended for general engineering and structural uses.

Further Information

For further information refer to the following publications available from www.austubemills.com:

ATM Technical Specification TS100 Profiles – Angles, Channels, and Flats

→ Profiles Product Availability Guide for further details.



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Product Manual: Pipe & Tube + Profiles

Profiles Flats – Dimensions & *Full* Section Properties

About principal x- and y-axes and baseline axis

	Dime	ensions		Grade	Section Properties										
Des	ignation Nominal	Mass per metre	Actual Thickness	Yield Stress	Full Area of Section	About 1-axis		Abou	t x-axis			About y-	axis		Torsion Constant
Width w	Thickness		t	fy	A _f	<i>I</i> ₁	I _x	Z _x	Sx	r _x	l _y	zy	Sy	ry	J
mm	mm	kg/m	mm	MPa	mm²	10 ⁶ mm ⁴	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	10 ⁶ mm ⁴	10 ³ mm ³	10 ³ mm ³	10 ³ mm ³	mm	106mm⁴
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
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:

- Based on nominal thickness (t), Flats are supplied in the following steel grades (see Specifications of TS100 for further details):
- C400L0 for $t \leq 6.0$ mm
- C350L0 for t > 6.0 mm
- 2. Full section properties are calculated in accordance with AS/NZS 4600.
- 3. For information on standard lengths for these products see following Mass & Bundling Tables.
- Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.



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Product Manual: Pipe & Tube + Profiles



PART 1 General Information

PART 2 Pipe & Tube Products

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Build with

Standards

ducts

Profiles

PART 5 Steel Grades

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PART 6 Mill Coatings PART 7 Mill Processing PART 8 Fabrication

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Product Manual: Pipe & Tube + Profiles
Profiles Flats – Mass & Bundling

Nominal Size	Nominal Thickness	Mass per Metre	Metres per Tonne	No. of Lengths per Pack	Arrangement of Pack	Overall Bundle Dimensions	Total Metres per Pack	Total Weight per Pack
mm	mm	kg/m	m/t		Cols x Rows	W x H (mm)	m	tonnes
				6.0 Me	etre Standard Leng	jths		
50	4.0	1.49	670	57	3 x 19	150 x 76	342	0.510
	5.0	1.84	542	45	3 x 15	150 x 75	270	0.498
65	4.0	1.94	516	44	2 x 22	130 x 88	264	0.512
	5.0	2.40	417	36	2 x 18	130 x 90	216	0.518
75	4.0	2.24	447	38	2 x 19	150 x 76	228	0.510
	5.0	2.77	361	32	2 x 16	150 x 80	192	0.530
90	6.0	4.24	236	26	2 x 13	180 x 78	156	0.661
100	4.0	2.98	335	28	2 x 14	200 x 56	168	0.501
	5.0	3.69	271	28	2 x 14	200 x 70	168	0.620
	6.0	4.71	212	26	2 x 13	200 x 78	156	0.735
	8.0	6.28	159	22	2 x 11	200 x 88	132	0.829
130	5.0	4.80	208	28	2 x 14	260 x 70	168	0.806
150	5.0	5.53	181	28	2 x 14	300 x 70	168	0.930
	6.0	7.07	142	24	2 x 12	300 x 72	144	1.02
	8.0	9.42	106	22	2 x 11	300 x 88	132	1.24
200	5.0	7.38	136	32	2 x 16	400 x 80	192	1.42
	6.0	9.42	106	28	2 x 14	400 x 84	168	1.58
	8.0	12.6	79.6	22	2 x 11	400 x 88	132	1.66
250	5.0	9.22	108	23	1 x 23	250 x 115	138	1.27
	8.0	15.7	63.7	16	1 x 16	250 x 128	96	1.51
300	5.0	11.1	90.3	19	1 x 19	300 x 95	114	1.26
	8.0	18.8	53.1	12	1 x 12	300 x 96	72	1.36



Notes:

 Refer to either ATM Technical Specification TS100 and/or the Profiles Product Availability Guide for information on availability and further details.





Build with Product Manual: Pipe & Tube + Profiles AUGUST 2013 4-31 **Austube**Mills **Standards** PART 1 General Information PART 2 Pipe & Tube Products PART 3 PART 4 Profiles PART 5 Steel Grades PART 6 Mill Coatings PART 7 PART 8 Other Tube Products Mill Processing Fabrication

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Product Manual: Pipe & Tube + Profiles

AUGUST 2013 4-32

Lintel – Lintels for Masonry Construction – Specifications

Technical Specifications

Australian Standards

Lintels – Lintels for Masonry Construction are manufactured and tested to comply with the requirements of the following specifications:

→ ATM Technical Specification TS100 Profiles – Angles, Channels and Flats.

AS/NZS 4791 – Hot-dipped (zinc) coatings on ferrous hollow sections, applied by an in-line process

and various other Australian and national Standards listed in TS100.

ATM Specification TS100 is available from www.austubemills.com

Mechanical Properties

Lintel products have the following mechanical properties for section thickness (*t*): → Minimum Yield Strength (*f*,):

Actual Thickness (mm)	Grade	Minimum Yield Strength (MPa)
t = 6	C450L0	450
<i>t</i> = 8	C400L0	400

\rightarrow Minimum Tensile Strength (f_u):

Actual Thickness (mm)	Grade	Minimum Tensile Strength (MPa)
t = 6	C450L0	500
t = 8	C400L0	450

→ Minimum Elongation in 5.65 $\sqrt{S_o}$:

Actual Thickness (mm)	Grade	Minimum Elongation
t = 6	C450L0	16%
<i>t</i> = 8	C400L0	16%

L0 indicates that Profiles have Charpy V-notch impact properties at 0° as specified in TS100. Tables 10.4.1 of AS4100 Steel Structures permits L0 grades to have the following minimum permissible service temperatures:

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

See TS100 for further details.

Tolerances

Tolerances for Lintel products are compliant with ATM Technical Specification TS100.

Supply Conditions

DuraGal^{Ultra®} Finish

Lintel products are manufactured from in-line galvanizing cold-formed open sections that have the following coating thickness of zinc aluminium: ➢ Minimum (av) coating mass ______ 250 g/m²
➢ Designated as ______ AS/NZS 4791 ILG 250

End Finish (Mill Processing)

→ Plain Ends only.

Standard Lengths

Standard lengths for Lintel products: ⇒ See following Mass & Bundling Tables Contact your Australian Tube Mills representative or refer to the ATM Profiles Product Availability Guide for further details.

Non-Standard Lengths

Special orders of non-standard pack lengths of Lintel products are available (conditions apply).

Minimum Length:

→ All sizes	_5.0 m
Maximum Length:	
→ All sizes	13.0 m

Notes:

- 1. Contact your Australian Tube Mills representative for lengths outside this range.
- 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.
- 3. Off-line cutting facilities are not available for Lintel products.

Thickness

Lintel products are available in 6.0 and 8.0 mm thickness. These thicknesses are identified by ends which are colour coded as specified in Table 8 of AS/NZS 4496.



3) DuraGal^{Ultra®}

General Description

Manufacturing Process

Lintel products are produced by low carbon steel strip and coated in-line applying a hot-dip zinc aluminium coating. This product is intended for general engineering and structural uses as well as for lintels in masonry construction.

Further Information

For further information refer to the following publications available from www.austubemills.com:

ATM Technical Specification TS100
 Profiles – Angles, Channels, and Flats
 Profiles Product Availability Guide for further details.

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Product Manual: Pipe & Tube + Profiles

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Lintel – **Product Range**

prod	Lintel luct desig	nation		
d	b	t	Base DuraGal ^{Ultra®} product	
	mm			
100 x	100 x	6.0 8.0	See 100 x 100 x 6.0 CA for further information See 100 x 100 x 8.0 CA for further information	
150 x	100 x	6.0 8.0	See 150 x 100 x 6.0 CA for further information See 150 x 100 x 8.0 CA for further information	

For the above Lintel Products, further information on -

- Dimensions & <u>Full</u> Section Properties
- Section Properties for Member Stability
- Mass & Bundling

can be found in the Profiles, Angles part of the Product Manual

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Notes:

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Product availability & other information – As the section, grade and finish of all products are subject to continuous improvement, reference should be made to the ATM *PRODUCT AVAILABILITY GUIDE* (PAG) for information on the <u>availability</u> of <u>listed sections</u> and associated <u>finishes</u>. The PAG is found at: www.austubernills.com.

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Product Manual: Pipe & Tube + Profiles

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Grade C250L0

Australian Tube Mills (ATM) Grade C250L0 steels are fully compliant with AS/NZS 1163 and can be readily processed to Australian/New Zealand Standards and/or industry practice for:

General, mechanical, piping and structural fabrication

→ Rolling/bending member lengths

→ Welding

→ Galvanizing

→ Surface preparation for top coats

End Processing (Screwed, Roll Grooved, Swaged) Due to the reduced level of cold-working, C250L0 steel grade is available in the following ATM circular tube products:

\rightarrow CHS

General Information

 \rightarrow Pipe (also complies with AS 1074)

→ Other sections based on enquiry.

ATM Grade C250L0 steel products are rated to meet AS/NZS 1163 steel quality and Charpy V-Notch impact test requirements at the test temperature of 0°C (i.e. L0). This property is important for use in lower temperatures and also critical for non-brittle behaviour of tubular products subject to dynamic loads – particularly for thicker sections and welded connections.

The "lower" strength properties (compared to our other available grades), higher ductility and ability to satisfy the above performance criteria of Grade C250L0 is achieved by the following material characteristics as required by AS/NZS 1163.

Pipe & Tube Products

Specifications and Standards

Minimum Yield Strength:
≥ 250 MPa (a measure of how strong the tube is – see Table 1).
Standard designation:
⇒ AS/NZS 1163 – C250L0.

Steelmaking process:

- Basic oxygen, Fully Killed, Continuously Cast, Fine Grained practice.
- Steel Feed manufacturing process:

→ Coil from Hot Strip Mill.

Product manufacture:

Cold-forming and high frequency Electric Resistance Welding (ERW) of steel strip. The cold-forming process enhances the strength, hardness and surface finish of the manufactured product.

Chemical composition:

- See Table 2 which applies to steelmake cast analysis and finished product analysis.
- Carbon Equivalence (CE):
- \rightarrow 0.25 see Table 2 for details.
- Welding Code Steel Type:
- ➡ Type 2 (from Table 4.6.1(B) of AS/NZS 1554.1 and AS/NZS 1554.5).

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Table 1: C250L0 Tensile test requirements to AS/NZS 1163

Minimum elongation as a proportion of the gauge length 5.65VS Minimum yield Minimum tensile strength strength Grade Circular Hollow Sections Rectangular Hollow Sections d_o/t (See Note 1) b/t, d/t (See Note 2) MPa MPa < 15 > 15 & < 30 >30 < 15 > 15 & < 30

(1) AS/NZS 1163 – Grade C250L0 is generally supplied as CHS

(2) These limits apply to the face from which the tensile test is taken.

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Table 2: C250L0 Chemical composition requirements to AS/NZS 1163

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Crada				Che	emical comp	osition % r	nax. (see	Note 1)			
Grade	С	Si	Mn	Р	S	Cr	Мо	Al	Ti	MAE	CE
C250L0	0.12	0.05	0.50	0.03	0.03	0.15	0.10	0.10 (see Note 2)	0.04	0.03 (See Note 3)	0.25 (See Note 4)

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Table 2 Notes:

C250L0

Table 1 Notes:

(1) The following elements may be present to the limits stated in the brackets: Cu (0.25%), Ni (0.25%)(2) The limit specified are for soluble and total aluminium.

(3) MAE = Micro-alloying elements which applies to Nb and V only.

(4) $CE = C + \frac{Mn}{r} + \frac{Cr + Mo + V}{r} + \frac{Ni + Cu}{r}$



Profiles

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Mechanical properties:

See Table 1 for tensile test and below for impact test requirements. For cold-flattening tests, AS/NZS 1163 requires deformation to 75% or less of initial tube depth.

Impact Properties:

- For nominal wall thickness (t) greater than or equal to 6 mm – satisfies Clause 10.6.2.1 of AS/NZS 1163 at the test temperature of 0°C (i.e L0) for L0 compliance.
- For nominal wall thickness (t) less than 6 mm satisfies Clause 10.6.2.2(b) of AS/NZS 1163 for L0 compliance.





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Notes:

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PART 6

Mill Coatings

 For Grade C250L0 product availability refer to the ATM Product Availability Guide (PAG). The PAG can be found at www.austubernills.com.

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Fabrication

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Product Manual: Pipe & Tube + Profiles

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Grade C350L0

Australian Tube Mills (ATM) Grade C350L0 steels are fully compliant with AS/NZS 1163 and can be readily processed to Australian/New Zealand Standards and/or industry practice for:

→ General, mechanical, piping and structural fabrication

→ Rolling/bending member lengths

→ Weldina

→ Galvanizing

→ Surface preparation for top coats

End Processing (Screwed, Roll Grooved, Swaged) - for CHS.

Due to the refined chemistry and higher level of working during the coil and tube manufacturing process. C350L0 steel grade is available in the following ATM tubular products:

- → CHS
- → RHS

→ SHS

General Information

Other sections based on enquiry.

ATM Grade C350L0 steel products are rated to meet AS/NZS 1163 steel quality and Charpy V-Notch impact test requirements at the test temperature of 0°C (i.e. L0). This property is important for use in lower temperatures and also critical for non-brittle behaviour of tubular products subject to dynamic loads - particularly for thicker sections and welded connections.

The mid-to-higher strength properties, ductility and ability to satisfy the above performance criteria of Grade C350L0 is achieved by the following material characteristics as required by AS/NZS 1163.

Specifications and Standards

Minimum Yield Strength: \rightarrow 350 MPa (a measure of how strong the tube is - see Table 1). Standard designation: → AS/NZS 1163 – C350L0. Steelmaking process: → Basic Oxygen, Fully Killed, Continuously Cast, Fine Grained practice. Steel Feed manufacturing process: → Coil from Hot Strip Mill.

Product manufacture:

 \rightarrow Cold-forming and high frequency Electric Resistance Welding (ERW) of steel strip. The cold-forming process enhances the strength, hardness and surface finish of the manufactured product.

Chemical composition:

→ See Table 2 which applies to steelmake cast analysis and finished product analysis. Carbon Equivalence (CE):

 \rightarrow 0.43 – see Table 2 for details.

Welding Code Steel Type:

→ Type 5 (from Table 4.6.1(B) of AS/NZS 1554.1 and AS/NZS 1554.5)

Mechanical properties:

→ See Table 1 for tensile test and below for impact test requirements. For cold-flattening tests. AS/NZS 1163 requires deformation to 75% or less of initial tube depth.

Impact Properties:

 \rightarrow For nominal wall thickness (t) greater than or equal to 6 mm – satisfies Clause 10.6.2.1 of AS/NZS 1163 at the test temperature of 0°C (i.e L0) for L0 compliance.

 \rightarrow For nominal wall thickness (t) less than 6 mm – satisfies Clause 10.6.2.2 (b) of AS/NZS 1163 for L0 compliance.



Notes:

1. For Grade C350L0 product availability refer to the ATM Product Availability Guide (PAG). The PAG can be found at www.austubemills.com

Table 1: C350L0 Tensile test requirements to AS/NZS 1163

Minimum yield strengtl		Minimum tensile strength	Minimum elongation as a proportion of the gauge length $5.65 \mathrm{vS}_o$ %						
Grade	MPa	MPa	Circular Hollow Sections (CHS) d_0/t			Non-CHS b/t, d/t (See Note 1 & 2)			
	ini u	ini a	≤ 15	> 15 & ≤ 30	> 30	≤ 15	> 15 & ≤ 30	> 30	
C350L0	350	430	16	18	20	12	14	16	

(1) Non-CHS refers to non-circular flat sided sections

(2) These limits apply to the face from which the tensile test is taken

Table 2: C350L0 Chemical composition requirements to AS/NZS 1163

Crada	Chemical composition % max. (see Note 1)									
Grade	С	Si	Mn	Р	S	Мо	AI	Ti	MAE	CE
C350L0	0.20	0.45	1.60	0.03	0.03	0.10	0.10 (see Note 2)	0.04	0.15 (See Note 3)	0.43 (See Note 4)

Table 2 Notes:

Table 1 Notes:

(1) The following elements may be present to the limits stated in brackets; Cu (0.25%), Ni (0.25%) (2) The limits specified are for soluble and total aluminium.

(3) MAE = Micro-alloying elements which applies to Nb, V and Ti only with V ≤ 0.10%.







PART 4

Profiles

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Grade C450PLUS®

Australian Tube Mills' (ATM) C450PLUS steels are fully compliant with AS/NZS 1163 and can be readily processed to Australian/New Zealand Standards and/or industry practice for:

→ General, mechanical and structural fabrication

- → Rolling/bending member lengths
- → Welding

→ Galvanizing

→ Surface preparation for top coats

C450PLUS products comply with the requirements of two AS/NZS 1163 steel grades - Grades C350L0 for tensile test elongation requirements and C450L0 for strength requirements.

Due to the refined chemistry and higher level of working during the coil and tube manufacturing process, C450PLUS steels are available in the following ATM tubular products:

→ RHS

→ SHS

→ Silo Sections

Other sections based on enquiry.

ATM C450PLUS steel products are rated to meet AS/NZS 1163 steel quality and Charpy V-Notch impact test requirements at the test temperature of 0°C (i.e. L0).

This property is important for use in lower temperatures and also critical for non-brittle behaviour of higher strength products subject to dynamic loads - particularly for thicker sections and welded connections.

The higher strength properties, ductility and ability to satisfy the above performance criteria of C450PLUS is achieved by the following material characteristics as required by AS/NZS 1163.

Specifications and Standards

Minimum Yield Strength:

 \rightarrow 450 MPa (a measure of how strong the tube is

- see Table 1).

- Standard designation:
- → AS/NZS 1163 C450L0.
- Alternatively, if acceptable to the specifier/purchaser, the designation C450PLUS may be used.

Steelmaking process:

Basic Oxygen, Fully Killed, Continuously Cast, Fine Grained practice.

Steel Feed manufacturing process:

→ Coil from Hot Strip Mill. Product manufacture:

- \rightarrow Cold-forming and high frequency Electric Resistance
- Welding (ERW) of steel strip. The cold-forming process enhances the strength, hardness and surface finish of the manufactured product.

Chemical composition:

⇒ See Table 2 which applies to steelmake cast analysis and finished product analysis.

Carbon Equivalence (CE):

 \rightarrow 0.43 – see Table 2 for details. (Note: this is the same limit as for C350L0 products).

Welding Code Steel Type:

→ Type 7B (from Table 4.6.1(B) of AS/NZS 1554.1 and AS/NZS 1554.5).

Mechanical properties:

→ See Table 1 for tensile test and below for impact test requirements. For cold-flattening tests. AS/NZS 1163 requires deformation to 75% or less of initial tube depth.

Impact Properties:

 \rightarrow For nominal wall thickness (t) greater than or equal to 6 mm - satisfies Clause 10.6.2.1 of AS/NZS 1163 at the test temperature of 0°C (i.e L0) for L0 compliance.

 \rightarrow For nominal wall thickness (t) less than 6 mm – satisfies Clause 10.6.2.2 (b) of AS/NZS 1163 for L0 compliance.

Table 1: C450PLUS Tensile test requirements to AS/NZS 1163

	Minimum yield strength	Minimum tensile strength	I	Minimum elongation as a proportion of the gauge length $5.65 \mathrm{vS}_{o}$ %							
Grade			Circular Hollow Sections (CHS) d_o/t (See Note 1)			Non-CHS b/t, d/t (See Note 2 & 3)					
	MPa	MPa	≤ 15	$> 15 \& \le 30$	>30	≤ 15	$> 15 \& \le 30$	>30			
C450PLUS	450	500	16	18	20	12	14	16			
Table 1 Notes	(able 1 Notes: (1) C450PLUS is generally supplied as Non-CHS										

(1) C450PLUS is generally supplied as Non-CHS

(2) Non-CHS refers to non-circular flat-sided sections (e.g Silo Section). (3) These limits apply to the face from which the tensile test is taken.

Table 2: C450PLUS Chemical composition requirements to AS/NZS 1163

Outralia	Chemical composition % max. (see Note 1)									
Grade	С	Si	Mn	Р	S	Мо	Al	Ti	MAE	CE
C450PLUS	0.20	0.45	1.60	0.03	0.03	0.10	0.10 (see Note 2)	0.04	0.15 (See Note 3)	0.43 (See Note 4)

Table 2 Notes: (1) The following elements may be present to the limits stated in brackets: Cu (0.25%), Ni (0.25%)

(2) The limits specified are for soluble and total aluminium.

(3) MAE = Micro-alloying elements which applies to Nb, V and Ti only with V \leq 0.10%. Cu (4)

$$CE = C + \frac{Mn}{c} + \frac{Cr + Mo + V}{c} + \frac{Ni + C}{15}$$

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1. For C450PLUS product availability refer to the ATM Product Availability Guide (PAG). The PAG can be found at www.austubemills.com.



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TS100 DuraGal^{Ultra®} Profile Grades – C350L0/ C400L0/ C450L0

Australian Tube Mills (ATM) DuraGal^{Ultra®} Profile Grades C350L0/C400L0 and C450L0 (i.e. "TS100") are fully compliant with:

→ ATM Technical Specification TS100 DuraGal^{Ultra®} Profiles - Angles, Channels, and Flats and can be readily processed to Australian/New Zealand Standards and/or industry practice for:

 \rightarrow General, mechanical and structural fabrications → Rolling/ bending member lengths

→ Welding

Surface preparation for top coats.

Due to the refined chemistry and higher level of working during the coil and profile manufacturing process, TS100 steel grades are available in the following ATM DuraGal^{Ultra®} Profile range:

- → Equal Angles
- → Unequal Angles
- → Channels

→ Flats

→ Lintels for Masonry Construction

ATM TS100 steel products are rated to meet Charpy V-Notch impact test requirements at the test temperature of 0°C (i.e. L0) as a minimum.

The higher strength properties, ductility and ability to satisfy the above performance criteria of TS100 grades is achieved by the following material characteristics.

Specifications and Standards

Minimum Yield Strength (a measure of how strong the steel is - see Table 1): → 350 MPa for C350L0 → 400 MPa for C400L0 → 450 MPa for C450L0 Steelmaking process: → Basic Oxygen, Fully Killed, Continuously Cast, Fine Grained practice. Steel Feed manufacturing process: → Coil from Hot Strip Mill. Product manufacture:

 \rightarrow Cold-forming and in-line hot-dip galvanizing of low carbon steel strip. Both the cold-forming and the patented in-line galvanizing process enhances the strength, hardness, and surface finish of the manufactured product.

Table 1: TS100 Tensile test requirements

Grade	Minimum yield strength MPa	Minimum tensile strength MPa	Minimum elongation as a proportion of the gauge length 5.65√S _o %		
C350L0	350	400	20		
C400L0	400	450	16		
C450L0	450	500	16		

Table 2: TS100 Chemical composition requirements

Crada							
Grade	С	Si	Mn	Р	S	Al	CE
C350L0/ C400L0/ C450L0	0.20	0.05	1.60	0.04	0.03	0.10	0.39 (See Note 1)

Table 2 Notes: (1) $CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$

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

Chemical composition: \rightarrow See Table 2. Carbon Equivalence (CE): \rightarrow See Table 2. Welding Code Steel Type (according to Table 4.6.1(B) of AS/NZS 1554.1 and Table 4.5.1(B) of AS/NZS 1554.5)-→ Grade C350L0: Type 5 → Grade C400L0: Type 7B → Grade C450L0: Type 7B Mechanical Properties:

→ See Table 1 for tensile test and below for Impact test requirements.

Impact Properties:

Actual Thickness

(mm)

 $t \le 6$

 $6 < t \le 10$

 \rightarrow L0 guaranteed Impact Properties at 0°C to AS/NZS 1163.

L0 indicates 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:

Lowest One Day Mean

Ambient Temperature

(°C)

-30

-20

6	
	11
1	Section

Notes:

1. For further information on TS100 grades refer to the following publications available from www.austubemills.com:

→ OneSteel Technical Specification TS100 DuraGal^{Ultra®} Profiles – Angles, Channels and Flats

→ DuraGal^{Ultra®} Profiles Product Availability Guide for further details.



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Notes:

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Product availability & other information – As the section, grade and finish of all products are subject to continuous improvement, reference should be made to the ATM *PRODUCT AVAILABILITY GUIDE* (PAG) for information on the <u>availability</u> of <u>listed sections</u> and associated <u>finishes</u>. The PAG is found at: www.austubernills.com.

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Product Manual: Pipe & Tube + Profiles

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Coating Types

General Description

Australian Tube Mills (ATM) product range is available in a variety of coating options to suit your needs. Coatings range from high protection hot-dipped galvanized finish to an uncoated finish.

- ATM coating options include:
- NOPC (No Oil, Paint or Coating)
- → Oil Coatings
- → DuraPrimed

→ Hot-Dip Galvanized Coatings

NOPC (No Oil, Paint or Coating)

NOPC products are manufactured with no additional surface treatment including no end colour code. These products are generally used in further processing or fabrication where surface coating may interfere with subsequent processes. It should be noted that products with this finish will be subject to the formation of immediate light surface oxidation (rust).

Oil Coatings

ATM oil coatings are intended for application where surface preparation is not required and where the coating must be easily removed.

Finish	Description	Features
LiteOil	Light (diluted with solvents) protective mineral based oil coating	 Temporary rust protection for dry storage Easily removed for further processing
Oil	Protective mineral based oil coating	 Temporary rust protection for dry storage Easily removed for further processing

DuraPrimed

ATM DuraPrimed is the result of years of research and development to obtain the perfect balance of adhesion for top coating applications while remaining strippable for additional hot-dip galvanizing and powder coating surface treatments.

The primary purpose of this coating is to protect the steel during internal storage and handling through warehousing and distribution.

The description and features of DuraPrimed are noted in Table 1.

Hot-Dip Galvanized Coatings

ATM pioneered the introduction of in-line and pregalvanized hot-dip galvanized coatings in the Australian and New Zealand markets and are the registered owners of the DuraGal[®] and DuraGal^{Plus} brands.

Hot-dipped galvanized coatings are metallurgically bonded to the steel by passing a prepared steel surface through molten zinc. The metallurgical bond is critical for the adherence of the zinc coating during further processing as well as ensuring unobstructed sacrificial protection. Typically in-line and pre-galvanized coatings will be used in various forms of structural fabrication from benign to mild and moderate corrosion environments and can be readily used in sheltered (internal) environments.

They are also suitable with top coats for more aggressive environments. AS/NZS 2312 should be consulted for the appropriate use of galvanized coatings referencing the AS/NZS 4792 designation for each coating option.

ATM coating options include:

- → In-line hot-dip galvanized
- → Pre-galvanized

→ Hot-dip galvanized using specialised process

The description and features of these coatings are noted in Table 2.

Table 1: Description and Features of ATM DuraPrimed coatings

Finish	Description	Features	Coating Thickness	Available Colours
DuraPrimed DP)	Smooth general purpose paint applied in-line by a fully automated process to the external surface.	 Temporary rust protection for dry storage Reduced surface preparation prior to fabrication and further processing Strippable for powder coating 	Coating thickness ranges from 6 to 20 microns dry film thickness.	DuraPrimed ^{Red} DuraPrimed ^{Blue} Clear
		and hot-dip galvanzing		
		 Easily marked up for welding 		
		 Weld spatter is easily wiped off 		
		 Does not need to be ground before welding. 		



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Table 2: Description and features of ATM Hot-Dip Galvanized (HDG) Coatings

	Process	Description	Features	Coating Weight	Designation / Standards	Additional Treatment
DuraGal®	In-line hot-dip galvanizing process	DuraGal [®] products are coated on the external surface using an in-line HDG process over a prepared metal surface to produce a fully intermetallic bonded coating.	 Intermetallic bonded HDG coating Uniform, smooth external galvanized surface Less weld fume compared with thicker HDG coatings Suitable for top coating Suitable for powder coating Does not need to be ground before welding Easily formed 	Minimum average coating mass of 100g/m ²	ILG100 in accordance with AS/NZ 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialised process	Si-Tek [®] – surface passivation treatment (See Note below)
DuraGal ^{Plus}	Pre-galvanized (manufactured using continuous hot-dip galvanizing process)	DuraGal ^{Plus} and PreGal products are coated on the external and internal surface by utilising pre-galvanized HDG strip. The pre-galvanized strip is coated on a prepared metal surface to produce a fully intermetallic bonded coating.	 Made from HDG steel strip with intermetallic bonded coating Internal and external coating Has a smooth even finish compared with thicker HDG coatings Less weld fume compared with thicker HDG coatings Suitable for top coating Suitable for powder coating Does not need to be ground before welding Easily formed 	Minimum average coating mass of 100g/m ²	ZB100/100 in accordance with AS/NZ 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialiased process	Protective Coating – surface passivation treatment (See Note below)
Gal 140	Pre-galvanized (manufactured using continuous hot-dip galvanizing process)	GAL140 products are coated on the external and internal surface by utilising pre-galvanized HDG strip. The pre-galvanized strip is coated on a prepared metal surface to produce a fully intermetallic bonded coating.	 40% more zinc than DuraGal[®] and DuraGal^{Plus} coatings Made from HDG steel strip with intermetallic bonded coating Internal and external coating Has a smooth even finish compared with thicker HDG coatings Less weld fume compared with thicker HDG coatings Suitable for top coating Suitable for powder coating Does not need to be ground before welding Easily formed 	Minimum average coating mass of 140g/m ²	ZB135/135 in accordance with AS/NZ 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialised process	Si-Tek [®] – surface passivation treatment (See Note below)
HotDipGal	Semi-Automatic hot-dip galvanizing using specialised process	HDG products are coated on the external and internal surface by utilising a specialised hot-dip galvanizing process resulting in a higher coating thickness than inline processes. The galvanizing process is conducted after manufacture following preparation of the metal surface to produce a fully intermetallic bonded coating.	 3 times more zinc than DuraGal[®] and DuraGal^{Plus} coatings Internal and external coating Longer lasting protection Only available in CHS/Pipe Suitable for a wide range of specific pipe-related applications 	Minimum average coating mass of 300g/m ²	HDG300 in accordance with AS/NZ 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialised process	Surface passivation treatment with Polymer Coating

Si-Tek® Passivation Treatment: Si-Tek® is a non-hazardous galvanized steel passivation treatment which adheres to the surface of the zinc via a chemical bond. Unlike oil coatings this means that decorative paints can be applied directly without the need to remove the coating and powder coating can be carried out with standard preparation resulting in excellent adhesion. Additionally the thin Si-Tek® coating produces less fume than oil and resin coatings. Standard safe work practices should be adopted for welding of zinc coated steel products. Please refer to the MSDS for further information.

Protective Coating – surface passivation treatment: is a non hazardous and non-dangerous passivation treatment for galvanized steel substrates, which adheres to the surface of the zinc via a chemical bond. The thin coating will provide excellent corrosion resistant protection and will produce less fume than oil and resin coatings. Standard safe work practices should be adopted for welding zinc coated steel products. Please refer to the MSDS for further information.

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Notes:

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Product availability & other information – As the section, grade and finish of all products are subject to continuous improvement, reference should be made to the ATM *PRODUCT AVAILABILITY GUIDE* (PAG) for information on the <u>availability</u> of <u>listed sections</u> and associated <u>finishes</u>. The PAG is found at: www.austubemills.com.

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Product Manual: Pipe & Tube + Profiles

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Threaded Pipe – Specifications

Pipe Grade C250L0 is available screwed on one or both ends, in accordance with AS 1074. The tapered Whitworth thread used complies with the requirements of AS ISO 7.1 and is suitable for both parallel and taper threaded sockets. Taper is 1 in 16.

Available Products

Refer to the Australian Tube Mills Product Availability Guide (PAG). The PAG can be found at www.austubemills.com.

Nominal Size (DN)	Outside Diameter (mm)	Threads per inch (tpi)	Pitch (mm)	Depth of Thread (mm)	Fitting Allowance (mm)	Wrenching Allowance (mm)	Useful Thread* (mm)
15	21.3	14	1.814	1.162	5.0	2.7	13.2
20	26.9	14	1.814	1.162	5.0	2.7	14.5
25	33.7	11	2.309	1.479	6.4	3.5	16.8
32	42.4	11	2.309	1.479	6.4	3.5	19.1
40	48.3	11	2.309	1.479	6.4	3.5	19.1
50	60.3	11	2.309	1.479	7.5	4.6	23.4
65	76.1	11	2.309	1.479	9.2	5.8	26.7
80	88.9	11	2.309	1.479	9.2	5.8	29.8
90	101.6	11	2.309	1.479	9.2	5.8	31.5
100	114.3	11	2.309	1.479	10.4	6.9	35.8
125	139.7	11	2.309	1.479	11.5	8.1	40.1
150	165.1	11	2.309	1.479	11.5	8.1	40.1



Notes:

1. * Minimum length of useful thread for basic gauge length.



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Product Manual: Pipe & Tube + Profiles

AUGUST 2013 7-4

Swaged CHS/Pipe – Specifications

Pipe Grade C350L0 is available with one or both ends swaged in sizes DN 25 to DN 50. Swaged Pipe provides an economical, easy to assemble, labour saving alternative for joining lengths of CHS in the factory or in the field.

Available Products

General Information

→ Refer to the Australian Tube Mills Product Availability Guide (PAG). The PAG can be found at www. austubemills.com.

СНЅ	Size		Shoulder Dimensions	
Nominal Size (DN)	Outside Diameter (mm)	Wall Thickness (mm)	Swage Diameter A (mm)	Av. Swage Length B (mm)
25	33.7	2.0XL	28.5	100.0
		2.6L	28.5	100.0
32	42.4	2.0XL	28.5	100.0
		2.6L	37.3	100.0
40	48.3	2.3XL	43.2	100.0
		2.9L	43.2	100.0
50	60.3	2.3XL	54.6	100.0
		2.9L	53.6	100.0



Fabrication



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Other Tube Products

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Product Manual: Pipe & Tube + Profiles

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Product availability & other information – As the section, grade and finish of all products are subject to continuous improvement, reference should be made to the ATM *PRODUCT AVAILABILITY GUIDE* (PAG) for information on the <u>availability</u> of <u>listed sections</u> and associated <u>finishes</u>. The PAG is found at: www.austubernills.com.

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Product Manual: Pipe & Tube + Profiles

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Telescoping Information – CHS/ Pipe





Notes:

- 1. REFER to the Australian Tube Mills PRODUCT AVAILABILITY GUIDE (PAG) for information on the availability of listed sections and associated finishes. The PAG can be found at www.austubemills.com.
- 2. Clearance = (AS/NZS 1163 Min. d_o 2t) (AS/NZS 1163 Max. d_o).
- 3. CHS is not a precision tube and all dimensions shown in this chart, although in accordance with the specifications, may vary marginally. Internal weld bead may need to be considered when a closer fit is required.
- 4. Sizes with a clearance less than 2.0 mm are shown **bold** in the charts.
- 5. For tight fits it is recommended that some form of testing is carried out prior to committing to material. Where telescoping over some length is required, additional allowance may be needed for straightness.



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F	ema	le (outer	.)	Male (inner)	Nominal
do		t		d _o	Clearance
mm		mm		mm	mm
508.0	Х	12.7	CHS	457.0	16.0
		9.5	CHS	457.0	22.4
		6.4	CHS	457.0	28.6
457.0	Х	12.7	CHS	406.4	16.6
		9.5	CHS	406.4	23.0
		6.4	CHS	406.4	29.2
406.4	Х	12.7	CHS	355.6	17.8
		9.5	CHS	355.6	24.2
		6.4	CHS	355.6	30.4
355.6	Х	12.7	CHS	273.1	50.8
		9.5	CHS	323.9	5.9
		6.4	CHS	323.9	12.1
323.9	Х	12.7	CHS	273.1	19.4
		9.5	CHS	273.1	25.8
		6.4	CHS	273.1	32.0
273.1	Х	12.7	CHS	219.1	23.7
		9.3	CHS	219.1	30.5
		6.4	CHS	219.1	36.3
		4.8	CHS	219.1	39.5
219.1	Х	8.2	CHS	168.3	30.5
		6.4	CHS	168.3	34.1
		4.8	CHS	168.3	37.3
168.3	Х	7.1	CHS	139.7	11.3
		6.4	CHS	139.7	12.7
		4.8	CHS	139.7	15.9
165.1	Х	5.4	CHS	139.7	11.6
		5.0	CHS	139.7	12.4
		3.5	CHS	139.7	15.4
		3.0	CHS	139.7	16.4
139.7	Х	5.4	CHS	114.3	12.1
		5.0	CHS	114.3	12.9
		3.5	CHS	114.3	15.9
		3.0	CHS	114.3	16.9
114.3	Х	5.4	CHS	88.9	12.6
-		4.5	CHS	101.6	1.5
		3.6	CHS	101.6	3.3
		3.2	CHS	101.6	4.1

			<i>'</i>		Nominai
d _o		t		d _o	Clearance
mm		mm		mm	mm
101.6	Х	5.0	CHS	88.9	0.8
		4.0	CHS	88.9	2.8
		3.2	CHS	88.9	4.4
		2.6	CHS	88.9	5.6
88.9	Х	5.9	CHS	60.3	15.3
		5.0	CHS	76.1	1.2
		4.0	CHS	76.1	3.2
		3.2	CHS	76.1	4.8
		2.6	CHS	76.1	6.0
76.1	х	5.9	CHS	60.3	2.6
		4.5	CHS	60.3	5.4
		3.6	CHS	60.3	7.2
		3.2	CHS	60.3	8.0
		2.3	CHS	60.3	9.8
60.3	Х	5.4	CHS	48.3	0.2
		4.5	CHS	48.3	2.0
		3.6	CHS	48.3	3.8
		2.9	CHS	48.3	5.2
		2.3	CHS	48.3	6.4
48.3	Х	4.0	CHS	33.7	5.4
		3.2	CHS	33.7	7.0
		2.9	CHS	33.7	7.6
		2.3	CHS	42.4	0.1
42.4	Х	4.0	CHS	26.9	6.3
		3.2	CHS	33.7	1.1
		2.6	CHS	33.7	2.3
		2.0	CHS	33.7	3.5
33.7	Х	4.0	CHS	n/a	n/a
		3.2	CHS	n/a	n/a
		2.6	CHS	26.9	0.4
		2.0	CHS	26.9	1.6
26.9	Х	4.0	CHS	n/a	n/a
		3.2	CHS	n/a	n/a
		2.6	CHS	n/a	n/a

Male (inner) Nominal

Female (outer)

d mn 101

2.3

2.0

CHS

CHS

n/a

n/a

n/a

n/a

How to use this chart:

- A. Select the size of Female (or Outer) member closest to your requirements from the left hand column.
- B. The next column lists the closest size Male (Inner) Member when positioned in the Female Member as noted in the Figure at the bottom right of this page.
- Male and Female Members are listed in the last column(s). The configuration of these Nominal Clearances are as shown in the Figure below.

member dimensions, not the gap on both sides.

- D. Depending on the two members being telescoped, the available clearance will also be dependent on end application requirements. Members may need to slide freely inside each other, or be locked with a pin, spot welded or fixed with wedges. This means, in some cases, a 'sloppy' fit may be suitable, while for others the tightest fit possible may be more appropriate.
- E. Where two telescoping sections are being used, thickness should be similar and will be determined by normal structural requirements. If a third section is to be used, consideration of both clearance and thickness within the size list available may be required.
- F. Pipe may need to be fixed against twisting by welding or bolting.
- G. Press Fit: for short pieces with no need for separation or sliding, an interference fit can be achieved using the available ductility of the steel. Sizes where clearance is shown as 0.0 may occasionally require press fit.

C. Based on (A) and (B) above, the Nominal Clearance between the

Note that the clearance is the total available difference between

	F	ema	le (outer)		Male (inner)		Nominal Clearance	
d		b		t		d	b	top	side
mm		mm		mm		mm	mm	mm	mm
400	Х	300	Х	16.0	RHS	350	250	18.0	18.0
				12.5	RHS	350	250	25.0	25.0
				10.0	RHS	350	250	30.0	30.0
				8.0	RHS	350	250	34.0	34.0
400	Х	200	Х	16.0	RHS	250	150	118.0	18.0
				12.5	RHS	250	150	125.0	25.0
				10.0	RHS	250	150	130.0	30.0
				8.0	RHS	250	150	134.0	34.0
350	Х	250	Х	16.0	RHS	300	200	18.0	18.0
				12.5	RHS	300	200	25.0	25.0
				10.0	RHS	300	200	30.0	30.0
				8.0	RHS	300	200	34.0	34.0
300	Х	200	Х	16.0	RHS	250	150	18.0	18.0
				12.5	RHS	250	150	25.0	25.0
				10.0	RHS	250	150	30.0	30.0
				8.0	RHS	250	150	34.0	34.0
				6.0	RHS	250	150	38.0	38.0
250	Х	150	Х	16.0	RHS	200	100	18.0	18.0
				12.5	RHS	200	100	25.0	25.0
				10.0	RHS	200	100	30.0	30.0
				9.0	RHS	200	100	32.0	32.0
				8.0	RHS	200	100	34.0	34.0
				6.0	RHS	200	100	38.0	38.0
				5.0	RHS	200	100	40.0	40.0
200	Х	100	Х	10.0	RHS	152	76	28.0	4.0
				9.0	RHS	152	76	30.0	6.0
				8.0	RHS	152	76	32.0	8.0
				6.0	RHS	152	76	36.0	12.0
				5.0	RHS	152	76	38.0	14.0
150		70		4.0	KH5	107	/b 	40.0	10.0
152	Х	<i>/</i> b	Х	6.U	RHS	107	51	15.0	15.0
150		100		5.0	RHS	107	51	15.0	0.0
150	х	100	Х	10.0	пп2	107	51	5.0	29.0
				9.0	ппо DUC	107	51	5.0	31.0
				0.U		107	51	11.0	27.0
				0.0 5.0	RHG	127	51	13.0	30.0
				10		107	51	15.0	41.0
				4.0	nnð	121	51	10.0	41.0

	F	ema	le (outer)		Male (inner)	Nom Clear	ninal ance
d		b		t		d	b	top	side
mm		mm		mm		mm	mm	mm	mm
150	Х	50	х	6.0	RHS	76	38	62.0	0.0
				5.0	RHS	76	38	64.0	2.0
				4.0	RHS	76	38	66.0	4.0
				3.0	RHS	76	38	68.0	6.0
				2.5	RHS	76	38	69.0	7.0
				2.0	RHS	76	38	70.0	8.0
127	х	51	х	6.0	RHS	76	38	39.0	1.0
				5.0	RHS	76	38	41.0	3.0
				3.5	RHS	76	38	44.0	6.0
125	Х	75	Х	6.0	RHS	100	50	13.0	13.0
				5.0	RHS	100	50	15.0	15.0
				4.0	RHS	100	50	17.0	17.0
				3.0	RHS	100	50	19.0	19.0
				2.5	RHS	100	50	20.0	20.0
				2.0	RHS	100	50	21.0	21.0
102	Х	76	х	6.0	RHS	76	38	14.0	26.0
				5.0	RHS	76	38	16.0	28.0
				3.5	RHS	76	38	19.0	31.0
100	Х	50	Х	6.0	RHS	76	38	12.0	0.0
				5.0	RHS	76	38	14.0	2.0
				4.0	RHS	76	38	16.0	4.0
				3.5	RHS	76	38	17.0	5.0
				3.0	RHS	76	38	18.0	6.0
				2.5	RHS	76	38	19.0	7.0
				2.0	RHS	/6	38	20.0	8.0
				1.6	RHS	/6	38	20.8	8.8
76	Х	38	Х	4.0	RHS	50	25	18.0	5.0
				3.0	RHS	50	25	20.0	7.0
75		50		2.5	RHS	50	25	21.0	8.0
75	Х	50	Х	6.0	RHS	50	25	13.0	13.0
				5.0	RHS	65	35	0.0	5.0
				4.0	RHS	65	35	2.0	7.0
				3.0	RHS	65	35	4.0	9.0
				2.5	RHS	65	35	5.0	10.0
				2.0	RHS	65	35	6.0	11.0
75		05		1.6	RHS	65	35	6.8	11.8
/5	Х	25	Х	2.5	RHS	n/a	n/a	n/a	n/a
				2.U 1.G	KHS DUC	n/a	n/a	n/a	n/a
				10		n/9	n/9	n/9	n/9

	F	ema	le (outer)		Male (inner)		Nominal Clearance	
d		b		t		d	b	top	side
mm		mm		mm		mm	mm	mm	mm
65	Х	35	х	4.0	RHS	50	25	7.0	2.0
				3.0	RHS	50	25	9.0	4.0
				2.5	RHS	50	25	10.0	5.0
				2.0	RHS	50	25	11.0	6.0
50	Х	25	Х	3.0	RHS	n/a	n/a	n/a	n/a
				2.5	RHS	n/a	n/a	n/a	n/a
				2.0	RHS	n/a	n/a	n/a	n/a
				1.6	RHS	n/a	n/a	n/a	n/a
50	Х	20	х	3.0	RHS	n/a	n/a	n/a	n/a
				2.5	RHS	n/a	n/a	n/a	n/a
				2.0	RHS	n/a	n/a	n/a	n/a
				1.6	RHS	n/a	n/a	n/a	n/a

How to use this chart:

- A. Select the size of Female (or Outer) member closest to your requirements from the left hand column.
- B. The next column lists the closest size Male (Inner) Member when positioned in the Fernale Member as noted in the Figure at the bottom right of this page.
- C. Based on (A) and (B) above, the Nominal Clearance between the Male and Female Members are listed in the last column(s). The configuration of these Nominal Clearances are as shown in the Figure below.

Note that the clearance is the total available difference between member dimensions, not the gap on both sides.

- D. Depending on the two members being telescoped, the available clearance will also be dependent on end application requirements. Members may need to slide freely inside each other, or be locked with a pin, spot welded or fixed with wedges. This means, in some cases, a 'sloppy' fit may be suitable, while for others the tightest fit possible may be more appropriate.
- E. Where two telescoping sections are being used, thickness should be similar and will be determined by normal structural requirements. If a third section is to be used consideration of both clearance and thickness within the size list available may be required.
- F. RHS has the obvious advantage that its shape prevents rotation of the section.
- G. Press Fit: for short pieces with no need for separation or sliding, an interference fit can be achieved using the available ductility of the steel. Sizes where clearance is shown as 0.0 may occasionally require press fit.





Notes:

- 1. REFER to the Australian Tube Mills PRODUCT AVAILABILITY GUIDE (PAG) for information on the <u>availability</u> of <u>listed</u> <u>sections</u> and associated <u>finishes</u>. The PAG can be found at www.austubemills.com.
- RHS is not a precision tube and all dimensions shown in this chart, although in accordance with the specifications, may vary marginally. Varying corner radii and the internal weld bead may need to be considered when a closer fit is required.
- 3. Sizes with a clearance less than 2.0 mm are shown **bold** in the charts.
- For tight fits it is recommended that some form of testing is carried out prior to committing to material. Where telescoping over some length is required, additional allowance may be needed for straightness.

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Telescoping Information – SHS

Female (outer)						Male ((inner)	Non Clear	ninal rance
d		b		t		d	b	top	side
mm		mm		mm		mm	mm	mm	mm
400	Х	400	Х	16.0	SHS	350	350	18.0	18.0
				12.5	SHS	350	350	25.0	25.0
				10.0	SHS	350	350	30.0	30.0
350	Х	350	Х	16.0	SHS	300	300	18.0	18.0
				12.5	SHS	300	300	25.0	25.0
				10.0	SHS	300	300	30.0	30.0
				8.0	SHS	300	300	34.0	34.0
300	Х	300	Х	16.0	SHS	250	250	18.0	18.0
				12.5	SHS	250	250	25.0	25.0
				10.0	SHS	250	250	30.0	30.0
				8.0	SHS	250	250	34.0	34.0
250	Х	250	Х	16.0	SHS	200	200	18.0	18.0
				12.5	SHS	200	200	25.0	25.0
				10.0	SHS	200	200	30.0	30.0
				9.0	SHS	200	200	32.0	32.0
				8.0	SHS	200	200	34.0	34.0
				6.0	SHS	200	200	38.0	38.0
200	Х	200	Х	16.0	SHS	150	150	18.0	18.0
				12.5	SHS	150	150	25.0	25.0
				10.0	SHS	150	150	30.0	30.0
				9.0	SHS	150	150	32.0	32.0
				8.0	SHS	150	150	34.0	34.0
				6.0	SHS	150	150	38.0	38.0
				5.0	SHS	150	150	40.0	40.0
150	Х	150	Х	10.0	SHS	125	125	5.0	5.0
				9.0	SHS	125	125	7.0	7.0
				8.0	SHS	125	125	9.0	9.0
				6.0	SHS	125	125	13.0	13.0
				5.0	SHS	125	125	15.0	15.0
125	Х	125	Х	10.0	SHS	100	100	5.0	5.0
				9.0	SHS	100	100	7.0	7.0
				8.0	SHS	100	100	9.0	9.0
				6.0	SHS	100	100	13.0	13.0
				5.0	SHS	100	100	15.0	15.0
				4.0	SHS	100	100	17.0	17.0

	F	- ema	le (outer)		Male (inner)	Norr Clear	iinal ance
d		b		t		d	b	top	side
mm		mm		mm		mm	mm	mm	mm
100	Х	100	Х	10.0	SHS	75	75	5.0	5.0
				9.0	SHS	75	75	7.0	7.0
				8.0	SHS	75	75	9.0	9.0
				6.0	SHS	75	75	13.0	13.0
				5.0	SHS	90	90	0.0	0.0
				4.0	SHS	90	90	2.0	2.0
				3.0	SHS	90	90	4.0	4.0
				2.5	SHS	90	90	5.0	5.0
				2.0	SHS	90	90	6.0	6.0
90	Х	90	Х	2.5	SHS	75	75	10.0	10.0
				2.0	SHS	75	75	11.0	11.0
89	Х	89	х	6.0	SHS	75	75	2.0	2.0
				5.0	SHS	75	75	4.0	4.0
				3.5	SHS	75	75	7.0	7.0
				2.0	SHS	75	75	10.0	10.0
75	Х	75	Х	6.0	SHS	50	50	13.0	13.0
				5.0	SHS	65	65	0.0	0.0
				4.0	SHS	65	65	2.0	2.0
				3.5	SHS	65	65	3.0	3.0
				3.0	SHS	65	65	4.0	4.0
				2.5	SHS	65	65	5.0	5.0
				2.0	SHS	65	65	6.0	6.0
65	Х	65	х	6.0	SHS	50	50	3.0	3.0
				5.0	SHS	50	50	5.0	5.0
				4.0	SHS	50	50	7.0	7.0
				3.0	SHS	50	50	9.0	9.0
				2.5	SHS	50	50	10.0	10.0
				2.0	SHS	50	50	11.0	11.0
				1.6	SHS	50	50	11.8	11.8
50	Х	50	х	6.0	SHS	35	35	3.0	3.0
				5.0	SHS	40	40	0.0	0.0
				4.0	SHS	40	40	2.0	2.0
				3.0	SHS	40	40	4.0	4.0
				2.5	SHS	40	40	5.0	5.0
				2.0	SHS	40	40	6.0	6.0
				1.6	SHS	40	40	6.8	6.8
40	Х	40	Х	4.0	SHS	30	30	2.0	2.0
				3.0	SHS	30	30	4.0	4.0
				2.5	SHS	35	35	0.0	0.0
				2.0	SHS	35	35	1.0	1.0

1.6 SHS 35

	F	ema	le (outer)		Male ((inner)	Non Clear	ninal ance
d		b		t		d	b	top	side
mm		mm		mm		mm	mm	mm	mm
35	Х	35	Х	3.0	SHS	25	25	4.0	4.0
				2.5	SHS	30	30	0.0	0.0
				2.0	SHS	30	30	1.0	1.0
				1.6	SHS	30	30	1.8	1.8
30	Х	30	Х	3.0	SHS	20	20	4.0	4.0
				2.5	SHS	25	25	0.0	0.0
				2.0	SHS	25	25	1.0	1.0
				1.6	SHS	25	25	1.8	1.8
25	х	25	х	3.0	SHS	n/a	n/a	n/a	n/a
				2.5	SHS	20	20	0.0	0.0
				2.0	SHS	20	20	1.0	1.0
				1.6	SHS	20	20	1.8	1.8
20	Х	20	Х	2.0	SHS	n/a	n/a	n/a	n/a
				1.6	SHS	n/a	n/a	n/a	n/a

How to use this chart:

- A. Select the size of Female (or Outer) member closest to your requirements from the left hand column.
- B. The next column lists the closest size Male (Inner) Member when positioned in the Female Member as noted in the Figure at the bottom right of this page.
- C. Based on (A) and (B) above, the Nominal Clearance between the Male and Female Members are listed in the last column(s). The configuration of these Nominal Clearances are as shown in the Figure below. Note that the clearance is the total available difference between member dimensions, not the gap on both sides.
- D. Depending on the two members being telescoped, the available clearance will also be dependent on end application requirements. Members may need to slide freely inside each other, or be locked with a pin, spot welded or fixed with wedges. This means, in some cases, a 'sloppy' fit may be suitable, while for others the tightest fit possible may be more appropriate.
- E. Where two telescoping sections are being used, thickness should be similar and will be determined by normal structural requirements. If a third section is to be used consideration of both clearance and thickness within the size list available may be required.
- F. SHS has the obvious advantage that its shape prevents rotation of the section.
- G. Press Fit: for short pieces with no need for separation or sliding, an interference fit can be achieved using the available ductility of the steel. Sizes where clearance is shown as 0.0 may occasionally require press fit.





Notes:

- REFER to the Australian Tube Mills PRODUCT AVAILABILITY GUIDE (PAG) for information on the <u>availability</u> of <u>listed</u> <u>sections</u> and associated <u>finishes</u>. The PAG can be found at www.austubemills.com.
- SHS is not a precision tube and all dimensions shown in this chart, although in accordance with the specifications, may vary marginally. Varying corner radii and the internal weld bead may need to be considered when a closer fit is required.
- Sizes with a clearance less than 2.0 mm are shown **bold** in the charts.
- For tight fits it is recommended that some form of testing is carried out prior to committing to material. Where telescoping over some length is required, additional allowance may be needed for straightness.

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Product Manual: Pipe & Tube + Profiles

1.8

PART 2 Pipe & Tube Products

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PART 5 Steel Grades PART 6 Mill Coatings

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Product Manual: Pipe & Tube + Profiles

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Welding Information – Welding Consumables Guide

Generally, standard procedures and consumables are used for welding Australian Tube Mills (ATM) products. Slight modifications in technique may be required to obtain the optimum weld appearance and strength.

These are listed below for Manual Metal Arc-Welding (MMAW), Gas Metal-Arc Welding (GMAW) and Flux-Cored Arc Welding (FCAW) processes. As in any welding operation, it is recommended that the techniques be practiced and refined by welders before they are used in a production situation. The consumables listed below are suitable for welding Structural Steel Hollow Sections to AS/NZS 1163 and satisfy the requirements of the Structural Steel Welding Standard AS/NZS 1554.1 and 1554.5.

The use of spray-on spatter release compound prior to welding (but not sprayed into the joint) may be beneficial in the cleaning up of weld spatter following the welding operation.

All welds should have any slag (when present) removed by chipping, followed by wire brushing to clean the adjacent area.

In using the following guide, it should be noted that the Australian/NZ structural fabrication industry has standardised on the higher strength E48XX/W50X type consumables. This consumable designation is suitable for all of ATM's prime grade steels – including C450PLUS.

The welding consumable recommendations in this publication is not exhaustive and are to be used as a guide only for multi-positional welds. Before welding, check with your consumable manufacturer/supplier for specific recommendations relating to your particular requirements. Further information may be obtained from your local welding consumable manufacturer/supplier. See Grade C250L0, Grade C350L0 and C450PLUS in Part 5 of this Product Manual for further information on parent material chemical composition, maximum Carbon Equivalence (CE) and mechanical properties.

Manual Metal Arc-Welding (MMAW)

Weld strength to match Grade C250L0 (Steel Type 2 – in AS/NZS 1554 Parts 1 & 5) – – Rutile coated electrodes.

B-E49X6 U/B-E49X8 U – Basic coated electrodes.

Weld strength to match Grade C350L0 (Steel Type 5 in AS/NZS 1554 Parts 1 & 5) Same as Grade C250L0 above.

Weld strength to match Grade C450L0 (Steel Type 7B in AS/NZS 1554 Parts 1 & 5) Same as Grade C250L0 above.

Notes:

- 1. Excessive heat input should be avoided. Do not over-weld.
- 2. Keep arc length short to avoid burn-through and undercut.
- 3. Increase joint gaps in butt joints to ensure complete penetration.

Gas Metal-Arc Welding (GMAW)

Weld strength to match Grade C250L0 (Steel Type 2 – in AS/NZS 1554 Parts 1 & 5) W502 ES4/B-G43 2U S4/B-G49 2U S4

 ES4/S4 type medium de-oxidised wires suitable with CO₂ and Argon based shielding gas mixture such as Ar/CO₂/O₂.

Weld strength to match Grade C350L0 (Steel Type 5 in AS/NZS 1554 Parts 1 & 5)

Same as Grade C250L0 above.

Weld strength to match Grade C450L0 (Steel Type 7B in AS/NZS 1554 Parts 1 & 5) W502 ES4/B-G49 2U S4

- ES4/S4 type medium de-oxidised wire suitable with CO₂ and Argon based shielding gas mixture such as Ar/CO₂/O₂ or alternatively
- ES6/S6 type higher level de-oxidised wires may be used.

Notes:

- 1. CO_2 shielding gas may be used where good penetration is required but some weld spatter is produced.
- Argon/CO₂ or Argon/CO₂/O₂ shielded gases may be used for improved weld appearance with reduced weld spatter.
- 3. Dip transfer welding method is generally used.
- Spray transfer welding method may be used where the joint fit-up is good and the sections are thick enough to prevent burn-through.
- W502 wires meet the L0 impact properties requirement. W503 wires, which exceed the L0 impact property requirement, can also be used.



Industry Associations

Australian Steel Institute (ASI) (formerly Australian Institute of Steel Construction) PO Box 6366 NORTH SYDNEY NSW 2059 Tel: +61-2-9931 6666 Fax: +61-2-9931 5406 E-mail: enquiries@steel.org.au Internet: www.steel.org.au

Galvanizers Association of Australia (GAA)

124 Exhibition Street MELBOURNE VIC 3000 Tel: +61-3-9654 1266 Fax: +61-3-9654 1136 E-mail: gaa@gaa.com.au Internet: www.gaa.com.au

Welding Technology Institute Australia (WTIA) PO Box 6165

SILVERWATER NSW 1811 Tel: +61-2-9748 4443 Fax: +61-2-9748 2858 E-mail: info@wtia.com.au Internet: www.wtia.com.au

Australian Tube Mills A.B.N. 21123 666 679. PO Box 246 Sunnybank, Queensland 4109 Australia Telephone +617 3909 6600 Facsimile +617 3909 6660 E-mail info@austubemills.com Internet www.austubemills.com **Build** with Product Manual: Pipe & Tube + Profiles AUGUST 2013 AustubeMills 8-7 Standards PART 1 PART 2 PART 3 PART 4 PART 8 PART 5 PART 6 PART 7 **General Information Pipe & Tube Products** Other Tube Products Profiles Steel Grades Mill Coatings Mill Processing Fabrication

Welding Information – Welding Consumables Guide

Flux-Cored Arc Welding (FCAW)

Weld strength to match Grade C250L0 (Steel Type 2 – in AS/NZS 1554 Parts 1 & 5) B-T432U/B-T492U

Weld strength to match Grade C350L0 (Steel Type 5 in AS/NZS 1554 Parts 1 & 5) Same as Grade C250L0 above.

Weld strength to match Grade C450L0 (Steel Type 7B in AS/NZS 1554 Parts 1 & 5) B-T492U

Notes:

1. B-T432U/B-T492U wires meet the L0 impact property requirement.

Welding DuraGal^{Ultra®} Profiles

DuraGal^{Ultra®} is readily weldable. Its thin evenly applied galvanized coating ensures minimal welding fumes. However, welding of any metal products can be injurous to health unless sensible welding practices are used. 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. In addition, the "Fume Management Guidelines" which are available from the WTIA web site at www.wtia.com.au are also recommended.

DuraGal^{Ultra®}'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/NZ 4855)	B-E49X6 U / B-E49X8 U - Basic coated electrodes
Submerged Arc (AS 1858.1)	W502Y
Flux-Cored Arc (AS/NZS ISO 17632)	B-T492U
Gas Metal-Arc (AS/NZS 2717.1 ISO 14341)	W502 ES4/ES6 / B-G49 2U S4/S6



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Product Manual: Pipe & Tube + Profiles

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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 $4d_0$ to $5d_0$ 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, Australian Tube Mills (ATM) 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 (l_x) of less than 10%. The actual values should be confirmed with your Roll Curving company as facilities and equipment may vary between companies.

Roll Curving – DuraGal^{Ultra®} Angles, Channels and Flats

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

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.



Draduat	Cian	Achieved Minimum Inside Bend Radii for Various Bending Modes (mm)					
Produci	5120	On Edge	Toe In	Toe Out	Weak axis*2		
DuraGal ^{Ultra®} 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 ^{Ultra®} 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 ^{Ultra®} Flat	Thickness, t ≤ 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.



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.

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.

ATM has not tested Ram Bender Formers for CHS sizes larger than DN50 (60.3 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. ATM 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

	Bend Centreline Radius (mm)									
Profile	DN15 (21.3OD)	DN20 (26.9OD)	DN25 (33.7OD)	DN32 (42.40D)	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

		Bend Centreline Radius (mm)									
Profile	DN15 (21.30D)	DN20 (26.90D)	DN25 (33.70D)	DN32 (42.40D)	DN40 (48.30D)	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 elliptical 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 ATM's DuraGal[®] and DuraGal^{Plus} 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 ATM results plotted on the chart below demonstrate how the increased side support to the pipe by the Elliptical and Cathedral profile, enabled the ATM pipes to be bent successfully without an internal mandrel.

Notes:

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



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

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Annexure F

Received: 5 November 2015

Fact Sheet





Given the diverse climate and geography of the Australian landscape, only a DuraGalPlus coating can give you the peace of mind that you have the protection you need for the job at hand.

DuraGalPlus can be used in a variety of residential construction applications such as roof trusses, fencing, verandahs, elevated



flooring solutions and shade structures. It is also commonly applied across a variety of other sectors including mining, commercial, engineering, manufacturing, agriculture and transport.

All Austube Mills products are third-party certified (ACRS) to meet the highest AUS/NZ Standards, ensuring you receive the safest and highest quality structural steel pipe and tube every time.

DuraGalPlus steel products have a smooth, even galvanized surface finish which produces significantly less weld spatter and fumes compared to traditional hot-dip galvanized coatings, making it safer and easier to weld. DuraGalPlus is manufactured to a minimum average coating mass of 100g/m² on the internal and external surface, resulting in superior corrosion protection. It is manufactured to the following AUS/NZ Standards:

- > AS/NZS 1163:2009 Cold-formed Structural Steel Hollow Sections.
- > AS/NZS 4792:2006 Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialised process.



DuraGalPlus products are part of the DuraGal® range of coatings and are available via the Austube Mills' network of more than 200 distribution partners across Australia and New Zealand.

For more information about DuraGalPlus, or for details to contact your local distributor, visit www.austubemills.com



For more than 80 years, Austube Mills has been providing you and your community with the best and most innovative steel solutions for Australian designs and conditions. Our tried and tested products and our passionate people give you the confidence to take your design ambitions and bring them to life.

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