AustubeMills

SHAPING POSSIBILITIES

PRODUCT MANUAL

PIPE & TUBE

Build with Standards

Product Manual – Contents

Section	Page
Part 1 – General Information	1-1
Part 2 – Pipe & Tube Products	2-1
Part 3 – Other Tube Products	3-1
Part 4 – Steel Grades	4-1
Part 5 – Mill Coatings	5-1
Part 6 – Mill Processing	6-1
Part 7 – Fabrication	7-1

Notes:

Disclaimer – Whilst every care has been taken in the preparation of this information, Austube 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 Austube Mills Product Availability Guide (PAG) for information on the availability of listed sections and associated finishes. The PAG is found at www.austubemills.com.

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Part 1 – General Information – Contents

Section	Page
Distributor List	1-3
References, Specifications & Standards	1-11
End Colour Coding Chart	1-13
Dimensional Tolerances	1-15
Notations & Abbreviations	1-17
Manufacturing Process – Hollow Sections	1-19

Notes:

Disclaimer – Whilst every care has been taken in the preparation of this information, Austube 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 Austube Mills Product Availability Guide (PAG) for information on the availability of listed sections and associated finishes. The PAG is found at www.austubemills.com.

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Distributors List

Queensland Distributors

BlueScope Distribution – Gladstone
Address: 4 Neil Street Callemondah QLD 4680
Phone: 07 4979 6400
Fax: 07 4979 6794

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 3633 8200
Fax: 07 3633 8220

BlueScope Distribution – Townsville
Address: 12 Forge Crt Bohle QLD
Phone: 07 4729 3939
Fax: 07 4755 3999

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

Metalcorp Steel – Charters Towers
Address: Hugh Quinn Crescent
Charters Towers QLD 4820
Phone: 07 4761 5000
Fax: 07 4761 500

Metalcorp Steel – Toowoomba
Address: 340-360 Anzac Avenue T
oowoomba QLD 4350
Phone: 07 4614 2000
Fax: 07 4614 2044

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

OneSteel Metalcentre – Brisbane
Address: 692 Boundary Road
Coopers Plains QLD 4108
Phone: 1300 302 317

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

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

OneSteel Metalcentre – Gold Coast
Address: 2 Distribution Avenue Molendinar QLD 4214
Phone: 07 5597 6822
Fax: 07 5597 7109

OneSteel Metalcentre – Mackay
Address: Cnr. Harbour Road & Spillers Avenue
North Mackay QLD 4740
Phone: 07 4955 1555

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

OneSteel Metalcentre – Rockhampton
Address: 1-17 Knight Street Rockhampton QLD 4701
Phone: 07 4936 9555
Fax: 07 4922 5944

OneSteel Metalcentre – Sunshine Coast
Address: 62 Enterprise Street Kunda Park QLD 4556
Phone: 07 5476 5366
Fax: 07 5476 5741

OneSteel Metalcentre – Toowoomba
Address: Cnr. Anzac Avenue & Canning Street
Toowoomba QLD 4350
Phone: 07 4637 7222
Fax: 07 4630 1960

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

Orrcon Pipe & Tube – Bundaberg
Address: 100 Enterprise Street Bundaberg QLD 4670
Phone: 07 4153 3733
Fax: 07 4153 3433

Orrcon Pipe & Tube – Cairns
Address: 75 Aumuller Street Portsmith QLD 4870
Phone: 07 4035 5155
Fax: 07 4035 5199

Orrcon Pipe & Tube – Northgate
Address: 920 Nudgee Road Northgate QLD 4013
Phone: 07 3633 8200
Fax: 07 3633 8220

Orrcon Pipe & Tube – Toowoomba
Address: 36 Carrington Road Toowoomba QLD 4350
Phone: 07 4699 9666
Fax: 07 4699 9699

Orrcon Pipe & Tube – Townsville
Address: 17 Leyland Street Garbutt QLD 4814
Phone: 07 4779 1888
Fax: 07 4779 1022

Southern Queensland Steel – Brisbane
Address: 97 Coulson Street Wacol QLD 4076
Phone: 07 3271 9111
Fax: 07 3271 9100

Southern Queensland Steel – Mackay
Address: 40-44 Maggiolo Drive Paget QLD 4740
Phone: 1300 778 335
Phone: 07 4998 5831
Fax: 07 4998 5931

Southern Queensland Steel – Toowoomba
Address: 6 Tait Street Toowoomba QLD 4350
Phone: 07 4529 9292
Fax: 07 4633 0918

Southern Queensland Steel – Townsville
Address: 646-658 Ingham Road Mt Louisa QLD 4818
Phone: 07 4779 8810
Fax: 07 4779 8720

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

Tonkin Steel – Cairns
Address: 74 Cook Street Portsmith QLD 4870
Phone: 07 4035 7000
Fax: 07 4035 7001

Tonkin Steel – Mareeba
Address: Cnr. Costin & Mason Streets
Mareeba QLD 4880
Phone: 07 4048 4130
Fax: 07 4048 4144

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

Vulcan Steel – Carole Park
Address: 6-14 Ron Boyle Cres Carole Park QLD 4300
Phone: 03 8792 9600
Fax: 03 8792 9666

Distributors List

New South Wales Distributors

BlueScope Distribution – Cardiff
Address: 45 Munibung Road Cardiff NSW 2285
Phone: 02 4954 8011
Fax: 02 4954 8637

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

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

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

Metaland – Albury
Address: 242 Kiewa Street Albury NSW 2640
Phone: 02 6021 6011
Fax: 02 6021 6746

Metaland – Bathurst
Address: 9 Toronto Street Kelso NSW 2795
Phone: 02 6331 2488
Fax: 02 6331 2979

Metaland – Central Coast - Lisarow
Address: 932 Pacific Highway Lisarow NSW 2250
Phone: 02 4328 5095
Fax: 02 4329 2888

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 1347

Metaland – Deniliquin
Address: Lot 2 Wakool Road Deniliquin NSW 2710
Phone: 03 5881 7600
Fax: 03 5881 7601

Metaland – Gunnedah
Address: Cnr. Farrer & Mullaley Road Gunnedah NSW 2380
Phone: 02 6742 2449
Fax: 02 6742 2418

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

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

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

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

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

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 – Lake Macquarie
Address: Unit 1 88 Munibung Road Cardiff NSW 2285
Phone: 02 4954 0455
Fax: 02 4954 0566

OneSteel Metalcentre – Newcastle
Address: Industrial Drive Mayfield NSW 2304
Phone: 02 4967 0900

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

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

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

OneSteel Metalcentre – Sydney
Address: 372-374 Victoria Street Wetherill Park NSW 2164
Phone: 02 9203 2222

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

OneSteel Metalcentre – Wollongong
Address: Five Islands Road Unanderra NSW 2526
Phone: 02 4271 1788

Orrcon Pipe & Tube – Dubbo
Address: 82 Fitzroy Street Dubbo NSW 2830
Phone: 02 6841 2800
Fax: 02 6882 7767

Orrcon Pipe & Tube – Tamworth
Address: 32 Hume Street West Tamworth NSW 2340
Phone: 02 6755 3222
Fax: 02 6765 6262

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 – Wagga
Address: 45 Dampier Street Bomen NSW 2650
Phone: 02 6931 8807
Fax: 02 6931 7719

Southern Steel Supplies – Wollongong
Address: 499 Princes Highway Fairymeadow NSW 2519
Phone: 02 4284 4733
Fax: 02 4283 5017

Distributors List

Victorian Distributors

BlueScope Distribution – Albury
Address: 20 Fallen Street Nth Albury VIC 2641
Phone: 02 6057 1760
Fax: 02 6025 4268

BlueScope Distribution – Ballarat
Address: Creswick Road Ballarat VIC 3353
Phone: 03 5320 7855
Fax: 03 5320 7866

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

BlueScope Distribution – Portland
Address: 24 Portland – Nelson Road
Portland VIC 3305
Phone: 03 5522 4255
Fax: 03 5527 1003

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

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 – 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

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

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

OneSteel Metalcentre – Horsham
Address: 68 Hamilton Road Horsham VIC 3400
Phone: 03 5382 4411
Fax: 03 5382 0613

OneSteel Metalcentre – Melbourne
Address: 1257-1259 Ferntree Gully Road
Scoresby VIC 3179
Phone: 03 9212 7800
Fax: 03 9764 1456

OneSteel Metalcentre – Mildura
Address: 436-444 Benetook Avenue
Mildura VIC 3502
Phone: 03 5023 5944
Fax: 03 5022 1442

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

Orrcon Pipe & Tube – Bendigo
Address: 15 – 35 Fairview Road
Kangaroo Flat VIC 3555
Phone: 03 5448 3811
Fax: 03 5434 9844

Orrcon Pipe & Tube – Morwell
Address: Lot 4 Jones Road Morwell VIC 3840
Phone: 03 5134 6266
Fax: 03 5128 5833

Orrcon Pipe & Tube – Westall
Address: 16-24 Westall Road Westall VIC 3169
Phone: 03 9549 2666
Fax: 03 9547 5776

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

Vulcan Steel – Dandenong
Address: 72 Nathan Road Dandenong VIC 3175
Phone: 03 8792 9600
Fax: 03 8792 9666

Distributors List

Western Australian Distributors

Metalcorp Steel - Kewdale
Address: 9 Bradford Street Kewdale WA 6105
Phone: 08 6250 1156
Fax: 08 6250 1111

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

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

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

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 – 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

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

OneSteel Metalcentre / Midalia Steel – 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 / Midalia Steel – Karratha
Address: Cnr. Cowle & Coolawanyah Roads Karratha WA 6714
Phone: 08 9144 0111
Fax: 08 9185 3663

OneSteel Metalcentre – Perth
Address: 1 Howson Way Spearwood WA 6163
Phone: 08 9418 9877
Fax: 08 9418 6013

Orrcon Pipe & Tube – Albany
Address: 62 Chester Pass Road Albany WA 6330
Phone: 08 9841 9700
Fax: 08 9841 9711

Orrcon Pipe & Tube – Esperance
Address: 26 Woods Street Esperance WA 6450
Phone: 08 9072 3100
Fax: 08 9072 3175

Orrcon Pipe & Tube – Kewdale
Address: 9 Bradford Street Kewdale WA 6105
Phone: 08 6250 1000
Fax: 08 6250 1111

Orrcon Pipe & Tube – Malaga
Address: 12 Denninup Way Malaga WA 6090
Phone: 08 9249 5592
Fax: 08 9248 5191

Orrcon Pipe & Tube – Mandurah
Address: 22 Fitzgerald Road Mandurah WA 6210
Phone: 08 9582 6900
Fax: 08 9582 6999

Southern Steel - Hope Valley
Address: 66 Armstrong Rd Hope Valley WA 6165
Phone: 08 9419 5386
Fax: 08 9419 3907

United Steel - Hazelmere
Address: 1270 Abernethy Road Hazelmere WA 6055
Phone: 08 9359 8900
Fax: 08 9359 8999

United Steel - Kalgoorlie
Address: 45 Great Eastern Hwy Kalgoorlie WA 6430
Phone: 08 9024 1388
Fax: 08 9024 1399

Distributors List

South Australian Distributors

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

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

Mighty M – Pooraka
Address: 11-15 Maxwell Road Pooraka SA 5095
Phone: 08 8405 7112
Fax: 08 8262 9322

OneSteel Metalcentre – Mount Gambier
Address: Jubilee Highway West Mt Gambier SA 5290
Phone: 08 8725 7500
Fax: 08 8725 0259

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

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

Orrcon Pipe & Tube – Gillman
Address: 123-131 Bedford Street Gillman SA 5095
Phone: 08 8245 5913
Fax: 08 8245 5910

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

Tasmanian Distributors

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

OneSteel Metalcentre – Derwent Park
Address: 61 Sunderland Street Moonah TAS 7009
Phone: 03 6272 2877
Fax: 03 6272 0977

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

Northern Territory Distributors

OneSteel Metalcentre – Darwin
Address: Lot 889 Stuart Highway Berrimah NT 0828
Phone: 08 8935 0350
Fax: 08 8935 0380

Orrcon Pipe & Tube – Darwin
Address: 50 O'Sullivan Circuit East Arm NT 0822
Phone: 08 8984 2600
Fax: 08 8984 2699

Southern Steel – Darwin
Address: 47 Lillwall Road East Arm NT 0882
Phone: 08 8947 4246
Fax: 08 8984 3780

United Steel – Darwin
Address: Lot 1036 Berrimah Road Berrimah NT 0828
Phone: 08 8947 2444
Fax: 08 8947 5158

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

Distributors List

New Zealand Distributors

Asmuss North Island (Auckland)
Address: 6 Gabador Place Mt Wellington 1060
Phone: +64 9 573 0099
Fax: +64 9 573 5590

Asmuss North Island (Hamilton)
Address: 40 Bryant Road Te Rapa Hamilton 3200
Phone: +64 7 849 2410
Fax: +64 7 849 2414

Asmuss North Island (Mt Maunganui)
Address: 40 Portside Drive Mt Maunganui 3116
Phone: +64 7 574 6774
Fax: +64 7 574 6775

Asmuss North Island (New Plymouth)
Address: 82 De Havilland Drive New Plymouth 4312
Phone: +64 6 755 2570

Asmuss North Island (Taupo)
Address: 144 Rakaunui Road Taupo 3378
Phone: +64 3 347 1569
Fax: +64 3 347 1572

Asmuss South Island (Christchurch)
Address: 60-70 Detroit Drive Rolleston 7075
Phone: +64 3 347 1569
Fax: +64 3 347 1572

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 Dunedin
Phone: +64 3 456 1750
Fax: +64 3 455 6538

Fletcher EasySteel (Hamilton)
Address: 220 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: 40 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

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: 62 De Havilland Drive, New Plymouth.
Phone: +64 6 755 9217
Fax: +64 6 755 9628

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: 20 Francis Way, Palmerston North.
Phone: +64 6 356 5252
Fax: +64 6 356 5247

Steel & Tube Distribution – Wellington
Address: 26 Hautonga Street, Petone.
Phone: +64 4 576 8989
Fax: +64 4 576 8988

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: 20A Bond Street, Invercargill.
Phone: +64 3 218 2803
Fax: +64 3 218 9131

Distributors List

New Zealand Distributors

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

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

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

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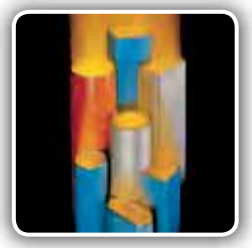
References, Specifications & Standards

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 Zealand 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 International 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*

Structural CHS Grade C250L0

M	Blue
H	Red
XH	No Colour

Structural CHS Grade C350L0*

XL	Green
L	Yellow

Pipe Grade C250L0

M	Blue
H	Red

Structural RHS/SHS C450PLUS®

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

Silo Section C450PLUS®

2.5	Pink
3.0	Blue

Notes:

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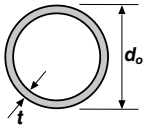
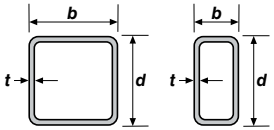
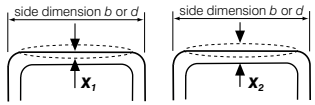
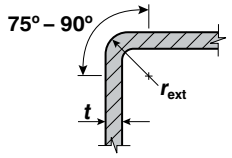
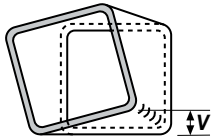
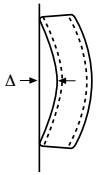
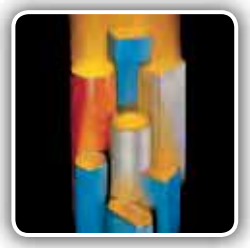
Dimensional Tolerances *compliant with AS/NZS 1163: 2009 Cold-formed structural steel hollow sections*

Dimension/Parameter	Tolerance
Cross-section – Variation in CHS outside diameter 	± 1%, with a minimum of ±0.5 mm and a maximum of ±10 mm
Cross-section – Variation in RHS/SHS outside dimensions 	± 1%, with a minimum of ±0.5 mm
Cross-section – Thickness (t)	• CHS – ◦ For $d_o \leq 406.4$ mm: ±10% ◦ For $d_o > 406.4$ mm: ±10% with a max of ±2 mm • RHS/SHS: ± 10%
Out-of-roundness (o)	o= 2% for hollow sections having a diameter to thickness ratio not exceeding 100, and where $o = \frac{d_{o\,max} - d_{o\,min}}{d_o} \times 100$
Concavity (x_1) or Convexity (x_2) 	(x_1) *or* (x_2) ≤ greater of 0.8% of side dimension and 0.5mm
Squareness of sides	90°±1°

Dimension/Parameter	Tolerance
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.
Member – Twist (RHS/SHS) 	Maximum value of V (see diagram) = 2 mm + 0.5 mm per metre length
Member – Straightness 	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.
Member – Mass of Hollow Section Length	Not less than 0.96 times the nominal mass
Member – Length	+ 25 mm – 0 mm] Acacia Ridge Mills + 50 mm – 0 mm] Newcastle Mills



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.
3. 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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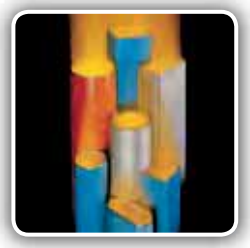
Notations & Abbreviations

Abbreviation	Description
A_e	effective area of cross-section
A_g	gross area of a cross-section
b	width of section
C	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
f_y	yield stress used in design, as defined in AS 4100
I	second moment of area of a cross-section
I_u	I about the cross-section u-axis (Silo section)
I_v	I 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
I_y	I about the cross-section minor principal y-axis
J	torsion constant for a cross-section

Abbreviation	Description
k_f	form factor for members subject to axial compression
L0	Impact properties (as required by AS/NZS 1163 at 0 degrees Celcius)
N	Non-compact section (in bending)
n	axis through the opposite corners of a SHS
RHS	Rectangular Hollow Section(s)
r	radius of gyration
r_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
S_y	(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
x	major principal axis value
y	minor principal axis value
Z	elastic section modulus
Z_e	effective section modulus
Z_{ex}	Z_e about the cross-section major principal x-axis
Z_{ey}	Z_e about the cross-section minor principal y-axis
Z_n	Z about the n-axis through the opposite corners of a SHS
Z_x	Z about the cross-section major principal x-axis
Z_y	Z about the cross-section minor principal y-axis
λ_e	plate element slenderness



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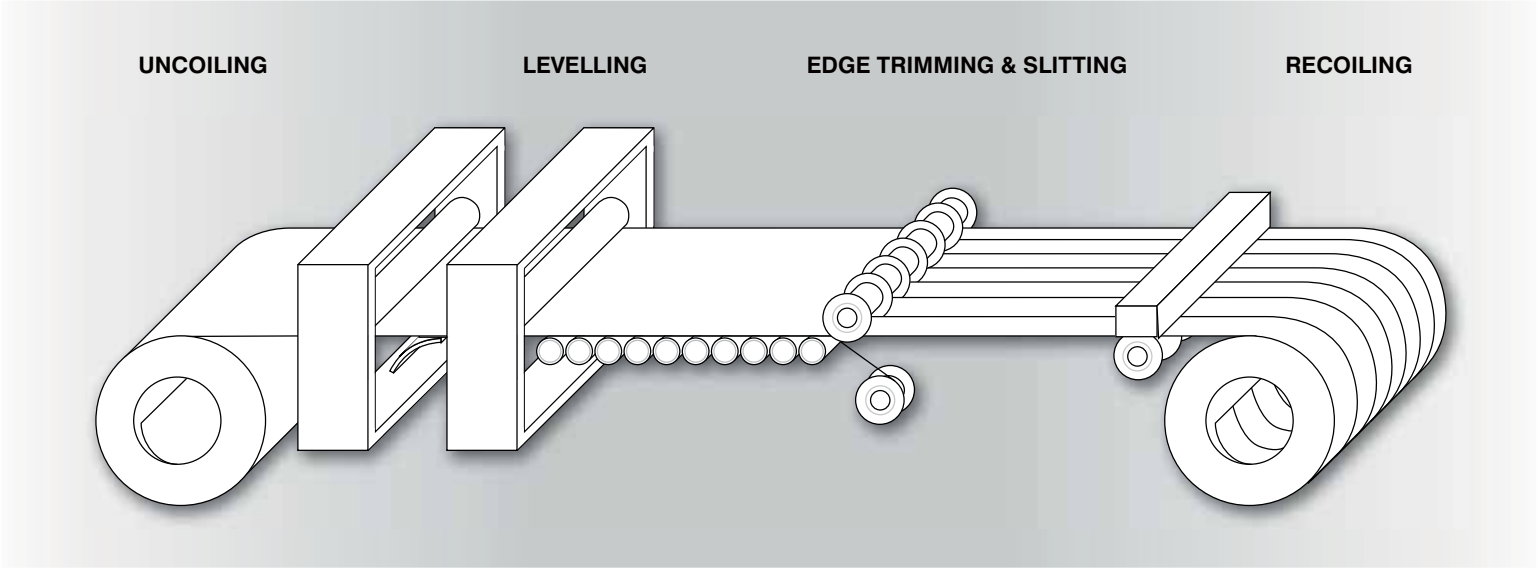
Manufacturing Process – Hollow Sections – ERW Process Step 1



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.

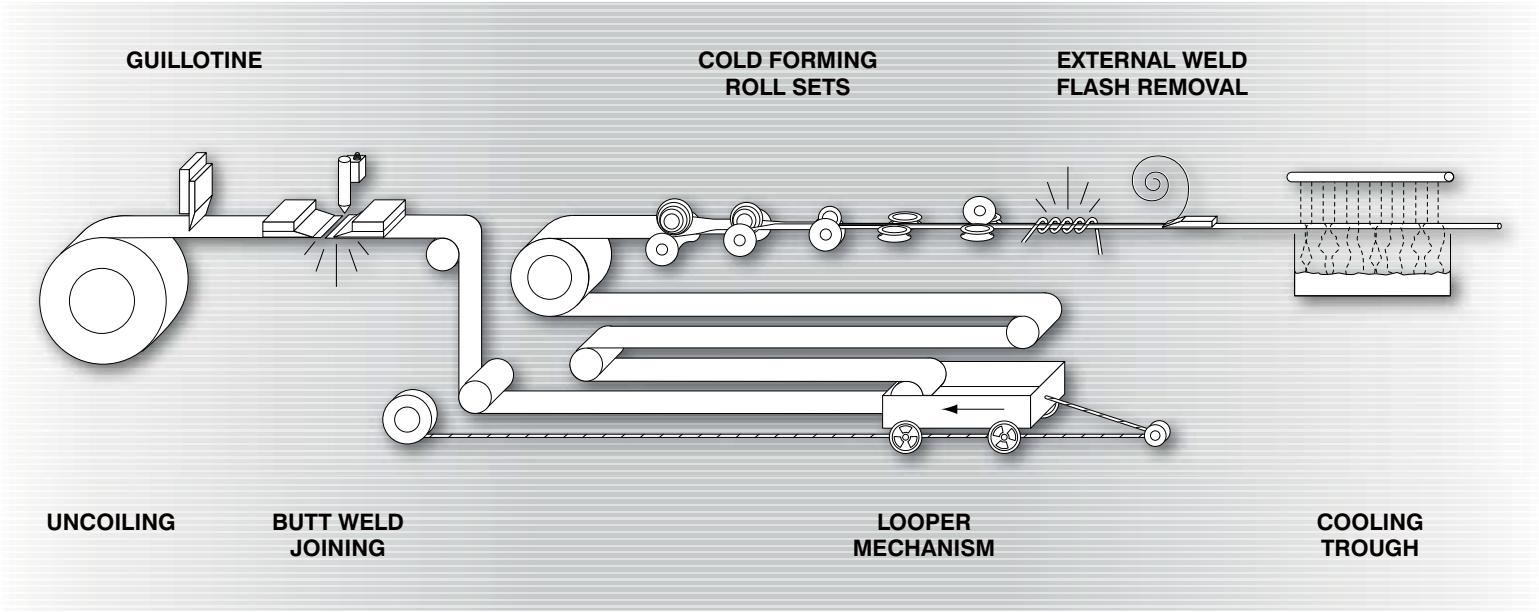
The coil ends are prepared for the start of the milling process by uncoiling and levelling. The edges are trimmed and the flat steel is then slit into the required widths to suit different products.

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.

Manufacturing Process – Hollow Sections – ERW Process Step 2



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.

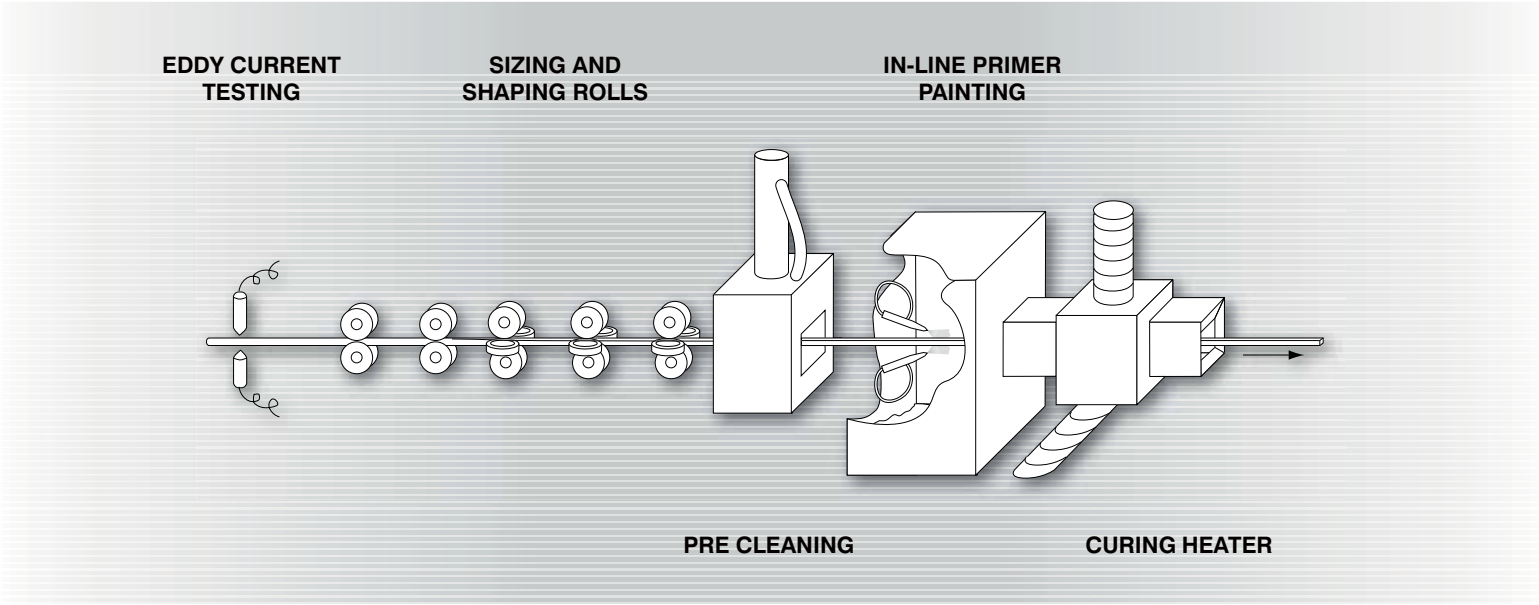
Cold Forming and Welding

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.

Manufacturing Process – Hollow Sections – ERW Process Step 3



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 Austube Mills' products such as StockRail.

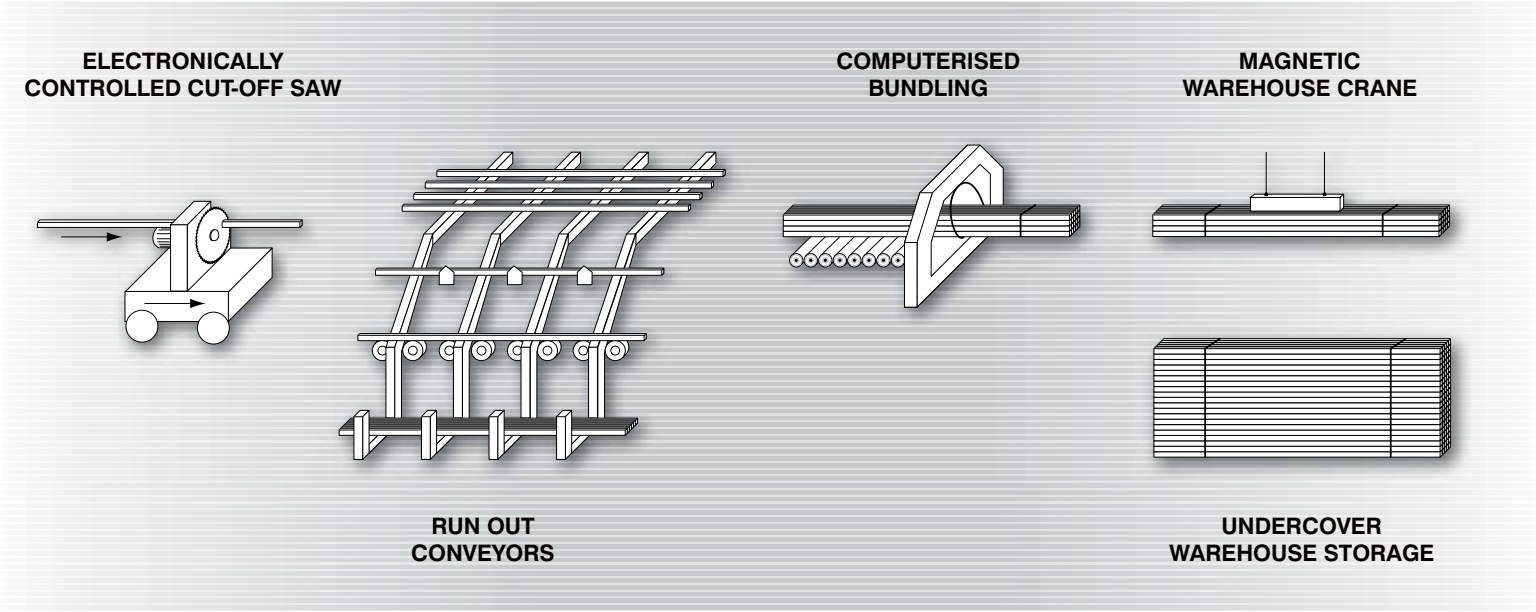
Painstaking measurement takes place throughout the process to make sure the product conforms with specifications.

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.

Manufacturing Process – Hollow Sections – ERW Process Step 4



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.

Part 2 – Pipe & Tube Products – Contents

Section	Page
CHS/ Pipe to AS/NZS 1163 – C250L0	
Specifications	2-3
Section Properties	2-5
Mass and Bundling	2-7
CHS to AS/NZS 1163 – C350L0	
Specifications	2-9
Section Properties	2-11
Mass and Bundling	2-13
RHS to AS/NZS 1163 – C350L0	
Specifications	2-15
Section Properties	2-17
Mass and Bundling	2-19
RHS to AS/NZS 1163 – C450PLUS®	
Specifications	2-21
Section Properties	2-23
Mass and Bundling	2-27
SHS to AS/NZS 1163 – C350L0	
Specifications	2-31
Section Properties	2-33
Mass and Bundling	2-35
SHS to AS/NZS 1163 – C450PLUS®	
Specifications	2-37
Section Properties	2-39
Mass and Bundling	2-43

Notes:

Disclaimer – Whilst every care has been taken in the preparation of this information, Austube 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 Austube Mills Product Availability Guide (PAG) for information on the availability of listed sections and associated finishes. The PAG is found at: www.austubemills.com.

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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
- Minimum Elongation in $5.65\sqrt{S_o}$

$d_o/t \leq 15$	$15 < d_o/t \leq 30$	$d_o/t > 30$
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:

- DuraPrimedRed
- Clear

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

- DuraPrimedRed & 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 Austube Mills 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/m^2 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 Austube Mills 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 Austube Mills 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 Austube Mills representative or refer to the Austube Mills 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:

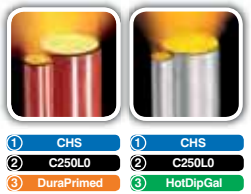
- (DN 20 – DN 40) DP_____ 8.0 m
- (DN 50 – DN 100) DP _____12.0 m
- (DN 90, DN 125 – DN 150) DP_____ 12.2 m
- (DN 20 – DN 100) HotDipGal _____ 7.2 m
- (DN 125 – DN 150) HotDipGal _____12.0 m

Note: Contact your Austube Mills representative 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 Austube Mills:

- Product Availability Guide (PAG), (www.austubemills.com)

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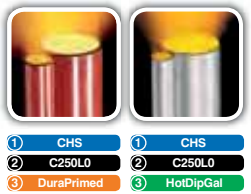
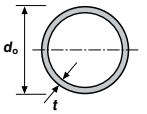
CHS/Pipe to AS/NZS 1163 – C250L0 – Section Properties *calculated in accordance with AS/NZS 1163 & AS 4100*

Dimensions and Ratios									Properties								Properties for Design to AS 4100		
Designation				Nominal Size	Mass per m	External Surface Area		$\frac{d_o}{t}$	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus	Form Factor	About any axis	
d_o		t				per m	per t		A_g	I	Z	S	r	J	C	k_f	Compactness	Z_e
mm		mm		DN	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3		(C,N,S)	10^3mm^3
165.1	x	5.4	CHS	150 H	21.3	0.519	24.4	30.6	2710	8.65	105	138	56.5	17.3	209	1.00	C	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	C	128
139.7	x	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	C	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	C	90.8
114.3	x	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	C	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	C	54.3
101.6	x	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	C	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	C	38.1
88.9	x	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	C	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	C	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	C	28.9
76.1	x	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	C	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	C	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	C	18.9
60.3	x	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	C	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	C	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	C	11.6
48.3	x	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	C	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	C	6.52
42.4	x	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	C	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	C	4.93
33.7	x	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	C	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	C	2.99
26.9	x	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	C	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	C	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	C	1.54



Notes:

1. 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.
2. C = Compact Section; N = Non-Compact Section; S = Slender Section (as defined in AS 4100).
3. 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.
5. 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.
7. Refer to the Austube 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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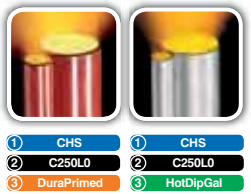
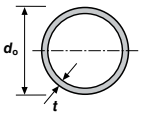
CHS/Pipe to AS/NZS 1163 – C250L0 – Mass and Bundling *calculated in accordance with AS/NZS 1163*

Dimensions				Bundling													Mass											
Designation			Nominal Size	Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				DuraPrimed						HotDipGal						
																Nominal Mass		Mass Per Bundle tonnes				Nominal Mass		Mass Per Bundle tonnes			
d_o	t			6.5	8.0	9.0	12.0																					
mm	mm		DN	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	kg/m	m/t	6.5	8.0	9.0	12.0
26.9 x	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 x	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 x	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 x	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 x	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 x	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 x	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 x	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 x	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 x	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 x	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:

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



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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
- Minimum Elongation in $5.65\sqrt{S_o}$

$d_o/t \leq 15$	$15 < d_o/t \leq 30$	$d_o/t > 30$
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 8-10 microns average

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

DuraGalPlus Finish

CHS to Grade C350L0 with DuraGalPlus 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 Austube Mills 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.

- 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 Austube Mills Product Availability Guide for further information on availability.

End Finish (Mill Processing)

- 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 Austube Mills Product Availability Guide for further information on availability.

Standard Lengths

Standard length for CHS to Grade C350L0:

- See following Mass & Bundling Tables

Contact your Austube Mills representative or refer to the Austube Mills 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) DuraGalPlus 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) DuraGalPlus _____ 8.0 m
- (60.3 OD – 114.3 OD) DuraGalPlus _____12.0 m
- (26.9 OD – 114.3 OD) HotDipGal_____ 7.2 m
- (139.7 OD – 165.1 OD) HotDipGal _____12.2 m

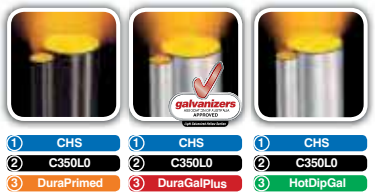
Note: Contact your Austube Mills representative for lengths outside this range.

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:

- 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 cold-forming 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 Austube Mills:

- Product Availability Guide (PAG) (www.austubemills.com)

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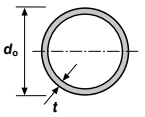
CHS to AS/NZS 1163 – C350L0 – Section Properties *calculated in accordance with AS/NZS 1163 & AS 4100*

Dimensions and Ratios								Properties								Properties for Design to AS 4100		
Designation			Nominal Size	Mass per m	External Surface Area		$\frac{d_o}{t}$	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus		Form Factor	About any axis	
d_o	t				per m	per t		A_g	I	Z	S	r	J	C		k_f	Compactness	Z_e
mm	mm		DN	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
508.0 x	12.7	CHS		155	1.60	10.3	40.0	19800	606	2390	3120	175	1210	4770		1.00	N	3060
	9.5	CHS		117	1.60	13.7	53.5	14900	462	1820	2360	176	925	3640		1.00	N	2170
	6.4	CHS		79.2	1.60	20.2	79.4	10100	317	1250	1610	177	634	2500		0.857	N	1300
457.0 x	12.7	CHS		139	1.44	10.3	36.0	17700	438	1920	2510	157	876	3830		1.00	N	2510
	9.5	CHS		105	1.44	13.7	48.1	13400	334	1460	1900	158	669	2930		1.00	N	1790
	6.4	CHS		71.1	1.44	20.2	71.4	9060	230	1010	1300	159	460	2010		0.904	N	1090
406.4 x	12.7	CHS		123	1.28	10.4	32.0	15700	305	1500	1970	139	609	3000		1.00	C	1970
	9.5	CHS		93.0	1.28	13.7	42.8	11800	233	1150	1500	140	467	2300		1.00	N	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	C	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	C	1230
	9.5	CHS		73.7	1.02	13.8	34.1	9380	116	717	939	111	232	1430		1.00	C	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	C	862
	9.3	CHS		60.5	0.858	14.2	29.4	7710	67.1	492	647	93.3	134	983		1.00	C	647
	6.4	CHS		42.1	0.858	20.4	42.7	5360	47.7	349	455	94.3	95.4	699		1.00	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	C	365
	6.4	CHS		33.6	0.688	20.5	34.2	4280	24.2	221	290	75.2	48.4	442		1.00	C	290
	4.8	CHS		25.4	0.688	27.1	45.6	3230	18.6	169	220	75.8	37.1	339		1.00	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	C	185
	6.4	CHS		25.6	0.529	20.7	26.3	3260	10.7	127	168	57.3	21.4	254		1.00	C	168
	4.8	CHS		19.4	0.529	27.3	35.1	2470	8.25	98.0	128	57.8	16.5	196		1.00	C	128

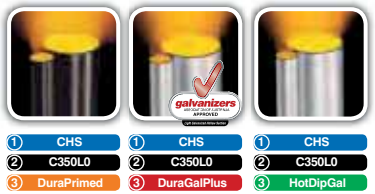
Notes:

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).
3. 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.
5. 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.
7. Refer to the Austube 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.



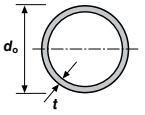
CHS to AS/NZS 1163 – C350L0 – Section Properties *calculated in accordance with AS/NZS 1163 & AS 4100*

Dimensions and Ratios									Properties							Properties for Design to AS 4100		
Designation				Nominal Size	Mass per m	External Surface Area		$\frac{d_o}{t}$	Gross Section Area	About any axis				Torsion Constant	Torsion Modulus	Form Factor	About any axis	
d_o		t				per m	per t		A_g	I	Z	S	r	J	C	k_f	Compactness	Z_e
mm		mm		DN	kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3		(C,N,S)	10^3mm^3
165.1	x	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	N	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	N	71.9
139.7	x	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	N	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	N	53.3
114.3	x	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	C	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	N	39.5
101.6	x	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	C	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	N	25.1
88.9	x	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	C	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	C	19.4
76.1	x	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	C	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	C	12.5
60.3	x	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	C	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	C	7.74
48.3	x	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	C	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	C	4.87
42.4	x	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	C	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	C	3.27
33.7	x	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	C	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	C	2.01
26.9	x	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	C	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	C	1.24



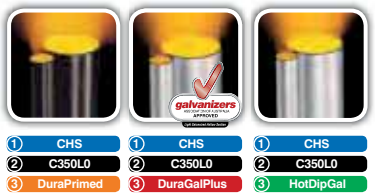
Notes:

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).
3. 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.
5. NOPC is 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.
7. Refer to the Austube 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.



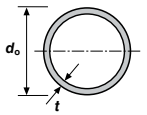
CHS to AS/NZS 1163 – C350L0 – Mass and Bundling *calculated in accordance with AS/NZS 1163*

Dimensions				Bundling												Mass											
Designation			Nominal Size	Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				DuraPrimed/DuraGalPlus						HotDipGal					
																Nominal Mass		Mass Per Bundle tonnes				Nominal Mass		Mass Per Bundle tonnes			
d_o	t			6.5	8.0	9.0	12.0																				
mm	mm		DN	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	kg/m	m/t	6.5	8.0	9.0	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	-	-	-
	2.3	CHS	20 L	350 306	-	-	-	127	-	-	-	825.5	-	-	-	1.40	717	1.15	-	-	-	1.44	694	1.19	-	-	-
33.7 x	2.0	CHS	25 XL	371 326	-	-	-	91	-	-	-	591.5	-	-	-	1.56	640	0.925	-	-	-	1.62	616	0.960	-	-	-
	2.6	CHS	25 L	371 326	-	-	-	91	-	-	-	591.5	-	-	-	1.99	501	1.18	-	-	-	2.05	487	1.21	-	-	-
42.4 x	2.0	CHS	32 XL	382 336	-	-	-	61	-	-	-	396.5	-	-	-	1.99	502	0.790	-	-	-	2.07	483	0.820	-	-	-
	2.6	CHS	32 L	382 336	-	-	-	61	-	-	-	396.5	-	-	-	2.55	392	1.01	-	-	-	2.63	381	1.04	-	-	-
48.3 x	2.3	CHS	40 XL	435 383	-	-	-	61	-	-	-	396.5	-	-	-	2.61	383	1.03	-	-	-	2.70	371	1.07	-	-	-
	2.9	CHS	40 L	435 383	-	-	-	61	-	-	-	396.5	-	-	-	3.25	308	1.29	-	-	-	3.33	300	1.32	-	-	-
60.3 x	2.3	CHS	50 XL	422 374	-	-	-	37	-	-	-	240.5	-	-	-	3.29	304	0.791	-	-	-	3.40	294	0.818	-	-	-
	2.9	CHS	50 L	422 374	-	-	-	37	-	-	-	240.5	-	-	-	4.11	244	0.987	-	-	-	4.21	237	1.01	-	-	-
76.1 x	2.3	CHS	65 XL	533 472	-	-	-	37	-	-	-	240.5	-	-	-	4.19	239	1.01	-	-	-	4.33	231	1.04	-	-	-
	3.2	CHS	65 L	533 472	-	-	-	37	-	-	-	240.5	-	-	-	5.75	174	1.38	-	-	-	5.89	170	1.42	-	-	-
88.9 x	2.6	CHS	80 XL	445 397	-	-	-	19	-	-	-	123.5	-	-	-	5.53	181	0.683	-	-	-	5.70	176	0.703	-	-	-
	3.2	CHS	80 L	445 397	-	-	-	19	-	-	-	123.5	-	-	-	6.76	148	0.835	-	-	-	6.92	144	0.855	-	-	-
101.6 x	2.6	CHS	90 XL	508 454	-	-	-	19	-	-	-	123.5	-	-	-	6.35	158	0.784	-	-	-	6.53	153	0.807	-	-	-
	3.2	CHS	90 L	508 454	-	-	-	19	-	-	-	123.5	-	-	-	7.77	129	0.959	-	-	-	7.95	126	0.982	-	-	-
114.3 x	3.2	CHS	100 XL	572 510	-	-	-	19	-	-	-	123.5	-	-	-	8.77	114	1.08	-	-	-	8.98	111	1.11	-	-	-
	3.6	CHS	100 L	572 510	-	-	-	19	-	-	-	123.5	-	-	-	9.83	102	1.21	-	-	-	10.0	99.6	1.24	-	-	-
139.7 x	3.0	CHS	125 XL	699 382	-	-	-	13	-	-	-	84.5	-	-	-	10.1	98.9	0.855	-	-	-	10.4	96.4	0.876	-	-	-
	3.5	CHS	125 L	699 382	-	-	-	13	-	-	-	84.5	-	-	-	11.8	85.1	0.993	-	-	-	12.0	83.2	1.02	-	-	-
165.1 x	3.0	CHS	150 XL	660 451	-	-	-	10	-	-	-	65	-	-	-	12.0	83.4	0.780	-	-	-	12.3	81.3	0.799	-	-	-
	3.5	CHS	150 L	660 451	-	-	-	10	-	-	-	65	-	-	-	13.9	71.7	0.907	-	-	-	14.3	70.2	0.926	-	-	-



Notes:

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

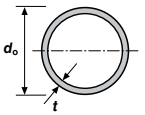


CHS to AS/NZS 1163 – C350L0 – Mass and Bundling *calculated in accordance with AS/NZS 1163*

Dimensions				Bundling												Mass											
Designation			Nominal Size	Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				DuraPrimed						HotDipGal					
																Nominal Mass	Mass Per Bundle tonnes					Nominal Mass	Mass Per Bundle tonnes				
d_o	t			6.5	8.0	9.0	12.0																				
mm	mm		DN	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	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 x	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:

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



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
- Minimum Elongation in $5.65\sqrt{S_o}$

$(b_f, d_f) \le 15$	$15 < (b_f, d_f) \le 30$	$(b_f, d_f) > 30$
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:

- DuraPrimedBlue

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

- DuraPrimedBlue _____ 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 Austube Mills Product Availability Guide for further information on availability.

DuraGalPlus Finish

RHS to Grade C350L0 with DuraGalPlus finish is manufactured using steel strip that has the following coating thickness:

- Minimum coating mass _____ 100 g/m^2 each side
- Designated as _____ AS/NZS 4792 ZB 100/100

See the Austube Mills 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 Austube Mills Product Availability Guide for further information on availability.

End Finish (Mill Processing)

- Plain Ends only.

Standard Lengths

Standard lengths for RHS to Grade C350L0:

- See following Mass & Bundling Tables.

Contact your Austube Mills representative or refer to the Austube Mills 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) DuraGalPlus/DP _____ 4.5 m
- (50x25 – 75x25 RHS) DuraGalPlus/DP _____ 4.2 m
- (65x35 – 75x25 RHS) DuraGalPlus/DP _____ 4.5 m

Maximum Length:

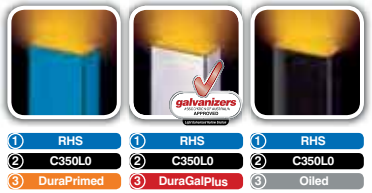
- (50x20 RHS) DuraGalPlus/DP _____ 9.0 m
- (50x25 RHS) DuraGalPlus/DP _____ 8.0 m
- (65x35 – 75x25 RHS) DuraGalPlus/DP _____ 12.2 m

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

Thickness

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



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 Austube Mills:

- Product Availability Guide (PAG) (www.austubemills.com.au)

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

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

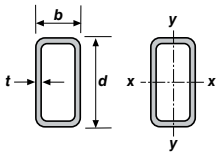
Notes:

1. 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).
3. 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.
6. Refer to the Austube 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 AUSTUBE MILLS' LARGER RANGE OF C450PLUS PRODUCTS.



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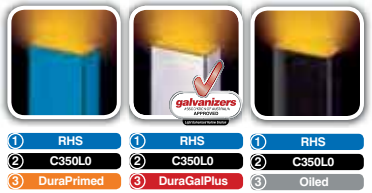
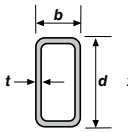
RHS to AS/NZS 1163 – C350L0 – Mass and Bundling *calculated in accordance with AS/NZS 1163*

Dimensions				Bundling																Mass					
Designation				Bundle Configuration (mm)				Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				Nominal Mass		Mass Per Bundle tonnes			
d	b	t		6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0														
mm	mm	mm		W x H	W x H	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
50	20	1.6	RHS		8 12				400 240				96				768			1.63	615		1.25		
		2.0	RHS		8 12				400 240				96				768			1.99	502		1.53		
		2.5	RHS		6 12				300 240				72				576			2.42	412		1.40		
		3.0	RHS		6 12				300 240				72				576			2.83	353		1.63		
50	25	1.6	RHS		8 12				400 300				96				768			1.75	571		1.35		
		2.0	RHS		8 12				400 300				96				768			2.15	465		1.65		
		2.5	RHS		6 12				300 300				72				576			2.62	382		1.51		
		3.0	RHS		6 10				300 250				60				480			3.07	326		1.47		
65	35	2.0	RHS		6 9				390 315				54				432			2.93	341		1.27		
		2.5	RHS		6 9				390 315				54				432			3.60	278		1.56		
		3.0	RHS		5 9				325 315				45				360			4.25	236		1.53		
		4.0	RHS		5 7				325 245				35				280			5.35	187		1.50		
75	25	1.6	RHS		5 13				375 325				65				520			2.38	420		1.24		
		2.0	RHS		5 13				375 325				65				520			2.93	341		1.53		
		2.5	RHS		4 12				300 300				48				384			3.60	278		1.38		



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 AUSTUBE MILLS' LARGER RANGE OF C450PLUS PRODUCTS.

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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
- Minimum Elongation in $5.65\sqrt{S_o}$

$(b_f, d_f) \leq 15$	$15 < (b_f, d_f) \leq 30$	$(b_f, d_f) > 30$
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:

- DuraPrimedBlue

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

- DuraPrimedBlue _____ 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 Austube Mills Product Availability Guide for further information on availability.

DuraGalPlus 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
- Designated as _____ AS/NZS 4792 ZB 100/100

See the Austube Mills 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 Austube Mills 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 Austube Mills representative or refer to the Austube Mills 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:

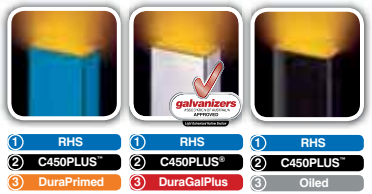
- (50x20 RHS) DP _____ 9.0 m
- (50x25 RHS) DP _____ 8.0 m
- (65x35 – 150x50 RHS) DP _____ 12.2 m

Note: Contact your Austube 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 Austube Mills:

- Product Availability Guide (PAG) (www.austubemills.com.au)

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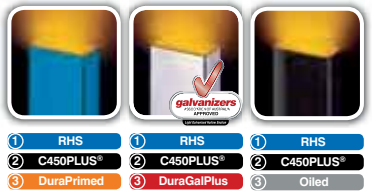
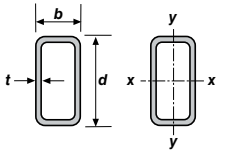
RHS to AS/NZS 1163 – C450PLUS® – Section Properties *calculated in accordance with AS/NZS 1163 & AS 4100*

Dimensions and Ratios																													
Designation				Mass per m	External Surface Area		b-2t / t	d-2t / t	Gross Section Area	Properties												Properties for Design to AS 4100							
										About x-axis					About y-axis					Torsion Constant	Torsion Modulus	Form Factor	About x-axis			About y-axis		
d	b	t			per m	per t			A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	C	k_f	λ_e	Compactness	Z_{ex}	λ_e	Compactness	Z_{ey}
mm	mm	mm		kg/m	m^2/m	m^2/t			mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3		(C,N,S)	10^3mm^3
400 x 300 x	16.0	RHS		161	1.33	8.27	16.8	23.0	20500	453	2260	2750	149	290	1940	2260	119	586	3170	1.00	22.5	C	2750	30.9	N	2230
	12.5	RHS		128	1.35	10.5	22.0	30.0	16300	370	1850	2230	151	238	1590	1830	121	471	2590	0.996	29.5	C	2230	40.2	S	1580
	10.0	RHS		104	1.36	13.0	28.0	38.0	13300	306	1530	1820	152	197	1320	1500	122	384	2130	0.877	37.6	N	1600	51.0	S	1120
	8.0	RHS		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		136	1.13	8.33	10.5	23.0	17300	335	1670	2140	139	113	1130	1320	80.8	290	2000	1.00	14.1	C	2140	30.9	N	1300
	12.5	RHS		109	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	C	1740	40.2	S	936
	10.0	RHS		88.4	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	C	1430	51.0	S	658
	8.0	RHS		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		136	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	C	1580
	12.5	RHS		109	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		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		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		111	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		89.0	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	C	1110	29.5	C	842
	10.0	RHS		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	C	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		45.0	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		85.5	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	C	834	18.3	C	583
	12.5	RHS		69.4	0.746	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	C	695	24.1	C	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	0.761	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		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	C	482	39.2	N	299
	6.0	RHS		35.6	0.774	21.8	23.0	39.7	4530	38.4	307	374	92.0	17.5	233	264	62.2	39.0	395	0.843	30.9	N	368	53.2	S	191
	5.0	RHS		29.9	0.779	26.0	28.0	48.0	3810	32.7	262	317	92.6	15.0	199	224	62.6	33.0	337	0.762	37.6	N	275	64.4	S	144



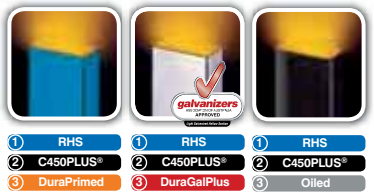
Notes:

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 .
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 Austube 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



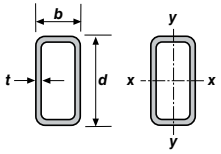
RHS to AS/NZS 1163 – C450PLUS® – Section Properties *calculated in accordance with AS/NZS 1163 & AS 4100*

Dimensions and Ratios									Properties												Properties for Design to AS 4100								
Designation				Mass per m	External Surface Area		b-2t	d-2t	Gross Section Area	About x-axis				About y-axis				Torsion Constant	Torsion Modulus	Form Factor	About x-axis				About y-axis			
																						Compactness				Compactness		
d	b	t			per m	per t	t	t	A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	C	k_f	λ_e		Z_{ex}	λ_e		Z_{ey}
mm	mm	mm		kg/m	m^2/m	m^2/t			mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3		(C,N,S)	10^3mm^3
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	C	318	24.1	C	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	C	293	27.1	C	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	C	267	30.9	N	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	C	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	C	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	N	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	C	116	31.3	N	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	C	99.8	38.1	N	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	C	199	17.4	C	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	C	185	19.7	C	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	C	169	22.5	C	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	C	134	30.9	N	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	C	115	37.6	N	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	C	91.2	30.9	N	40.4
		5.0	RHS	14.2	0.379	26.6	8.00	28.0	1810	4.44	59.2	78.9	49.5	0.765	30.6	35.7	20.5	2.30	56.8	1.00	10.7	C	78.9	37.6	N	31.8
		4.0	RHS	11.6	0.383	32.9	10.5	35.5	1480	3.74	49.8	65.4	50.2	0.653	26.1	29.8	21.0	1.93	48.2	0.877	14.1	C	65.4	47.6	S	22.7
		3.0	RHS	8.96	0.390	43.5	14.7	48.0	1140	2.99	39.8	51.4	51.2	0.526	21.1	23.5	21.5	1.50	38.3	0.713	19.7	C	51.4	64.4	S	14.5
		2.5	RHS	7.53	0.391	52.0	18.0	58.0	959	2.54	33.9	43.5	51.5	0.452	18.1	19.9	21.7	1.28	32.8	0.633	24.1	C	43.5	77.8	S	10.9
		2.0	RHS	6.07	0.393	64.7	23.0	73.0	774	2.08	27.7	35.3	51.8	0.372	14.9	16.3	21.9	1.04	26.9	0.553	30.9	N	31.6	97.9	S	7.64
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	C	68.9	25.7	C	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	C	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	C	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	C	84.2	25.3	C	59.1
		5.0	RHS	14.2	0.379	26.6	13.0	23.0	1810	3.64	58.3	72.7	44.8	1.65	43.9	51.1	30.1	3.83	75.3	1.00	17.4	C	72.7	30.9	N	50.5
		4.0	RHS	11.6	0.383	32.9	16.8	29.3	1480	3.05	48.9	60.3	45.4	1.39	37.0	42.4	30.6	3.16	63.0	1.00	22.5	C	60.3	39.2	N	37.4
		3.0	RHS	8.96	0.390	43.5	23.0	39.7	1140	2.43	38.9	47.3	46.1	1.11	29.5	33.3	31.1	2.43	49.5	0.845	30.9	N	46.5	53.2	S	24.2
		2.5	RHS	7.53	0.391	52.0	28.0	48.0	959	2.07	33.0	40.0	46.4	0.942	25.1	28.2	31.4	2.05	42.1	0.763	37.6	N	34.7	64.4	S	18.2
		2.0	RHS	6.07	0.393	64.7	35.5	60.5	774	1.69	27.0	32.5	46.7	0.771	20.6	22.9	31.6	1.67	34.4	0.624	47.6	S	24.8	81.2	S	13.0
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	C	61.9	20.1	C	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	C	53.7	24.7	C	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	C	39.9	36.4	N	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.
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 Austube 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*

Dimensions and Ratios										Properties													Properties for Design to AS 4100								
Designation				Mass per m	External Surface Area		b-2t	d-2t		Gross Section Area	About x-axis				About y-axis				Torsion Constant	Torsion Modulus	Form Factor	About x-axis				About y-axis				
																								Compactness				Compactness		
d	b	t			per m	per t	t	t		A_g	I_x	Z_x	S_x	r_x	I_y	Z_y	S_y	r_y	J	C	k_f	λ_e		Z_{ex}	λ_e		Z_{ey}		
mm	mm	mm		kg/m	m^2/m	m^2/t				mm^2	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3		(C,N,S)	10^3mm^3		
100	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	C	45.3	19.7	C	27.7		
		5.0	RHS	10.3	0.279	27.0	8.00	18.0		1310	1.53	30.6	39.8	34.1	0.511	20.4	24.4	19.7	1.35	36.5	1.00	10.7	C	39.8	24.1	C	24.4		
		4.0	RHS	8.49	0.283	33.3	10.5	23.0		1080	1.31	26.1	33.4	34.8	0.441	17.6	20.6	20.2	1.13	31.2	1.00	14.1	C	33.4	30.9	N	20.3		
		3.5	RHS	7.53	0.285	37.9	12.3	26.6		959	1.18	23.6	29.9	35.1	0.400	16.0	18.5	20.4	1.01	28.2	1.00	16.5	C	29.9	35.6	N	17.1		
		3.0	RHS	6.60	0.290	43.9	14.7	31.3		841	1.06	21.3	26.7	35.6	0.361	14.4	16.4	20.7	0.886	25.0	0.967	19.7	C	26.7	42.0	S	13.9		
		2.5	RHS	5.56	0.291	52.4	18.0	38.0		709	0.912	18.2	22.7	35.9	0.311	12.4	14.0	20.9	0.754	21.5	0.856	24.1	C	22.7	51.0	S	10.4		
		2.0	RHS	4.50	0.293	65.1	23.0	48.0		574	0.750	15.0	18.5	36.2	0.257	10.3	11.5	21.2	0.616	17.7	0.746	30.9	N	18.2	64.4	S	7.33		
		1.6	RHS	3.64	0.295	81.0	29.3	60.5		463	0.613	12.3	15.0	36.4	0.211	8.43	9.33	21.3	0.501	14.5	0.661	39.2	N	12.5	81.2	S	5.19		
76	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	C	18.1	22.8	C	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	C	14.8	31.3	N	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	C	12.7	38.1	N	7.00		
75	x 50 x	6.0	RHS	9.67	0.224	23.2	6.33	10.5		1230	0.800	21.3	28.1	25.5	0.421	16.9	21.1	18.5	1.01	29.3	1.00	8.50	C	28.1	14.1	C	21.1		
		5.0	RHS	8.35	0.229	27.4	8.00	13.0		1060	0.726	19.4	24.9	26.1	0.384	15.4	18.8	19.0	0.891	26.4	1.00	10.7	C	24.9	17.4	C	18.8		
		4.0	RHS	6.92	0.233	33.7	10.5	16.8		881	0.630	16.8	21.1	26.7	0.335	13.4	16.0	19.5	0.754	22.7	1.00	14.1	C	21.1	22.5	C	16.0		
		3.0	RHS	5.42	0.240	44.2	14.7	23.0		691	0.522	13.9	17.1	27.5	0.278	11.1	12.9	20.0	0.593	18.4	1.00	19.7	C	17.1	30.9	N	12.8		
		2.5	RHS	4.58	0.241	52.7	18.0	28.0		584	0.450	12.0	14.6	27.7	0.240	9.60	11.0	20.3	0.505	15.9	1.00	24.1	C	14.6	37.6	N	9.95		
		2.0	RHS	3.72	0.243	65.4	23.0	35.5		474	0.372	9.91	12.0	28.0	0.199	7.96	9.06	20.5	0.414	13.1	0.904	30.9	N	11.8	47.6	S	7.07		
		1.6	RHS	3.01	0.245	81.3	29.3	44.9		383	0.305	8.14	9.75	28.2	0.164	6.56	7.40	20.7	0.337	10.8	0.799	39.2	N	8.26	60.2	S	5.01		
75	x 25 x	2.5	RHS	3.60	0.191	53.1	8.00	28.0		459	0.285	7.60	10.1	24.9	0.0487	3.89	4.53	10.3	0.144	7.14	1.00	10.7	C	10.1	37.6	N	4.05		
		2.0	RHS	2.93	0.193	65.8	10.5	35.5		374	0.238	6.36	8.31	25.3	0.0414	3.31	3.77	10.5	0.120	6.04	0.878	14.1	C	8.31	47.6	S	2.88		
		1.6	RHS	2.38	0.195	81.7	13.6	44.9		303	0.197	5.26	6.81	25.5	0.0347	2.78	3.11	10.7	0.0993	5.05	0.746	18.3	C	6.81	60.2	S	2.02		
65	x 35 x	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	C	13.3	19.1	C	8.58		
		3.0	RHS	4.25	0.190	44.7	9.67	19.7		541	0.281	8.65	11.0	22.8	0.106	6.04	7.11	14.0	0.259	10.4	1.00	13.0	C	11.0	26.4	C	7.11		
		2.5	RHS	3.60	0.191	53.1	12.0	24.0		459	0.244	7.52	9.45	23.1	0.0926	5.29	6.13	14.2	0.223	9.10	1.00	16.1	C	9.45	32.2	N	5.95		
		2.0	RHS	2.93	0.193	65.8	15.5	30.5		374	0.204	6.28	7.80	23.4	0.0778	4.44	5.07	14.4	0.184	7.62	0.985	20.8	C	7.80	40.9	S	4.37		
50	x 25 x	3.0	RHS	3.07	0.140	45.5	6.33	14.7		391	0.112	4.47	5.86	16.9	0.0367	2.93	3.56	9.69	0.0964	5.18	1.00	8.50	C	5.86	19.7	C	3.56		
		2.5	RHS	2.62	0.141	54.0	8.00	18.0		334	0.0989	3.95	5.11	17.2	0.0328	2.62	3.12	9.91	0.0843	4.60	1.00	10.7	C	5.11	24.1	C	3.12		
		2.0	RHS	2.15	0.143	66.6	10.5	23.0		274	0.0838	3.35	4.26	17.5	0.0281	2.25	2.62	10.1	0.0706	3.92	1.00	14.1	C	4.26	30.9	N	2.58		
		1.6	RHS	1.75	0.145	82.5	13.6	29.3		223	0.0702	2.81	3.53	17.7	0.0237	1.90	2.17	10.3	0.0585	3.29	1.00	18.3	C	3.53	39.2	N	1.92		
50	x 20 x	3.0	RHS	2.83	0.130	45.8	4.67	14.7		361	0.0951	3.81	5.16	16.2	0.0212	2.12	2.63	7.67	0.0620	3.88	1.00	6.26	C	5.16	19.7	C	2.63		
		2.5	RHS	2.42	0.131	54.2	6.00	18.0		309	0.0848	3.39	4.51	16.6	0.0192	1.92	2.32	7.89	0.0550	3.49	1.00	8.05	C	4.51	24.1	C	2.32		
		2.0	RHS	1.99	0.133	66.8	8.00	23.0		254	0.0723	2.89	3.78	16.9	0.0167	1.67	1.96	8.11	0.0466	3.00	1.00	10.7	C	3.78	30.9	N	1.93		
		1.6	RHS	1.63	0.135	82.7	10.5	29.3		207	0.0608	2.43	3.14	17.1	0.0142	1.42	1.63	8.29	0.0389	2.55	1.00	14.1	C	3.14	39.2	N	1.44		

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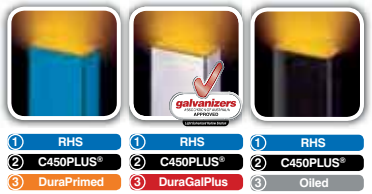
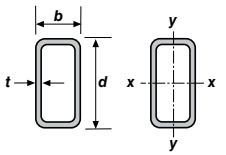


Notes:

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.
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 Austube 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
7. **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 Austube Mills PAG for further information on grades and availability.**



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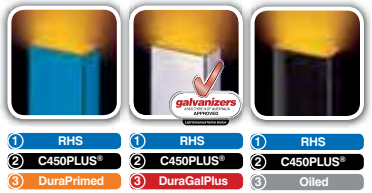
RHS to AS/NZS 1163 – C450PLUS® – Mass and Bundling *calculated in accordance with AS/NZS 1163*

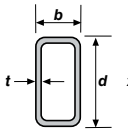
Dimensions				Bundling																Mass					
Designation				Bundle Configuration (mm)				Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				Nominal Mass		Mass Per Bundle tonnes			
d	b	t		6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0			6.5	8.0	9.0	12.0
mm	mm	mm		W x H	W x H	W x H	W x H	W x H	W x H	W x H	W x H									kg/m	m/t				
50	20	1.6	RHS		8 12				400 240				96				768			1.63	615		1.25		
		2.0	RHS		8 12				400 240				96				768			1.99	502		1.53		
		2.5	RHS		6 12				300 240				72				576			2.42	412		1.40		
		3.0	RHS		6 12				300 240				72				576			2.83	353		1.63		
50	25	1.6	RHS		8 12				400 300				96				768			1.75	571		1.35		
		2.0	RHS		8 12				400 300				96				768			2.15	465		1.65		
		2.5	RHS		6 12				300 300				72				576			2.62	382		1.51		
		3.0	RHS		6 10				300 250				60				480			3.07	326		1.47		
65	35	2.0	RHS		6 9				390 315				54				432			2.93	341		1.27		
		2.5	RHS		6 9				390 315				54				432			3.60	278		1.56		
		3.0	RHS		5 9				325 315				45				360			4.25	236		1.53		
		4.0	RHS		5 7				325 245				35				280			5.35	187		1.50		
75	25	1.6	RHS		5 13				375 325				65				520			2.38	420		1.24		
		2.0	RHS		5 13				375 325				65				520			2.93	341		1.53		
		2.5	RHS		4 12				300 300				48				384			3.60	278		1.38		
75	50	1.6	RHS		6 9		6 9		450 450		450 450		54		54		432		648	3.01	332		1.30		1.95
		2.0	RHS		6 7		6 7		450 350		450 350		42		42		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		300 300		35		24		280		288	5.42	184		1.52		1.56
		4.0	RHS		4 7		4 6		300 350		300 300		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	38	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	50	1.6	RHS		4 8		4 8		400 400		400 400		32		32		256		384	3.64	275		0.931		1.40
		2.0	RHS		4 8		4 8		400 400		400 400		32		32		256		384	4.50	222		1.15		1.73
		2.5	RHS		4 8		4 6		400 400		400 300		32		24		256		288	5.56	180		1.42		1.60
		3.0	RHS		4 8		4 6		400 400		400 300		32		24		256		288	6.60	152		1.69		1.90
		3.5	RHS		4 6		3 6		400 300		300 300		24		18		192		216	7.53	133		1.45		1.63
		4.0	RHS		4 6		3 6		400 300		300 300		24		18		192		216	8.49	118		1.63		1.83
		5.0	RHS		3 6		3 5		300 300		300 250		18		15		144		180	10.3	96.9		1.49		1.86
		6.0	RHS		3 5		3 4		300 250		300 200		15		12		120		144	12.0	83.1		1.44		1.73

NON-STANDARD GRADE



Notes:

1. See also Notes for Section Properties for this product
2. **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 Austube Mills PAG for further information on grades and availability.**



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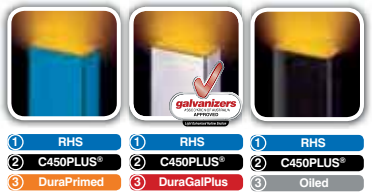
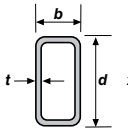
RHS to AS/NZS 1163 – C450PLUS® – Mass and Bundling *calculated in accordance with AS/NZS 1163*

Dimensions				Bundling																	Mass						
Designation				Bundle Configuration (mm)				Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				Nominal Mass		Mass Per Bundle tonnes					
d	b	t		6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0																
mm	mm	mm		W x H	W x H	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
102	76	3.5	RHS		3 4				306 304				12				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				48			14.7	68.2		0.704		
125	75	2.0	RHS		4 6				500 450				24				192			6.07	165		1.17		
		2.5	RHS		4 6		4 5		500 450		500 375		24		20		192		240	7.53	133		1.45		1.81
		3.0	RHS		4 5		4 5		500 375		500 375		20		20		160		240	8.96	112		1.43		2.15
		4.0	RHS		3 5		3 5		375 375		375 375		15		15		120		180	11.6	86.0		1.40		2.09
		5.0	RHS		3 5		3 3		375 375		375 225		15		9		120		108	14.2	70.2		1.71		1.54
		6.0	RHS		3 4		3 2		375 300		375 150		12		6		96		72	16.7	59.7		1.61		1.21
127	51	3.5	RHS		3 4				381 204				12				96			9.07	110		0.870		
		5.0	RHS		2 4				254 204				8				64			12.5	79.9		0.801		
		6.0	RHS		2 4				254 204				8				64			14.7	68.2		0.939		
150	50	2.0	RHS		3 7		3 7		450 350		450 350		21		21		168		252	6.07	165		1.02		1.53
		2.5	RHS		3 8				450 400				24				192			7.53	133		1.45		
		3.0	RHS		3 7		3 5		450 350		450 250		21		15		168		180	8.89	112		1.49		1.60
		4.0	RHS		3 5		3 5		450 250		450 250		15		15		120		180	11.6	86.0		1.40		2.09
		5.0	RHS		3 5		3 3		450 250		450 150		15		9		120		108	14.2	70.2		1.71		1.54
		6.0	RHS		3 5		3 3		450 250		450 150		15		9		120		108	16.7	59.7		2.01		1.81
150	100	4.0	RHS		3 4		3 3		450 400		450 300		12		9		96		108	14.8	67.7		1.42		1.59
		5.0	RHS		3 4		2 4		450 400		300 400		12		8		96		96	18.2	55.0		1.74		1.74
		6.0	RHS		3 3		2 3		450 300		300 300		9		6		72		72	21.4	46.6		1.54		1.54
		8.0	RHS		2 3		2 2		300 300		300 200		6		4		48		48	27.7	36.1		1.33		1.33
		9.0	RHS		2 3		2 2		300 300		300 200		6		4		48		48	30.6	32.7		1.47		1.47
		10.0	RHS				2 2				300 200				4				48	33.4	29.9				1.60
152	76	5.0	RHS		2 3		2 3		304 228		304 228		6		6		48		72	16.4	60.8		0.789		1.18
		6.0	RHS		2 3		2 3		304 228		304 228		6		6		48		72	19.4	51.6		0.930		1.40
200	100	4.0	RHS		2 4		2 3		400 400		400 300		8		6		64		72	17.9	55.8		1.15		1.29
		5.0	RHS		2 4		2 3		400 400		400 300		8		6		64		72	22.1	45.3		1.41		1.59
		6.0	RHS		2 4		2 2		400 400		400 200		8		4		64		48	26.2	38.2		1.67		1.26
		8.0	RHS		2 3		2 2		400 300		400 200		6		4		48		48	33.9	29.5		1.63		1.63
		9.0	RHS		2 3		2 2		400 300		400 200		6		4		48		48	37.7	26.6		1.81		1.81
		10.0	RHS				1 2				200 200				2				24	41.3	24.2				0.990



Notes:

1. See also notes for section properties for this product.



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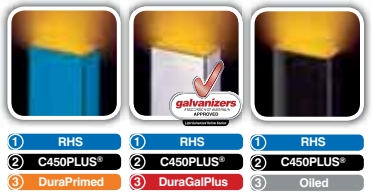
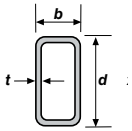
RHS to AS/NZS 1163 – C450PLUS® – Mass and Bundling *calculated in accordance with AS/NZS 1163*

Dimensions				Bundling																Mass					
Designation				Bundle Configuration (mm)				Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				Nominal Mass		Mass Per Bundle tonnes			
d	b	t		6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0														
mm	mm	mm		W x H	W x H	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	150	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	200	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	250	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	200	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	300	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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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 mechanical properties:

- Minimum Yield Strength _____ 350 MPa
- Minimum Tensile Strength _____ 430 MPa
- Minimum Elongation in $5.65\sqrt{S_o}$

$(b_{/t}, d_{/t}) \leq 15$	$15 < (b_{/t}, d_{/t}) \leq 30$	$(b_{/t}, d_{/t}) > 30$
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:

- DuraPrimedBlue

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

- DuraPrimedBlue _____ 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 Austube Mills Product Availability Guide for further information on availability.

DuraGalPlus Finish

SHS to Grade C350L0 with DuraGalPlus finish is manufactured using steel strip that has the following coating thickness:

- Minimum coating mass _____ 100 g/m^2 each side
- Designated as _____ AS/NZS 4792 ZB 100/100

See the Austube Mills 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 Austube Mills 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 Austube Mills representative or refer to the Austube Mills 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) DuraGalPlus/DP ___ 4.2 m
- (50x50 SHS) DuraGalPlus/DP _____ 4.5 m

Maximum Length:

- (20x20 – 50x50 SHS) DuraGalPlus/DP ___ 8.0 m
- (50x50 SHS) DuraGalPlus/DP _____ 12.2m

Note: Contact your Austube Mills representative 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 Austube Mills:

- Product Availability Guide (PAG) (www.austubemills.com)

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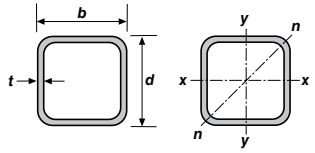
SHS to AS/NZS 1163 – C350L0 – Section Properties *calculated in accordance with AS/NZS 1163 & AS 4100*

Dimensions and Ratios										Section Properties								Properties for Design to AS 4100			
Designation				Mass per m	External Surface Area		b-2t / t	Gross Section Area	About x-, y- and n-axis					Torsion Constant	Torsion Modulus	Form Factor	About x and y-axis		
d	b	t			per m	per t		A_g	I_x	Z_x	Z_n	S_x	r_x	J	C	k_f	λ_e	Compact-ness	Z_{ex}
mm	mm	mm		kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3
50 x 50 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	C	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	C	13.2
	4.0	SHS	5.35	0.183	34.2	10.5	681	0.229	9.15	7.33	11.4	18.3	0.403	14.3	1.00	12.4	C	11.4
	3.0	SHS	4.25	0.190	44.7	14.7	541	0.195	7.79	5.92	9.39	19.0	0.321	11.8	1.00	17.4	C	9.39
	2.5	SHS	3.60	0.191	53.1	18.0	459	0.169	6.78	5.09	8.07	19.2	0.275	10.2	1.00	21.3	C	8.07
	2.0	SHS	2.93	0.193	65.8	23.0	374	0.141	5.66	4.20	6.66	19.5	0.226	8.51	1.00	27.2	C	6.66
	1.6	SHS	2.38	0.195	81.7	29.3	303	0.117	4.68	3.44	5.46	19.6	0.185	7.03	1.00	34.6	N	5.10
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	C	6.74
	3.0	SHS	3.30	0.150	45.3	11.3	421	0.0932	4.66	3.61	5.72	14.9	0.158	7.07	1.00	13.4	C	5.72
	2.5	SHS	2.82	0.151	53.7	14.0	359	0.0822	4.11	3.13	4.97	15.1	0.136	6.21	1.00	16.6	C	4.97
	2.0	SHS	2.31	0.153	66.4	18.0	294	0.0694	3.47	2.61	4.13	15.4	0.113	5.23	1.00	21.3	C	4.13
	1.6	SHS	1.88	0.155	82.3	23.0	239	0.0579	2.90	2.15	3.41	15.6	0.0927	4.36	1.00	27.2	C	3.41
35 x 35 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	C	4.23
	2.5	SHS	2.42	0.131	54.2	12.0	309	0.0529	3.02	2.33	3.69	13.1	0.0889	4.58	1.00	14.2	C	3.69
	2.0	SHS	1.99	0.133	66.8	15.5	254	0.0451	2.58	1.95	3.09	13.3	0.0741	3.89	1.00	18.3	C	3.09
	1.6	SHS	1.63	0.135	82.7	19.9	207	0.0379	2.16	1.62	2.57	13.5	0.0611	3.26	1.00	23.5	C	2.57
30 x 30 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	C	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	C	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	C	2.21
	1.6	SHS	1.38	0.115	83.3	16.8	175	0.0231	1.54	1.16	1.84	11.5	0.0377	2.32	1.00	19.8	C	1.84
25 x 25 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	C	1.91
	2.5	SHS	1.64	0.0914	55.7	8.00	209	0.0169	1.35	1.08	1.71	8.99	0.0297	2.07	1.00	9.47	C	1.71
	2.0	SHS	1.36	0.0931	68.3	10.5	174	0.0148	1.19	0.926	1.47	9.24	0.0253	1.80	1.00	12.4	C	1.47
	1.6	SHS	1.12	0.0945	84.1	13.6	143	0.0128	1.02	0.780	1.24	9.44	0.0212	1.54	1.00	16.1	C	1.24
20 x 20 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	C	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	C	0.751

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).
3. 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.
6. Refer to the Austube 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) 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 AUSTUBE MILLS' LARGER RANGE OF C450PLUS PRODUCTS.

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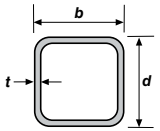
SHS to AS/NZS 1163 – C350L0 – Mass and Bundling *calculated in accordance with AS/NZS 1163*

Dimensions				Bundling																Mass					
Designation				Bundle Configuration (mm)				Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				Nominal Mass		Mass Per Bundle tonnes			
d	b	t		6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0														
mm	mm	mm		W x H	W x H	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
20	x 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			
25	x 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			
30	x 30	x 1.6	SHS		10 10				300 300				100				800			1.38	727		1.10		
		2.0	SHS		10 10				300 300				100				800			1.68	596		1.34		
		2.5	SHS		10 10				300 300				100				800			2.03	492		1.63		
		3.0	SHS		8 8				240 240				64				512			2.36	423		1.21		
35	x 35	x 1.6	SHS		10 10				350 350				100				800			1.63	615		1.30		
		2.0	SHS		10 10				350 350				100				800			1.99	502		1.59		
		2.5	SHS		8 8				280 280				64				512			2.42	412		1.24		
		3.0	SHS		8 8				280 280				64				512			2.83	353		1.45		
40	x 40	x 1.6	SHS		9 9				360 360				81				648			1.88	533		1.22		
		2.0	SHS		9 9				360 360				81				648			2.31	434		1.49		
		2.5	SHS		8 8				320 320				64				512			2.82	355		1.44		
		3.0	SHS		8 8				320 320				64				512			3.30	303		1.69		
		4.0	SHS		7 7				280 280				49				392			4.09	244		1.60		
50	x 50	x 1.6	SHS		8 8				400 400				64				512			2.38	420		1.22		
		2.0	SHS		8 8				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 6				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		

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 AUSTUBE MILLS' LARGER RANGE OF C450PLUS PRODUCTS.

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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
- Minimum Elongation in $5.65\sqrt{S_o}$

$(b_t, d_t) \leq 15$	$15 < (b_t, d_t) \leq 30$	$(b_t, d_t) > 30$
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:

- DuraPrimedBlue

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

- DuraPrimedBlue _____ 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 Austube Mills Product Availability Guide for further information on availability.

DuraGalPlus Finish

SHS 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
- Designated as _____ AS/NZS 4792 ZB 100/100

See the Austube Mills 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 Austube Mills 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 Austube Mills representative or refer to the Austube Mills 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) DuraGalPlus/DP ___ 4.2 m
- (50x50 – 100x100 SHS) DuraGalPlus/DP__ 4.5 m
- (125x125 – 200x200 SHS) DuraGalPlus/DP 5.3 m

Maximum Length:

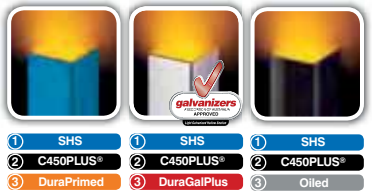
- (20x20 – 40x40 SHS) DuraGalPlus/DP ___ 8.0 m
- (50x50 – 200x200 SHS) DuraGalPlus/DP _ 12.2 m

Note: Contact your Austube 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
- 16.0 mm _____ 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 Austube Mills:

- Product Availability Guide (PAG) (www.austubemills.com.au).

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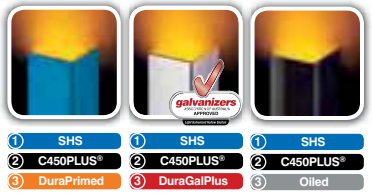
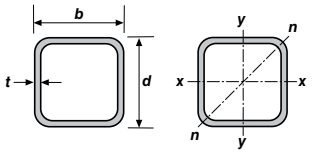
SHS to AS/NZS 1163 – C450PLUS® – Section Properties *calculated in accordance with AS/NZS 1163 & AS 4100*

Dimensions and Ratios								Properties									Properties for Design to AS 4100			
Designation				Mass per m	External Surface Area		b-2t	Gross Section Area	About x, y and n-axis					Torsion Constant	Torsion Modulus	Form Factor	About x-and y-axis			
d	b	t			per m	per t	t	A_g	I_x	Z_x	Z_n	S_x	r_x	J	C	k_f	λ_e	Compactness	Z_{ey}	
mm	mm	mm		kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3	
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	N	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	C	2530	
	12.5	SHS		128	1.35	10.5	26.0	16300	305	1740	1300	2040	137	493	2650	1.00	34.9	N	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	C	1810	
	12.5	SHS		109	1.15	10.6	22.0	13800	187	1240	937	1470	116	305	1900	1.00	29.5	C	1470	
	10.0	SHS		88.4	1.16	13.1	28.0	11300	155	1030	769	1210	117	250	1570	1.00	37.6	N	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	C	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	C	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	C	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	C	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	C	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	C	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	C	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	C	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	C	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	N	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	



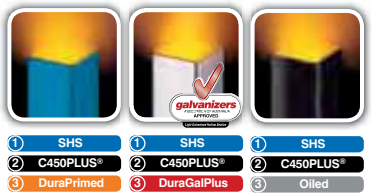
Notes:

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.
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 Austube 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



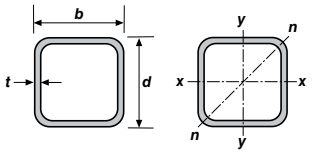
SHS to AS/NZS 1163 – C450PLUS® – Section Properties *calculated in accordance with AS/NZS 1163 & AS 4100*

Dimensions and Ratios								Properties									Properties for Design to AS 4100			
Designation				Mass per m	External Surface Area		b-2t	Gross Section Area	About x, y and n-axis					Torsion Constant	Torsion Modulus	Form Factor	About x-and y-axis			
d	b	t			per m	per t	t	A_g	I_x	Z_x	Z_n	S_x	r_x	J	C	k_f	λ_e	Compactness	Z_e	
mm	mm	mm		kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3	
125	x 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	C	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	C	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	C	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	C	120	
		5.0	SHS	18.2	0.479	26.3	23.0	2310	5.44	87.1	65.4	103	48.5	8.87	133	1.00	30.9	N	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	N	73.2	
100	x 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	C	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	C	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	C	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	C	73.5	
		5.0	SHS	14.2	0.379	26.6	18.0	1810	2.66	53.1	40.5	63.5	38.3	4.42	81.4	1.00	24.1	C	63.5	
		4.0	SHS	11.6	0.383	32.9	23.0	1480	2.23	44.6	33.5	52.6	38.8	3.63	68.0	1.00	30.9	N	51.9	
		3.0	SHS	8.96	0.390	43.5	31.3	1140	1.77	35.4	26.0	41.2	39.4	2.79	53.2	0.952	42.0	S	34.4	
		2.5	SHS	7.53	0.391	52.0	38.0	959	1.51	30.1	21.9	34.9	39.6	2.35	45.2	0.787	51.0	S	26.1	
		2.0	SHS	6.07	0.393	64.7	48.0	774	1.23	24.6	17.8	28.3	39.9	1.91	36.9	0.624	64.4	S	18.8	
90	x 90 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	x 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	C	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	C	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	x 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	C	38.4	
		5.0	SHS	10.3	0.279	27.0	13.0	1310	1.03	27.5	21.6	33.6	28.0	1.77	42.6	1.00	17.4	C	33.6	
		4.0	SHS	8.49	0.283	33.3	16.8	1080	0.882	23.5	18.1	28.2	28.6	1.48	36.1	1.00	22.5	C	28.2	
		3.5	SHS	7.53	0.285	37.9	19.4	959	0.797	21.3	16.1	25.3	28.8	1.32	32.5	1.00	26.1	C	25.3	
		3.0	SHS	6.60	0.290	43.9	23.0	841	0.716	19.1	14.2	22.5	29.2	1.15	28.7	1.00	30.9	N	22.2	
		2.5	SHS	5.56	0.291	52.4	28.0	709	0.614	16.4	12.0	19.1	29.4	0.971	24.6	1.00	37.6	N	17.0	
		2.0	SHS	4.50	0.293	65.1	35.5	574	0.505	13.5	9.83	15.6	29.7	0.790	20.2	0.841	47.6	S	12.1	
65	x 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	C	27.5	
		5.0	SHS	8.75	0.239	27.3	11.0	1110	0.638	19.6	15.6	24.3	23.9	1.12	30.6	1.00	14.8	C	24.3	
		4.0	SHS	7.23	0.243	33.6	14.3	921	0.552	17.0	13.2	20.6	24.5	0.939	26.2	1.00	19.1	C	20.6	
		3.0	SHS	5.66	0.250	44.1	19.7	721	0.454	14.0	10.4	16.6	25.1	0.733	21.0	1.00	26.4	C	16.6	
		2.5	SHS	4.78	0.251	52.6	24.0	609	0.391	12.0	8.91	14.1	25.3	0.624	18.1	1.00	32.2	N	13.7	
		2.0	SHS	3.88	0.253	65.3	30.5	494	0.323	9.94	7.29	11.6	25.6	0.509	14.9	0.978	40.9	S	9.80	
		1.6	SHS	3.13	0.255	81.2	38.6	399	0.265	8.16	5.94	9.44	25.8	0.414	12.2	0.774	51.8	S	7.01	



Notes:

1. 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).
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 Austube 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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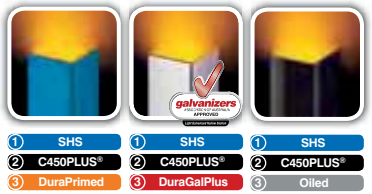
SHS to AS/NZS 1163 – C450PLUS® – Section Properties *calculated in accordance with AS/NZS 1163 & AS 4100*

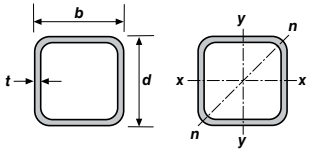
Dimensions and Ratios								Properties									Properties for Design to AS 4100			
Designation				Mass per m	External Surface Area		b-2t	Gross Section Area	About x, y and n-axis					Torsion Constant	Torsion Modulus	Form Factor	About x-and y-axis			
d	b	t			per m	per t	t	A_g	I_x	Z_x	Z_n	S_x	r_x	J	C	k_f	λ_e	Compactness	Z_e	
mm	mm	mm		kg/m	m^2/m	m^2/t		mm^2	10^6mm^4	10^3mm^3	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3			(C,N,S)	10^3mm^3	
50	50	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	C	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	C	13.2	
		4.0	SHS	5.35	0.183	34.2	10.5	681	0.229	9.15	7.33	11.4	18.3	0.403	14.3	1.00	14.1	C	11.4	
		3.0	SHS	4.25	0.190	44.7	14.7	541	0.195	7.79	5.92	9.39	19.0	0.321	11.8	1.00	19.7	C	9.39	
		2.5	SHS	3.60	0.191	53.1	18.0	459	0.169	6.78	5.09	8.07	19.2	0.275	10.2	1.00	24.1	C	8.07	
		2.0	SHS	2.93	0.193	65.8	23.0	374	0.141	5.66	4.20	6.66	19.5	0.226	8.51	1.00	30.9	N	6.58	
		1.6	SHS	2.38	0.195	81.7	29.3	303	0.117	4.68	3.44	5.46	19.6	0.185	7.03	1.00	39.2	N	4.74	
40	40	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	C	6.74	
		3.0	SHS	3.30	0.150	45.3	11.3	421	0.0932	4.66	3.61	5.72	14.9	0.158	7.07	1.00	15.2	C	5.72	
		2.5	SHS	2.82	0.151	53.7	14.0	359	0.0822	4.11	3.13	4.97	15.1	0.136	6.21	1.00	18.8	C	4.97	
		2.0	SHS	2.31	0.153	66.4	18.0	294	0.0694	3.47	2.61	4.13	15.4	0.113	5.23	1.00	24.1	C	4.13	
		1.6	SHS	1.88	0.155	82.3	23.0	239	0.0579	2.90	2.15	3.41	15.6	0.0927	4.36	1.00	30.9	N	3.37	
35	35	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	13.0	C	4.23	
		2.5	SHS	2.42	0.131	54.2	12.0	309	0.0529	3.02	2.33	3.69	13.1	0.0889	4.58	1.00	16.1	C	3.69	
		2.0	SHS	1.99	0.133	66.8	15.5	254	0.0451	2.58	1.95	3.09	13.3	0.0741	3.89	1.00	20.8	C	3.09	
		1.6	SHS	1.63	0.135	82.7	19.9	207	0.0379	2.16	1.62	2.57	13.5	0.0611	3.26	1.00	26.7	C	2.57	
30	30	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	10.7	C	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	13.4	C	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	C	2.21	
		1.6	SHS	1.38	0.115	83.3	16.8	175	0.0231	1.54	1.16	1.84	11.5	0.0377	2.32	1.00	22.5	C	1.84	
25	25	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	C	1.91	
		2.5	SHS	1.64	0.0914	55.7	8.00	209	0.0169	1.35	1.08	1.71	8.99	0.0297	2.07	1.00	10.7	C	1.71	
		2.0	SHS	1.36	0.0931	68.3	10.5	174	0.0148	1.19	0.926	1.47	9.24	0.0253	1.80	1.00	14.1	C	1.47	
		1.6	SHS	1.12	0.0945	84.1	13.6	143	0.0128	1.02	0.780	1.24	9.44	0.0212	1.54	1.00	18.3	C	1.24	
20	20	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	C	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	C	0.751	

NON-STANDARD GRADE



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.
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 Austube 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
7. **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 Austube Mills PAG for further information on grades and availability.**



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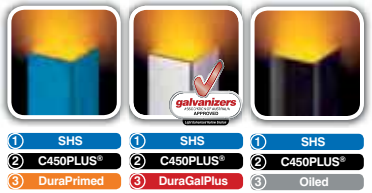
SHS to AS/NZS 1163 – C450PLUS® – Mass and Bundling *calculated in accordance with AS/NZS 1163*

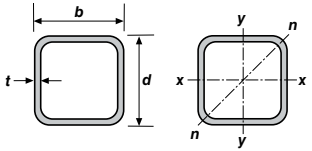
Dimensions				Bundling														Mass					
Designation				Bundle Configuration (mm)				Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				Nominal Mass		Mass Per Bundle tonnes			
d	b	t		6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0														
mm	mm	mm		W x H	W x H	W x H	W x H	W x H	W x H	W 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
20	20	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			
25	25	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			
30	30	1.6	SHS		10 10				300 300				100				800			1.38	727		1.10		
		2.0	SHS		10 10				300 300				100				800			1.68	596		1.34		
		2.5	SHS		10 10				300 300				100				800			2.03	492		1.63		
		3.0	SHS		8 8				240 240				64				512			2.36	423		1.21		
35	35	1.6	SHS		10 10				350 350				100				800			1.63	615		1.30		
		2.0	SHS		10 10				350 350				100				800			1.99	502		1.59		
		2.5	SHS		8 8				280 280				64				512			2.42	412		1.24		
		3.0	SHS		8 8				280 280				64				512			2.83	353		1.45		
40	40	1.6	SHS		9 9				360 360				81				648			1.88	533		1.22		
		2.0	SHS		9 9				360 360				81				648			2.31	434		1.49		
		2.5	SHS		8 8				320 320				64				512			2.82	355		1.44		
		3.0	SHS		8 8				320 320				64				512			3.30	303		1.69		
		4.0	SHS		7 7				280 280				49				392			4.09	244		1.60		
50	50	1.6	SHS		8 8				400 400				64				512			2.38	420		1.22		
		2.0	SHS		8 8				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 6				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		

NON-STANDARD GRADE



Notes:

1. See also notes for wection properties for this product
2. **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 Austube Mills PAG for further information on grades and availability.**



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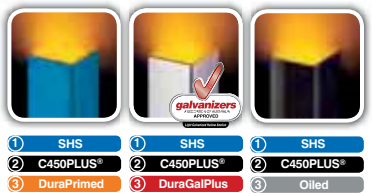
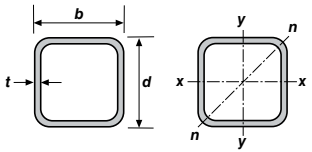
SHS to AS/NZS 1163 – C450PLUS® – Mass and Bundling *calculated in accordance with AS/NZS 1163*

Dimensions				Bundling																Mass					
Designation				Bundle Configuration (mm)				Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				Nominal Mass		Mass Per Bundle tonnes			
d	b	t		6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0														
mm	mm	mm		W x H	W x H	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
65	65	1.6	SHS		7 7				455 455				49				392			3.13	319		1.23		
		2.0	SHS		7 6				455 390				42				336			3.88	258		1.30		
		2.5	SHS		7 6				455 390				42				336			4.78	209		1.61		
		3.0	SHS		6 6				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				325 260				20				160			10.1	98.6		1.62		
75	75	2.0	SHS		6 6				450 450				36				288			4.50	222		1.30		
		2.5	SHS		6 5		6 5		450 375		450 375		30		30		240		360	5.56	180		1.34		2.00
		3.0	SHS		6 5		5 5		450 375		375 375		30		25		240		300	6.60	152		1.58		1.98
		3.5	SHS		5 5		5 4		375 375		375 300		25		20		200		240	7.53	133		1.51		1.81
		4.0	SHS		5 5		5 3		375 375		375 225		25		15		200		180	8.49	118		1.70		1.53
		5.0	SHS		5 4		5 3		375 300		375 225		20		15		160		180	10.3	96.9		1.65		1.86
		6.0	SHS		4 4				300 300				16				128			12.0	83.1		1.54		
89	89	2.0	SHS		5 4				445 356				20				160			5.38	186		0.861		
		3.5	SHS		5 4		4 4		445 356		356 356		20		16		160		192	9.07	110		1.45		1.74
		5.0	SHS		4 4		4 3		356 356		356 267		16		12		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	90	2.0	SHS		5 4				450 360				20				160			5.45	184		0.871		
		2.5	SHS		5 4				450 360				20				160			6.74	148		1.08		
100	100	2.0	SHS		5 4		5 4		500 400		500 400		20		20		160		240	6.07	165		0.972		1.46
		2.5	SHS		5 4				500 400				20				160			7.53	133		1.20		
		3.0	SHS		5 4		4 4		500 400		400 400		20		16		160		192	8.89	112		1.42		1.71
		4.0	SHS		4 4		4 3		400 400		400 300		16		12		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 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	125	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



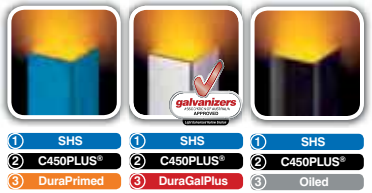
Notes:

1. See also notes for section properties for this product.



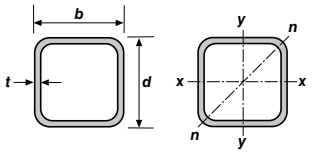
SHS to AS/NZS 1163 – C450PLUS® – Mass and Bundling *calculated in accordance with AS/NZS 1163*

Dimensions				Bundling																Mass					
Designation				Bundle Configuration (mm)				Bundle Dimensions (mm)				Lengths Per Bundle				Metres Per Bundle				Nominal Mass		Mass Per Bundle tonnes			
d	b	t		6.5	8.0	9.0	12.0	6.5	8.0	9.0	12.0														
mm	mm	mm		W x H	W x H	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
150	150	5.0	SHS		3 3		3 2		450 450		450 300		9		6		72		72	22.1	45.3		1.59		1.59
		6.0	SHS		3 2		3 2		450 300		450 300		6		6		48		72	26.2	38.2		1.26		1.88
		8.0	SHS				2 2				300 300				4				48	33.9	29.5				1.63
		9.0	SHS		3 2		2 2		450 300		300 300		6		4		48		48	37.7	26.6		1.81		1.81
		10.0	SHS				2 1				300 150				2				24	41.3	24.2				0.990
200	200	5.0	SHS		3 2		2 2		600 400		400 400		6		4		48		48	29.9	33.4		1.44		1.44
		6.0	SHS		2 2		2 2		400 400		400 400		4		4		32		48	35.6	28.1		1.14		1.71
		8.0	SHS				2 1				400 200				2				24	46.5	21.5				1.12
		9.0	SHS		2 2		2 1		400 400		400 200		4		2		32		24	51.8	19.3		1.66		1.24
		10.0	SHS				2 1				400 200				2				24	57.0	17.6				1.37
		12.5	SHS				2 1				400 200				2				24	69.4	14.4				1.67
		16.0	SHS				1 1				200 200				1				12	85.5	11.7				1.03
250	250	6.0	SHS		2 2		2 1		500 500		500 250		4		2		32		24	45.0	22.2		1.44		1.08
		8.0	SHS		2 2		2 1		500 500		500 250		4		2		32		24	59.1	16.9		1.89		1.42
		9.0	SHS		2 1		2 1		500 250		500 250		2		2		16		24	65.9	15.2		1.05		1.58
		10.0	SHS				2 1				500 250				2				24	72.7	13.8				1.74
		12.5	SHS				1 1				250 250				1				12	89.0	11.2				1.07
		16.0	SHS				1 1				250 250				1				12	111	9.04				1.33
300	300	8.0	SHS				1 1				300 300				1				12	71.6	14.0				0.860
		10.0	SHS				1 1				300 300				1				12	88.4	11.3				1.06
		12.5	SHS				1 1				300 300				1				12	109	9.21				1.30
		16.0	SHS				1 1				300 300				1				12	136	7.36				1.63
350	350	8.0	SHS				1 1				350 350				1				12	84.2	11.9				1.01
		10.0	SHS				1 1				350 350				1				12	104	9.61				1.25
		12.5	SHS				1 1				350 350				1				12	128	7.80				1.54
		16.0	SHS				1 1				350 350				1				12	161	6.21				1.93
400	400	10.0	SHS				1 1				400 400				1				12	120	8.35				1.44
		12.5	SHS				1 1				400 400				1				12	148	6.76				1.77
		16.0	SHS				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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Part 3 – Other Tube Products – Contents

Section	Page
Silo Section to C450PLUS®	
Specifications	3-3
Section Properties	3-5
Mass & Bundling	3-7

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 Austube Mills *Product Availability Guide* (PAG) for information on the availability of listed sections and associated finishes. The PAG is found at: www.austubemills.com.

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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 mechanical properties:

- Minimum Yield Strength _____ 450 MPa
- Minimum Tensile Strength _____ 500 MPa
- 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:

- DuraPrimedBlue

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

- DuraPrimedBlue _____ 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 Austube Mills Product Availability Guide for further information on availability.

DuraGalPlus Finish

Silo Section to C450PLUS with DuraGalPlus 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 Austube Mills Product Availability Guide for further information on availability.

End Finish (Mill Processing)

- Plain Ends only.

Standard Lengths

Standard length for Silo Section to C450PLUS:

- See the following Mass & Bundling Table

Contact your Austube Mills representative or refer to the Austube Mills 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:

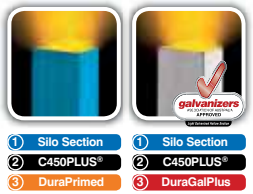
- (75x64) DuraGalPlus/DP _____ 12.2 m

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

Thickness

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 cold-forming 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 Austube Mills:

- Product Availability Guide (PAG) (www.austubemills.com)

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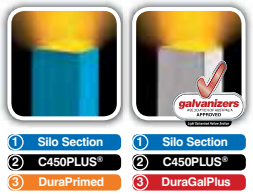
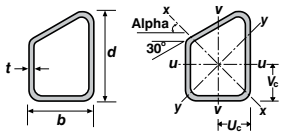
Silo Section to C450PLUS® – Section Properties *calculated in accordance with AS/NZS 1163 & AS 4100*

Dimensions and Ratios				Properties															Properties for Design to AS 4100				
Designation			Mass per m	Gross Section Area														Torsion Constant	Form Factor	About u-axis		About v-axis	
d	b	t		A_g	u_c	v_c	I_u	$Z_u$min	$Z_u$max	r_u	I_v	$Z_v$min	$Z_v$max	r_v	I_x	I_y	Alpha	J	k_f	Compact-ness	Z_{eu}	Compact-ness	Z_{ev}
mm	mm	mm	kg/m	mm^2	mm	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^3mm^3	10^3mm^3	mm	10^6mm^4	10^6mm^4	Deg.	10^6mm^4		(C,N,S)	10^3mm^3	(C,N,S)	10^3mm^3
75 x 64 x		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	N	14.7	N	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 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).
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 Austube 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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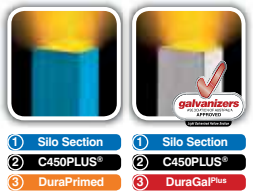
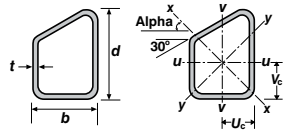
Silo Section to C450PLUS® – Mass & Bundling *calculated in accordance with AS/NZS 1163*

Dimensions				Bundling												Mass				
Designation				Bundle Configuration			Bundle Dimensions (mm)			Lengths Per Bundle			Metres Per Bundle			Nominal Mass		Mass Per Bundle tonnes		
d	b	t		6.5 m	8.0 m	12.0 m	6.5 m	8.0 m	12.0 m											
mm	mm	mm		W x H	W x H	W x H	W x H	W x H	W x H	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	64	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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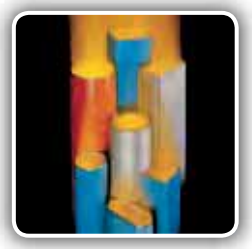
Part 4 – Steel Grades – Contents

Section	Page
Grade C250L0	**4-3**
Grade C350L0	**4-5**
Grade C450PLUS®	**4-7**



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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 Austube Mills Product Availability Guide (PAG) for information on the availability of listed sections and associated finishes. The PAG is found at: www.austubemills.com.

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Grade C250L0

Austube 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:

- CHS
- 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.

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):

- 0.25 – see Table 2 for details.

Welding Code Steel Type:

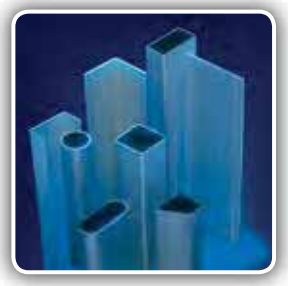
- Type 2 (from Table 4.6.1(B) of AS/NZS 1554.1 and AS/NZS 1554.5).

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.



1. Section
2. C250L0
3. Finish

Table 1: C250L0 Tensile test requirements to AS/NZS 1163

Grade	Minimum yield strength	Minimum tensile strength	Minimum elongation as a proportion of the gauge length $5.65\sqrt{S_o}$ %					
			Circular Hollow Sections d_o/t (See Note 1)			Rectangular Hollow Sections b/t, d/t (See Note 2)		
	MPa	MPa	≤ 15	> 15 & ≤ 30	>30	≤ 15	> 15 & ≤ 30	>30
C250L0	250	320	18	20	22	14	16	18

Table 1 Notes: (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.

Table 2: C250L0 Chemical composition requirements to AS/NZS 1163

Grade	Chemical composition % max. (see Note 1)										
	C	Si	Mn	P	S	Cr	Mo	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)

Table 2 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) $CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$

Notes:

1. For Grade C250L0 product availability refer to the ATM Product Availability Guide (PAG). The PAG can be found at www.austubemills.com.

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Grade C350L0

Austube 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
- Welding
- 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
- 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:

- 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:

- 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):

- 0.43 – see Table 2 for details.

Welding Code Steel Type:

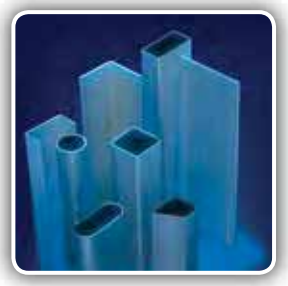
- Type 5 (from Table 4.6.1(B) of AS/NZS 1554.1 and AS/NZS 1554.5).

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:

- 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.



1 Section
2 C350L0
3 Finish

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

Grade	Minimum yield strength MPa	Minimum tensile strength MPa	Minimum elongation as a proportion of the gauge length $5.65\sqrt{S_o}$ %					
			Circular Hollow Sections (CHS) d_o/t			Non-CHS b/t, d/t (See Note 1 & 2)		
			≤ 15	> 15 & ≤ 30	> 30	≤ 15	> 15 & ≤ 30	> 30
C350L0	350	430	16	18	20	12	14	16

Table 1 Notes: (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

Grade	Chemical composition % max. (see Note 1)									
	C	Si	Mn	P	S	Mo	Al	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: (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%.
(4) $CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$

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Grade C450PLUS®

Austube 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:

- 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:

- 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):

- 0.43 – see Table 2 for details. (Note: this is the same limit as for C350L0 products).

Welding Code Steel Type:

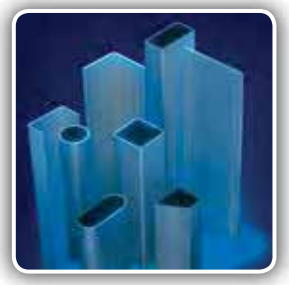
- Type 7B (from Table 4.6.1(B) of AS/NZS 1554.1 and AS/NZS 1554.5).

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:

- 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.



1 Section
2 C450PLUS®
3 Finish

Table 1: C450PLUS Tensile test requirements to AS/NZS 1163

Grade	Minimum yield strength	Minimum tensile strength	Minimum elongation as a proportion of the gauge length $5.65\sqrt{S_o}$ %					
			Circular Hollow Sections (CHS) d_o/t (See Note 1)			Non-CHS b/t, d/t (See Note 2 & 3)		
	MPa	MPa	≤ 15	> 15 & ≤ 30	>30	≤ 15	> 15 & ≤ 30	>30
C450PLUS	450	500	16	18	20	12	14	16

Table 1 Notes: (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

Grade	Chemical composition % max. (see Note 1)									
	C	Si	Mn	P	S	Mo	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 ≤ 0.10%.
(4) $CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$

Notes:

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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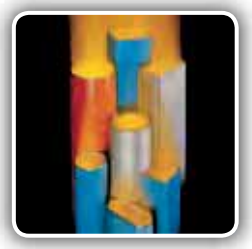
Part 5 – Mill Coatings – Contents

Section	Page
Coating Types	
General Description	5-3
NOPC (No Oil, Paint or Coating)	5-3
Oil Coatings	5-3
Primer Paint	5-3
Hot-Dip Galvanized Coatings	5-3



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 Austube Mills Product Availability Guide (PAG) for information on the availability of listed sections and associated finishes. The PAG is found at: www.austubemills.com.

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Coating Types

General Description

Austube 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 pre-galvanized hot-dip galvanized coatings in the Australian and New Zealand markets and are the registered owners of the DuraGal® and DuraGalPlus 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 and hot-dip galvanzing • Easily marked up for welding • Weld spatter is easily wiped off • Does not need to be ground before welding.	Coating thickness ranges from 6 to 20 microns dry film thickness.	DuraPrimedRed DuraPrimedBlue Clear

Table 2: Description and features of ATM Hot-Dip Galvanized (HDG) Coatings

	Process	Description	Features	Coating Weight	Designation / Standards	Additional Treatment
DuraGalPlus	Hollow Sections manufactured by the ERW process from continuously hot-dip galvanized steel strip with a zinc aluminium metal spray coating applied to the longitudinal weld seam	DuraGalPlus and PreGal products are coated on the external and internal surface with a fully intermetallic bonded coating containing free zinc and zinc-iron alloy layers, and coated on the outside with a passivation treatment to restrict the formation of white rust.	• 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 and weld spatter compared with thicker HDG coatings • Suitable substrate for the application of decorative and corrosion protection coatings • Suitable for powder coating • Does not require zinc to be removed before welding • Coating remains adherent during server manipulation • Catholic protection which provides corrosion protection to uncoated areas or damaged areas of coating from the surrounding zinc	Minimum average coating mass of 100g/m^2	ZB135/135 in accordance with AS/NZ 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialised process	Surface passivation treatment with Polymer Coating (See note below)
DuraGalClear						Si-Tek® – surface passivation treatment (See note below)
DuraGalPlus ZB135/135	Hollow Sections manufactured by the ERW process from continuously hot-dip galvanized steel strip with a zinc aluminium metal spray coating applied to the longitudinal weld seam	ZB135/135 products are coated on the external and internal surface with a fully intermetallic bonded coating containing free zinc and zinc-iron alloy layers, and coated on the outside with a passivation treatment to restrict the formation of white rust.	• 35% more zinc than DuraGalPlus coating • Greater corrosion protection than DuraGalPlus • Made from HDG steel strip with intermetallic bonded coating • Internal and external coating • Has a smooth even finish compared with thicker HDG coatings • Does not require zinc to be removed before welding • Less weld fume and weld spatter compared with thicker HDG coating • Suitable substrate for the application of decorative and corrosion protection coatings • Coating remains adherent during server manipulation • Catholic protection which provides corrosion protection to uncoated areas or damaged areas of coating from the surrounding zinc	Minimum average coating mass of 135g/m^2	ZB100/100 in accordance with AS/NZ 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialised process	Surface passivation treatment with Polymer Coating (See note below)
HotDipGal	Hollow Sections Hot Dip Galvanized by immersing individual pre-treated lengths in a bath of molten zinc	Prepared items are immersed in molten zinc. All surfaces are completely covered, producing a uniform coating of zinc and zinc-iron alloy layers whose thickness is determined principally by the mass of the steel.	• All surface coated • Greater coating thicknesses than hot dip zinc coatings applied continuously to strip • Greater corrosion protection than hot dip zinc coatings applied continuously to strip • Catholic protection - damaged coating areas are provide corrosion protection by surrounding zinc • Metallurgical structure of the galvanized coating provides outstanding toughness and resistance to mechanical damage in transport, erection and service • Duplex coatings of galvanising-plus paint provide increase protection for highly corrosive environments	Minimum average coating mass thickness ≤1.5 mm - 320 g/m^2 thickness >1.5 ≤3 mm - 390 g/m^2 thickness >3 ≤6 mm - 500 g/m^2 thickness >6 mm - 600 g/m^2	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles	Quench to promote passivation

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.

Part 6 – Mill Processing – Contents

Section	Page
Threaded Pipe	**6-3**
Swaged CHS/Pipe	**6-5**

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 Austube Mills Product Availability Guide (PAG) for information on the availability of listed sections and associated finishes. The PAG is found at: www.austubemills.com.

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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.

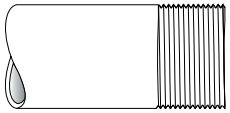
Available Products

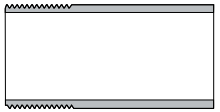
Refer to the Austube Mills Product Availability Guide (PAG). The PAG can be found at www.austubemills.com.

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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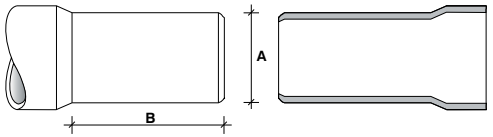
Swaged CHS/Pipe – Specifications

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

Refer to the Austube Mills Product Availability Guide (PAG). The PAG can be found at www.austubemills.com.

CHS 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



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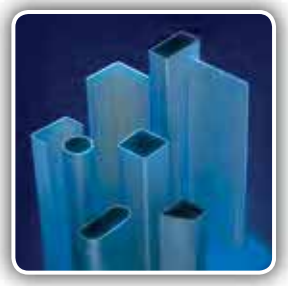
Part 7 – Fabrication – Contents

Section	Page
Telecoping Information	
CHS/Pipe	7-3
RHS	7-4
SHS	7-5
Welding Information	
Welding Consumables Guide	7-7
Bending	**7-9**



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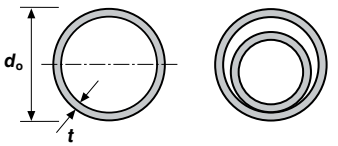
Telescoping Information – CHS/ Pipe

1 CHS/ Pipe
2 Grade
3 Finish

Female (outer) d_o		t		Male (inner) d_o	Nominal Clearance
mm		mm		mm	mm
508.0	x	12.7	CHS	457.0	16.0
		9.5	CHS	457.0	22.4
		6.4	CHS	457.0	28.6
457.0	x	12.7	CHS	406.4	16.6
		9.5	CHS	406.4	23.0
		6.4	CHS	406.4	29.2
406.4	x	12.7	CHS	355.6	17.8
		9.5	CHS	355.6	24.2
		6.4	CHS	355.6	30.4
355.6	x	12.7	CHS	273.1	50.8
		9.5	CHS	323.9	5.9
		6.4	CHS	323.9	12.1
323.9	x	12.7	CHS	273.1	19.4
		9.5	CHS	273.1	25.8
		6.4	CHS	273.1	32.0
273.1	x	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	x	8.2	CHS	168.3	30.5
		6.4	CHS	168.3	34.1
		4.8	CHS	168.3	37.3
168.3	x	7.1	CHS	139.7	11.3
		6.4	CHS	139.7	12.7
		4.8	CHS	139.7	15.9
165.1	x	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	x	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	x	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

Female (outer) d_o		t		Male (inner) d_o	Nominal Clearance
mm		mm		mm	mm
101.6	x	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	x	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	x	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	x	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	x	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	x	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	x	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	x	4.0	CHS	n/a	n/a
		3.2	CHS	n/a	n/a
		2.6	CHS	n/a	n/a
		2.3	CHS	n/a	n/a
		2.0	CHS	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.

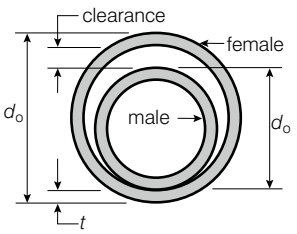
E. Where two telescoping sections are being used, thickness should be similar and will be determined by normal structural requirements. If a third section is to be used, consideration of both clearance and thickness within the size list available may be required.

F. 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.

Notes:

1. Refer to the Austube 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 carriedout prior to committing to material. Where telescoping over some length is required, additional allowance may be needed for straightness.



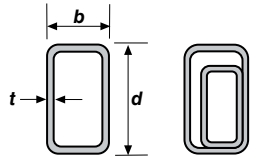
Telescoping Information – RHS

1 RHS
2 Grade
3 Finish

Female (outer) d	b	t		Male (inner) d	b	Nominal Clearance top	side
mm	mm	mm		mm	mm	mm	mm
400 x 300 x		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 x 200 x		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 x 250 x		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 x 200 x		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 x 150 x		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 x 100 x		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
		4.0	RHS	152	76	40.0	16.0
152 x 76 x		6.0	RHS	127	51	13.0	13.0
		5.0	RHS	127	51	15.0	15.0
150 x 100 x		10.0	RHS	127	51	3.0	29.0
		9.0	RHS	127	51	5.0	31.0
		8.0	RHS	127	51	7.0	33.0
		6.0	RHS	127	51	11.0	37.0
		5.0	RHS	127	51	13.0	39.0
		4.0	RHS	127	51	15.0	41.0

Female (outer) d	b	t		Male (inner) d	b	Nominal Clearance top	side
mm	mm	mm		mm	mm	mm	mm
150 x 50 x		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 x 51 x		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 x 75 x		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 x 76 x		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 x 50 x		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	76	38	20.0	8.0
		1.6	RHS	76	38	20.8	8.8
76 x 38 x		4.0	RHS	50	25	18.0	5.0
		3.0	RHS	50	25	20.0	7.0
		2.5	RHS	50	25	21.0	8.0
75 x 50 x		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
		1.6	RHS	65	35	6.8	11.8
75 x 25 x		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

Female (outer) d	b	t		Male (inner) d	b	Nominal Clearance top	side
mm	mm	mm		mm	mm	mm	mm
65 x 35 x		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 x 25 x		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 x 20 x		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 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. 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 Austube 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. 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.
4. 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.

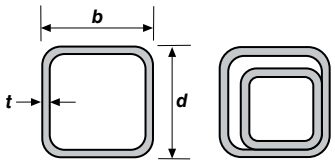
Telescoping Information – SHS

1 SHS
2 Grade
3 Finish

Female (outer) d	b	t		Male (inner) d	b	Nominal Clearance top	side
mm	mm	mm		mm	mm	mm	mm
400 x	400 x	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 x	350 x	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 x	300 x	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 x	250 x	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 x	200 x	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 x	150 x	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 x	125 x	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

Female (outer) d	b	t		Male (inner) d	b	Nominal Clearance top	side
mm	mm	mm		mm	mm	mm	mm
100 x	100 x	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 x	90 x	2.5	SHS	75	75	10.0	10.0
		2.0	SHS	75	75	11.0	11.0
89 x	89 x	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 x	75 x	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 x	65 x	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 x	50 x	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 x	40 x	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	35	**1.8**	**1.8**

Female (outer) d	b	t		Male (inner) d	b	Nominal Clearance top	side
mm	mm	mm		mm	mm	mm	mm
35 x	35 x	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 x	30 x	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 x	25 x	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 x	20 x	2.0	SHS	n/a	n/a	n/a	n/a
		1.6	SHS	n/a	n/a	n/a	n/a



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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 Austube 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. 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.
3. Sizes with a clearance less than 2.0 mm are shown **bold** in the charts.
4. 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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Welding Information – Welding Consumables Guide

Generally, standard procedures and consumables are used for welding Austube 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 CO_2 and Argon based shielding gas mixture such as Ar/CO_2/O_2.

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 CO_2 and Argon based shielding gas mixture such as Ar/CO_2/O_2 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.
2. Argon/CO_2 or Argon/CO_2/O_2 shielded gases may be used for improved weld appearance with reduced weld spatter.
3. Dip transfer welding method is generally used.
4. Spray transfer welding method may be used where the joint fit-up is good and the sections are thick enough to prevent burn-through.
5. 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

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.

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

Bending

Here are some guidelines on bending of CHS, SHS and RHS. 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 and RHS

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

Press Bending or Draw Bending without a Mandrel – CHS

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

Roll Curving

Roll Curving – CHS

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

For more information contact the roll bending companies in your area.

Roll Curving – SHS & RHS

SHS and RHS can be economically bent by roll curving. Some distortion of the section will result using this method. If a flat roll, 3 roll bender is used, Austube 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 (I_x) of less than 10%. The actual values should be confirmed with your roll curving company as facilities and equipment may vary between companies.

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

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

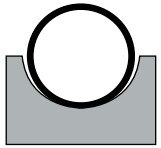
Ram Bending Alternative Formers (by Dawn Tool & Vice*) – Cast

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

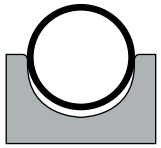
*Contact number for Dawn Tool & Vice: (03) 9462 1934

The Right Former

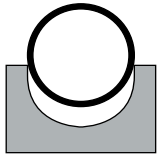
The most critical element is the former. It must give the pipe adequate support. Good results can be achieved from the simplest of benders if suitable formers are used. Three types of formers exist, each giving the bent section a different profile.



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



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



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

Ram Bending Hints

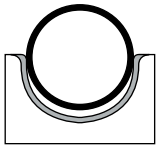
- Some wrinkling of the inside of the bend can be expected on CHS (DN32 and DN50 are most prone to wrinkling).
- If the bend collapses (i.e. the centre of the bend lifts out of the former) during bending, move the support rollers in. For the support roller centres used during development and testing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

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

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

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

Recommended Weld Position



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

Problems encountered with ram bending

Flattening / Collapsing / Wrinkling.

Possible causes

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

Alternatives

- Try a former with an 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 DuraGalPlus 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 DuraGalPlus DN50 Extra-Light

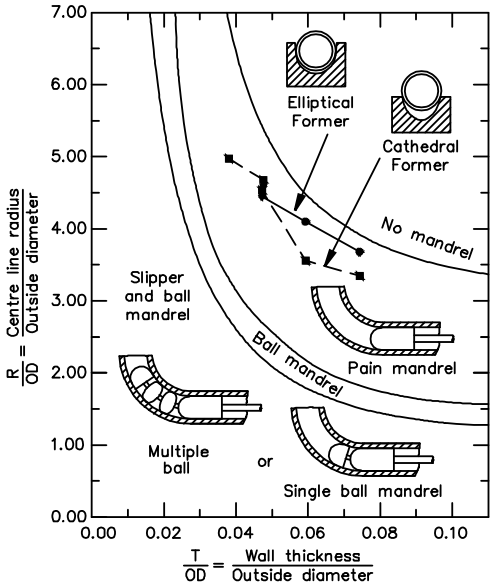


Chart: The Pipe Handbook, King, C Reno, McGraw-Hill Australia, 5th Edition (1967) pp 7-126, Fig 50 (Mandrel and shoe requirements for cold-bending of pipe)
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