

LYSAGHT

MADE IN AUSTRALIA FOR 90 YEARS

REFEREE



33RD COMMEMORATIVE EDITION

Celebrating The Metal Trades' Referee & Storekeepers Guide since 1897

+ Environment Chart

THE LYSAGHT REFEREE

33RD COMMEMORATIVE EDITION

PRODUCED BY



**BLUESCOPE
LYSAGHT**

As a general reference handbook it is not possible to list contact addresses for all contributors and/or suppliers of products and services.

Information on many of the listed steel products is available from distributors of BlueScope Steel, located throughout Australia.

Product or contact information is also available from BlueScope Steel's Customer Support centre, known as BlueScope Steel Direct, by calling **1800 641 417** or by visiting our web site at **www.lysaght.com**

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FOREWORD

The publication of this 33rd commemorative edition of The Lysaght Referee coincides with an important milestone for our company.

This year is the 90th anniversary of the production of LYSAGHT® steel building products in Australia, following 60 years of importation from the United Kingdom. That's quite a milestone for a brand which first came into existence when young Irishman John Lysaght purchased a small galvanising works in Bristol, England.

Half a world away, the quality of LYSAGHT® products and the growing demand for them in the Australian colonies, led to the decision to commence manufacturing locally. At the time, Lysaght could never have imagined the success of his early business and the impact that Lysaght's 'Orb' Brand Corrugated Iron would have on shaping Australian architecture.

Today, John Lysaght's Australian business is part of Australia's leading steel company, BlueScope Steel Limited, and Lysaght's name is perpetuated in the company's building products business, BlueScope Lysaght, proud publisher of The Lysaght Referee.

In fact, The Lysaght Referee has been an integral part of the LYSAGHT® brand story for 115 years – first published in 1897 in Melbourne as 'The Metal Trades' Referee and Storekeepers' Guide', even before our products were manufactured in Australia.

Today BlueScope Lysaght is acknowledged not just for the quality of its steel building products, but for its technical expertise and the numerous ways in which it provides this information to those who need it. That's a tradition which began with the first edition of The Lysaght Referee, a rich source of diverse information for builders, plumbers, business people, farmers,

architects, engineers, students – and just about anybody handy with the contents of a toolbox.

BlueScope Lysaght is proud to continue distributing this iconic publication. The latest Lysaght Referee maintains its contemporary technical relevance by reflecting the newest improvements and additions to our product range, but it also does something else that we hope you'll enjoy.

It acknowledges its origins by incorporating material first published in the very first Lysaght Referee. Take the time to glance through those pages and reflect on how our industry has changed over the years and what it might become in the future.

Some information in this edition has been provided by outside sources and recognised authorities. Whilst great care has been taken to ensure accuracy, no responsibility can be accepted for any errors which may have escaped the attention of the editors.

We hope you will find this latest edition of The Lysaght Referee as useful as did generations before you.

A
SOUVENIR OF THE
. . . DIAMOND JUBILEE.



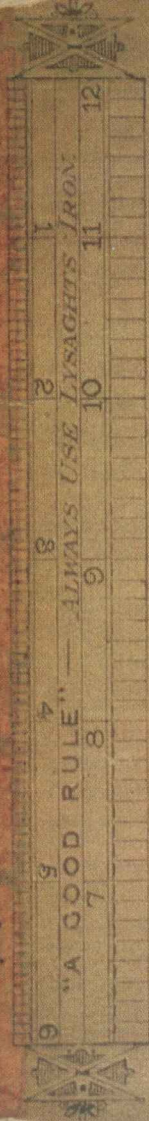
The
Metal Trades'
Referee
and Storekeepers'
Guide



Being a Table of
Weights, Measurements,
and Other
Useful Information.

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Lysaght's Trade Marks.



"ORB" Galvanised Corrugated Iron is favorably known and used throughout the world. Its uniformly reliable character is recognised by consumers everywhere. There are many imitations, but to those who compare its covering capacity with other nominally cheaper brands, its superiority in all respects is at once apparent.

"ORB" Tenax Flat Sheet Iron, for working up, is of the finest possible quality, suitable for special high-class work, and is, in many instances, used as a substitute for copper.



"QUEEN'S HEAD" Galvanised . . . Tinned Special Flat Sheets. This brand will stand the severest tests, and commands the confidence of iron-workers everywhere.

"BLACK SHEETS" of the same brand are extensively used by manufacturers of Ventilating and other Pipes, Trunks, Stoves, Fender Bottoms, Ovens, &c., and for all other purposes where a reliable quality is desired.



"FLEUR-DE-LIS" Galvanised . . . Tinned Flat Sheets enter largely into consumption, in the lighter gauges, for that class of work in which a somewhat cheaper sheet is asked for. It will be found equal to all such requirements.

1837

1897

A Diamond Jubilee.



IT may not be generally known that the introduction of GALVANISED IRON—now so important a feature of modern civilization—dates back only to 1837: the present year being in effect its **Diamond Jubilee.**

Earlier in the century various attempts had been made with a view to coating metals—chiefly by a galvanic process—which appear to have met with no commercial success. It is from these earlier methods that the term “Galvanised,” as applied to Iron, has come down to the present day.

In 1837, Mr. Henry Crawford, a commander in the R.N., obtained a patent for a method of coating metals with zinc, for preventing oxidation—thus paving the way for the introduction of what is now known as Galvanised Iron.

Amongst the more prominent workers in this field of invention were Messrs. Morewood & Rogers, of Birmingham, by whom various patents were obtained, and at the date of the great Exhibition, 1851, they had so far perfected their methods as to exhibit a Galvanised Plain Sheet, 8ft. x 3ft., for which they received a gold medal. Another firm also exhibited, at the same Exhibition, a more or less crude form of Corrugated Iron, of which no notice appears to have been taken in the awards. Shortly afterwards, Morewood & Rogers introduced a Patent Galvanised Tile, known as “Morewood’s Tile,” some of which, on older buildings, are extant to the present day.

The application of steam to the process of Corrugating by machinery—for which a patent was taken out in 1854—appears to have given a great stimulus to the trade, rendering possible (owing to the strength

imparted to the sheets by Corrugation) cheaper methods of fixing and lighter roofs than were previously in use. This occurring almost simultaneously with the great expansion of Colonial trade which succeeded the gold discoveries of California and Australia, the use of Galvanised Corrugated Iron for roofing, etc., became immediately popular, and a constantly extending business resulted.

In the early history of the trade, the Gospel Oak brand, for a time, occupied a leading position; but the brands of most of the other pioneers of this industry have since sunk into comparative oblivion.

A little later on—about 1860—a new brand of Galvanised Iron, possessing many remarkable features and uniformity of quality, known as LYSAGHT'S "ORB" BRAND, began to attract the attention of the trade—its manufacturer being Mr. John Lysaght, of Bristol, an engineer by profession, an energetic, far-seeing man, who, from a very small foundation, year by year worked his way up to the very foremost position in the trade; sparing no expense to secure the very best appliances, and personally superintending every important detail of its manufacture; establishing also Sheet Iron Works at Wolverhampton, embracing every process from Iron in its crude form to the finished sheet, thus securing that uniformity of quality for which "ORB," "QUEEN'S HEAD," "FLEUR DE LIS," and other brands of this maker are so pre-eminent.

Although the founder has passed away, the works he has established at Bristol (embracing not only Galvanised Iron, but the manufacture of structural parts for Iron buildings—such as railway stations, wharf and dock warehouses, churches, etc., and the manufacture of wire netting), remain as a monument of his industry; and the business of John Lysaght Limited, which, by the exercise of remarkable foresight and energy he so successfully built up, is being

continued by his successors under like progressive conditions, providing employment for an army of some 4000 trained hands, and pressing onward to still greater achievements.

Already (to meet the growing necessities of the trade) preparations are being made for the erection of additional Black Sheet works at Newport, Mon., where an area of some 70 acres, with water carriage facilities, has been secured, thus permitting of the production of Steel and other sheets under more favorable conditions than have hitherto existed, and enabling the Company to keep its manufactures well abreast of the times.

The facilities for its production and the care displayed in its manufacture have secured for LYSAGHT'S GALVANISED IRON an unrivalled reputation throughout the world ; and while it is true that the sun never sets on the Queen's dominions, it is equally true that there is scarcely a country throughout the whole civilised world in which LYSAGHT'S "ORB" BRAND Galvanised Iron may not be found.

Other brands almost too numerous to mention have from time to time been placed on the market by various makers, all competing for public favor, their claims to attention being, in many instances, based on an assumed lowness of price rather than on excellence of quality.

The enormous proportions which the production of Galvanised Iron has reached in Great Britain (exceeding 230,000 tons *per annum*) would, in its earlier history, have been deemed incredible, and the area of its adaptability is constantly being extended, embracing purposes little thought of at its inception. It has revolutionized methods of construction as regards building, and has proved itself to be one of the most important evolutions of economic science for which

the "record reign" of Queen Victoria has been so pre-eminently distinguished.

Who will venture to say that science has spoken its last word in relation to improved processes of manufacture? or that a product such as Galvanised Iron, which has become a necessity of modern life, and which contributes so much to the comfort and convenience of mankind in general, has reached its ultimate development!!!

June 22nd, 1897.

THE tables given herein have been carefully compiled from various existing sources; no originality is, therefore, claimed for them.

They supply in a condensed form information not otherwise readily accessible, thus affording a convenient REFERENCE to both Principal and Assistant in the many cases in which approximate information at a glance is of more importance than mere mathematical exactness.

Suggestions for improvements or additions thereto, with a view to incorporation in any later addition, will be thankfully received, and may be addressed:—

THE PUBLISHER,

Metal Trades Referee,

230 FLINDERS LANE,

MELBOURNE.

Weight-Bearing Iron.

Approximate Weight per Square Foot.
(Corrugations 4 inches wide by 2½ inches deep).

Gauge.	WEIGHT.	
	Ibs.	ozs.
16	5	8
18	4	4
20	3	12
22	2	14
24	2	6

LYSAGHT'S Weight-bearing Iron is of the well-known "Orb" brand of English manufacture, and has secured the highest approval of architects and others wherever it has been used. It is made in almost any desired Corrugation or Gauge, black or galvanised, curved or otherwise.

Galvanised Corrugated Iron.

Approximate No. of Sheets to a Case (Ordinary Corrugations) weighing about 10 cwt.

Length.	GAUGES.					
	18	20	22	24	26	28
5 feet	47	56	65	83	115 <i>up</i>	124 <i>132</i>
6 "	39	46	55	70	96 ✓	103
7 "	33	40	47	60	82 ✓	88
8 "	29	35	41	52	72 ✓	77
9 "	26	30	36	47	64 ✓	68
10 "	23	28	33	42	57 <i>36</i>	61



LYSAGHT'S "Orb" Brand Corrugated Iron usually contains sheets in excess of the numbers given in the above tables, and is made in all lengths up to 12 feet, the heavier gauges to special order. Corrugations from 1 to 5 inches, those chiefly in use being 1-inch for ceilings, fences, &c., and 3-inch for ordinary purposes.

Lysaght's Trade Marks.



**"NEW GUINEA" Galvanised . . .
Corrugated Sheets.** This brand is
manufactured principally for the West Indies,
Java and Phillippine Islands, &c., &c.



**"GLOBE" Galvanised Corrugated
Sheets,** used chiefly in the South American,
Indian and South African Markets.



"REDCLIFFE" Corrugated Iron.—
A brand of well-established repute and in
large demand—occupying a premier position
in those markets in which price is a primary
consideration.



**"WEIGHT BEARING" Iron—Lysaght's
"ORB" brand,** used for building purposes
maintains the maker's reputation, and may
be specified by Architects and Engineers in the
full confidence that it will justify their preference.

INTRODUCTION TO BLUESCOPE STEEL

BlueScope Steel is the leading steel company in Australia and New Zealand, supplying a large percentage of all flat steel products for the building, construction and manufacturing industries of Australasia, South-East Asia, the United States of America, and the Pacific Rim, with worldwide distribution through a global network of sales offices.

We specialise in the production of flat steel products, including slab, hot rolled coil, cold rolled coil, plate and value-added metallic coated and painted steel solutions. Our steelworks at Port Kembla in New South Wales is the largest steel production facility in Australia and one of the world's lowest-cost producers of steel products.

Within Australia, our BlueScope Lysaght business rollforms and supplies a range of steel building products, including roof and wall cladding, rainwater products such as guttering and downpipes, fencing, structural products such as purlins and flooring systems, and home improvement products. LYSAGHT® products are sold through many distributors and suppliers Australia-wide.

BlueScope Water is a specialist Australian business established to develop rainwater harvesting and stormwater management systems. The comprehensive offer of WATERPOINT® and Pioneer water storage tanks provides an ideal solution for rainwater harvesting and water storage systems for many applications in Australia.

BlueScope Steel operates the only integrated flat products steelworks in New Zealand. In North American markets, the Company is well known for its outstanding range of steel products including premium quality hot rolled coil from its 50% joint venture in North Star BlueScope Steel, Steelscape's range of high quality metallic coated and painted steels such as Z-NAL®, TruZinc®

and SPECTRASCAPE® steels, Butler Manufacturing and VP Buildings' range of customised steel pre-engineered buildings for the non-residential market, and ASC Profiles' range of innovative steel building components.

BlueScope Steel is a global leader in pre-engineered steel buildings, with significant market share in the world's most populous growth regions of United States and China.

Metallic coating and painting plants are located in Australia, New Zealand, China, Thailand, Malaysia, Vietnam and Indonesia. These facilities are complemented by a network of roll-forming facilities across the Asia Pacific region that are unmatched by any other steel company. Tata BlueScope Steel, our 50% joint venture with Tata Steel further enhances our distribution channel throughout Southern Asia.

We supply customers in Australia, New Zealand, Asia, the US, Europe, the Middle East, the Pacific and elsewhere with purpose-designed products backed by comprehensive after-sales service, technical support, and transport and logistics capability.

Going forward, BlueScope Steel is focused on growth in the global pre-engineered building market and building products market, further reducing costs and maintaining value in its existing businesses.

BlueScope Steel's key strengths include low-cost operations, strong brands, leading domestic market positions, and a growing presence in the markets of Asia. You may know BlueScope Steel best for its value-added brands including COLORBOND® steel (known as COLORSTEEL® in New Zealand), ZINCALUME® metallic coated steel, GALVABOND® and GALVASPAN® steel - all leaders in their markets in Australia and New Zealand - as well as the famous LYSAGHT® brand, a name synonymous with quality steel building products in Australia for well over a century.



In Asian markets, BlueScope Steel is continuing to develop branded products tailored to meet specific regional needs, such as Clean COLORBOND® steel which is resistant to tropical discolouration.

BlueScope Steel has led the way in developing tailored solutions to customers' product requirements. Focused on being responsive to customers' needs, BlueScope Steel is widely recognised for fostering the development of innovative steel solutions through its own research and through strategic alliances with world-leading technical partners.

BlueScope Steel has led the industry with value-adding technologies such as metallic coating. Solid paint technology is another innovation currently being commercialised. The company is continuing to explore opportunities to break new ground in steel markets.

The markets BlueScope Steel has been building throughout Asia offer exciting growth potential. Having traded in Asia for over six decades, BlueScope Steel has forged strong relationships based on trust and reliability - principles highly valued in the region. This has allowed the company to build a strong market profile and attract an expanding range of customers throughout Asia.

To serve customers' needs directly, over recent years BlueScope Steel has built manufacturing facilities in a number of Asian countries and these are now operating efficiently and growing rapidly in profitability. We are looking to further develop these established businesses and take advantage of the significant potential for growth in countries such as China and Vietnam, and build on our aim to be a world-class manufacturer of high-value steel products and solutions, primarily for the global building and construction market.

Led by Chairman Graham Kraehe and Managing Director and Chief Executive Officer Paul O'Malley, BlueScope Steel has an experienced and energetic Board of Directors and Management Team dedicated to maximising value for shareholders.

OUR BOND

We and our customers proudly bring inspiration, strength and colour to communities with BlueScope Steel.

OUR CUSTOMERS ARE OUR PARTNERS

Our success depends on our customers and suppliers choosing us. Our strength lies in working closely with them to create value and trust, together with superior products, service and ideas.

OUR PEOPLE ARE OUR STRENGTH

Our success comes from our people. We work in a safe and satisfying environment. We choose to treat each other with trust and respect and maintain a healthy balance between work and family life. Our experience, teamwork and ability to deliver steel inspired solutions are our most valued and rewarded strengths.

OUR SHAREHOLDERS ARE OUR FOUNDATIONS

Our success is made possible by the shareholders and lenders who choose to invest in us. In return we commit to continuing profitability and growth in value, which together make us stronger.

OUR COMMUNITIES ARE OUR HOMES

Our success relies on communities supporting our business and products. In turn, we care for the environment, create wealth, respect local values and encourage involvement. Our strength is in choosing to do what is right.

BLUESCOPE STEEL BUSINESSES AND LOCATIONS

It is not practical to list all BlueScope Steel Offices in this publication. Please visit www.bluescopesteel.com for more information. A selection of businesses featured in The Referee are shown below:

CORPORATE HEAD OFFICE

120 Collins Street, Melbourne, Victoria 3000

Tel: (61 3) 9666 4000

www.bluescopesteel.com

COATED AND INDUSTRIAL PRODUCTS AUSTRALIA

www.bluescopesteel.com.au

Produces a wide range of steel products for Australian and International internal and external customers including slab, hot rolled coil and plate, cold rolled coil, zinc/aluminium alloy coated ZINCALUME® steel, galvanised and pre-painted COLORBOND® steel.

Coated and Industrial Products Australia incorporates the following facilities:

- Port Kembla Steelworks - and integrated steelmaking operation.
It manufactures slab, hot rolled coil and plate products.
- Metallic coating and painting facilities located in Springhill, NSW and Westernport, Victoria.
- Steel painting facilities in Western Sydney, NSW and Acacia Ridge, QLD.

BLUESCOPE DISTRIBUTION:

Tel: (61 3) 8540 8600

www.bluescopedistribution.com

Operates an integrated network of over 100 metropolitan and regional sites around Australia that offer a diverse range of flat and long steel products to customers operating in industries including manufacturing, building and construction, mining, automotive and transport, infrastructure and agriculture.

BlueScope Distribution offers processing services which range from simple cutting, slitting and stamping of coil to complex multiple precision processing of plate and beams.

Their product range includes steel plate, sheet and coil, reinforcing fabric, bar, building products, merchant bar, structural steel, tubular and aluminium products.

BLUESCOPE LYSAGHT:

Product Information: 1800 641 417

www.lysaght.com

Produces and markets the extensive range of LYSAGHT® rollformed steel building and industrial products throughout Australia. Steel roofing and walling products are probably the most visible, but this business also manufactures purlins and girts, structural decking, steel rainwater goods, fencing, a range of light steel sections, and products for the home improvement market. The company pioneered the introduction of corrugated steel roofing in Australia and operates extensive product development and engineering facilities. Sales offices are located in all capital cities and many regional towns, and their products are available from distribution outlets nationwide.



SHEET METAL SUPPLIES

Tel: 1800 010 247

www.sheetmetalsupplies.com.au

Sheet Metal Supplies offers a diverse range of sheet and coil steel products, comprising galvanised, zinc coated, aluminium zinc coated, hot rolled, cold rolled, pre-painted, aluminised, COLORBOND® and ZINCALUME® steel.

METALCORP STEEL

Tel: 1300 306 204

www.metalcorpsteel.com.au

Metalcorp Steel provides a large range of steel products and operates through a growing steel retail network across Australia.

BLUESCOPE WATER

Tel: 1800 654 774 (FREECALL)

www.bluescopewater.com.au

BlueScope Water is a manufacturer of steel based products for the water industry. Products include WATERPOINT® and Pioneer tanks.

BLUESCOPE STEEL ASIA

Tel: +65 6333 3378

Fax: +65 6231 1995

www.bluescopesteelasia.com

BlueScope Steel operates in Malaysia, Singapore, Brunei, Thailand, Indonesia, Vietnam, India and Sri Lanka. Its facilities include metallic coating and painting lines and BlueScope Lysaght operations.

BLUESCOPE STEEL CHINA

Tel: +86 21 6841 1898

Fax: +86 21 6841 1760

www.bluescopesteel.com.cn

In China, BlueScope Steel operates three businesses: BlueScope Steel Suzhou, BlueScope Butler and BlueScope Lysaght. Our operations comprise a metallic coating and painting facility, seven world class building systems manufacturing facilities and 32 sales and marketing offices.

Lysaght has four manufacturing centres and offers a broad product range in China. Products include roofing, walling and purlins that have been extensively used in power stations, industrial plants, sport stadiums, airport buildings, railway stations and exhibition centres. Lysaght structural decking has also been widely used in high-rise buildings.

The new metallic coating and coil painting facilities within China complement the long established Lysaght rollforming and Butler PEB businesses extensively operated throughout the country in over 60 locations. These businesses provide comprehensive, customised and value-added building solutions designed to meet the customer's specific needs.

TATA BLUESCOPE STEEL

Tel: +91 20 6621 8000

Fax: +91 20 6621 8011

Tata BlueScope Steel is an equal joint venture between Tata Steel and BlueScope Steel operating in the South Asian Association for Regional Cooperation (SAARC) region. Tata BlueScope Steel has three divisions, namely, Coated Steel, Building Solutions and Building Products and Distribution. The Coated Steel business markets metallic coated and pre-painted steel for the building and construction industry. The Building

Solutions business manufactures pre-engineered building solutions. Its brands include Butler Building Systems. The Building Products and Distribution business manufactures and rollforms roofing and walling and related building components. Its brands include Lysaght®.

NEW ZEALAND STEEL LTD

Tel: (64 9) 375 8999

Fax: (64 9) 375 8959

www.nzsteel.co.nz

New Zealand Steel operates an integrated steelworks at Glenbrook, south of Auckland serving domestic and export markets with flat and coated products, hot-rolled coils, sheet and plate for pipe making, heavy and light engineering and barge construction; cold rolled steel for tubing; hollow sections for agricultural products, commercial construction and reticulation; and coated steels for construction.

HOT ROLLED PRODUCTS NORTH AMERICA

North Star BlueScope Steel LLC

Tel: 1 419 822 2200

Fax: 1 419 822 2209

www.northstarbluescope.com

A 50-50 joint venture between BlueScope Steel and North Star Steel based in Delta, Ohio. It uses leading edge technologies to produce hot rolled coil.

COATED AND BUILDING PRODUCTS NORTH AMERICA

Is engaged in the manufacturing, construction and sale of pre-engineered buildings, metal coating and painting, the manufacture of insulated panels and building components. The segment represents the most recent addition to BlueScope Steels global operations and includes:

- BlueScope Buildings - is a fully integrated business and includes Butler Buildings, HCI Buildings, Varco Pruden Buildings. The group designs, manufactures and markets PEB's and component systems.
www.bluescopebuildings.com
- Steelscape, Inc. - a producer of metal coated and painted steel coils.
www.steelscape.com
- Metl-Span - a leading North American manufacturer of insulated steel panels for commercial, industrial and cold storage buildings.
www.metlspan.com
- ASC Profiles Inc. - a leading North American manufacturer of building components including architectural roof and wall systems and structural roof and floor decking.
www.ascprofiles.com

Please refer to the Building Solutions section for further information about the following businesses:

PERMALITE® ALUMINIUM ROOFING SOLUTIONS

Tel: 1300 850 389

www.permalite.com.au

RANBUILD SHEDS

Tel: 1300 726 284

www.ranbuild.com.au

THE ROOFING CENTRE TASMANIA

www.roofingcentretas.com.au

KITELEY'S ROOFING WORLD

www.kiteleys.com.au

ADVANCED FENCING

www.advancedfencing.com.au

METALFORM

www.metalform.net.au

BLUESCOPE PIPELINE SUPPLIES

Tel: 1300 661 156

www.bluescopepipelinesupplies.com

Offers a wide range of steel pipe and fittings to service mining, fire and mechanical, utilities and rural industry customers throughout Australia.

BLUESCOPE STEEL DIRECT

Tel: 1800 800 789

Fax: 1800 800 744

www.bluescopesteel.com.au

BLUESCOPE STEEL - A LONG AND PROUD HISTORY

BlueScope Steel is one of the newest names in the global steel industry, yet it has a long and proud history as an efficient, trusted and innovative steel maker.

The company evolved from the coming together of three companies that pioneered the Australian steel industry in the early 20th Century – The Broken Hill Proprietary Company Limited (BHP), John Lysaght (Australia) Pty Ltd (Lysaght's) and Australian Iron and Steel Limited (AI&S) – with the more recent acquisitions of international companies, New Zealand Steel, Butler Manufacturing Company, Smorgon Steel Distribution and IMSA Steel Corporation. The three original companies were led by pioneers of the Australian steel industry - John Lysaght, the Hoskins brothers, and the man who persuaded BHP to go into steel, Guillaume Delprat.

The story of these three companies begins as early as 1857, when John Lysaght bought a small galvanising works in Bristol, England, and selected "Orb" as the brand his product would carry. From the early years, much of the galvanised iron had been exported, with Australia as an important consumer. At this time, each individual merchant was buying direct from England though this arrangement had not proved very successful for the parties involved. John Lysaght decided to establish a Central Selling Agency in Australia through which all Australian sales would be made. The agency was opened in Melbourne in 1880 with other branches to follow in other Australian states. During this time the first Lysaght Referee was distributed through the Australian market.

BHP at the time had developed into a successful mining company following Charles Rasp's discovery of the world's richest known deposits of silver, lead and zinc at Broken Hill in 1883. For more than 45 years, the BHP Big

Mine was to produce fabulous wealth for its owners and make a substantial contribution to the growth of Australia's economy.

In 1912, BHP's General Manager Guillaume Delprat took his vision for an Australian steel industry to the directors of BHP. At his urging work began on a new steelworks at Newcastle in New South Wales, that for many years were to be the backbone of BHP's steelmaking operations. In 1915 the steelworks was completed and officially opened by Governor-General Sir Reginald Ferguson and while World War One and the depression hampered activities in the early years, BHP successfully forged ahead, experiencing significant growth.

In 1914 to 1918 the galvanised iron production capabilities of Lysaght's in Bristol, England was crippled as a result of World War One. The meagre resources available were mainly directed at the special needs of war and emphasised the isolation of the Australian business and its dependence on British production. The dangerous significance of this situation was realised very early by the firm and arrangements were made at Newcastle to erect a galvanised iron manufacturing facility beside BHP's new steelworks. To mark the coming of an era the Australian organisation was renamed John Lysaght (Australia) Pty Ltd and the head office was transferred from Melbourne to Sydney.

Meanwhile, Charles and George Hoskins were experiencing great success in running an iron foundry business in Ultimo, Sydney. Using their highly developed skills and knowledge, the Hoskins brothers took over William Sandford's ailing Lithgow Steelworks in 1907 (originally opened in 1876) and became the first people to profitably make steel in Australia. Under Sandford's management the Steelworks had not proved financially viable, and it soon became clear to Charles Hoskins that Lithgow was not a suitable location for the plant. Despite this, and the increasing competition from BHP, the Lithgow works flourished during World War One with the manufacture of many special steels that could no longer be imported.

However, during the early 1920s, the Lithgow works continued to fall behind the increasingly technologically sophisticated BHP works in Newcastle. In 1924, Charles Hoskins and his son Cecil acquired land at Port Kembla for the development of an integrated steelworks. Port Kembla was the obvious choice for the steelworks given its deep water harbour, high quality coal deposits, family owned coke ovens at nearby Wongawilli, proximity to limestone deposits at Marulan and the reasonably close proximity to the NSW capital, Sydney.

The steelworks was carefully planned to avoid the inefficiencies of the Lithgow works and allow for future growth and development. The plans included facilities not only for making steel, but also for production of rolled steel sheets. The financial requirements of its development led to the formation of a new company, Australian Iron and Steel Limited in 1928. Charles Hoskins died in 1926 but his sons continued his work and on 29 August 1928 Charles' widow Emily commissioned the No. 1 Blast Furnace.

BHP acquired AI&S in 1935, and at this time made an offer to sell the sheet steel facilities to Lysaght's, provided they installed and operated a sheet plant at Port Kembla with an output double that of the existing AI&S plant. The official purchase went through in March 1936, and Lysaght's designed and erected the Lysaght Springhill plant adjoining the AI&S facilities. During its construction, production continued at the AI&S plant until 1939 when the new Lysaght Springhill plant was completed.

With BHP and Lysaght's now with significant interests in Newcastle and Port Kembla, both companies continued to grow and prosper. Numerous improvements to the plants and facilities occurred, domestic and international foot prints broadened and significant steel product innovations were launched.

The 1960s was a big decade for Lysaght's as they launched COLORBOND® steel into the market, closed the Newcastle sheet steel plant, purchased a 600 hectare site at Western Port to build a vast new steel mill and

BHP acquired a 50% share in their ownership. In 1971, Lysaght's acquired the steel building products division of Brownbult resulting in a merger of the similar product offers and renamed the building products division Lysaght Brownbult Industries. This placed them as the biggest steel building products supplier in Australia.

The remainder of the 1970s continued as a significant time in Lysaght's history as the Western Port facilities were commissioned, ZINCALUME® steel was launched and BHP acquired the remaining 50% of John Lysaght (Australia) Pty Ltd in 1979 from British firm GKN (Guest Keen & Nettlefords Limited) which had superseded John Lysaght as the parent company. This acquisition was the final step in bringing together three separate ventures into one proud company.

In 1985, BHP restructured the business and John Lysaght (Australia) Limited became known as the Coated Products Division of BHP Steel. It incorporated all aspects of the old company with the sheet manufacturing business operating as Sheet & Coil Products. Lysaght Brownbult Industries was the only divisional unit of Coated Products division to retain the original Lysaght name which is synonymous with high quality steel building products though retired the Brownbult name and became known as Lysaght Building Industries in 1987.

The 1980s and 90s saw major changes in the industry and the growth of BHP's steel business in South-East Asia. BHP made huge investments in modernisation, but it was also a period of consolidation and rationalisation which saw the closure of the Newcastle Steelworks, the acquisition of New Zealand Steel, and the Lysaght name was retired as Lysaght Building Industries and became known as BHP Building Products and later reintroduced as BHP Steel Lysaght in 1999.

In 2000, the long products business became OneSteel Limited, an independent, publicly listed company and then in 2001, having merged with Anglo-South African mining company Billiton Plc, BHP decided to quit steel altogether. Its remaining steel business was floated on the Australian Stock Exchange in 2002 as an unrelated public company, which today is BlueScope Steel Limited. Since the public listing BlueScope Steel has expanded further into Asia with the development of new plants in China, Indonesia, Thailand and Vietnam.

In 2004, BlueScope Water commenced operations in Australia as a supplier of premium rainwater harvesting and stormwater infrastructure systems. The same year the company acquired the United States based Butler Manufacturing Company, which had started life in the early 1900s, manufacturing grain bins in the United States and has grown to become the leader in pre-engineered metal buildings in North America and China. The most recent acquisitions mark another significant move in BlueScope Steel's history with the purchase of the Smorgon Steel's distribution business (now BlueScope Distribution) in 2007 and IMSA Steel Corporation in North America in 2008.

BlueScope Steel also has a fifty percent interest in North Star BlueScope Steel, a steel mini mill in Ohio in the United States, which was commissioned in 1995. In 2005, BlueScope Steel entered another fifty-fifty joint venture with Tata Steel to establish manufacturing facilities for zinc/aluminium metallic coated steel, painted steel, rollformed steel products and pre-engineered buildings in India and South Asia.

Today, BlueScope Steel employs 17,000 people in 17 countries, with over 100 manufacturing facilities worldwide. It is a recognised global leader in safety, and is engaged in a range of initiatives to improve environmental performance and the sustainability of steel products.

REFEREE HISTORY

The Lysaght Referee has been an Australian building and construction industry institution since its first publication in Melbourne in 1897 as "The Metal Trades Referee and Storekeepers Guide".

With over one hundred and fifteen years in circulation, this long and proud tradition has seen the publication of thirty-three editions. The eleventh edition saw the first publication under the title "The Lysaght Referee", coinciding with the opening of Lysaght's first Australian factory at Newcastle in New South Wales, and the first Australian production of ORB® brand galvanised corrugated steel sheet.

To browse through all the editions of the Referee is to take a journey through the history of a company and a country, as well as to learn something of the various trades and citizens catered for by the handbook. One sees reference to old Lysaght brand names, prices, terms, how to detect signs of or treat ague, apoplexy, delirium tremens, rupture, snake bite, sore feet or sunstroke. Key highlights in Australian history can also be noted, such as the conversion from imperial to metric systems of weights and measures and implementation of the decimal currency system.

Compare the content in this thirty-third edition of The Lysaght Referee to that of the first and you will notice vast developments in the progressive steel industry over time. The first edition contained only thirty-two pages, a far cry from the 400 pages detailed in this edition. The diversification and development of the Lysaght business and products through time are detailed throughout each edition of the handbook. Exploring buildings and architectural history along with the Lysaght Referees of that time demonstrates the way BlueScope Steel and LYSAGHT® products have helped shape the Australian built environment over the past one hundred and fifty years.

Now considered unique and sometimes quirky, the relevance of the “useful” and “general” information sections is now regarded as company heritage within the handbook and the publishers feel it important to maintain these historical qualities. Information such as stock breeding tables and hay stack volume calculations were included to assist farmers and are known by the company to still be used today.

The Lysaght Referee is a sought after publication with many avid collectors endeavouring to grow complete sets of the thirty-three editions. Early editions of the handbook have been known to be sold in secondhand bookstores and in more recent years have even been available for auction on eBay. A full list of the titles and publication years of The Lysaght Referee is detailed below:

Edition No	Year	Title
1st	1897	The Metal Trades' Referee and Storekeepers' Guide
2nd	1900	The Metal Trades' Referee and Storekeepers' Guide
3rd	1906	The Metal Trades' Referee and Storekeepers' Guide
4th	1908	The Metal Trades' Referee and Storekeepers' Guide
5th	1908	The Metal Trades' Referee and Storekeepers' Guide
6th	1910	The Metal Trades' Referee and Storekeepers' Guide
7th	1912	The Metal Trades' Referee
8th	1914	The Metal Trades' Referee With Other Useful Information
9th	1916	The Metal Trades' Referee With Other Useful Information
10th	1918	The Metal Trades' Referee With Other Useful Information
11th	1920	The Referee. A Handbook of Useful Information
12th	1922	The Referee. A Handbook of Useful Information
13th	1923	The Referee. A Handbook of Useful Information
14th	1924	The Referee. A Handbook of Useful Information



Edition No	Year	Title
15th	1927	The Referee. A Handbook of Useful Information
16th	1934	Lysaght's Referee. A Handbook of Useful Information
17th	1938	Lysaght's Referee. A Handbook of Useful Information
18th	1950	Lysaght's Referee. A Handbook of Useful Information
19th (Centenary)	1957	Lysaght's Referee. A Handbook of Useful Information
20th (Centenary)	1957	Lysaght's Referee. A Handbook of Useful Information
21st	1961	Lysaght Referee. A Handbook of Useful Information
22nd	1963	Lysaght Referee. A Handbook of Useful Information
23rd	1967	Lysaght Referee
24th	1972	Lysaght Referee
25th	1974	Lysaght Referee
26th	1981	Lysaght Referee
27th	1985	The Referee
28th	1988	The Referee. A Handbook of Useful Information
29th (Centenary)	1997	The Referee
30th	1999	Lysaght Referee
31st	2005	Lysaght Referee
32nd	2008	Lysaght Referee
33rd	2012	Lysaght Referee - 33rd Commemorative Edition

UNDERSTANDING STEEL

WHAT IS STEEL?

Have you ever tried to imagine your world without steel? It's the metal that provides you with cars, bridges, trains and buses for transport, house frames, roofs and fences for protection, sporting equipment and venues for leisure, and electrical appliances and furniture for comfort and convenience.

Steel is a general term for iron containing small amounts of carbon, manganese and other elements.

Steel is used to make such a wide range of products because it possesses many useful features which can be controlled and slightly changed to suit a particular purpose.

IRONMAKING

In traditional blast furnace technology, iron is extracted from iron ore at high temperatures in a reduction process. Coke and fluxes are the other materials required in this process.

BASIC OXYGEN STEELMAKING

A Basic Oxygen Steelmaking (BOS) vessel holds about 280 tonnes of steel. Molten iron and scrap are charged into the vessel. Almost pure oxygen is blown into the vessel, causing the temperature to rise and carbon content to be lowered. The resulting product is molten steel. This is the method used at BlueScope Steel's integrated steelworks at Port Kembla.

ELECTRIC ARC FURNACE STEELMAKING

An Electric Arc Furnace (EAF) is used to produce new steel from scrap metal or other iron feed such as HBI (Hot Briquetted Iron). Electrodes produce arcs of electricity to the charge, which melt the iron and reduce it to molten steel. This is the method used at the company's Delta, Ohio, operations in the USA.

CASTING

Liquid steel is cast continuously into lengths so it can be rolled into a variety of shapes and sizes.

ROLLING

Cast steel is a relatively weak mass of coarse, uneven metal crystals, or 'grains'. Rolling causes this coarse grain structure to recrystallise into a much finer grain structure, giving greater toughness, shock resistance and tensile (stress) strength.

Rolling is the main method used to shape steel into different products. There are two types of rolling – hot and cold.

The rolling process (for both hot and cold) consists of passing the steel between two rolls revolving at the same speed but in opposite directions. The gap between the rolls is smaller than the steel being rolled, so that the steel is reduced in thickness and at the same time lengthened.

COATING AND PAINTING

Some cold-rolled products are coated with other metals or paint to protect the steel surface, or to give the steel special characteristics.

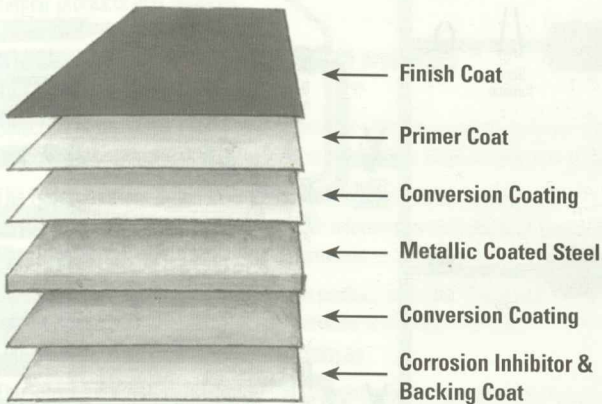
ZINCALUME® steel is steel strip with a coating of 45% zinc and 55% aluminium. The coating makes the steel more corrosion resistant.

The process involves cleaning, annealing and then coating the strip. Annealing is a general term which describes processes that clean and soften the steel and prepare it for further machining.

The strip enters a coating bath that contains the heated zinc/aluminium mixture. The strip then passes by Jets that control the amount of metal coating by blowing off any excess.

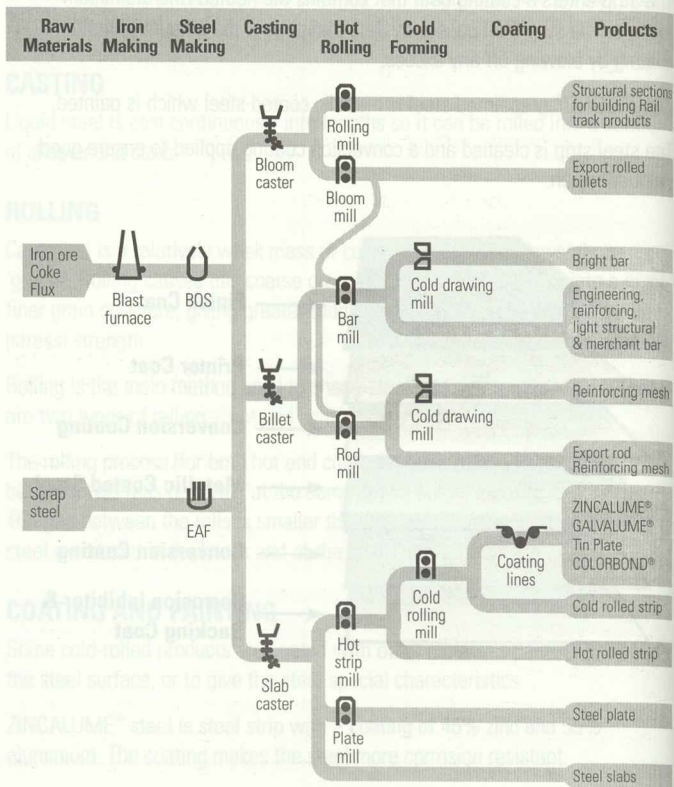
COLORBOND® prepainted steel is metallic coated steel which is painted.

The steel strip is cleaned and a conversion coating applied to ensure good paint adhesion.



THE STEEL PATHWAY

The pathway from raw material to finished steel product is a complex one. This chart shows the main steps involved in the process.



CUSTOMER SUPPORT

The many contributors to this handbook, including government authorities and associations, offer information and support services. Where possible, we have identified the source.

The Referee's aim is to supply general information to a wide range of businesses and trades. For that reason, it cannot hope to cover all aspects of each subject.

We suggest the reader contact the individual supplier of goods or services for any additional information. There are also a number of suppliers of quality steel sections and/or products utilising BlueScope Steel products offering similar products and services.

STEEL – CORRECT SELECTION FOR USE AND TECHNICAL SERVICES

Selection of the correct steel type or product with the appropriate finish is the first and perhaps most important step in producing a finished article or goods.

The Referee offers broad information about steel in the building and construction industry. For more in-depth information on individual products, BlueScope Steel offers a number of avenues.

BlueScope Steel has a comprehensive product website. The latest information on all our products and services is available for your convenience at www.bluescopesteel.com.au

The latest information related to the Lysaght product range can be found at www.lysaght.com

In each State capital and in some regional centres, there is a BlueScope Steel sales office with staff trained to assist customers in the selection of the most cost effective material for their requirements. BlueScope Steel staff

can also help solve problems which may arise through the application of this material. Printed data and other information on steel sheet products are freely available.

Product information is also available from BlueScope Steel's Customer Support Centre, Port Kembla, referred to as Steel Direct:

Tel: 1800 800 789 Fax: 1800 800 744

AUSTRALIAN STEEL INSTITUTE

Australia's steel industry employs 91,000 people and has an annual turnover of \$29 billion. The Australian Steel Institute (ASI) was, formed in 2002 from the amalgamation of two long established steel bodies, the Australian Institute of Steel Construction (AISC) and the Steel Institute of Australia (SIA), as the peak industry association representing this important sector of the Australian economy.

Vision: To influence profitable growth for the complete Australian steel value chain.

Mission: To deliver increased use of Australian steel and improved industry competitiveness in construction and other strategic markets.

Membership of ASI covers the full spectrum of companies and individuals involved in the manufacture, distribution, rollforming, fabrication, design, detailing, education, surface protection and construction of steel.

Membership also includes suppliers of goods and services to the industry.

The head office of the Australian Steel Institute is at:

Level 13, 99 Mount Street

North Sydney NSW 2060

Phone 02 9931 6666

Fax 02 9931 6633

For more information visit the ASI web site at www.steel.org.au

HOT ROLLED PLATE

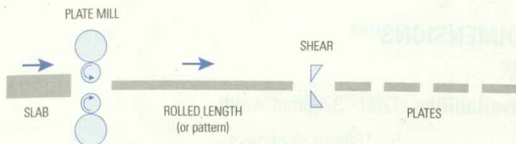
Hot rolled plate steel products, including plate (branded as XLERPLATE®) and coil plate, are manufactured by BlueScope Steel in a wide range of width, length, thickness and grade combinations.

For information and availability of XLERPLATE® and Coil Plate, both of which can be purchased through a national distribution network you can contact BlueScope Steel Direct on 1800 800 789 or visit our website

www.xlerplate.com.au

XLERPLATE® is a product rolled on the plate mill at Port Kembla, New South Wales, and is produced to the AS/NZS 3678 and AS1548 standards.

XLERPLATE® Production Flow



Coil Plate is a product rolled on a continuous hot strip mill and then cut to the required length. BlueScope Steel's grades are supplied to AS/NZS 1594 standard.

Coil Plate Production Flow

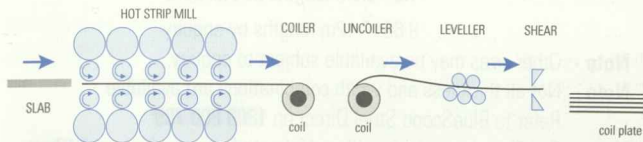


PLATE GRADES

XLERPLATE® and Coil Plate are available in structural, analysis, boiler and pressure vessel grades. Visit www.xlerplate.com.au to download the current datasheets.

Structural Grades (AS/NZS 3678) - Plate for structural applications including floor plate.

Analysis Grades (AS/NZS 3678) - Plate that meets a specific chemical composition.

Boiler & Pressure Vessel Grades (AS 1548) - Plate designed for boiler and pressure vessel applications.

XLERPLATE LITE® (AS/NZS 1594) - Coil Plate in a range of structural, formable and analysis grades.

PRODUCT DIMENSIONS⁽¹⁾⁽²⁾

XLERPLATE®

Dimension Availability: 1200 - 3200mm width
5 - 150mm thickness
2.4 - 18.3m lengths

XLERPLATE LITE® Coil Plate

Dimension Availability: 910 - 1500mm width
1.6 - 12mm thickness⁽³⁾
1.2 - 9.6m lengths as standard
9.601 - 12m lengths by enquiry

⁽¹⁾ **Note** - Other sizes may be available subject to enquiry.

⁽²⁾ **Note** - Not all thickness and width combinations are available.

Refer to BlueScope Steel Direct on **1800 800 789**.

⁽³⁾ **Note** - Coil Plate is available with a thickness between 3mm and 12mm.

XLERPLATE® AND COIL PLATE MASS CALCULATIONS

Plate Mass (t) = Density (t/m³) x width (m) x length (m) x thickness (m)

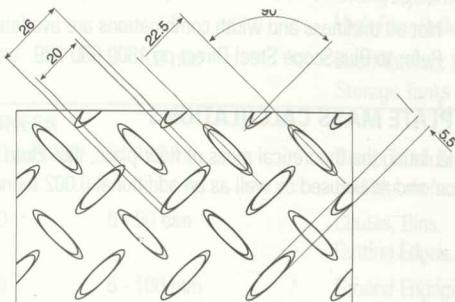
Mass = 7.85 x 3 x 9 x 0.01

= 2.120t

FLOOR PLATE

Floor Plate is characterised by a raised angular pattern (see diagram) rolled on to one surface. The nominal thickness of floor plates is exclusive of the raised pattern.

XLERPLATE® Floor Plate is produced on the plate mill to AS/NZS 3678-250. Coil Floor Plate is produced on the hot strip mill to AS/NZS 1594-HA250.



FLOOR PLATE PRODUCT DIMENSIONS

XLERPLATE® Floor Plate

Dimension Availability: 1800mm width
6 - 12mm thickness
6m lengths

Coil Floor Plate

Dimension Availability: 1200 and 1500mm width as standard⁽¹⁾
2.1, 3, 5, 6, 8mm thicknesses⁽²⁾
1.2 – 9.6m lengths as standard
9.601 – 12m lengths by enquiry

⁽¹⁾ **Note** - Other sizes may be available subject to enquiry.

⁽²⁾ **Note** - Not all thickness and width combinations are available.
Refer to BlueScope Steel Direct on 1800 800 789.

FLOOR PLATE MASS CALCULATIONS

When calculating the theoretical mass of floor plate, the 'Plate Mass Calculation' should be used as well as an additional 0.002 tonne per metre squared.

BISPLATE®

Bisalloy Steels, producer of BISPLATE®, is Australia's sole manufacturer of high strength, abrasion - resistant/high hardness and armour plate grades of quenched and tempered steel plate.

Product range as follows*:

Grade	Thickness Availability	Typical Applications
HIGH - STRENGTH		
BISPLATE® 60,70 and 80	5 - 100 mm	Transport Equipment, Dump Trucks, Mining Buckets, Cranes & Lifting Equipment, & High Rise Buildings.
BISPLATE® 80PV	6 - 100 mm	Road Tankers & Storage Tanks
HIGH - HARDNESS		
BISPLATE® 320 and 400	5 - 100 mm	Dump Truck & Bucket Liners
BISPLATE® 450	6 - 50 mm	Chutes, Bins, Cutting Edges,
BISPLATE® 500	8 - 100 mm	Ground-Engaging Tools,WearParts in Industrial Equipment
ARMOUR PLATE		
BISPLATE® HHA	5 - 50 mm	Armoured Personnel Carrier, Ballistic Panels, Security Booths

* Refer to www.bisalloy.com.au for complete details.

SUMMARY TABLES OF MECHANICAL PROPERTIES

STRUCTURAL STEEL GRADES

Steel Grade	Plate Thickness (mm)	Carbon Equivalent (IIW), typical Average	MECHANICAL PROPERTIES			
			TENSILE			
			Plate Thickness (mm)	0.2% Proof Stress (MPa)	Tensile Strength (MPa)	Elongation in 50mm G.L
BISPLATE® 60	5-<16	0.40				
AS 3597	≥16-80	0.50	5-100	500	590-730	20
Grade 500	>80-100	0.58				
BISPLATE® 70	5-<16	0.40				
AS 3597	≥16-80	0.50	5-100	600	690-830	20
Grade 600	>80-100	0.58				
BISPLATE® 80	5-<16	0.40	5	650	750-900	18
AS 3597	≥16-80	0.50	6-65	690	790-930	18
Grade 700	>80-100	0.58	70-100	620	720-900	16
BISPLATE® 80PV	≥16-80	0.50	6-65	690	790-930	18
AS 3597	>80-100	0.58	70-100	620	720-900	16
Grade 700PV						

LEGEND

L Longitudinal

T Transverse

IIW Carbon Equivalent Formula: $C.E = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}$

Please refer to www.bisalloy.com.au for full details

STRUCTURAL STEEL GRADES (continued)

Steel Grade	Plate Thickness (mm)	Carbon Equivalent (IIW), typical Average	MECHANICAL PROPERTIES CHARPY V - NOTCH IMPACT			
			Plate Thickness (mm)	Energy (J)	Test Temp. (°C)	Test Direction
BISPLATE® 60	5<16	0.40	5	By Agreement	-20	L
AS 3597	≥16-80	0.50	6-9.5	45	-20	L
Grade 500	>80-100	0.58	9.5-12	60	-20	L
			13-100	80	-20	L
BISPLATE® 70	5<16	0.40	5	By Agreement	-20	L
AS 3597	≥16-80	0.50	6-9.5	40	-20	L
Grade 600	>80-100	0.58	9.5-12	60	-20	L
			13-100	75	-20	L
BISPLATE® 80	5<16	0.40	5	By Agreement	-20	L
AS 3597	≥16-80	0.50	6-9.5	20	-20	L
Grade 700	>80-100	0.58	9.5-12	30	-20	L
			13-100	40	-20	L
BISPLATE® 80PV	≥16-80	0.50	6-100	Lateral	By	T
AS 3597	>80-100	0.58		Expansion	Agreement	
Grade 700PV				0.38mm min	Max 0°C	

LEGEND

L Longitudinal

T Transverse

IIW Carbon Equivalent Formula: $C.E = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}$

Please refer to www.bisalloy.com.au for full details

SUMMARY TABLES OF MECHANICAL PROPERTIES

HIGH HARDNESS STEEL GRADES

Steel Grade	Plate Thickness (mm)	Carbon Equivalent (IIW), typical Average	Brinell Hardness (HB 3000/10)	MECHANICAL PROPERTIES CHARPY V - NOTCH IMPACT		
				Energy (J)	Test Temp. (°C)	Test Direction
*BISPLATE® 320	5<16	0.40	320-360	60	+20	L
	≥16-80	0.50				
	>80-100	0.58				
*BISPLATE® 400	5<16	0.40	370-430	55	+20	L
	≥16-80	0.50				
	>80-100	0.58				
BISPLATE® 450	6-20	0.46	425-475	25	-40	L
	25-40	0.58		20	-40	L
	>40-50	0.58		15	-40	L
*BISPLATE® 500	6-100	0.62	477-534	35	+20	L

ARMOUR PLATE

Steel Grade	Plate Thickness (mm)	Carbon Equivalent (IIW), typical Average	Brinell Hardness (HB 3000/10)	MECHANICAL PROPERTIES CHARPY V - NOTCH IMPACT (10mm x 10mm)		
				Energy (J)	Test Temp. (°C)	Test Direction
*BISPLATE® HHA	5-50	0.61	477-534	16J	40	T
				20J	40	L

LEGEND

L Longitudinal

T Transverse

IIW Carbon Equivalent Formula: $C.E. = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}$

Please refer to www.bisalloy.com.au for full details.

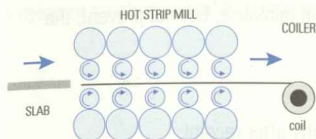
BISPLATE® is a registered trademark of Bisalloy Steel Pty Ltd.

*All values quoted as typical Average (provided for reference information only)

HOT ROLLED COIL

For information relating to the availability of grades, thicknesses and specific customer requirements, please contact BlueScope Steel Direct on **1800 800 789**.

Hot Rolled Coil Production Flow



Hot rolled products are available in five product groups; Formable, Extra Formable, Structural, Carbon and Hardness.

The product designations are based on those of the Australian Standard AS/NZS 1594:2002.

Surface Characteristics

The temperature at which hot-rolling is completed results in an oxidized strip surface. This oxide film is termed hot-mill scale.

Pickling removes the hot-mill scale. Pickled strip is generally supplied oiled to preserve this surface finish.

Skin-passing is a light cold rolling operation which suppresses the appearance of stretcher strain and minimizes coil break during uncoiling and subsequent processing. The surface texture and flatness are improved by skin passing.

Ageing

Non ageing, or stabilized, steels, do not experience yield point reappearance during storage. Stretcher strain markings do not develop in these steels during pressing or drawing.

Storage

The surface of pickled material is susceptible to atmospheric corrosion during storage. For this reason the normal supply condition is 'pickled and oiled', the thin layer of protective oil providing improved resistance to atmospheric corrosion.

When an oiled surface is not compatible with the customer's further processing requirements 'pickled and not oiled' may be supplied. In this case adherence to the following guidelines will minimise, but not prevent, the occurrence of surface corrosion:

- Packs must be kept dry;
- Packs must be stored under cover;
- The material should be used promptly after receipt;
- The material should not be stored as part coils after unpacking.

Where possible the guidelines for storage and use of 'pickled - not oiled' product should be used for 'pickled-oiled' to minimize the opportunity for surface corrosion.

Edge Condition

Mill edge strip (ME) is supplied with the hot-rolled edge intact. The width tolerances for mill edge strip are quite broad.

Side trimmed or slit material should be specified if tighter width tolerances are required. Mill edge strip is not normally available in widths less than 650mm.

Formable grades

Formable grades are typically used for applications such as general fabrication, structural members, shelving and tanks.

Extra Formable grades

Extra Formable grades are typically used for applications requiring minimum yield strengths in the range 300-480 MPa, combined with a greater degree of formability than is achievable with structural steels.

Structural grades

These are steels supplied for applications where minimum yield strengths are required, and/or where surface standard is not of prime importance. Minimum yield strengths in the range 200 to 350 MPa are available, all with excellent weldability.

Analysis grades

A range of steels supplied to guaranteed chemical compositions.

COLD ROLLED STEEL PRODUCTS

BlueScope Steel produces a variety of cold-rolled steel sheet and strip to AS/NZ 1595 specification. These steels are available in strip or sheet form in a range of surface finishes and surface qualities, with formability and/or hardness requirements for most end applications.

Dimensional tolerances are in accordance with AS 1365.

Designations

In AS/NZ 1595, cold rolled steel is signified by the first character in the designation.

Basic types of cold rolled steel are:

Formable (ductile), Hardness, Structural (strength) and Composition

In addition, the quality designation indicates:

Surface finish, and Surface quality. Formable (Ductile) Grades.

The second character (**A, U, V, K, M or W**) indicates steel type:

A = Aluminium killed

K = Silicon/aluminium killed

U = Unspecified steel type

V = Vitreous enamelling steel

The third character (**1, 2, 3 or 4**) indicates degree of formability:

1 = Commercial forming

3 = Deep drawing

2 = Commercial drawing

4 = Extra deep drawing

5 = Extra Deep Drawing Fully Stabilised

A fourth character (**S or A**) is added to designate performance characteristics, and a fifth character (**N**) if non-ageing grade steel is necessary.

S = Skin-passed

A = Annealed last

N = Non-ageing (stabilised)

Hardness Grades the second and third characters are a two-digit number representing the minimum Rockwell hardness (scale B).

The fourth character is the letter **T** to indicate that the hardness has been achieved by temper rolling.

Surface Quality designated by a letter (**G, E**) joined to the quality designation by a dash.

G = General purpose

E = Exposed

TYPICAL COLD ROLLED STEEL QUALITIES

Formable (Ductile) grades

For applications requiring formability, a range of steels is available with ductilities varying from commercial forming through to extra deep drawing. Non-ageing steel types are also available.

Details of the full range of BlueScope Steel Cold Rolled Steel qualities can be obtained from BlueScope Steel sales offices. Assistance with the selection and specification of steels is also freely available.

Typical BlueScope Steel products include:

CA2S-E - a skin-passed commercial drawing steel capable of moderate forming and pressing and with a surface suitable for exposed panels. This is a very versatile product.

CA3SN-G - a skin-passed deep drawing steel guaranteed non-ageing and free from stretcher strain for general purpose components.

CA5SN-E - a skin-passed critical drawing steel suitable for severely drawn components in exposed applications with a minimum of rework. This product is guaranteed free of ageing and stretcher straining.

Hardness grades

These are produced for applications where minimum hardness is required and where ductility and surface finish are not of prime importance.

Structural grades

A range of structural grade steels is produced mainly for applications where design requirements specify minimum strength. Steels are available with minimum yield strengths varying from 350 to 600 MPa. These steels are outside the scope of AS/NZ 1595 but designation and supply follow the principles embodied in Australian standards.

Composition/Carbon grades

These are plain carbon steels often used in applications where heat treatment is a necessary part of the manufacturing process. The chemical composition is guaranteed and indicated by a four digit carbon content. The first two numbers in BlueScope Steel composition grades are "10" for plain, unalloyed, carbon steels.

GENERAL GUIDE TO COMPARATIVE FEATURES - COLD ROLLED STEEL

Quality	CA2S-E	CA3SN-G	CA5SN-E
Form	Strip, sheet	Strip, sheet	Strip, sheet
Surface quality	Exposed Panel	General Purpose	Exposed Panel
	Oiled	Oiled	Oiled
Bending	Excellent	Excellent	Excellent
Roll-forming	Excellent	Excellent	Excellent
Pressing	Good	Excellent	Excellent
Drawing	Good	Very good	Excellent
Welding	Excellent	Excellent	Excellent
Painting (pretreatment)	Excellent	Excellent	Excellent

Dimensions of Cold Rolled Flat Steel Products

Details of the wide range of thickness/width/length combinations possible are available on request. The following table gives the normal thickness ranges of the formable products listed.

Product	Thickness range, mm
CA2S-E	0.50-3.2
CA3SN-G	0.60-3.2
CA5SN-E	0.60-3.0

METALLIC COATED STEEL PRODUCTS

COATINGS ON STEEL SHEET

Coatings are applied to steel sheet to protect the steel against its natural tendency to form iron oxide (rust). Sometimes coatings serve to provide decoration, but frequently both oxide protection and for decoration.

Steel coating technology has progressed to keep pace with, or ahead of, changing atmospheric environments in cities and industrial areas, particularly where claddings for buildings are concerned.

Selection of the appropriate coated steel to suit conditions is important. For example, coating needs for rural or non-aggressive inland locations differ from those required for marine and industrial environments. Some useful information is included under the heading "Atmospheric Exposure Conditions."

In general terms, the metallic-coated steel products produced on the continuous coil coating lines by BlueScope Steel are:-

- Zinc-coated (AS 1397)
- Zinc/aluminium alloy-coated (AS 1397)
- Zinc-iron alloy coated (AS 1397)

Zinc-coated products include GALVABOND® steel (ductile-coated products), ZINCFORM® steel (structural) and ZINC HI-TEN® steel (high strength) in various coating classes and finishes. ZINCANNEAL® steel, a ductile product, has a surface modified in production by a post galvanizing heat treatment. DECKFORM® steel and GALVASPAN® steel are zinc coated structural steels.

Zinc/aluminium alloy-coated sheet include ZINCALUME® steel in structural and high strength grades in two coating classes and TRUECORE® steel which is a zinc/aluminium alloy coated steel with a distinctive blue surface finish, developed for use in residential low-rise framing applications.

GENERAL DESCRIPTION

The metallic-coated products of BlueScope Steel are generally described by a registered trade mark followed by a designation of the steel base and coating class, as outlined in Australian Standard AS 1397.

Metallic-coated steels

As the surface of steel products gradually reverts to its most stable form (that is, iron oxide,) it is necessary to isolate the surface from atmospheric conditions to prevent the unsightly oxide forming. This can be achieved by covering the surface with metals, such as zinc and aluminium, or organic materials, such as paint or laminate. The latter materials and some metals like aluminium provide a blanket covering to protect the steel from the atmosphere. This is successful provided the complete coverage remains intact. Some metals, such as zinc, give an added feature of sacrificial protection at areas where the steel base is exposed, such as cut edges, holes and scratches. A zinc/aluminium alloy-coating combines the best features of both aluminium and zinc coatings. Metallic coating with zinc or zinc/aluminium alloy is a universally proven and accepted system. The continuous metallic coating lines operated by BlueScope Steel produce a range of zinc-coated and zinc/aluminium-coated steel sheet and strip products to meet the requirements of manufacturers in Australia.

The degree of corrosion protection afforded by each coating type and class depends on the many macro and micro environments in which it performs and therefore cannot be simply quantified. However, it can be generally assumed that for a particular coating class the life of the sheet would be in direct proportion to the coating mass on the sheet. For normal exterior protection, the life of zinc/aluminium coatings is far superior to the life of an equivalent thickness zinc coating.

For optimum product lifespan and performance, the metallic coating should be specified to suit the environment. ZINCALUME® steel generally offers superior performance in most building applications. Galvanised coatings do offer some advantages in specific applications such as intensive animal farming (Refer to "Atmospheric Exposure Conditions").

ZINCALUME® steel, TRUECORE® steel and GALVALUME® steel are the brand names of BlueScope Steel's alloy-coated steel sheet.

ZINCALUME® steel (zinc/aluminium alloy-coated steel) is supplied standard with a specially-formulated water-based clear acrylic resin film, factory applied and oven cured over the conventional passivation layer. The resin film, in combination with the passivation layer, has excellent adhesion to the substrate, very good impact resistance and flexibility, excellent marking resilience, and the resin film acts as a lubricant during forming operations.

GALVALUME® steel (zinc/aluminium alloy-coated steel) is essentially the same product as ZINCALUME® steel, except it is not supplied with a resin coating. TRUECORE® steel material compatibility is the same as for ZINCALUME® steel. It is a zinc/aluminium alloy coated steel with a distinctive blue surface finish.

For recommendation on the most suitable product for a given environment or need, visit the BlueScope Steel web site www.bluescopesteel.com.au or contact BlueScope Steel Direct on 1800 800 789.

GENERAL INFORMATION

Metallic-coated steels

The steel base grades of BlueScope Steel's metallic-coated steels qualities are designated with the letter "G" followed by characters which indicate formability or strength and condition. Refer to the table below.

DESIGNATION SYSTEM FOR BASE STEEL METALLIC COATED

Groups	Character Position			
	1	2	3	4
Formable (Ductile)	Product Type	Degree of Formability	Condition	Surface Quality
	G - Continuously heat-treated and metallic coated	1 - Profiling 2 - Commercial 3 - Drawing	S - Skin-passed N - Non-ageing X - Special properties	F - Fully inspected
Example	G	2	S	
Structural (Strength)	Product Type	Strength (Minimum Yield Strength - MPa)		
	G - Continuously heat-treated and metallic coated	Numeral	Numeral	Numeral
Example	G	2	5	0

Designation System – Coatings

Metallic coatings on steel sheet and strip are divided into three different types. Refer to the table below.

METALLIC COATING TYPES AND DESIGNATIONS

Coating Type	Coating Designation
Zinc (Zn)	Z
Zinc/aluminium (Zn/Al)	AZ
Zinc/iron (Zn/Fe)	ZF, ZS

Coating Mass

The ability of a metallic-coated sheet and strip product to withstand corrosion in a particular environment is a function of the amount (and type) of coating on the surface of the steel base substrate. This is quantified as the “coating mass” and is the combined mass of coating on both sides of the steel base expressed in grams per square metre (g/m^2).

Coating Class

Coating Class is designated by the specified coating type and the minimum mass of coating on both sides of the sheet measured by the triple spot test, as detailed in Australian Standard AS 1397, eg AZ150, zinc/aluminium coating with a minimum coating of 150 g/m^2 .

FORMABLE STEEL GRADES

GALVABOND® G2, G3N steel (AS 1397)

GALVABOND® steel is a general purpose zinc-coated flat sheet and is the most widely used of zinc-coated products. It is suitable for a broad range of applications demanding a high standard of formability, coating adhesion and resistance to corrosion. Several optional coating classes and finishes and two steel base grades are available to suit specific applications.

GALVABOND® steel base grade G2 with regular coating class Z275 will permit severe forming (including lock-forming) and many drawing operations. For the more critical drawing or spinning operations, base grade G3N is manufactured.

The coating, with its characteristic spangled pattern, has excellent adherence and will permit a wide range of forming operations without peeling or flaking. Soldering and welding, if carried out according to recommended practices, present no difficulties.

To achieve satisfactory paint adhesion, pretreatment or priming is required. Recommendations are given in Technical Bulletin 2, available from the BlueScope Steel product website.

Typical Applications

GALVABOND® steel is recommended for:

- Meter boxes
- Motor housings
- Ducting
- Cable Trays
- Expanded metal
- Containers
- Garage doors
- Garbage cans
- Poultry feeding equipment

ZINCANNEAL® G2, G3 steel (AS 1397)

Modification by a post galvanizing heat treatment, which converts the coating into a zinc/iron alloy, gives ZINCANNEAL® steel its distinctive smooth grey surface with a complete absence of spangle appearance. The coating, which possesses good adherence to the steel base, provides a corrosion-resistant surface for painting directly with high quality finishes without any additional surface treatment such as priming, (except for severe external conditions where etch priming is recommended for optimum performance). ZINCANNEAL® steel must be painted for external applications.

The mechanical properties of the base are such that ZINCANNEAL® steel permits many bending and forming operations, but as the zinc/iron alloy coating has only limited ductility, powdering may occur if the deformation becomes excessive.

ZINCANNEAL® steel presents no difficulties in welding. It can be readily soldered, but attention must be paid to the use of recommended fluxing techniques.

Typical Applications

ZINCANNEAL® steel is recommended for:

- Signs
- Number plates
- Door frames
- Commercial refrigerators and freezers
- Van and bus doors
- Louvres

ZINCSEAL® G2 steel

ZINCSEAL® steel is produced in a similar manner to ZINCANNEAL® steel. It is a low coating mass zinc/iron alloy-coated commercial forming steel suitable for bending and moderate forming, with a skin-passed extra smooth high quality surface finish suitable for high quality paint finishes. Most suitable for office furniture, light fittings and general fabrication.

ZINCFORM® G250, G300 steel (AS 1397)

ZINCFORM® steel is produced to meet the minimum strength requirements of AS 1397 base grades G250 and G300. It has been specially developed for structural applications, particularly roll-formed sections, and is available in a variety of coating classes to suit particular end uses. ZINCFORM® steel is not suitable for applications where fluting is critical (eg. Rima machines) or for severe drawing, pressing or lock-forming.

ZINCFORM® steel has a bright, relatively smooth appearance with a full spangle surface pattern. It has very good corrosion resistance and may be readily soldered, welded or painted. Pretreatment or priming is necessary to promote paint adhesion.

Typical Applications

ZINCFORM® steel is recommended for:

- Z200 (internal applications only)
 - building sections, studs, plates, purlins, ceiling hangers, fittings, general roll-formed sections
- Z275 – general roll-forming, purlins
- Z450 – rainwater goods and accessories
- Z600 – corrugated tank walls, general items exposed to severe corrosion

ZINC HI-TEN® G450, G500, G550 steel (AS 1397)

ZINC HI-TEN® steel is a flat zinc-coated product produced to meet the minimum strength requirements of AS 1397 base grades G450, G500 and G550, and a specific market demand for high strength zinc-coated steel sheet with very good corrosion resistance. Careful design will often make it possible to achieve savings in costs by allowing the substitution of thinner ZINC HI-TEN® steel sheet for thicker sheet otherwise required in other

qualities. In some cases, modifications to the profile may be necessary to compensate for any loss of rigidity under load resulting from this reduction in sheet thickness.

Although not intended for the same wide range of applications as GALVABOND® steel, ZINC-HI-TEN® steel has been used successfully in many roll-forming and bending operations.

ZINC HI-TEN® steel is readily formable on a brake press or other equipment in common use for cold forming operations. Only slightly higher forming pressures are required to produce a permanent set, since the lighter ZINC HI-TEN® steel is usually used without any loss of structural strength. The technique of forming ZINC HI-TEN® steel consists mainly in making provision for more liberal radii of bends, for slightly increased die clearances and for more springback.

ZINC HI-TEN® steel may be soldered, welded and painted, provided recommended procedures are followed. In welding, allowances should be made for the loss of strength in the area of the weld where the mechanical properties will revert to those of ZINCFORM® steel. Priming or pretreatment is necessary before painting to achieve satisfactory adhesion.

Typical Applications

ZINC HI-TEN® steel is recommended for:

Coating class

- Z275 – fence droppers, tubing
- Z600 – general items exposed to severe corrosion conditions

GALVSPAN® G450, G500, G550 steel (AS 1397)

GALVSPAN® steel is a zinc coated structural steel with a spangled surface. Suitable for roll-formed sections for internal structural applications in benign environments.

Typical Applications

GALVSPAN® steel is recommended for:

- Z350 – purlins and girts

DECKFORM® G550 steel

DECKFORM® steel is a zinc coated structural steel with a spangled surface. It was developed for use in composite concrete slabs and formwork.

Typical Applications

DECKFORM® steel is recommended for:

- Z350 – composite concrete slabs and formwork

ZINCALUME® G300 steel (AS 1397)

ZINCALUME® steel provides significantly improved corrosion resistance when compared to galvanised steel, particularly in a marine environment. It is produced to meet the minimum strength requirements of AS 1397 base grade G300 and is suitable for roll-forming and bending.

All materials (except lead) that can be used in contact with traditional zinc-coated steel can be used in contact with ZINCALUME® G300 steel in the field. Economical joining and sealing systems using silicone rubber sealants are described under Sealants. Do not place ZINCALUME® steel in contact with lead based building materials.

Typical Applications

ZINCALUME® G300 steel is recommended for:

Coating class

- AZ150 – general roll-forming, garage doors, roof decking, gutters and downpipes, ridge capping and valleys, rainwater goods and accessories, vertical walling, fencing systems, refrigerator and stove rear panels, air conditioning panels (NOT DUCTWORK)
- AZ200 – near marine and industrial conditions

Note: Grade 250 is also available; good ductility makes it suitable for tubing, mufflers, signs and roll-formed structural sections. A restricted thickness range is offered.

ZINCALUME® G550 steel (AS 1397)

ZINCALUME® steel provides significantly improved corrosion resistance when compared to galvanised steel, particularly in a marine environment. It is produced to meet the minimum strength requirements of AS 1397 base grade G550.

The same general comments apply to ZINCALUME® steels as for ZINC HI-TEN® steel equivalent products. Two notable differences are

- priming or pretreatment are usually not necessary before painting
- ZINCALUME® steel does not readily solder – use sealants instead.

All materials (except lead) that can be used in contact with traditional zinc-coated steel can be used in contact with ZINCALUME® G550 steel. Do not place ZINCALUME® steel in contact with lead based building materials.

Typical Applications

ZINCALUME® G550 steel is recommended for:

Coating class

- AZ150 – roll-formed decking and walling
- AZ200 – for severe corrosion conditions

TRUECORE® steel (AS 1397)

TRUECORE® steel is a zinc/aluminium alloy coated steel with a distinctive blue surface finish. It was developed for use in residential low-rise framing applications.

Material compatibility is the same for ZINCALUME® steel, and it is available in a range of sizes and strengths.

Typical Applications

Wall frames, roof trusses, bearers, joists, roof battens, wall battens and ceiling battens used in low-rise, residential dwellings

GALVALUME® G2N, G250, G300, G550 steel (AS 1397)

GALVALUME® zinc/aluminium alloy-coated steel with a spangled surface is suitable for a wide range of products, depending on the mechanical properties and coating class used (which will affect fabricating performance).

Unlike ZINCALUME® steel, GALVALUME® steel is not supplied with a resin coating.

Typical Applications are:

- G2N – roofing tiles, auto components, solar heaters
- G250 – tubing, mufflers, signs, structural sections
- G300 – mufflers and general manufacturers articles
- G550 – general manufactured articles

DIMENSIONS OF ZINC-COATED AND ZINC/ALUMINIUM ALLOY-COATED FLAT STEEL SHEET

All BlueScope Steel products are available as strip and some products are available as sheet subject to enquiry. Typical dimensions are shown for regularly produced product but other thickness/width combinations are available subject to enquiry.

Grade	Zinc-Coated		Zinc/Aluminium-Coated	
	Typical thickness mm	Maximum width mm	Typical thickness mm	Maximum width mm
Formable				
Commercial	0.30 - 3.2	1525*	—	—
Deep Drawing	0.50 - 1.6	1525*	—	—
Structural				
G250	0.8 - 3.20	1485*	—	—
G300	0.30 - 2.9	1525*	0.30 - 1.2	1235
G450	1.5 - 3.2	1350*	—	—
G500	1.1 - 1.5	1350	—	—
G550	0.35 - 1.0	1220	0.30 - 1.00	1235

* Restricted width when >2.00mm thickness

Typical Applications

ZINCALUME® G550 steel is recommended for:

Coating class

- A2150 – salt formed cladding and walling
- A2700 – for severe corrosion conditions

COLORBOND® PREPAINTED STEEL

COLORBOND® prepainted steel can be fabricated into an end product without further treatment. Produced on high speed continuous strip coating lines, COLORBOND® steel is available with a base of zinc-coated or zinc/aluminium alloy-coated steel.

A range of colours, coating types and gloss levels has been developed for a wide variety of applications, both exterior and interior. These products are available either single sided or double sided.

By selecting the correct COLORBOND® steel product, standard fabrication techniques such as deep drawing, roll-forming, lock-seaming, stamping, spinning and brake press forming are possible without damage or deterioration to the coating. In some fabrication techniques the paint coating acts as a lubricant and can measurably increase tool life.

COLORBOND® steel is available in widths from 25mm to 1500mm and in preferred thicknesses from 0.30mm to 1.6mm, depending on steel substrate.

The paint finish coating on COLORBOND® steel for both interior and exterior use is applied over a corrosion-inhibitive primer.

If it is intended to use COLORBOND® steel in exterior applications within 1km of a salt marine location, or in severe industrial or unusually corrosive environments, please contact the nearest BlueScope Steel sales office for specialised advice.

COLORBOND® Steel Designation System

Each COLORBOND® steel and Prepainted steel product can be identified by its own name, which indicates in initial form the application the product was designed for, or any special features the product offers.

The range of COLORBOND® steel and Prepainted steel products can be divided into two categories as follows:

EXTERIOR

COLORBOND® Coolmax® steel – designed to provide the highest solar reflectance prepainted steel roofing to achieve the best benefit from cost effective and durable thermal performance.

COLORBOND® Metallic steel – a highly decorative, long life product designed for feature applications such as curtain walling.

COLORBOND® Stainless steel – designed to provide exceptional corrosion resistance and weatherability in exterior applications.

- particularly suited to severe marine and industrial environments.

COLORBOND® steel – designed for a range of roofing and walling applications, rainwater goods and accessories.

COLORBOND® Ultra steel – designed for severe environments with excellent corrosion resistance near marine or industrial environments, or in areas not washed by rain.

COLORBOND® XFP steel – Exterior Fencing Product. Designed to provide a high level of durability in fencing applications.

COLORBOND® XGD – Exterior Garage Doors. Designed to provide a high level of durability and formability for garage door applications.

COLORBOND® XHI steel – Exterior Home Improvements. Designed to provide a high durability material for patios and pergolas, with a high gloss finish. Typically used for roofing, post and beam components.

For products intended to be used for architectural (sandwich) panels, material should be ordered as COLORBOND® steel; COLORBOND® Ultra, Metallic or Stainless steel (depending upon performance requirements) with either Foam Grey or HiTemp Foam Grey backing coat as required. These backing coats are specially designed to facilitate adhesion to foam cores.

AQUAPLATE® steel – a product consisting of a formable steel outer lined with a food grade polymer film designed for the manufacture of water storage tanks.

Exterior Manufactured Articles prepainted steel – a formable product designed for use in hot water jackets, air conditioner cabinets, garden sheds and other applications requiring good exterior performance.

Exterior Hot Water prepainted steel – designed to provide a cost effective product for Hot Water System wrappers.

INTERIOR

COLORBOND® Insulation Panel steel – a product designed for the manufacture of sandwich panels for the coolroom industry.

COLORBOND® Permagard® Insulation Panel steel – a product designed for the manufacture of sandwich panels for the coolroom industry, with antibacterial properties.

Drumstock® prepainted steel – a product exhibiting high formability specifically designed for drumstock, combining a chemically resistant inner lining with an outer lining having good weatherability.

General Manufactured Articles prepainted steel – a product having excellent formability for general purpose manufactured articles such as garbage bins and air conditioning ducting.

Interior Furniture & Shelving prepainted steel – a product having good formability, designed for interior manufactured articles such as indoor furniture, office equipment and shelving.

Interliner prepainted steel – designed specifically for indoor panel use in factories and buildings with limited humidity. Limited flexibility at low/moderate cost.

Primer Only Material steel – normally overpainted after fabrication. Provides a readily paintable surface with good formability for products such as drum lids and body stock and appliance components.

Sign Writing Panel prepainted steel – a product specifically developed for overpainting by the sign writing industry.

Superior Gloss Articles prepainted steel – a durable and mar resistant product for the manufacture of non-critical interior appliance products.

Applicable Standards

All COLORBOND® steel products are supplied to conform to the appropriate Australian standard.

Dimensional tolerances: AS/NZS 1365

Substrate

Cold-rolled: AS/NZS 1595

Stainless steel: JIS G4305

Hot-dipped metallic-coated: AS 1397

Organic Finishes: AS/NZS 2728 Prepainted and organic film/metal laminate products – performance requirements for interior/exterior applications in buildings.
AS 2070 Plastic materials for food contact use.

For most products, the metallurgical ageing process which is inherent in the paint stoving cycle will result in some loss of ductility compared with unpainted product. However, minimum strength levels designated by relevant standards will still be met.

Supply Condition

All COLORBOND® steel products are supplied in a non-oiled condition. COLORBOND® steel products are ink branded (unless otherwise requested) on the reverse side indicating the COLORBOND® steel product category, paint batch number, input coil number, date of production, and paint line number. Double-sided COLORBOND® XFP steel (infill sheets) are laser branded on both surfaces with the COLORBOND® steel logo.

The majority of products within the COLORBOND® prepainted steel range are available with an optional protective polyethylene film with the trade mark CORSTRIP®.

CORSTRIP® polyethylene film is designed to protect the painted surface during fabrication, storage, transportation and on-site handling. It also provides additional lubrication particularly during drawing and pressing operations.

The CORSTRIP® film should not be exposed to sunlight for prolonged periods and must be removed immediately after the finished product goes into service.



AREA PER TONNE OF SHEET PRODUCT

Calculated area per tonne of product (square metres per tonne) Uncoated & Coated Sheet & Strip.

Specified thickness of base steel mm	Uncoated Steel	METALLIC COATED						
		Z100 ZF100	Z200	Z275	Z450	Z600	AZ50	AZ150
0.30	424.6	402.4	388.3	378.1	354.0	332.8	412.4	396.0
0.35	363.9	347.5	336.9	329.2	310.8	294.3	354.9	342.7
0.40	318.5	305.8	297.6	291.5	277.0	263.9	311.5	302.1
0.42	303.3	291.8	284.3	278.8	265.5	253.4	297.0	288.4
0.48	265.4	256.5	250.8	246.4	236.0	226.3	260.6	253.9
0.50	254.8	246.6	241.3	237.2	227.5	218.6	250.3	244.2
0.55	231.6	224.8	220.4	217.0	208.9	201.3	227.9	222.8
0.60	212.3	206.6	202.8	200.0	193.1	186.6	209.2	204.9
0.65	196.0	191.1	187.9	185.5	170.5	173.9	193.3	189.7
0.70	182.0	177.8	175.0	172.9	167.6	162.7	179.7	176.5
0.75	169.8	166.2	163.7	161.9	157.3	153.0	167.8	165.1
0.80	159.2	156.0	153.8	152.2	148.1	144.3	157.5	155.0
0.85	149.9	147.0	145.1	143.6	140.0	136.6	148.3	146.2
0.90	141.5	139.0	137.3	136.0	132.7	129.6	140.2	138.2
0.95	134.1	131.8	130.2	129.1	126.1	123.3	132.8	131.1
1.00	127.4	125.3	123.9	122.9	120.2	117.6	126.3	124.7
1.15	110.8	109.2	108.1	107.3	105.3	103.3	109.9	108.7
1.20	106.2	104.7	103.7	103.0	101.0	99.3	105.4	104.3
1.40	91.0	89.9	89.2	88.7	87.3	85.9	90.4	89.6
1.50	84.9	84.0	83.4	82.9	81.7	80.5	84.4	83.7
1.60	79.6	78.8	78.2	77.8	76.7	75.7	79.2	78.6
1.80	70.8	70.1	69.7	69.3	68.5	67.7	70.4	69.9
1.90	67.0	66.5	66.1	65.8	65.0	64.2	66.7	66.3
2.00	63.7	63.2	62.8	62.5	61.8	61.2	63.4	63.0
2.20	57.9	57.5	57.2	56.9	56.4	55.7	57.7	57.3
2.50	51.0	50.6	50.4	50.2	49.8	49.2	50.8	50.5
3.00	42.5	42.2	42.1	41.9	41.6	41.3	42.3	42.2
3.20	39.8	39.6	39.5	39.4	39.1	38.8	39.7	39.5

ROOFING & WALLING PRODUCTS

Product Development

The flagship profile LYSAGHT CUSTOM ORB® has led the development of an extensive range of roofing and walling profiles suitable for a variety of design solutions. The BlueScope Lysaght Research and Technology Department is NATA registered and tests our products to ensure accuracy and reliability of our data.

Finishes

Most profiles are available in the full range of COLORBOND® steel colours including the Ultra and Metallic range. Unpainted ZINCALUME® steel is also available.

Lengths Available

Lysaght roofing and walling profiles are available in custom cut lengths. The maximum length available is dependent on transport legislation and machine capability in your area. Please contact your local office for confirmation.

Crest fastened profiles; lengths greater than 24m will require an expansion joint. Valley fastened profiles; lengths greater than 15m will require an expansion joint. Further information is available in the latest edition of the LYSAGHT® Roofing & Walling installation manual.

New capabilities in transport and mobile roll forming means particular profiles are suitable for long length design, allowing further design freedom. These will be noted on individual profile information.

Warranties

BlueScope Steel offers a variety of warranties to back our quality products. These warranties include perforation and performance. For a full list of Terms & Conditions to the warranties please check the website www.lysaght.com, or speak to your local representative.

More Information

The following pages outline basic design information which will assist selection for your design or installation. We recommend you access the latest product brochures and manuals for complete design information. These brochures and the availability of profiles and finishes can be found on our website www.lysaght.com.

APPLICATION OF LYSAGHT CLADDING PROFILES

Profile	Roofing	Walling	Fencing
CUSTOM ORB®	•	•	—
TRIMDEK®	•	•	—
SPANDEK®	•	•	•
KLIP-LOK® 406, 700 HS and Classic	•	•	—
SPANRIB®	•	•	—
INTEGRITY® 820	•	•	—
LONGLINE 305®	•	•	—
FLATDEK®	•	—	—
PANELRIB®	—	•	—
MINI ORB®	—	•	•
MULTICLAD®	—	•	—
WALLCLAD®	—	•	•
TRIMWALL®	—	•	•
EASYCLAD®	—	•	—

ROOF DRAINAGE

Rainwater run-off

The drainage or run-off capacity of roof sheeting can limit on the total length of a sheet run and must be considered in roof design and construction.

As a guide, the table below lists the maximum recommended length of roof run for various LYSAGHT® sheet profiles at the roof slopes and rainfall intensities shown. These are based on CSIRO research and BlueScope Lysaght Research and Technology calculation of the behaviour of roofing profiles under peak rainfall conditions.

The roof run is the total length of roof sheeting draining rainwater in one direction, including any end laps, expansion joints or steps that may be present in the roof. Careful considerations should be given to rainwater diverted around roof penetrations.

See the table below for rainfall intensities for selected localities.

MAXIMUM ROOF LENGTHS FOR DRAINAGE MEASURED FROM RIDGE TO GUTTER (m)

	Peak rainfall intensity mm/hr	Roof Slope						Peak rainfall intensity mm/hr
		1 in 50 (1°)	1 in 30 (2°)	1 in 20 (3°)	1 in 12 (5°)	1 in 7.5 (7.5°)	1 in 6 (10°)	
CUSTOM ORB® CUSTOM BLUE ORB®	100				29	34	38	100
	150				20	23	25	150
	200				15	17	19	200
	250				12	14	15	250
	300				10	11	13	300
	400				7	8	10	400
	500				6	7	8	500
INTEGRITY® 820 SPANRIB®	100		410	480	598	713	820	100
	150		273	320	399	476	547	150
	200		205	240	299	357	410	200
	250		164	192	239	285	328	250
	300		137	160	199	238	273	300
	400		102	120	150	178	205	400
	500		82	96	120	143	164	500

	Peak rainfall intensity mm/hr	Roof Slope						Peak rainfall intensity mm/hr
		1 in 50 (1°)	1 in 30 (2°)	1 in 20 (3°)	1 in 12 (5°)	1 in 7.5 (7.5°)	1 in 6 (10°)	
KLIP-LOK® 406	100	375	467	548	682	813	934	100
	150	250	311	365	454	542	623	150
	200	188	234	274	341	406	467	200
	250	150	187	219	273	325	374	250
	300	125	156	183	227	271	311	300
	400	94	117	137	170	203	234	400
	500	75	93	110	136	163	187	500
KLIP-LOK® 700 HI-STRENGTH	100	344	428	502	624	745	856	100
	150	229	285	334	416	496	571	150
	200	172	214	251	312	372	428	200
	250	137	171	201	250	298	342	250
	300	115	143	167	208	248	285	300
	400	86	107	125	156	186	214	400
	500	69	86	100	125	149	171	500
KLIP-LOK® CLASSIC 700	100	247	308	361	449	536	616	100
	150	165	205	241	300	357	411	150
	200	124	154	181	225	268	308	200
	250	99	123	144	180	214	246	250
	300	82	103	120	150	179	205	300
	400	74	93	108	135	161	185	400
	500	49	62	72	90	107	123	500
LONGLINE 305® (not tapered)	100	219	273	320	398	475	546	100
	150	146	182	213	265	317	364	150
	200	110	136	160	199	237	273	200
	250	88	109	128	159	190	218	250
	300	73	91	107	133	158	182	300
	400	55	68	80	100	119	136	400
	500	44	55	64	80	95	109	500
SPANDEK®	100		97	111	133	154	173	100
	150		65	74	89	103	115	150
	200		49	55	67	77	86	200
	250		39	44	53	62	69	250
	300		32	37	44	51	58	300
	400		24	28	33	39	43	400
	500		19	22	22	31	35	500

	Peak rainfall intensity mm/hr	Roof Slope						Peak rainfall intensity mm/hr
		1 in 50 (1°)	1 in 30 (2°)	1 in 20 (3°)	1 in 12 (5°)	1 in 7.5 (7.5°)	1 in 6 (10°)	
TRIMDEK®	100		220	257	320	382	439	100
	150		146	172	214	255	293	150
	200		110	129	160	191	220	200
	250		88	103	128	163	176	250
	300		73	86	107	127	146	300
	400		55	64	80	96	110	400
	500		44	51	64	76	88	500

- Some lengths in this table may exceed the maximum allowable transport length.
- Data are based on work of CSIRO and BlueScope Lysaght.
- SPANDEK® with slope of 2° (1 in 30) is available subject to enquiry.

OTHER CONSIDERATIONS AND/ OR REQUIREMENTS WHEN CONTEMPLATING A STEEL ROOF

- Type of Fastenings

Fixing to Steel or Timber -

Select appropriate fasteners.

Painted heads for use with COLORBOND® steel

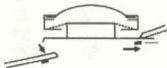


- Insulation - For heat and/or noise reduction

- Roof Ventilators



- Skylights



- Translucent Sheeting

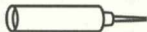
- Pipe Flashings



- Infill Strips - Protect against dust, insects, birds etc

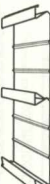


- Sealants



SPECIFICATIONS OF PROFILES FOR ROOFING & WALLING

Maximum recommended spacing of supports ROOFS

	BMT Mass ¹ mm kg/m ²	Width overall approx. mm	Cover width mm	Rib depth mm	Roof pitch minimum ² degrees	Eaves Overhang ³									
						Single mm	End mm	Internal mm	Unstiff- ened mm	Stiff- ened mm	Single mm	End mm	Internal mm	Over- hang mm	
 CUSTOM ORB ⁴	0.42	4.3	838	762	16	5° (1 in 12)	700	900	1200	200	300	1800	2500	2700	200
	0.48	4.9	838	762	16	5° (1 in 12)	800	1300	1700	250	350	1800	2700	2700	250
 CUSTOM BLUE ORB ⁴	0.60	6.1	838	762	17	5° (1 in 12)	1600	1600	1800	200	300	2400	3000	3300	200
	0.80	8.0	838	762	17	5° (1 in 12)	1800	1800	2600	400	600	2400	3200	3600	400
 FLATDEK ⁵	0.42	6.0	272	250	45	2° (1 in 30)	2000	2600	3000	-	-	-	-	-	-
 FLATDEK II ⁵	0.42	5.2	642	620	45	2° (1 in 30)	2400	2800	3200	-	-	-	-	-	-
 INTEGRITY 820	0.42	4.6	895	820	48	2° (1 in 30)	2100	2300	2800	150	300	2600	3400	3600	150
	0.48	5.2	895	820	48	1° (1 in 50)	2500	2550	3050	200	350	2700	3600	3600	200
 KLIP-LOK 406	0.48	5.6	432	406	41	1° (1 in 50)	1500	1800	2100	200	600	-	-	-	-

¹ Masses are for unpainted ZINCALUME steel.

² See Section 2.5.

³ See Section 10.6 for explanation of 'stiffened'.

⁴ With 5 fasteners per sheet, per support

⁵ FLATDEK & FLATDEK III are Home Improvement profiles. Please refer to the brochures for more installation details.

⁶ With 4 fasteners per sheet, per support

⁷ Slope of 2° (1 in 30) is available subject to enquiry. Please refer to Section 2.5.

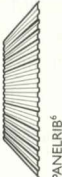
SPECIFICATIONS OF PROFILES FOR ROOFING & WALLING

Maximum recommended spacing of supports
ROOFS
WALLS

	BMT Mass ¹ mm kg/m ²	Width overall mm	Cover width mm	Rib depth mm	Roof pitch minimum degrees	Eaves Overhang ²						Overhang	
						Single	End	Internal	Unstiff- ened	Stiff- ened	Single	End	Internal
						mm	mm	mm	mm	mm	mm	mm	mm
 KLIP-LOK 700 HI-STRENGTH	0.42	4.7	710	700	43	1650	1750	2200	150	450	2600	3200	3850
	0.48	5.3	710	700	43	2050	2350	2800	200	500	3000	3450	3900
	0.60	6.6	710	700	43	2350	3000	3600	250	550	3300	3600	3900
 KLIP-LOK CLASSIC 700	0.42	4.7	729	700	41	-	1800	2200	200	500	-	2150	3250
	0.48	5.3	729	700	41	-	2100	3050	250	600	-	2500	3550
 LONGLINE 305 (not tapered)	0.70	9.7	310	305	48	1800	2000	2500	150	450	-	2700	2700
 SPANDEK ⁴	0.42	4.7	754	700	24	1300	1800	2400	300	600	2500	3000	3300
	0.48	5.3	754	700	24	2000	2200	3000	400	700	3000	3000	3300
 SPANRIB	0.42	4.6	895	820	48	2100	2300	2800	150	300	2600	3400	3600
	0.48	5.2	895	820	48	2500	2550	3050	200	350	2700	3600	3600
 TRIMDEK	0.42	4.3	816	762	29	1100	1300	1900	150	300	2400	3000	3000
	0.48	4.9	816	762	29	1600	1850	2600	200	350	2700	3000	3000

¹ Masses are for unpainted ZINCALUME steel.² See Section 2.5.³ See Section 10.6 for explanation of 'stiffened'.⁴ With 5 fasteners per sheet, per support⁵ FLATDEK & FLATDEK II are Home Improvement profiles. Please refer to the brochures for more installation details.⁶ With 4 fasteners per sheet, per support⁷ Slope of 2° (1 in 30) is available subject to enquiry. Please refer to Section 2.5.

SPECIFICATIONS OF PROFILES FOR WALLING ONLY

	BMT mm	Mass ¹ kg/m ²	Width overall approx. mm	Cover width mm	Rib depth mm	Maximum recommended spacing of wall supports			
						Single mm	End mm	Internal mm	Overhang mm
 EASY-CLAD	0.42	4.5	330	300	19	-	1500	1500	100
 MINI ORB ²	0.42 0.48	4.0 4.5	841 841	820 820	6 6	1200 1500	1500 1500	1500 1500	100 125
 MULTICLAD	0.35 0.42	3.3 3.9	880 880	840 840	12 12	1400 1700	1800 1800	1800 1800	150 150
 PANELRIB ⁶	0.35 0.42	3.2 3.7	915 915	850 850	4 4	1100 1200	1200 1200	1200 1200	150 150
 TRIMWALL ⁴	0.35	3.6	816	762	29	2100	2900	3000	150

¹ Masses are for unpainted ZINCALUME steel.

⁴ With 5 fasteners per sheet, per support

⁶ With 4 fasteners per sheet, per support

⁷ With 6 fasteners per sheet, per support

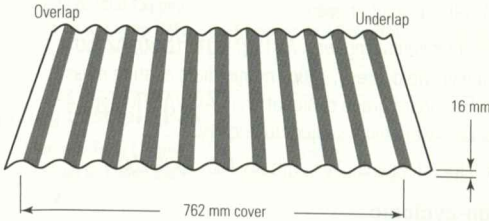
SPECIFICATIONS OF PROFILES FOR WALLING ONLY

BMT	Mass ¹ kg/m ²	Width overall approx. mm	Cover width mm	Rib depth mm	Maximum recommended spacing of wall supports			
					Single mm	End mm	Internal mm	Overhang mm
 WALLCLAD	0.35	838	762	16	2100	2400	2400	150
	0.42	4.1	272	12	-	1000	1000	n/a

WEATHERBOARD

¹ Masses are for unpainted ZINCALUME steel.² With 5 fasteners per sheet, per support³ With 4 fasteners per sheet, per support⁴ With 6 fasteners per sheet, per support

LYSAGHT CUSTOM ORB®



LYSAGHT CUSTOM ORB® is the famous corrugated profile that is equally at home with traditional and contemporary design. It is a wide, strong and light weight profile that can be quickly and easily installed. It offers excellent value.

Application -

Roofing and walling

Not for machine curving (see CUSTOM BLUE ORB®)

Finishes available -

Standard COLORBOND® steel colours, COLORBOND® Ultra steel, COLORBOND® Stainless steel, COLORBOND® Metallic steel and ZINCALUME® steel

BMT -

0.42mm 0.48mm

(COLORBOND® Metallic is available in 0.48mm - subject to enquiry, and COLORBOND® Stainless is available in 0.42mm subject to enquiry)

Minimum Roof Slope -

5 degrees (1:12)

Curving Data -

Spring Curving; Minimum radii for convex curving is 12m

Material Specification

LYSAGHT CUSTOM ORB® is made from:

- ZINCALUME® steel complying with AS1397-2011 G550, AZ150 (550MPa minimum yield stress, 150g/m² minimum coating mass).
- Stainless steel standard grade designation is AISI/ASTM Type 430; UNS No. S43000. Availability subject to enquiry.
- The COLORBOND® steel complies with AS/NZS 2728:2007.

Fixing data - Non-cyclonic

LYSAGHT CUSTOM ORB® is pierce-fixed to steel or timber supports. This means that fasteners pass through the sheeting. To maximise watertightness always place fasteners through the crests. For walling, you may use either crest or valley fixing.

Always drive the screws perpendicular to the sheeting, and in the centre of the corrugation or rib.

Don't place fasteners less than 25mm from the ends of the sheets.

For cyclonic fixing data please refer to the latest version of the Lysaght Product Catalogue.

Fixing to steel - Crest

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
M6-11X50 ROOFZIPS	#12-14X35 HH HG/TG M5.5-14X39 AUTOTEKS	#12-14X35 HH HG/TG M5.5-14X39 AUTOTEKS

Fixing to steel - Pan

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16X16 HH M5-16X25 DH M6-11x25 ROOFZIPS	#10-16X16 HH M5-16X25 DH	#10-16X16 HH

Fixing to Hardwood

Pan	Crest
#10-12X25 T17 HH #12-11X25 T17 HH M5-16X25 DH	#12-11X50 T17 HG/TG HH

Fixing to Softwood

Pan	Crest
#10-12X30 T17 HH #12-11X25 T17 HH M5-16X25 DH M6-11X25 ROOFZIPS	#12-11X50 T17 HG/TG HH M6-11X50 ROOFZIPS

Crest: 3 fasteners



Valley: 3 fasteners



Crest: 5 fasteners



Valley: 5 fasteners



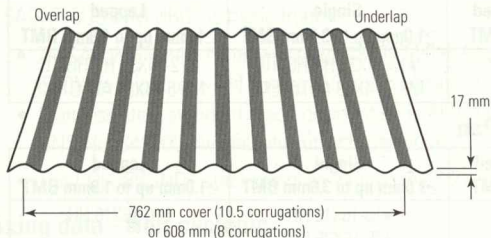
S = Side lap

Roofzips®, AutoTeks®, Rippletex® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

Number of fasteners depends on wind pressure (see brochure on this product).

LYSAGHT CUSTOM BLUE ORB®



LYSAGHT CUSTOM BLUE ORB® is the corrugated profile perfect for curving, it is the perfect match to harmonise with LYSAGHT CUSTOM ORB®. Roll formed using thicker ductile steel it is used in roofing and walling applications where bull-nosing or curving is required.

*Cyclonic design data is available for this product.

Application -

Roofing and walling

Finishes available -

COLORBOND® steel

ZINCALUME® steel

ZINCFORM® steel (Zinc coated galvanised steel)

painted and unpainted - suitable for tanks

and subject to enquiry

Stainless Steel (Subject to enquiry)

BMT -

0.60mm (and 0.80mm subject to enquiry)

Minimum Roof Slope -

5 Degrees (1:12)

Curving Data

Pre-curve - The minimum radii for pre-curving is 300 mm (400 mm in Victoria). At the end of the curve, there must be a straight vertical section of at least 100 mm (50 mm in Dubbo, 80 mm in Victoria).

Spring Curve - The minimum radii for convex spring curving is 9m.

Material Specification

LYSAGHT CUSTOM BLUE ORB® is made from:

- ZINCALUME® zinc/aluminium alloy-coated steel complying with AS 1397-2011 G300, AZ150 (300 MPa minimum yield stress, 150g/m² minimum coating mass);
- ZINCFORM® zinc coated (galvanised) steel complying with AS 1397-2011 G300, Z600 (300 MPa minimum yield stress, 600 g/m² minimum coating class);
- Stainless steel standard grade designation is AISI/ASTM Type 430 UNS No. S43000 (Availability subject to enquiry).
- COLORBOND® steel complies with AS/NZS 2728:2007.

All the materials cover either 608 mm or 762 mm, except stainless steel, which is only available in 762 mm cover.

Fixing data - Non-cyclonic

LYSAGHT CUSTOM BLUE ORB® is pierce-fixed to steel or timber supports. This means that fasteners pass through the sheeting. To maximise watertightness always place roof screws through the crests. For walling, you may use either crest or valley fixing.

Always drive the screws perpendicular to the sheeting, and in the centre of the corrugation or rib.

Don't place fasteners less than 25mm from the ends of the sheets.

For cyclonic fixing data please refer to the latest version of the Lysaght Product Catalogue.

Fixing to steel - Crest

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
M6-11X50 ROOFZIPS	#12-14X35 HH HG/TG M5.5-14X39 AUTOTEKS	#12-14X35 HH HG/TG M5.5-14X39 AUTOTEKS

Fixing to steel - Pan

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16X16 HH M5-16X25 DH M6-11x25 ROOFZIPS	#10-16X16 HH M5-16X25 DH	#10-16X16 HH

Fixing to Hardwood

Pan	Crest
#10-12X25 T17 HH #12-11X25 T17 HH M5-16X25 DH	#12-11X50 T17 HG/TG HH

Fixing to Softwood

Pan	Crest
#10-12X30 T17 HH #12-11X25 T17 HH M5-16X25 DH M6-11X25 ROOFZIPS	#12-11X50 T17 HG/TG HH M6-11X50 ROOFZIPS

Crest: 3 fasteners†



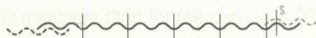
Valley: 3 fasteners†



Crest: 5 fasteners†



Valley: 5 fasteners†



S = Side lap

Roofzips®, AutoTeks®, Rippletex® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

Number of fasteners depends on wind pressure (see brochure on this product).

LYSAGHT WALLCLAD®



LYSAGHT WALLCLAD® is a lightweight and attractive corrugated walling sheet with the same traditional profile as CUSTOM ORB®. WALLCLAD® can be installed either vertically or horizontally for dynamic effects.

Application -	Walling and Fencing (check local availability)
Finishes available -	Standard COLORBOND® steel colours and ZINCALUME® steel
BMT -	0.35mm
Curving Data -	Not suitable for curving

Material Specification

- LYSAGHT WALLCLAD® is manufactured from ZINCALUME® steel complying with AS1397-2011-G550-AZ150 (550MPa minimum yield strength, 150g/m² minimum coating mass).
- The COLORBOND® steel used in the manufacture of LYSAGHT WALLCLAD® complies with AS/NZS 2728: 2007.

Fixing data - Non-cyclonic

LYSAGHT WALLCLAD® is pierce-fixed to steel or timber supports. This means that fasteners pass through the sheeting. We recommend valley fixing for premium results.

Always drive the screws perpendicular to the sheeting, and in the centre of the corrugation or rib.

Don't place fasteners less than 25mm from the ends of the sheets.

For cyclonic fixing data please refer to the latest version of the Lysaght Product Catalogue.

Fixing to steel - Crest

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
M6-11X50 ROOFZIPS	#12-14X35 HH HG/TG M5.5-14X39 AUTOTEKS	#12-14X35 HH HG/TG M5.5-14X39 AUTOTEKS

Fixing to steel - Pan

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16X16 HH M5-16X25 DH M6-11x25 ROOFZIPS	#10-16X16 HH M5-16X25 DH	#10-16X16 HH

Fixing to Hardwood

Pan	Crest
#10-12X25 T17 HH #12-11X25 T17 HH M5-16X25 DH	#12-11X50 T17 HG/TG HH

Fixing to Softwood

Pan	Crest
#10-12X30 T17 HH #12-11X25 T17 HH M5-16X25 DH M6-11X25 ROOFZIPS	#12-11X50 T17 HG/TG HH M6-11X50 ROOFZIPS

Valley: 3 fasteners†



Valley: 5 fasteners†

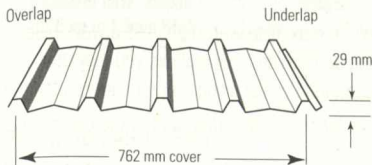


S = Side lap

Roofzips®, AutoTeks®, Rippletex® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT TRIMDEK®



LYSAGHT TRIMDEK® is a stylish, ribbed profile with subtle fluting in the pans to provide strength. Equally suitable for domestic and commercial applications and long spanning capabilities.

*Cyclonic design data is available for this product.

Application -

Roofing and Walling

Finishes available -

Standard COLORBOND® steel colours, COLORBOND® Ultra steel, COLORBOND® Stainless steel, COLORBOND® Metallic and ZINCALUME® steel

BMT -

0.42mm and 0.48mm (COLORBOND® Metallic is available in 0.48 subject to enquiry and COLORBOND® Stainless is available in 0.42 subject to enquiry)

Minimum Roof Slope -

2 degrees (1:30)

Curving Data -

Not suitable for curving

Material Specification

- ZINCALUME® steel complying with AS1397-2011 G550, AZ150 (550MPa minimum yield stress, 150g/m² minimum coating mass).
- Stainless steel standard grade designation is AISI/ASTM Type 430; UNS No. S43000. Availability subject to enquiry.
- The COLORBOND® steel complies with AS/NZS 2728:2007.

supports. This means that
tightness always place
walling, you may use
ing for premium results.

ing, and in the centre of

s of the sheets.

Version of the Lysaght

Fixing to steel - Crest

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
M6-11X50 ROOFZIPS	#12-14X45 HH HG/TG #12-14X55 HH HG/TG M5.5-14X50 AUTOTEKS	#12-14X45 HH HG/TG #12-14X55 HH HG/TG M5.5-14X50 AUTOTEKS

Fixing to steel - Pan

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16X16 HH M5-16X25 DH M6-11x25 ROOFZIPS	#10-16X16 HH M5-16X25 DH	#10-16X16 HH

Fixing to Hardwood

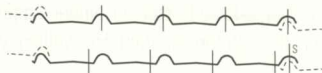
Pan	Crest
#10-12X25 T17 HH #12-11X25 T17 HH M5-16X25 DH	#12-11X65 T17 HG/TG HH

Fixing to Softwood

Pan	Crest
#10-12X30 T17 HH #12-11X25 T17 HH M5-16X25 DH M6-11X25 ROOFZIPS	#12-11X65 T17 HG/TG HH M6-11X65 ROOFZIPS

Crest: 4 fasteners†

Valley: 4 fasteners†

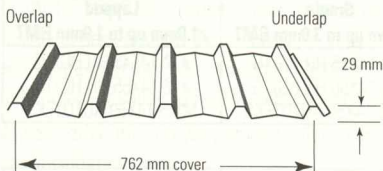


S = Side lap

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Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT TRIMWALL®



LYSAGHT TRIMWALL® is an attractive, lightweight and versatile steel walling profile designed to complement LYSAGHT TRIMDEK®. LYSAGHT TRIMWALL® is predominantly used on shed walls.

Application -	Walling only
Finishes available -	Standard COLORBOND® steel colours and ZINCALUME® steel
BMT -	0.35mm
Curving Data -	Not suitable for curving

Material Specification

- LYSAGHT TRIMWALL® is manufactured from ZINCALUME® steel complying with AS1397-2011-G550-AZ150 (550MPa minimum yield strength, 150g/m² minimum)
- The COLORBOND® steel complies with AS/NZS 2728-2007.

Fixing data - Non-cyclonic

LYSAGHT TRIMWALL® is pierce-fixed to steel or timber supports. This means that fastener screws pass through the sheeting. For walling, you may only use valley fixing.

Always drive the screws perpendicular to the sheeting, and in the centre of the corrugation or rib.

Don't place fasteners less than 25mm from the ends of the sheets.

For cyclonic fixing data please refer to the latest version of the Lysaght Product Catalogue.

Fixing to steel - Crest

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
M6-11X50 ROOFZIPS	#12-14X45 HH HG/TG #12-14X55 HH HG/TG M5.5-14X50 AUTOTEKS	#12-14X45 HH HG/TG #12-14X55 HH HG/TG M5.5-14X50 AUTOTEKS

Fixing to steel - Pan

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16X16 HH M5-16X25 DH M6-11x25 ROOFZIPS	#10-16X16 HH M5-16X25 DH	#10-16X16 HH

Fixing to Hardwood

Pan	Crest
#10-12X25 T17 HH #12-11X25 T17 HH M5-16X25 DH	#12-11X65 T17 HG/TG HH

Fixing to Softwood

Pan	Crest
#10-12X30 T17 HH #12-11X25 T17 HH M5-16X25 DH M6-11X25 ROOFZIPS	#12-11X65 T17 HG/TG HH M6-11X65 ROOFZIPS

Valley: 4 fasteners†

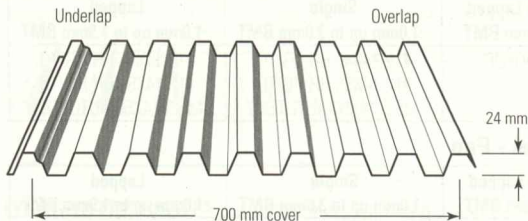


S = Side lap

Roofzips®, AutoTeks®, Rippletex® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT SPANDEK®



LYSAGHT SPANDEK® is a contemporary looking trapezoidal profile, which is ideal where a stronger, bolder modern corrugated appearance is required. Originally designed for the commercial sector, LYSAGHT SPANDEK® is finding increasing popularity in contemporary home design.

*Cyclonic design data is available for this product.

Application -

Roofing and Walling

Finishes available -

Standard COLORBOND® steel colours, COLORBOND® Ultra steel, COLORBOND® Stainless steel (in 0.42 subject to enquiry), COLORBOND® Metallic (in 0.48 subject to enquiry) and ZINCALUME® steel

BMT -

0.42mm and 0.48mm

Minimum Roof Slope -

3 degrees (1:20)

Curving Data -

Spring curving – the minimum radii for convex spring curve is 20m

Material Specification

- ZINCALUME® steel complying with AS 1397-2011 G550, AZ150 (550 MPa minimum yield stress, 150 g/m² minimum coating mass).
- Stainless steel standard grade designation is AISI/ASTM Type 430; UNS No. S43000. Availability subject to enquiry.

The COLORBOND® steel complies with AS/NZS 2728: 2007.

Fixing data - Non-cyclonic

LYSAGHT SPANDEK® is pierce-fixed to timber or steel supports. This means that fastener screws pass through the sheeting.

You can place screws for LYSAGHT SPANDEK® through the crests or in the valleys. To maximise watertightness, always place roof screws through the crests. For walling, you may use either crest or valley fixing.

Always drive the screws perpendicular to the sheeting, and in the centre of the corrugation or rib.

Don't place fasteners less than 25mm from the ends of the sheets.

For cyclonic fixing data please refer to the latest version of the Lysaght Product Catalogue.

Fixing to steel - Crest

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
M6-11X50 ROOFZIPS	#12-14X45 HH HG/TG #12-14X55 HH HG/TG M5.5-14X50 AUTOTEKS	#12-14X45 HH HG/TG #12-14X55 HH HG/TG M5.5-14X50 AUTOTEKS

Fixing to steel - Pan

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16X16 HH M5-16X25 DH M6-11x25 ROOFZIPS	#10-16X16 HH M5-16X25 DH	#10-16X16 HH

Fixing to Hardwood

Pan	Crest
#10-12X25 T17 HH #12-11X25 T17 HH M5-16X25 DH	#12-11X50 T17 HG/TG HH

Fixing to Softwood

Pan	Crest
#10-12X30 T17 HH #12-11X25 T17 HH M5-16X25 DH M6-11X25 ROOFZIPS	#12-11X65 T17 HG/TG HH M6-11X65 ROOFZIPS

Crest: 3 fasteners†

Valley: 3 fasteners†

Crest: 4 fasteners†

Valley: 4 fasteners†

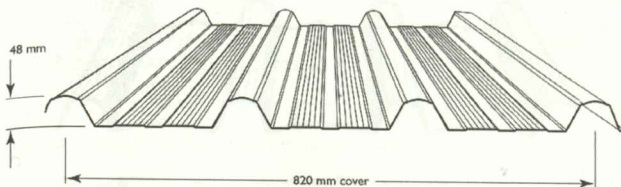
Number of fasteners depends on
wind pressure (see brochure on
this product).

S = Side lap

Roofzips®, AutoTeks®, Rippletex® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT SPANRIB® (Available in QLD only)



LYSAGHT SPANRIB® cladding provides the benefits of long spanning, pierced-fix cladding, with excellent rainwater carrying capacity. It is available in Queensland only. It has been designed for commercial and industrial applications where long span and fast installation are major requirements. Minimum order quantities apply - subject to enquiry.

Application -

Roofing and Walling

Finishes available -

Limited COLORBOND® steel colours and ZINCALUME® steel (subject to enquiry)

BMT -

0.42mm and 0.48mm

Minimum Roof Slope -

1 degree for BMT 0.48mm (1:50)
2 degree for 0.42 BMT (1:30)

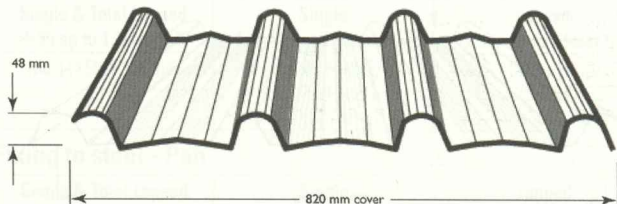
Curving Data -

Not available for curving

Material Specification

- ZINCALUME® steel complying with AS1397-2011 G550, AZ150 (550 MPa minimum yield stress, 150g/m² minimum coating mass); or
- The COLORBOND® steel complies with AS/NZS2728:2007.

LYSAGHT INTEGRITY® 820



LYSAGHT INTEGRITY® 820 is an exterior cladding profile designed for commercial and industrial applications, where long span and wide cover for fast installation is required. Availability subject to enquiry.

Application -

Roofing and Walling

Finishes available -

Limited COLORBOND® steel colours and ZINCALUME® steel (subject to enquiry)

BMT -

0.42mm and 0.48mm

Minimum Roof Slope -

1 degree for BMT 0.48mm (1:50)
2 degree for 0.42 BMT (1:30)

Curving Data -

Not available for curving

Material Specification

- ZINCALUME® steel complying with AS1397-2011 G550, AZ150 (550 MPa minimum yield stress, 150g/m² minimum coating mass); or
- The COLORBOND® steel complies with AS/NZS2728:2007.

Fixing data - Non-cyclonic

Fixing to steel - Crest

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
M6-11X65 ROOFZIPS	#12-14X68 HH HG/TG	#12-14X68 HH HG/TG

Do not fix screws less than 25mm from the end of sheet.

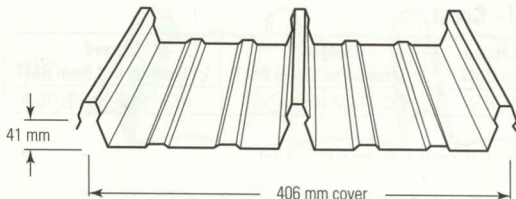
Crest: 4 fastener†



S = Side lap

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Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT KLIP-LOK® 406



LYSAGHT KLIP-LOK® 406 is a strong, durable and long length profile that combines the strength of steel, a lock action rib design and concealed fixing to allow application on low pitched roofs. It is commonly used on industrial and commercial projects. In the Northern Territory it is known as KLIP-LOK® 406 High Wind and is cyclonically rated when pierce fixed with cyclonic screw assemblies.

Application -	Roofing and Walling
Finishes available -	Limited COLORBOND® steel colours, and ZINCALUME® steel
BMT -	0.42mm
Minimum Roof Slope -	2 degrees for BMT 0.42mm (1:30)
Curving Data -	Not available for curving

Material Specification

LYSAGHT KLIP-LOK® 406 is made from:

- ZINCALUME® zinc/aluminium alloy coated steel complying with AS 1397 - 2011 G550, AZ150 (550 MPa minimum yield stress, 150 g/m² minimum coating mass); or

- In the Northern Territory - Steel grade G300, bmt 0.55mm (standard) and 0.70mm for extreme applications.
- The COLORBOND® steel complies with AS/NZS 2728 - 2007.

Fixing data - Non-cyclonic

Fixing to steel - Pan

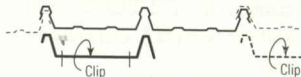
Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16X16 WH #10-16X22 WH	#10-16X16 WH #10-16X22 WH	#10-16X16 WH #10-16X22 WH

Fixing to Hardwood

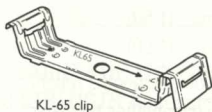
Pan	Crest
#10-12X25 T17 WH	N/A

Fixing to Softwood

Pan	Crest
#10-12X35 T17 WH	N/A



LYSAGHT KLIP-LOK® 406 Accessories



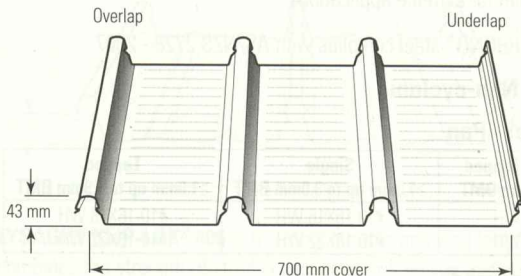
KL-65 clip
(For KLIP-LOK 406)

S = Side lap

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Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT KLIP-LOK® 700 HI STRENGTH



LYSAGHT KLIP-LOK® 700 HI STRENGTH is a wide-cover concealed fixed cladding offering long spans and excellent uplift performance. Also available on our mobile machine, onsite rollforming allows for long lengths previously unachievable due to transport limitations.

Application - Roofing and Walling

Finishes available - COLORBOND® steel colours, COLORBOND® Ultra, COLORBOND® Metallic (subject to enquiry) and ZINCALUME® steel

BMT - 0.42mm and 0.48mm (0.60 for mobile)

Minimum Roof Slope - 2 degrees for BMT 0.42mm (1:30)

1 degree for BMT 0.48mm (1:50)

1 degree for BMT 0.60mm (1:50)

Lengths - Available custom cut. Maximum lengths reliant on transport and handling capabilities however long lengths available with mobile machine.

Curving Data - Not available for curving

Material Specification

LYSAGHT KLIP-LOK® 700 HI STRENGTH is made from:

- ZINCALUME® zinc/aluminium alloy-coated steel complying with AS1397-2011, G550, AZ150 (550 MPa minimum yield stress, 150 g/m² minimum coating mass); or
- The COLORBOND® prepainted steel complies with AS/NZS 2728: 2007.

Fixing data - Non-cyclonic

Fixing to steel - Pan

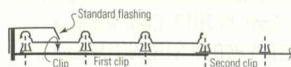
Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
M6-11x25 ROOFZIPS #15-15x25 HH	#12-14x20 HH #12-14x30 HH	#12-14x20 HH #12-14x30 HH

Fixing to Hardwood

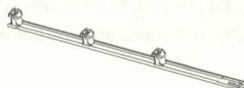
Pan	Crest
#12-11X25 T17 HH M5.5-11x40 BATTENZIPS	N/A

Fixing to Softwood

Pan	Crest
#12-11X25 T17 HH M5.5-11x40 BATTENZIPS M6-11X25 ROOFZIPS	N/A



LYSAGHT KLIP-LOK® 700 HI STRENGTH Accessories



KL-700HS clip
(For KLIP-LOK 700 HI-Strength)

S = Side lap

Roofzips®, AutoTeks®, Rippletex® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT KLIP-LOK® 700 HI STRENGTH ROOF SYSTEM – FM APPROVED

FM GLOBAL AND FM APPROVALS

FM Approvals (www.fmaprovals.com) is a third party certification agency that tests and certifies Fire Protection and Loss Prevention products. Active since 1897, FM Approvals operates as a business unit of FM Global (www.fmglobal.com), the world's largest commercial property insurance and risk management company - there are over 130,000 FM Global insured locations, in 120 countries worldwide.

FM GLOBAL AND FM APPROVALS

- Are recognised by insurance companies, which can contribute to reducing the overall building insurance cost.
- Are recognised by building assessors which can help accelerate building approval.
- Reduce damage in case of disaster, which can lead to faster recovery.
- Require less safety facilities, which can reduce overall building cost and construction time.

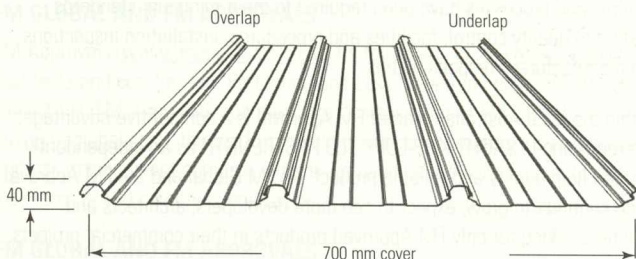
FM APPROVAL CLASS 4471

LYSAGHT KLIP-LOK® 700 HI STRENGTH roof system has been FM Approved under FM Approval Class 4471 (2010) as of April 23 2012. Certified as a Class 1 roof panel product, LYSAGHT KLIP-LOK® 700 HI STRENGTH has passed rigorous testing relating to combustibility (above & below), wind uplift resistance, foot traffic resistance and hail damage resistance.

To assure that all LYSAGHT KLIP-LOK® 700 HI STRENGTH product supplied is of the same superior quality as the samples tested, BlueScope Lysaght's systems and processes have been required to meet minimum standards relating to quality control, facilities and procedures, installation inspections and manufacturer's responsibilities.

Within the local Australian market FM Approval is a competitive advantage, differentiating LYSAGHT KLIP-LOK® 700 HI STRENGTH as an independently certified high quality and reliable product. As FM Global and the FM Approval brand continue to grow, expect to see more developers, architects and specifiers asking for only FM Approved products in their commercial projects.

LYSAGHT KLIP-LOK CLASSIC® (Available in WA and SA only)



LYSAGHT KLIP-LOK CLASSIC® is our newest clip fixed roofing profile and is strong, durable and offers excellent performance. It is commonly used in industrial and commercial applications.

Application -	Roofing and Walling
Finishes available -	COLORBOND® steel colours, and ZINCALUME® steel
BMT -	0.42mm and 0.48mm
Minimum Roof Slope -	2 degrees for BMT 0.42mm (1:30) 1 degree for BMT 0.48mm (1:50)
Curving Data -	Not available for curving

Material Specification

LYSAGHT KLIP-LOK CLASSIC® is made from:

- ZINCALUME® zinc/aluminium alloy-coated steel complying with AS1397-2011, G550, AZ150 (550 MPa minimum yield stress, 150 g/m² minimum coating mass); or
- The COLORBOND® prepainted steel complies with AS/NZS 2728: 2007.

Fixing data - Non-cyclonic

Fixing to steel - Pan

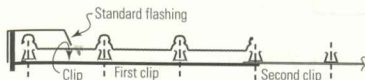
Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
M6-11x25 ROOFZIPS #15-15x25 HH	#12-14x20 HH #12-14x30 HH	#12-14x20 HH #12-14x30 HH

Fixing to Hardwood

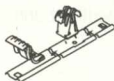
Pan	Crest
#12-11x25 T17 HH M5-16x25 DH M5.5-11x40 BATTENZIPS	N/A

Fixing to Softwood

Pan	Crest
#12-11x25 T17 HH M5-16x25 DH M5.5-11x40 BATTENZIPS M6-11x25 ROOFZIPS	N/A



LYSAGHT KLIP-LOK® CLASSIC Accessories



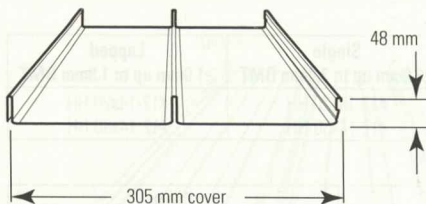
KL-Classic clip
(For KLIP-LOK CLASSIC)

S = Side lap

Roofzips®, AutoTeks®, Rippletex® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT LONGLINE® 305



Long clean lines are the visual aesthetics of this strong, durable and versatile cladding. It features smart lines of narrow ribs, smooth pans and concealed fixing. There are three variations of LYSAGHT LONGLINE® 305 available.

Because it is designed for large commercial projects minimum quantities may be applied. Subject to enquiry in some regions.

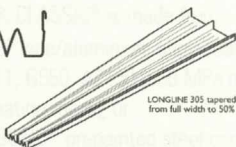
Plain – Flat pans



Fluted – Small creases in the centre of the pans



Tapered – Pan width reduced by up to 50% of normal width at one end.



LONGLINE 305 tapered
from full width to 50%

Application -	Roofing
Finishes available -	Limited COLORBOND® steel colours, and ZINCALUME® steel
BMT -	0.70mm
Minimum Roof Slope -	1 degree for BMT 0.70 (1:60)
Curving Data -	Not available for curving

Material Specification

LONGLINE 305® is made from ZINCALUME® zinc/aluminium alloy-coated steel complying with AS 1397-2011 G300, AZ150 (300 MPa minimum yield stress, 150 g/m² minimum coating mass). The COLORBOND® steel complies with AS/NZS 2728: 2007.

Fixing data - Non-cyclonic

Fixing to steel - Pan

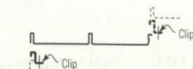
Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16X16 WH #10-16X22 WH	#10-16X16 WH #10-16X22 WH	#10-16X16 WH #10-16X22 WH

Fixing to Hardwood

Pan	Crest
#10-12X25 T17 WH	N/A

Fixing to Softwood

Pan	Crest
#10-12X35 T17 WH	N/A

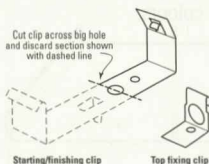


S = Side lap

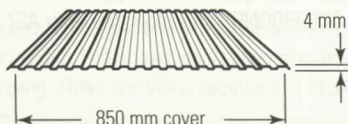
Roofzips®, AutoTeks®, Rippletaks® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT LONGLINE® Accessories



LYSAGHT PANELRIB®



LYSAGHT PANELRIB® has a lightly fluted profile making it suitable for many applications where flat sheet would not normally be considered. The longitudinal flutes provide rigidity along the length of the sheet while retaining full flexibility across the width.

LYSAGHT PANELRIB® can be used on exterior and interior walls and on straight or curved surfaces with flutes horizontal or vertical.

Application - Walling – external and internal

Finishes available - Limited COLORBOND® steel colours, and ZINCALUME® steel

BMT - 0.35mm and 0.42mm

Material Specification

LYSAGHT PANELRIB® is manufactured from ZINCALUME® steel complying with AS1397-2011-G550-AZ150 (550MPa minimum yield strength, 150g/m² minimum coating mass).

The COLORBOND® steel used in the manufacture of LYSAGHT PANELRIB® complies with AS/NZS 2728: 2007.

Fixing data - Non-cyclonic

Fixing to steel - Pan

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16x16 HH M5-16X25 DH M6-11x25 ROOFZIPS	#10-16x16 HH M5-16X25 DH	#10-16x16 HH

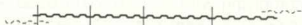
Fixing to Hardwood

Pan	Crest
#10-12X25 T17 HH #12-11X25 T17 HH M5-16X25 DH	N/A

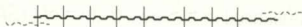
Fixing to Softwood

Pan	Crest
#10-12X30 T17 HH #12-11X25 T17 HH M5-16X25 DH M6-11X25 ROOFZIPS	N/A

Valley: 4 fasteners†



Valley: 8 fasteners†



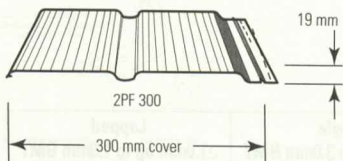
Number of fasteners depends on wind pressure (see brochure on this product).

S = Side lap

Roofzips®, AutoTeks®, Rippletaks® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT EASYCLAD®



The **LYSAGHT EASYCLAD®** system features stylish, clean-line panels with a wide range of trim sections and accessories catering for various design situations. A variation is available in the Northern Territory.

LYSAGHT EASYCLAD® can be fixed either vertically or horizontally.

It is popular for use on walls, soffit linings, infill panels and screens.

Application - Walling – external and internal

Finishes available - Limited COLORBOND® steel colours, and ZINCALUME® steel

BMT 2pf300 - 0.42 BMT

BMT EH300 (NT only) - 0.55 BMT

Material Specification

- ZINCALUME® steel complying with AS1397-2011 G550, AZ150 (550MPa minimum yield stress, 150g/m² minimum coating mass). or
- The COLORBOND® steel used in the manufacture of LYSAGHT EASYCLAD® complies with AS/NZS 2728:2007.

Fixing data - Non-cyclonic

Fixing to steel - Pan

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16x16 HH M5-16X25 DH M6-11x25 ROOFZIPS	#10-16x16 HH M5-16X25 DH	#10-16x16 HH

Fixing to Hardwood

Pan	Crest
#10-12X25 T17 HH #12-11X25 T17 HH M5-16X25 DH	N/A

Fixing to Softwood

Pan	Crest
#10-12X30 T17 HH #12-11X25 T17 HH M5-16X25 DH M6-11X25 ROOFZIPS	N/A

EASYCLAD 2P

1 fastener

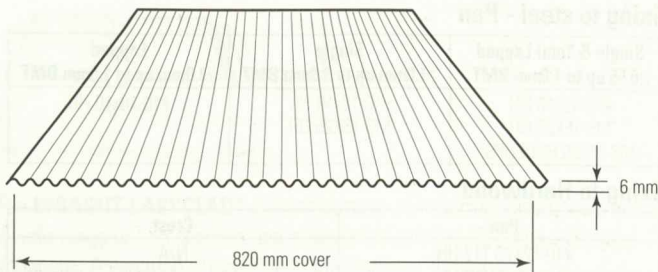


S = Side lap

Roofzips®, AutoTeks®, Rippletex® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT MINI ORB® (Not for roofing)



Offering traditional style in an elegant profile, **LYSAGHT MINI ORB®** creates a sophisticated look. Suitable for use in both interior and exterior applications, LYSAGHT MINI ORB® can be fixed either horizontally or vertically on straight or curved surfaces.

LYSAGHT MINI ORB® has also been known for its creative design applications.

Application -

Walling – external and internal

Finishes available -

COLORBOND® steel, COLORBOND® Ultra steel and COLORBOND® Metallic steel colours (in 0.48mm only), and ZINCALUME® steel

BMT -

0.42 (and 0.48BMT by request)

Lengths -

Available custom cut. Maximum lengths reliant on machine and transport capabilities

Curving Data

Pre-curve - The minimum radii for pre-curving radius is 150mm

Spring Curve - The minimum radii for convex spring curving is 1500mm

Material Specification

LYSAGHT MINI ORB® is made from ZINCALUME® zinc/aluminium alloy-coated steel complying with AS1397-2011 G550, AZ150 (550MPa minimum yield stress, 150g/m² minimum coating mass).

- The COLORBOND® steel complies with AS/NZS 2728:2007

Fixing data - Non-cyclonic

Fixing to steel - Pan

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16X20 RIPPLETEKS M4.8-16X25 RIPPLEZIPS	#10-16X20 RIPPLETEKS M4.8-16X25 RIPPLEZIPS	#10-16X20 RIPPLETEKS M4.8-16X25 RIPPLEZIPS

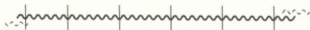
Fixing to Hardwood

Pan	Crest
#10-16X20 RIPPLETEKS M4.8-16X25 RIPPLEZIPS	N/A

Fixing to Softwood

Pan	Crest
#10-16X20 RIPPLETEKS M4.8-16X25 RIPPLEZIPS	N/A

Valley: 6 fasteners†



Valley: 11 fasteners†



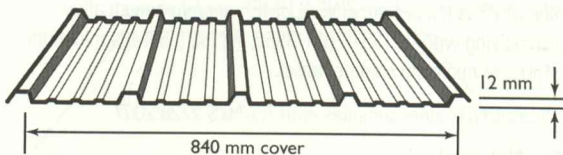
Number of fasteners depends on wind pressure (see brochure on this product).

S = Side lap

Roofzips®, AutoTeks®, Rippletex® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT MULTICLAD®



LYSAGHT MULTICLAD® is an attractive trapezoidal multi ribbed profile that is quick and easy to install. It's most common application is walls of garages and sheds.

Application -

Walling – external and internal

Finishes available -

COLORBOND® steel and ZINCALUME® steel

BMT -

0.35 and 0.42 BMT

Material Specification

LYSAGHT MULTICLAD® is manufactured from ZINCALUME® zinc/aluminium alloy-coated steel complying with AS1397-2011 G550, AZ150 (550MPa minimum yield stress, 150g/m² minimum coating mass).

- The COLORBOND® prepainted steel complies with AS/NZS 2728-2007.

Fixing data - Non-cyclonic

Fixing to steel - Pan

Single & Total Lapped ≥0.55 up to 1.0mm BMT	Single ≥1.0mm up to 3.0mm BMT	Lapped ≥1.0mm up to 1.9mm BMT
#10-16x16 HH M5-16X25 DH M6-11x25 ROOFZIPS	#10-16x16 HH M5-16X25 DH	#10-16x16 HH

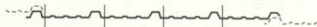
Fixing to Hardwood

Pan	Crest
#10-12X25 T17 HH #12-11X25 T17 HH M5-16X25 DH	N/A

Fixing to Softwood

Pan	Crest
#10-12X30 T17 HH #12-11X25 T17 HH M5-16X25 DH M6-11X25 ROOFZIPS	N/A

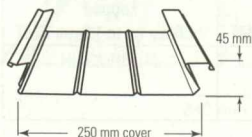
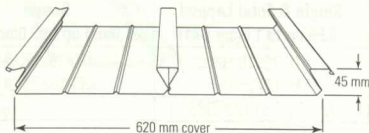
Valley: 4 fasteners†



S = Side lap

Roofzips®, AutoTeks®, Rippletex® and Designer Heads® are registered trademarks of ITW Australia Pty Ltd.

Notes: HH - Hex Head, WH - Wafer Head, HG - High Grip, DH - Designer Head, TG - Top Grip, T17 - Type 17 Timber Screw.

LYSAGHT FLATDEK®**LYSAGHT FLATDEK® II (AVAILABLE IN QLD ONLY)****LYSAGHT FLATDEK®****LYSAGHT FLATDEK® II**

LYSAGHT FLATDEK® is a long-span cladding with an attractive hi-gloss ceiling finish. It is particularly suited for home improvement projects such as patios, verandahs and carports.

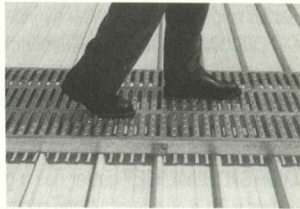
The excellent structural performance is derived from the profile's unique shape and the inherent strength of the high tensile steel.

Application	Roofing (light foot or no foot installation options)
Finishes available	Double-sided COLORBOND® Hi gloss steel
BMT	0.42mm
Minimum Pitch	2 degrees (1:30)
Lengths	Available custom cut. Maximum lengths reliant on transport and handling capabilities.
Mass	6.0kg/m ² (5.2kg/m ² for FLATDEK® II)

Check with your local Lysaght branch for colour availability in your area.

LYSAGHT ROOFTRAK® 675 & 450

LYSAGHT ROOFTRAK® provides a safe and stable surface for incidental access on flat roofs. It may be installed parallel or at 90° to the ribs of roof sheeting. Rooftrak is supplied in kits that include components and fixings.



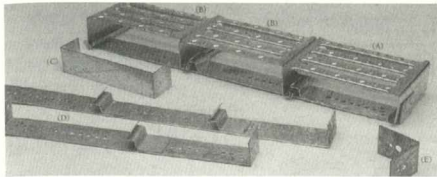
LYSAGHT ROOFTRAK® 675 is a 675mm wide walkway system. LYSAGHT

ROOFTRAK® 450 is a cost effective 450mm wide alternate system. Check with governing authorities for use of the narrow version of this product.

Material: Zinc-coated steel to AS 1397 G300, Z450 coating class in 1.2 and 2.0mm thicknesses.

Widths: 675mm (3 sections wide) and 450mm (2 sections wide)

Lengths: Nom. 3m & 6m (Actual 3018 and 6074mm)



Component	Mass
(A) Plank (male/male) standard length 3m* or 6m†	3.78 kg/m
(B) Plank (male/female) standard length 3m* or 6m†	3.78 kg/m
(C) Blanking Plate or Butt Plate G065BP	0.24 kg
(D) Support Bracket	0.50 kg
(E) Heel/Toe End Plate Bracket	0.13kg

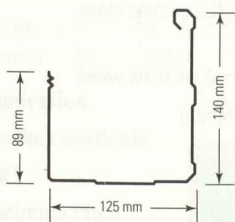
LYSAGHT RAINWATER GOODS

Gutter and downpipe systems made from ZINCALUME® steel or COLORBOND® steel are available in a range of profiles to suit any home design - contemporary to traditional. They offer excellent corrosion resistance with a durable and low maintenance paint finish.

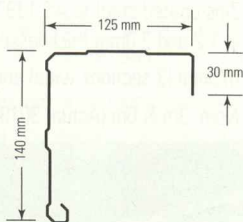
LYSAGHT EMLINE®

LYSAGHT EMLINE® gutter has a generous rainwater carrying capacity and comes with a choice of all the components needed for a perfect finish. It is concealed-fixed and is compatible with LYSAGHT NOVALINE® Fascia.

LYSAGHT EMLINE® gutter is only available in QLD.

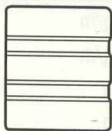


Gutter

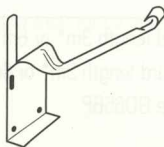


Capping

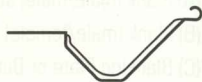
Gutter Accessories



Stop end



LYSAGHT EMLINE® GP Bracket



NOVALINE® Overstrap

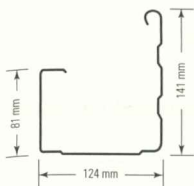
LYSAGHT SHEERLINE®

The **LYSAGHT SHEERLINE®** gutter system features concealed fixing for a clean, seamless finish. With the choice of optional slotting to allow overflow during heavy rainfall, as well as all the components needed for a perfect finish, LYSAGHT SHEERLINE® is an extremely adaptable gutter system.

LYSAGHT SHEERLINE® is available in WA, SA, NT, NSW, and VIC.

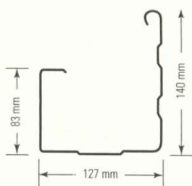
LYSAGHT SHEERLINE® gutter is commonly used in home improvement applications.

In NT, LYSAGHT SHEERLINE® is also known as Square Gutter.

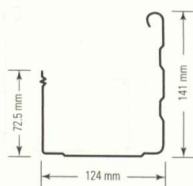


Gutter (All states except SA & WA)

Note: NSW profile has a stiffener in the back face

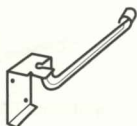


Gutter (WA only)

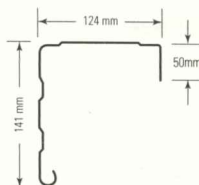


Gutter (SA only)

Gutter Accessories



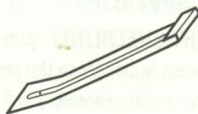
General purpose gutter clip



Capping



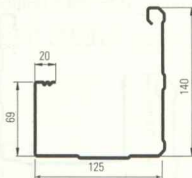
Stop end



SGCI gutter clip

LYSAGHT FITFAST® GUTTER

The **LYSAGHT FITFAST®** gutter is only available in QLD.



FITFAST® Gutter

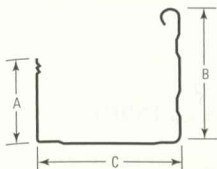


SGCI gutter clip

LYSAGHT TRIMLINE®

The **LYSAGHT TRIMLINE®** gutter is a slim, elegant gutter, that is concealed-fixed and is compatible with LYSAGHT NOVALINE® Fascia. It is available slotted or unslotted.

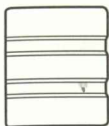
LYSAGHT TRIMLINE® is available in SA, NT, QLD, NSW, and VIC.



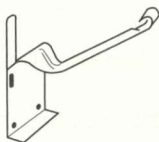
Length	NSW	VIC/TAS	QLD
A	73	72	70
B	117	116	116
C	124	124	124

Note: In NSW, availability is subject to enquiry

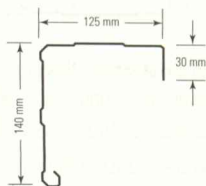
Gutter Accessories



Stop end



TRIMLINE® Clip



TRIMLINE® Capping



TRIMLINE® Overstrap

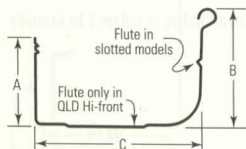
THE QUAD GUTTER RANGE

The traditional "D" shape of the QUAD (or "D") gutter perfectly complements our range of roofing and walling products to give a professional and finished look. Available in long lengths and a variety of colours, there will be a QUAD gutter that will suit your needs.

Choices vary from state to state, with a range of widths that's appropriate for the water carrying capacity in your area.

Some profile dimensions may vary slightly from state to state.

LYSAGHT QUAD 115 GUTTERS (HI-FRONT & LO-FRONT)



QUAD 115 is a traditional gutter, and is compatible with LYSAGHT NOVALINE® fascia system. QUAD 115 Hi-Front gutter obscures the end of low-to-medium height roofing profiles from view.

In some states, this profile is available with optional slotting to allow overflow during heavy rainfall.

QUAD 115 Hi-Front is available in SA, QLD, NSW, and VIC.

In SA, QUAD Gutters are known as D Gutters.

In QLD, QUAD 115 Hi-Front is fluted and slotted.

In VIC, QUAD 115 Hi-Front is known as QUAD.

QUAD 115 Lo-Front is only available in NSW.

QUAD 115 Hi-Front Dimensions (NSW, QLD, SA, VIC,)

A = 62mm (nominal)

B = 90mm (nominal)

C = 115mm (nominal)

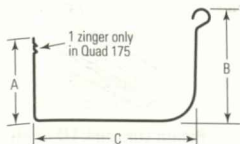
QUAD 115 Lo-Front Dimensions (NSW only)

A = 65mm (nominal)

B = 70mm (nominal)

C = 115mm (nominal)

LYSAGHT QUAD 125, 150 & 175



QUAD 150 & 175 are our traditional gutters in two wider profiles. QUAD 150 is compatible with LYSAGHT NOVALINE® Fascia. **QUAD 125** is supplied in South Australia to match old installations, and is compatible with LYSAGHT NOVALINE® Fascia.

QUAD 125 is only available in SA and is known as D Gutter. QUAD 150 and 175 are only available in QLD.

QUAD 125

Dimensions in SA

A = 70mm (nominal)

B = 80mm (nominal)

C = 125mm (nominal)

QUAD 150

Dimensions in QLD

A = 75mm (nominal)

B = 74mm (nominal)

C = 150mm (nominal)

QUAD 175

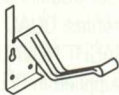
Dimensions

A = 103mm (nominal)

B = 96mm (nominal)

C = 175mm (nominal)

LYSAGHT QUAD GUTTER ACCESSORIES



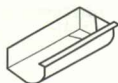
Internal GP bracket

Used with each QUAD gutter.
ZINCALUME® steel



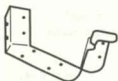
External Bracket (T-head bracket)

Used with each QUAD gutter.
ZINCALUME® steel &
Powdercoated steel



Return stop end: LH or RH

Used with Hi-front.
ZINCALUME® steel &
Powdercoated steel
Not available in NSW.



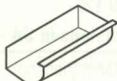
Internal corner

Diecast 90° & 45°
Used with QUAD 115.
Diecast &
Powdercoated steel



External corner

Diecast 90° & 45°
Used with QUAD 115.
Diecast &
Powdercoated steel



Full stop end: LH or RH

Used with 150, 175.
ZINCALUME® steel &
Powdercoated steel
Not available in NSW
or QLD.



Overstrap

Used with each QUAD gutter except 175.
ZINCALUME® steel



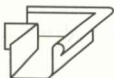
Stop end plate: LH or RH

Used with each QUAD gutter.
ZINCALUME® steel &
COLORBOND® steel



Spike bracket

Used with 150 & 175.
GALVANISED



External corner

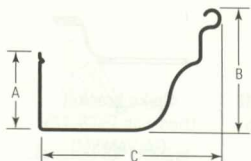
Manufactured steel.
ZINCALUME® steel & COLORBOND® steel
Not available in NSW or for
115 in QLD and SA.



Internal corner

Manufactured steel.
ZINCALUME® steel & COLORBOND® steel
Not available in NSW or for
115 in QLD and SA.

LYSAGHT OGEE® GUTTER



Finish your roof off with the distinctive style of **LYSAGHT OGEE®** gutters. Compatible with NOVALINE® FASCIA, LYSAGHT OGEE® gutter comes with a range of accessories.

LYSAGHT OGEE® is available in SA and VIC.

Dimensions in SA & VIC

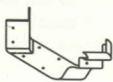
A = 62mm (nominal)

B = 98mm (nominal)

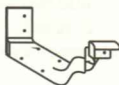
C = 145mm (nominal)

Note: Availability in other states subject to enquiry.

Gutter Accessories



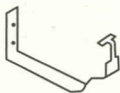
External corner
Diecast 90° & 45°
Diecast &
Powdercoated steel



Internal corner
Diecast 90° & 45°
Diecast &
Powdercoated steel



OGEE overstrap



OGEE external bracket



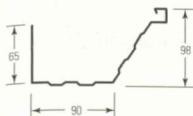
OGEE internal GP bracket



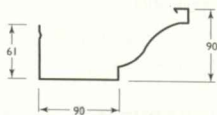
Stop end: LH or RH

LYSAGHT RANCELINE® AND COLONIAL GUTTER

LYSAGHT RANCELINE® AND COLONIAL Gutters can add classic and decorative features to your home. They are available in WA only.



RANCELINE® GUTTER
RANCELINE® SLOTTED
RANCELINE® PATIO



COLONIAL GUTTER

Gutter Accessories



External corner



Stop End



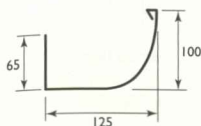
Gutter strap
(timber fix)



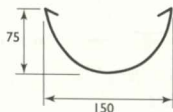
Gutter strap
(metal fix)

LYSAGHT CUSTOM WA GUTTERS

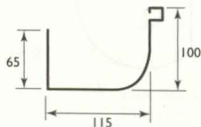
These three gutters are made only in WA.



Quarter-round gutter



Half-round gutter



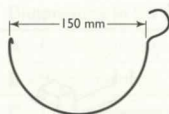
Quad gutter:
Square bead

LYSAGHT HALF ROUND & FLAT BACK GUTTERS

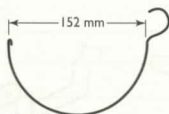
Half round gutter is a simple profile, supported by external brackets. The style is becoming increasingly popular both in residential and commercial applications.

A full range of accessories is available. Variations are available in QLD, VIC, NSW, SA and NT.

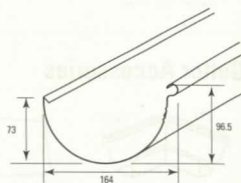
LYSAGHT Half-round gutter



Victoria dimension is 150mm nominal.

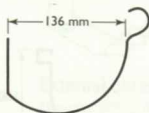


Queensland dimensions

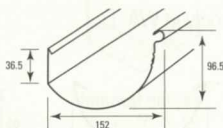


New South Wales dimensions

Flat back gutter



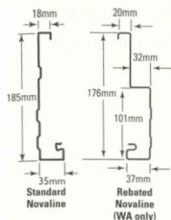
Queensland, Vic. dimensions



New South Wales dimensions

Please check with your local Lysaght branch for additional sizes and to check the dimensions in your area.

LYSAGHT NOVALINE® FASCIA SYSTEM



LYSAGHT NOVALINE® Fascia System has been designed for ease of use. A spring clip snaps on to the LYSAGHT NOVALINE® fascia and makes fixing of the gutters quick and easy. It is available in custom cut lengths to suit your application.

Compatible Gutters: EMLINE®, QUAD 115 HI-FRONT, QUAD 115 LO-FRONT, QUAD 125, QUAD 150, OGEE®, TRIMLINE®, SHEERLINE®, RANCELINE®, COLONIAL

Gutter Accessories



Multi-purpose fascia brack
ZINCALUME® steel



Spring clip



Internal cover cap
ZINCALUME® steel & COLORBOND® steel



Internal corner
ZINCALUME® steel
& COLORBOND® steel



External corner
ZINCALUME® steel
& COLORBOND® steel



Barge mould: RH
ZINCALUME® steel
& COLORBOND® steel



Barge mould: LH
ZINCALUME® steel
& COLORBOND® steel



Splice plate
ZINCALUME® steel

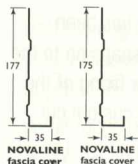


Apex cover
ZINCALUME® steel
& COLORBOND® steel



End closer (Not Available in NSW)
ZINCALUME® steel
& COLORBOND® steel

LYSAGHT NOVALINE® FASCIA COVER



The **LYSAGHT NOVALINE®** Fascia Cover has the ability to cover warped or weathered timber, peeling paint or discoloured wood. LYSAGHT NOVALINE® Fascia Cover is designed to go over existing fascia boards.

VIC

NSW

LYSAGHT DOWNPIPES AND ACCESSORIES



To complete its range of rainwater goods, BlueScope Lysaght has a wide range of square, rectangular and circular downpipes. They are available in ZINCALUME® steel and a wide range of COLORBOND® prepainted steel colours.

Please check with your local Lysaght branch for size availability in your area.

Downpipe Accessories

Downpipe Nozzles / Drops



Round



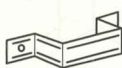
Square/Rectangular

Downpipe Straps / Astragals / Brackets



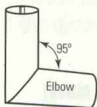
Round

(Shape differs from state to state)



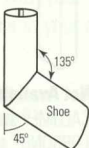
Square/Rectangular

Downpipe Bends/Elbows/Shoes



95°

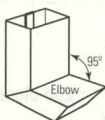
Elbow



135°

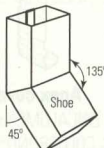
Shoe

45°



95°

Elbow



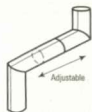
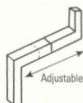
135°

Shoe

45°

Adjustable Downpipes / Offsets

For size availability refer to local region.



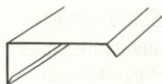
Crimped Bends

(N/A in WA)



LYSAGHT FLASHING AND CAPPINGS

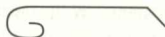
BlueScope Lysaght manufactures a large range of standard and custom flashings. The illustrations give you an idea of what's available for different areas of your roof. Shape and size may change from state to state. Inquire locally for specific dimensions.



Barge Capping



Barge Roll (N/A in WA)



Barge Roll Capping



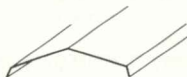
Spear Point



Apron Flashing (N/A in WA)



Tile Flashing



Ridge Capping



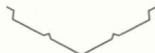
Roll Top Ridge Capping



Valley Flashing



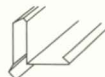
**Ribbed Valley
(N/A in WA)**



**Structural Valley
(N/A in WA)**



Valley Support



Barge Gutter

ROOF DRAINAGE

ROOF DRAINAGE SYSTEM DESIGN

Roof drainage systems should be designed and detailed by a suitably qualified trade or professional in accordance with BCA and the Australian Standards. Particular reference should be made to the correct sizing of gutter; quantity and placement of downpipes; and the provision of appropriate overflow devices. Some supporting guidance is available in our publication "LYSAGHT® Roofing & Walling Installation Manual" (Section 6 - Roof Drainage).

OVERFLOW PROVISION

The detailing and sizing of the selected overflow method/s is normally completed by the designer/installer, but must be adequate for the situation and must meet the relevant performance requirement of the BCA and Australian Standards. Further detail is available from our publication "Water Overflow & Residential Gutters".

GUTTER FALL

Install gutters with a suitable fall to avoid ponding and to allow water to easily flow away. Steeper falls are preferred for prolonged life of the gutter. Refer to the BCA and Australian Standards for guidance.

Careful design of drainage will protect people and property. To assist you with your calculations these tables can be used as a guide.

DESIGN RAINFALL INTENSITIES

		For overflow of eaves gutters once in 20 years (mm/hr)	For overflow of internal box gutters once in 100 years (mm/hr)
ACT	Canberra	137	194
New South Wales	Broken Hill	130	181
	Bathurst	143	197
	Sydney	214	273
	Newcastle	181	233
Victoria	Mildura	125	174
	Melbourne	127	186
	Ballarat	127	184
Queensland	Brisbane	251	333
	Rockhampton	248	336
	Mackay	273	363
	Mt Isa	169	223
	Townsville	260	346
	Cairns	282	368
South Australia	Mount Gambier	108	168
	Adelaide	123	186
Western Australia	Geraldton	132	173
	Perth	146	214
Tasmania	Hobart	99	155
Northern Territory	Alice Springs	139	204
	Darwin	285	366

Rainwater run-off

The drainage or run-off capacity of roof sheeting can limit on the total length of a sheet run and must be considered in roof design and construction.

As a guide, the table below lists the maximum recommended length of roof run for various LYSAGHT® sheet profiles at the roof slopes and rainfall intensities shown. These are based on CSIRO research and BlueScope Lysaght Research and Technology calculation of the behaviour of roofing profiles under peak rainfall conditions.

The roof run is the total length of roof sheeting draining rainwater in one direction, including any end laps, expansion joints or steps that may be present in the roof. Careful considerations should be given to rainwater diverted around roof penetrations.

See the table below for rainfall intensities for selected localities.

MAXIMUM ROOF RUN FOR DRAINAGE MEASURED FROM RIDGE TO GUTTER (m)

	Peak rainfall intensity mm/hr	Roof Slope						Peak rainfall intensity mm/hr
		1 in 50 (1°)	1 in 30 (2°)	1 in 20 (3°)	1 in 12 (5°)	1 in 7.5 (7.5°)	1 in 6 (10°)	
CUSTOM ORB® CUSTOM BLUE ORB®	100				29	34	38	100
	150				20	23	25	150
	200				15	17	19	200
	250				12	14	15	250
	300				10	11	13	300
	400				7	8	10	400
	500				6	7	8	500
INTEGRITY® 820 SPANRIB®	100		410	480	598	713	820	100
	150		273	320	399	476	547	150
	200		205	240	299	357	410	200
	250		164	192	239	285	328	250
	300		137	160	199	238	273	300
	400		102	120	150	178	205	400
	500		82	96	120	143	164	500

	Peak rainfall intensity mm/hr	Roof Slope						Peak rainfall intensity mm/hr
		1 in 50 (1°)	1 in 30 (2°)	1 in 20 (3°)	1 in 12 (5°)	1 in 7.5 (7.5°)	1 in 6 (10°)	
KLIP-LOK® 406	100	375	467	548	682	813	934	100
	150	250	311	365	454	542	623	150
	200	188	234	274	341	406	467	200
	250	150	187	219	273	325	374	250
	300	125	156	183	227	271	311	300
	400	94	117	137	170	203	234	400
	500	75	93	110	136	163	187	500
KLIP-LOK® 700 HI-STRENGTH	100	344	428	502	624	745	856	100
	150	229	285	334	416	496	571	150
	200	172	214	251	312	372	428	200
	250	137	171	201	250	298	342	250
	300	115	143	167	208	248	285	300
	400	86	107	125	156	186	214	400
	500	69	86	100	125	149	171	500
KLIP-LOK® CLASSIC 700	100	247	308	361	449	536	616	100
	150	165	205	241	300	357	411	150
	200	124	154	181	225	268	308	200
	250	99	123	144	180	214	246	250
	300	82	103	120	150	179	205	300
	400	74	93	108	135	161	185	400
	500	49	62	72	90	107	123	500
LONGLINE 305® (not tapered)	100	219	273	320	398	475	546	100
	150	146	182	213	265	317	364	150
	200	110	136	160	199	237	273	200
	250	88	109	128	159	190	218	250
	300	73	91	107	133	158	182	300
	400	55	68	80	100	119	136	400
	500	44	55	64	80	95	109	500
SPANDEK®	100		97	111	133	154	173	100
	150		65	74	89	103	115	150
	200		49	55	67	77	86	200
	250		39	44	53	62	69	250
	300		32	37	44	51	58	300
	400		24	28	33	39	43	400
	500		19	22	22	31	35	500

	Peak rainfall intensity mm/hr	Roof Slope						Peak rainfall intensity mm/hr
		1 in 50 (1°)	1 in 30 (2°)	1 in 20 (3°)	1 in 12 (5°)	1 in 7.5 (7.5°)	1 in 6 (10°)	
TRIMDEK®	100		220	257	320	382	439	100
	150		146	172	214	255	293	150
	200		110	129	160	191	220	200
	250		88	103	128	163	176	250
	300		73	86	107	127	146	300
	400		55	64	80	96	110	400
	500		44	51	64	76	88	500

- Some lengths in this table may exceed the maximum allowable transport length.
- Data are based on work of CSIRO and BlueScope Lysaght.
- SPANDEK® with slope of 2° (1 in 30) is available subject to enquiry.

GUTTER SIZES FOR VARIOUS RAINFALL INTENSITIES AND ROOF CATCHMENT AREAS PER DOWNPIPE

Rainfall Intensity (mm/hr)	Roof Catchment Area				
	10m ²	20m ²	50m ²	100m ²	200m ²
	Cross Sectional Area of Gutter (mm ²) Required to drain above roof catchment area into one downpipe				
80	1300	220	4600	8000	14000
90	1420	2400	5100	8750	15220
100	1540	2600	5500	9450	16430
110	1630	2800	5890	10150	17630
120	1740	2990	6280	10850	18820
130	1850	3180	6670	11530	20000
140	1950	3370	7050	12210	21170
150	2050	3560	7430	12890	22330
160	2150	3750	7810	13570	23490
175	2300	4030	8370	14570	25210
200	2550	4480	9290	16220	28060
225	2800	4920	10200	17820	30860
275	3300	5760	12000	20920	36400
325	3780	6560	13750	23920	41700
425	4650	8060	16800	29250	51000

Note: For internal box gutters add 25mm of freeboard depth to cross sectional areas given in this table.

GUTTER AREAS AND DOWNPIPES

Minimum standard downpipe sizes to suit gutters (gradient $\geq 1:500$)

	Slotted yes/no	Effective [#] cross-section (mm) ²	Round (diameter) (mm)	Rectangular or Square (mm)
COLONIAL	no	4465	n/a	45 x 95
EMLINE	yes	6723	100	100 x 75
EMLINE	no	9540	125	100 x 75
FITFAST	yes	6723	90	100 x 75
FITFAST	no	7209	90	100 x 75
FLAT BACK 150	yes	5220	90	100 x 75
FLAT BACK 150	no	6447	90	100 x 75
HALF ROUND 150	yes	4775	90	100 x 75
HALF ROUND 150	no	6995	90	100 x 75
OGEE	no	5242	-	100 x 50
QUAD 115				
Hi-front	yes	5225	90	75 x 75
Hi-front	no	5809	90	100 x 50
Hi-front fluted QLD	yes	5285	90	75 x 75
Hi-front fluted QLD	no	5809	90	100 x 50
Low-front	no	6165	90	100 x 50
QUAD 150	no	8910	100	100 x 75
QUAD 175	no	14672	100	100 x 75
Square Bead Quad	no	5420	n/a	45 x 95
Quarter Round	no	5570	n/a	45 x 95
SHEERLINE	yes	7630	100	100 x 75
SHEERLINE	no	8370	100	100 x 75
TRIMLINE	yes	6244	100	100 x 75
TRIMLINE	no	7800	100	100 x 75

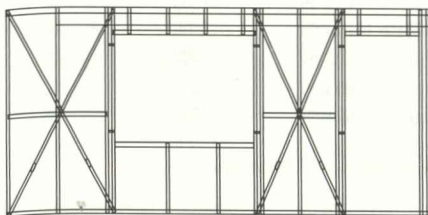
Values calculated in accordance with AS/NZS 2179.1:1994

HOUSE FRAMING COMPONENTS

BlueScope Lysaght manufactures a number of components that are for use in the fabrication of wall, roof and floor frames. Framing made from TRUECORE® steel won't warp, twist, shrink, rot or split. By the very nature of steel it is termite resistant and won't become fuel for fire. With an assurance of consistent quality and distinctive blue resin surface, TRUECORE® steel is an ideal framing solution.

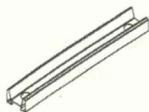
LYSAGHT SUPRAFRAME®

An engineered wall framing system.

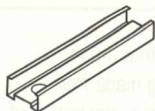


Components and accessories

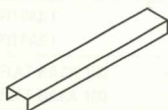
Boxed stud



BMT	Section	Stocked lengths*	Pack sizes
0.48	70 x 38	2408, 2443, 2708, 2743, 7500	50
0.48	75 x 38	Made to order*	50
0.48	90x 38	2408, 2443, 2708, 2743, 7500	40

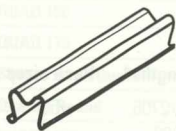
Open stud

BMT	Section	Stocked lengths*	Pack sizes
0.55	75 x 38	2408, 2443, 2708, 2743, 7500	60
0.55	70 x 38	Made to order*	60
0.75	75 x 38	Made to order*	60
0.75	90 x 38	Made to order*	60

Plate

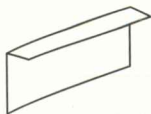
BMT	Section	Stocked lengths*	Pack sizes
0.75	70 x 35	7500	50
0.75	70 x 65	7500	50
1.0	70 x 65	7500	50
0.75	75 x 35	7500	50
0.75	75 x 65	7500	50
1.0	75 x 65	7500	50
0.75	90 x 35	7500	50
1.0	90 x 65	7500	50

* Non-standard lengths: 1800mm minimum, 12000mm maximum

Nogging

BMT	Section	Stocked lengths	Pack sizes
0.48	20 x 22	6100	20

Lintel



BMT

1.0
1.5

Section

200 x 35
200 x 35

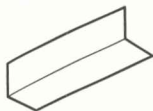
Stocked lengths

6000
6000

Pack sizes

25
25

Trim angle



BMT

1.0
1.0

Section

35 x 35
35 x 35

Stocked lengths

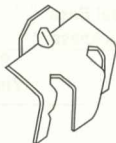
4800
5800

Pack sizes

40
40

Nogging clip

Pack size: 900



Round washer

32mm x 2.5 with
6mm hole
Galvanised steel
Pack size: 500



Plumbing grommet

Pack size: 2000



Brick tie

Galvanised steel - Pack size: 500
Stainless steel - Pack size: 500



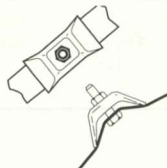
Electrical grommet

Pack size: 2000

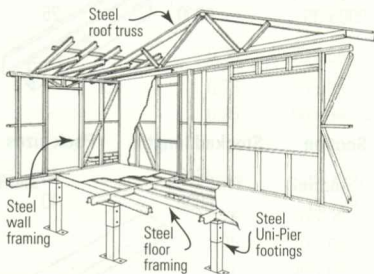


Tensioner set

Pack size: 100

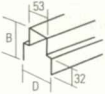


LYSAGHT STEEL BUILDING FRAME SYSTEM



This is a system of components that can be used for fabrication into wall, roof and floor frames.

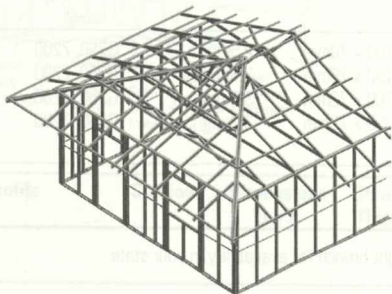
Profile	Section	Dimensions D x B	Steel Base Thickness	Material to AS1397-1977 Steel Grade and Zinc Coating Class
	Standard Plate	78 x 31mm	1.2mm	G300, Z200
	Stud	75 x 32mm	1.2mm	G300, Z200
	Nogging	72 x 34mm	1.2mm	G300, Z200
	Light Duty Stand	75 x 32mm	0.8mm	G300, Z200
	Junction Stud	75 x 38mm	1.2mm	G300, Z200
	Corner Stud	75 x 38mm	1.2mm	G300, Z200

Profile	Section	Dimensions D x B	Steel Base Thickness	Material to AS1397-1977 Steel Grade and Zinc Coating Class
	Stiffened Plate	79 x 75mm	1.6mm	G450, Z200
	Angle Head Beam	100 x 70mm 150 x 70mm 200 x 72mm 250 x 72mm	2.5mm 2.5mm 3.2mm 3.2mm	G250, Z200 G250, Z200 G250, Z200 G250, Z200
	Brick Wall Tie	-	-	-

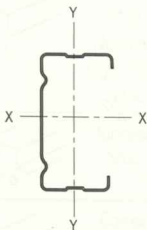
Note: Check with your local Lysaght branch for availability in your state.

ENDUROFRAME™

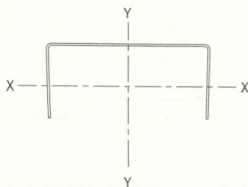
The ENDUROFRAME™ building system is a fully engineered and certified light gauge steel wall framing and truss system suitable for the residential or light commercial market. The ENDUROFRAME™ building system is the latest addition to the building range developed by BlueScope Steel, complementing the larger Ranbuild and Butler range of building solutions.



Components



RIBBED C- SECTION

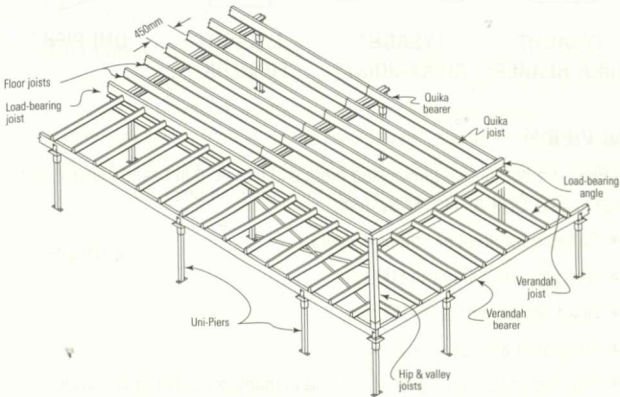


UNRIBBED U- SECTION

For further information visit www.enduroframe.com

LYSAGHT QUIKA-FLOOR® SYSTEM

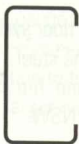
LYSAGHT QUIKA-FLOOR® is a fully engineered and certified sub floor system with pre-cut components that save time and labour costs. It is the steel alternative to conventional timber bearers and joists and is termite, fire and corrosion resistant. LYSAGHT QUIKA-FLOOR® is not available in NSW.



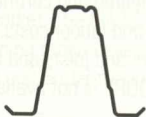
QUIKA-FLOOR® components

- Galvanised piers, each adjustable up to 200mm
- Galvanised steel bearers, generally 150mm deep
- ZINCALUME® steel joists, 120mm deep
- Accessories such as load bearing angles, angle bracing, bracketry and screws.

When designing for verandahs LYSAGHT FIRMLOK® can be substituted for aesthetic appeal.



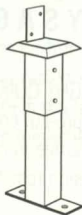
**LYSAGHT
QUIKA-BEARER®**



**LYSAGHT
QUIKA-JOIST®**



**LYSAGHT
FIRMLOK®**



UNI-PIER™

UNI-PIER™

Uni-Piers are hot dipped galvanised piers and can be purchased separately to the LYSAGHT QUIKA-FLOOR® system.

- Suitable for steel or timber bearers
- Sized to suit 200mm to 5000mm
- Head adjustment up to 200mm
- Integrated ant cap
- Hot dipped galvanised finish for use in many corrosive environments
- Available in 2 sizes: Builders Grade (65 x 65 x 2mm)
Heavy Grade (75 x 75 x 2.5mm)

Please check with your local Lysaght branch for availability in your state.

Uni-Pier™ is a trademark of Uni-Pier Australia Pty Ltd.

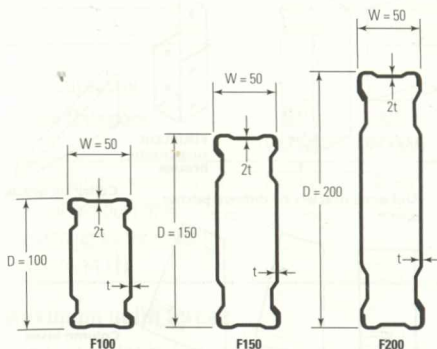
HOME IMPROVEMENTS

Additions to homes have become a popular method for adding value to property and improving lifestyle. BlueScope Lysaght has a range of products to use for additions such as patios, carports and extensions. It also offers a complete solution known as Lysaght Living Collection®.

LYSAGHT FIRMLOK®

LYSAGHT FIRMLOK® beam is a light, strong structural beam, useful in a wide range of applications including verandah, flooring, carports, and patios. It is developed for maximum aesthetic and structural performance. The unique interlocking Cee profiles provide a universal structural member with excellent spanning capacity. They do not warp or split, no painting is required and they are easily fixed with standard self drilling screws.

Schematics



All dimensions are nominal.

Section	Dimensions D x W (mm)	Metal Thickness t (mm)	Mass (COLORBOND® steel) (kg/m)
F10011	100 x 50 (nom)	0.55	1.94
F15015	150 x 50 (nom)	0.75	3.21
F20015	200 x 50 (nom)	1.00	5.01

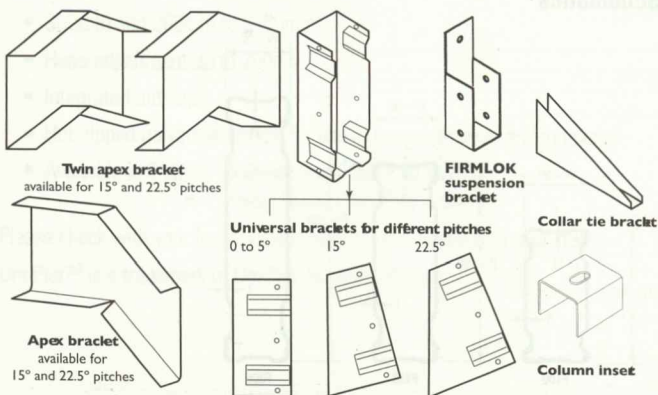
LYSAGHT FIRMLOK® beams are available in ZINCALUME® steel and several high gloss colours in COLORBOND® steel

The base metal thicknesses are 0.55, 0.75 and 1.00mm.

The COLORBOND® steel complies with AS/NZS 2728:2007

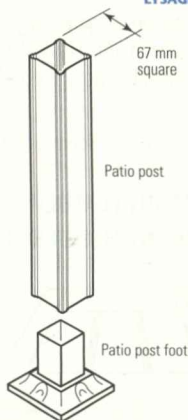
Please check with your local Lysaght branch for stock length availability in your area.

A variety of accessories are also available.



LYSAGHT® PATIO POST

LYSAGHT® PATIO POST is a post designed for maximum visual impact and structural strength. The post is made from extruded aluminium and features a fluted profile and high gloss powder-coated finish. The posts sit neatly on die-cast aluminium feet, which are fastened to concrete slabs or footings.



Specification

Wall Thickness	Area	Weight	Temper	Moment of inertis
1.6 mm	453.29 mm ²	1.230 kg/m	T5	$I_{xx} = I_{yy} = 0.292 \times 10^6 \text{ mm}^4$

Post Capacity

Wind Category	N1 (W28N)	N2 (W33N)	N3 (W41N)	N4 (W50N)
Maximum allowable area of roof per post (m) ² .	21.2m ²	15.5m ²	10.3m ²	7.0m ²
Governing factor is uplift force of 14 kN.				

Maximum uplift forces

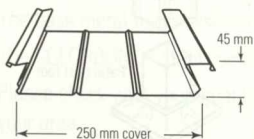
- Sustainable by foot (as detailed with two M10 Dynabolts): 18kN
- Sustainable by head with one central M8 bolt in slotted hole: 14 kN (as detailed with four 10-16x16 screws)

Greater uplift forces can be sustained at the 'head-to-post' connection by fixing LYSAGHT FIRMLOK® beams to posts with LYSAGHT FIRMLOK® Universal Brackets. Forces will depend on the number of screws used.

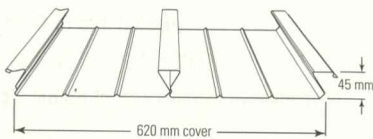
Please refer to the LYSAGHT FIRMLOK® Quick Selection Tables Brochure which you can download from www.lysaght.com

LYSAGHT FLATDEK®

LYSAGHT FLATDEK® II (AVAILABLE IN QLD ONLY)



LYSAGHT FLATDEK®



LYSAGHT FLATDEK® II

LYSAGHT FLATDEK® is a long-span cladding with an attractive hi-gloss ceiling finish. It is particularly suited for home improvement projects such as patios, verandahs and carports.

The excellent structural performance is derived from the profile's unique shape and the inherent strength of the high tensile steel.

Application

Finishes available

BMT

Minimum Pitch

Lengths

Mass

Roofing (light foot or no foot installation options)

Double-sided COLORBOND® Hi gloss steel

0.42mm

2 degrees (1:30)

Available custom cut. Maximum lengths reliant on transport and handling capabilities.

6.0kg/m² (5.2kg/m² for FLATDEK® II)

Check with your local Lysaght branch for colour availability in your area.

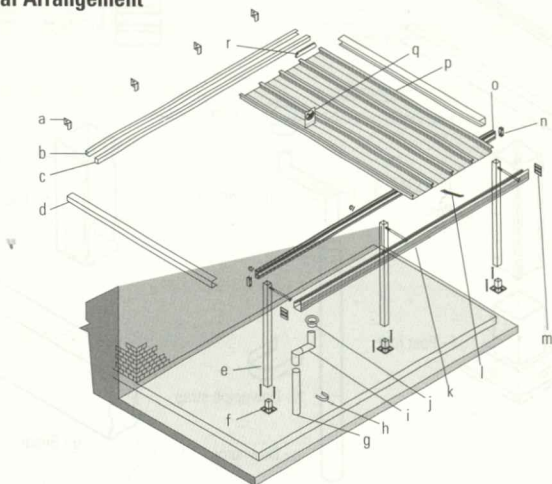
HOME ADDITIONS USING LYSAGHT FIRMLOK®

LYSAGHT FLATDEK® PATIO

BlueScope Lysaght's structural beam, LYSAGHT FIRMLOK® provides the framework to design a range of stunning verandahs and patios.

Detailed installation instructions are available from Steel Direct by calling **1800 641 417** or at our website www.lysaght.com The following gives you the general arrangement and components. Other arrangements are available.

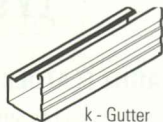
General Arrangement



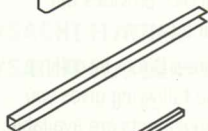
General Components



a - 140 universal bracket
and 70 universal bracket



k - Gutter



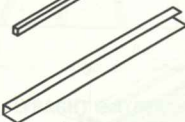
b - Receiver channel



c - Closed-cell foam strip



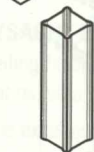
l - Gutter clip



d - Barge channel



m - Gutter end stop



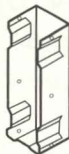
e - Post



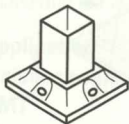
j - Gutter nozzle



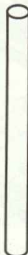
i - Gutter offset



n - End cap

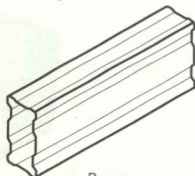


f - Post foot

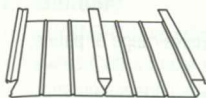


h - Downpipe strap

g - Downpipe



o - Beam



p - Roofing



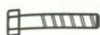
q - Safety sign



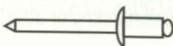
r - Closed-cell
foam insert



Cleaning brush



Blue-tip Screw Bolt
10 mm diameter



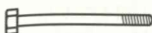
Blind rivet



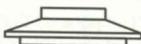
Blue-tip Screw Bolt
6.5 mm diameter



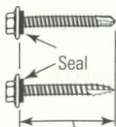
Bulb-tite rivet



Hexhead bolt, washer
& Nyloc nut



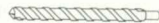
Aluminium
bonded washer



Metal Tek screw

Seal

Type 17 screw



10mm masonry drill bit



M12 Purlin bolt

Length is shown in size code at cc
(SIZE CODE: aa-bb x cc)

LYSAGHT LIVING COLLECTION®

The **LYSAGHT Living Collection®** includes an extensive range of patios, verandahs, carports, home extensions and decks.

For home improvement options as attractive and well engineered as they are affordable, you won't find better than the LYSAGHT Living Collection® range.

Key features include:

- Available as freestanding or attached structures in a wide variety of style choices
- Designed using industry leading software
- Engineered and tested to Australian Standards
- Provided with full documentation to facilitate council approvals
- Made using components that are 100% termite, warp and rot resistant
- Available as either a DIY kit or fully supplied and installed by experienced distributors
- Available with your choice of COLORBOND® steel, translucent sheeting or mix and match
- Available in a wide choice of colours and cladding profiles, including insulated panel
- Low maintenance and prepainted – manufactured to last
- Constructed using SmartParts™ connectors for structural accuracy and durability
- Every LYSAGHT Living Collection® design comes with a 20 Year Structural Performance Warranty*.

***please refer to our website for specific warranty terms and conditions**

SmartParts™

SmartParts™ simplify construction for building professionals and they can give LYSAGHT Living Collection® Do It Yourself projects the same quality finish. These engineered and tested brackets and components are pre-welded and pre-drilled to maximise assembly accuracy and minimise construction time. They make it easy to follow the comprehensive installation guide supplied with each set of materials.

Cc Builder®

Each LYSAGHT Living Collection® solution has met rigorous engineering standards thanks to our industry leading Cc Builder® software. It ensures accurate engineering and designs through state of the art XCC (Exact Connection Checking) XPD (Exact Pitch Design) and XBD (Exact Beam Design) engines. Spanning capabilities, connection strength and structural integrity are guaranteed when your home addition is designed using Cc Builder®.

Available designs

Attached Structures

SWHA

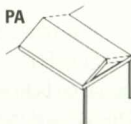


Skillion (Flat) with headbeam and rear gutter.

SNHA

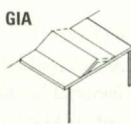


PA



Pitched with collar tie with rear gutter. Gable end shown. Other options are Hip, Dutch, and Open Gable.

GIA



Gable insert with rear gutter.

SWHARC



Skillion (Flat) with headbeam attached with receiver channel.

GIARC



Gable insert attached with receiver channel.

PAPF



Pitched portal frame. Open Gable end shown. Other options are Hip, Dutch, and Gable - no rear gutter.

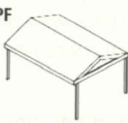
Free Standing Structures

SWHF



Skillion (Flat) with headbeam and rear gutter.

PF



Pitched with collar tie. Gable end shown. Other options are Hip, Dutch and Open Gable.

PFPF



Pitched portal frame. Open Gable end shown. Other options are Hip, Dutch and Open Gable.

For further information phone 1800 044 151 or visit
www.lysaghtlivingcollection.com.au



LYSAGHT FENCING RANGE

The LYSAGHT® product range offers a number of classic engineered fencing systems that are stylish, strong and durable providing security, privacy and low maintenance requirements. The LYSAGHT® fence designs are manufactured from COLORBOND® steel meaning it won't crack, chip, peel or warp ensuring a long and low maintenance life. The fence systems are certified to withstand winds of up to 216km/hour, be termite resistant and have been CSIRO fire tested.

The LYSAGHT® fencing range offers a number of styles including: the original durable LYSAGHT NEETASCREEN®, the attractive mini corrugated LYSAGHT MINISCREEN®, the 'similar on both sides' LYSAGHT SMARTASCREEN®, LYSAGHT CUSTOMSCREEN® and the new LYSAGHT SPANSCREEN®. Some of these styles are available in our "PLUS" style topped with lattice, and attractive accessories such as ball caps to finish the fence. All fence types are complemented by our range of gates. BlueScope Lysaght also offers two fence styles specifically for the Cyclonic regions of Far North Queensland and Western Australia.

10 Year Warranty

BlueScope Lysaght warrants that a LYSAGHT® fence is free from all defects in materials and manufacture, will not suffer perforation from natural weathering, and will resist the maximum basic wind speeds applicable to the wind region up to 216km per hour (AS1170.2) when installed and maintained in accordance with specifications.

The LYSAGHT® complete fence 10 year warranty is the warranty of choice for complete peace of mind because it covers all the fence components.

COLORBOND® Steel

The Lysaght fencing range is made from COLORBOND® steel with a double-sided finish. This ensures both neighbours get the benefit of an attractive long lasting finish.

COLORBOND® steel is 100% termite resistant and a fence made from COLORBOND® steel won't rot. It's also non-combustible and fire resistant.

The availability of the standard colour range may vary from state to state.

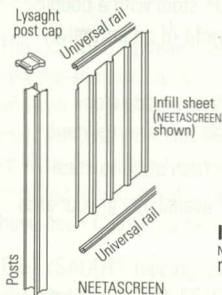
Please check with your local Lysaght branch for colour availability in your area.

LYSAGHT NEETASCREEN® FENCING

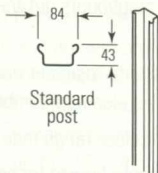
The original boundary fence produced by BlueScope Lysaght. The LYSAGHT® NEETASCREEN® fence uses an attractive trapezoidal profile and can be either stepped or raked for sloping terrain. LYSAGHT® fencing components have been designed to ensure maximum flexibility and strength. The fence rails are designed to allow for a fence rake of 1 in 20 (117mm in 2350mm) without the need to cut the infill sheets.

The attractive octagonal fence post is one of the strongest COLORBOND® fencing posts available on the market today and provides the backbone of the fencing system. NEETASCREEN® is also available in the Plus range.

Components



Posts Standard lengths 2100, 2400, 2700 & 3000 mm

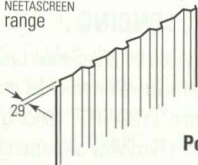


Standard post

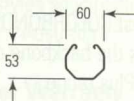
Square post
Corner junctions &
single gates 60 x 60 x 1.6
Extra wide gates
65 x 65 x 2.5
Length 2400 + 3000mm



Infill sheets Standard lengths 1490, 1790 & 2090 mm
NEETASCREEN range



Rails Standard lengths 2350 mm
NEETASCREEN universal rail



Post caps

Lysaght
post cap
(cut with knife
to get single caps)



Insert Cap
(for square post)



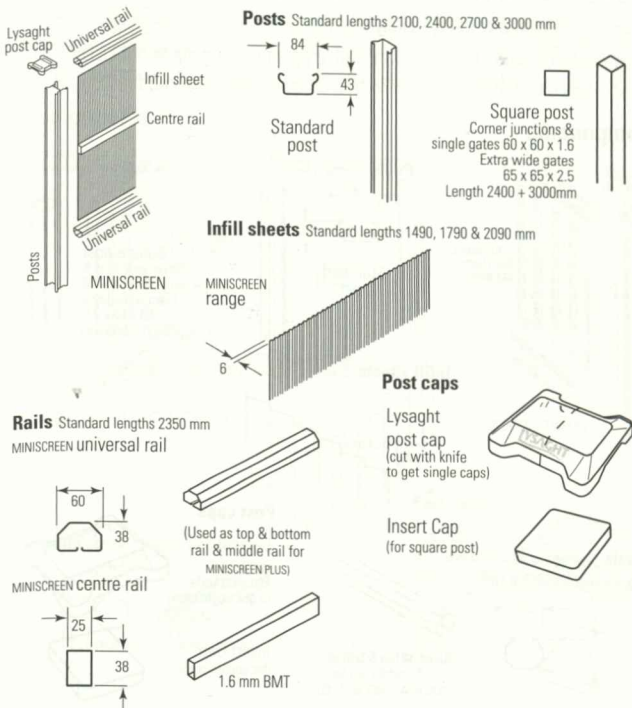
Size Availability

The nominal heights of fences are 1200, 1500, 1800 and 2100mm from top rail to bottom of bottom rail. The bottom rail should be a minimum of 50mm above ground level. Standard panel widths are 2350mm.

LYSAGHT MINISCREEN® FENCING

Using the attractive LYSAGHT MINI ORB® profile this fence offers a stylish and attractive finish whilst still offering the strength of LYSAGHT® fence systems. Use the Plus lattice for a distinctive finish.

Components



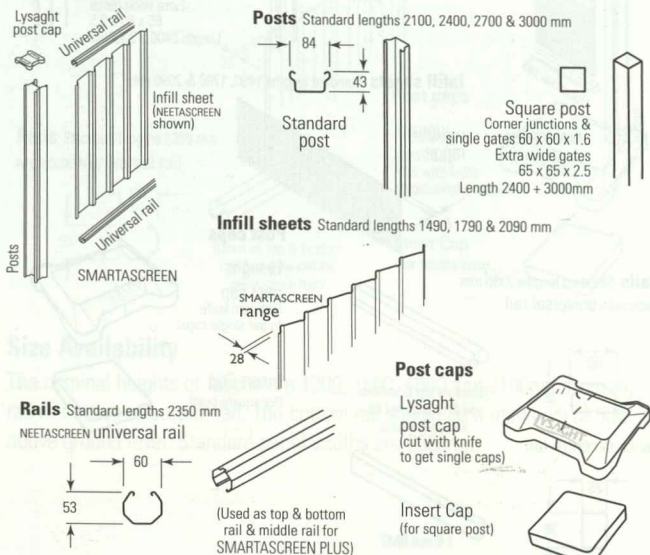
Size Availability

The nominal heights of fences are 1200, 1500, 1800 and 2100mm from top rail to bottom of bottom rail. The bottom rail should be a minimum of 50mm above ground level. Standard panel widths are 2350mm.

LYSAGHT SMARTASCREEN® FENCING

LYSAGHT SMARTASCREEN® keeps neighbours happy with its stylish appearance on both sides. This innovative panel fencing made of COLORBOND® steel offers clean attractive lines with a unique subtle textured finish.

Components



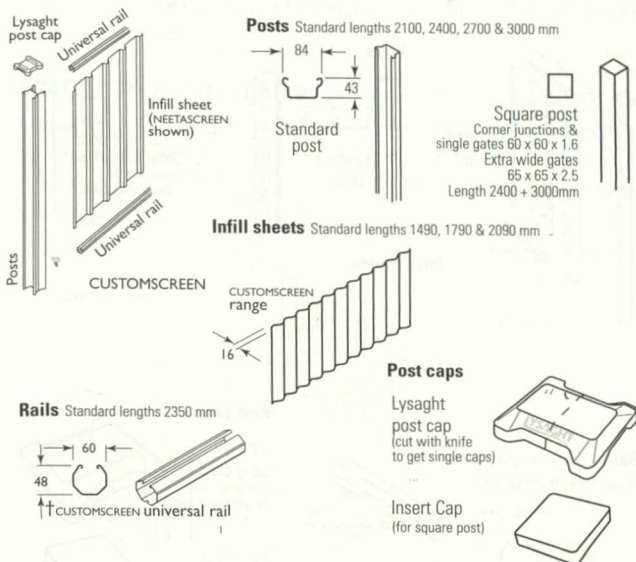
Size Availability

The nominal heights of fences are 1200, 1500, 1800 and 2100mm from top rail to bottom of bottom rail. The bottom rail should be a minimum of 50mm above ground level. Standard panel widths are 2350mm.

LYSAGHT CUSTOMSCREEN® FENCING

LYSAGHT CUSTOMSCREEN® is the fencing profile designed to match the traditional style of our CUSTOM ORB® profile. Also available in the "PLUS" range, this fence system will add style and value to any property.

Components



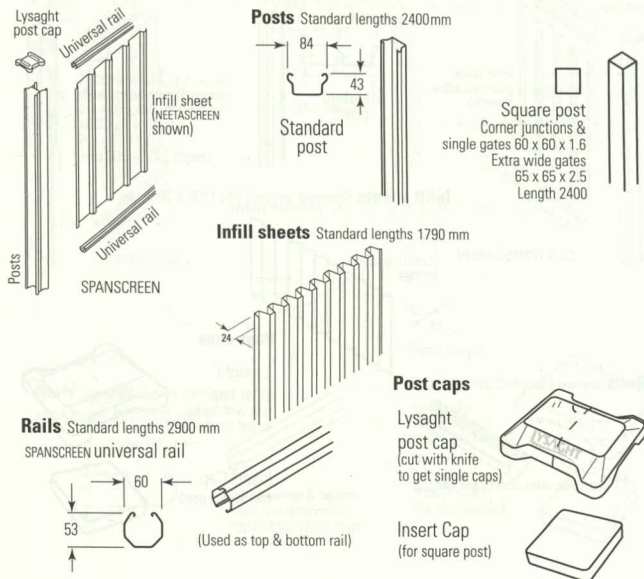
Size Availability

The nominal heights of fences are 1200, 1500, 1800 and 2100mm from top rail to bottom of bottom rail. The bottom rail should be a minimum of 50mm above ground level. Standard panel widths are 2350mm.

LYSAGHT SPANSCREEN® FENCING

LYSAGHT SPANSCREEN® fencing is the latest fencing profile available from Lysaght. It features a deep trapezoidal profile and is our boldest and most contemporary style to date.

With a greater panel width (2900mm) than any other style of Lysaght steel fence, there are fewer posts to interrupt the fresh, clean lines.



Size Availability

The nominal height is 1800mm from top rail to bottom of bottom rail. The bottom rail should be a minimum of 50mm above ground level. Standard panel widths are 2900mm.

CYCLONIC FENCE RANGE

LYSAGHT® Cyclonic fences are based on our well respected NEETASCREEN® fences. They are much safer than standard fences. However, cyclonic wind conditions can be so extreme that LYSAGHT® Cyclonic fences cannot be guaranteed to survive a cyclone. Gates and their installation must be engineered for each individual application.

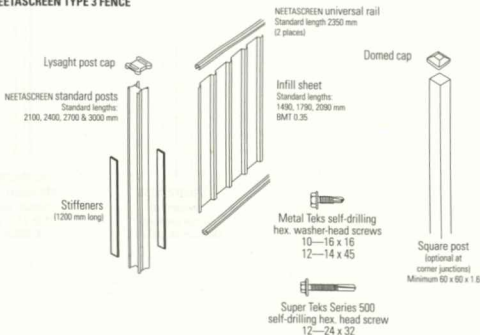
Two fences have been designed specifically for two Geographic regions.

LYSAGHT TYPE 3 NEETASCREEN® (Available in Far North QLD and NT)

The modular LYSAGHT TYPE 3 NEETASCREEN® fence is one of the most versatile and durable fencing systems on the market. The COLORBOND® pre-painted steel finish with vertical ribbed LYSAGHT NEETASCREEN® panels provide strength and simple assembly.

LYSAGHT TYPE 3 NEETASCREEN® also offers the option of a Plus style.

NEETASCREEN TYPE 3 FENCE



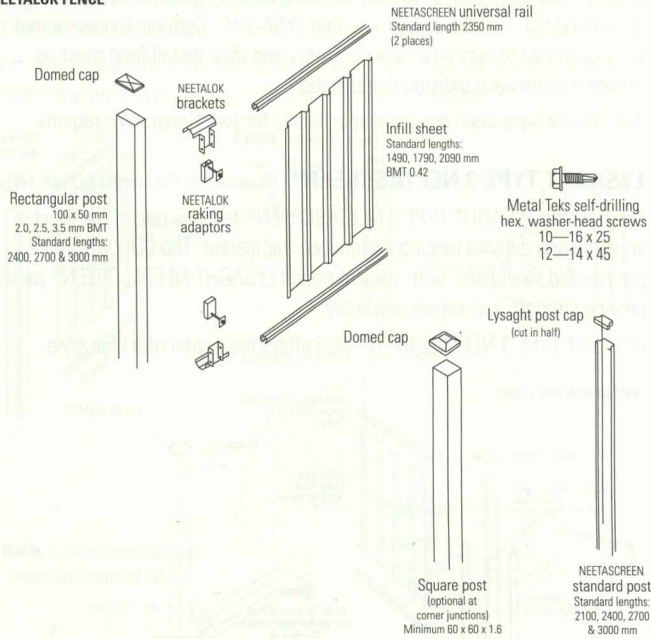


LYSAGHT NEETALOK® (Available in WA)

Specifically designed for Western Australia's climate and legislation BlueScope Lysaght has introduced LYSAGHT NEETALOK® cyclonic fencing. Using the familiar NEETASCREEN® profile this fence offers outstanding strength and simple installation.

Components

NEETALOK FENCE



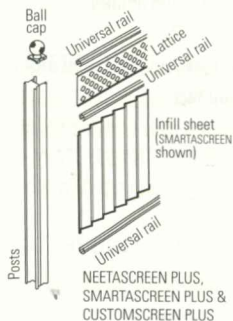
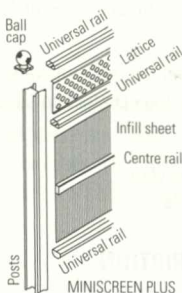
THE PLUS RANGE

Most of the LYSAGHT® fence styles can be accessorised with the addition of a powder coated lattice and the choice of either plain or ball post caps. This is known as the "PLUS" range and gives the standard design a distinctive look.

Existing LYSAGHT® fences can also be converted to a "PLUS" design.

Information on how to convert your fence is available through your local BlueScope Lysaght branch or at www.lysaght.com

Components



POLYMER COATED STEEL WATER TANKS

INTRODUCTION

BlueScope Water Australia Pty Ltd offers a comprehensive range of water storage tanks made from BlueScope Steel materials. The range of WATERPOINT® and Pioneer Water storage Tanks provides an ideal solution for rainwater harvesting and water storage applications in both urban and rural areas, helping you to secure one of Australia's vital and limited resources – water.

To find out more about the range of water storage tanks and products offered by BlueScope Water, their contact details are as follows:

BlueScope Water
www.bluescopewater.com
Freecall: 1800 654 774

PRODUCT DESCRIPTION

WATERPOINT® Rainwater Tanks

BlueScope Water's range of WATERPOINT® rainwater tanks are made from AQUAPLATE® steel, a special polymer coated steel designed for use in water tanks to store potable (drinking), rainwater, bore or river water. With the strength of steel and a traditional corrugated appearance, the range of tanks blend well with the environment. They can be made with a galvanised (zinc coated) or painted finish to match the range of COLORBOND® steel colours.

The interior AQUAPLATE® coating is a food grade polymer film lamination that makes the tanks tolerant to a wide range of water qualities and catchment materials. It is a tough, abrasion resistant film that is produced to meet Australian Standard 2070, Part 2 – Plastic Materials for Food Contact Use. AQUAPLATE® rainwater tanks from BlueScope Water are

approved to AS4020:1999, products approved for storing water fit for human consumption.

Care must be taken with the application of products for surfaces used to collect drinking water. Appropriate coated steel products from BlueScope Steel have been accredited to Australian Standard AS 4020:1999. These include COLORBOND® steel and COLORBOND® steel premium products, ZINCALUME® steel and GALVABOND® steel, all of which can be used in conjunction with a polymer coated steel tank. For health reasons lead, copper and treated timber catchments are not recommended for the collection of drinking water.

WATERPOINT SLIMLINE®

WATERPOINT SLIMLINE® oval shaped rainwater tanks provide a space efficient solution with a range of capacities from 1,000L to 5,000L. The WATERPOINT SLIMLINE® range combines the traditional corrugated profile with a modern appearance to suit any style of home.

WATERPOINT CLASSIC®

The WATERPOINT CLASSIC® range of rainwater tanks builds on the design of the iconic round tank, a familiar site in rural Australia. The WATERPOINT CLASSIC® round tank will complement any home or property, providing a range of capacities from 1000L to 10,000L. The classic round design provides an efficient and durable water storage solution with the benefits of using AQUAPLATE® steel in its construction.

PIONEER WATER TANKS

Pioneer Water Tanks are ideally suited to larger rural, commercial and industrial applications. Available in capacities ranging from 12,000L to 2.6 Million litres, the range of Pioneer Water tanks provides a quality storage solution for any application.

The range of Pioneer Water Tanks uses ZINCALUME® steel or COLORBOND® steel and an advanced polymer/textile membrane providing a durable internal lining. The unique design allows the tank to be erected on site, allowing delivery to remote or difficult locations. For further information on the Pioneer Water Tank range, contact BlueScope Water on 1800 999 599 or visit www.pioneertanks.com.au

INSTALLATION, CARE & MAINTENANCE OF TANKS

First Fill

As with all water tanks, it is essential that at least a portion of the first fill be drained from the tank. This is advisable for health reasons, as the roof or gutter catchment could have toxic matter on or in it. The tank itself may also have residuals within it as a result of manufacture and transportation. If the roof is painted, check the paint is suitable for the collection of drinking water.

Tank Base

The tank must be totally supported by a firm, flat, stable platform, the dimensions of which must be larger than the diameter of the tank. AQUAPLATE® steel tanks are supplied with a protective membrane under the base, and it is recommended they are placed directly onto a concrete or timber base.

Tank stands must be engineered to safely support the tank when full of water, bearing in mind that water has a mass of 1 kilogram per litre.

Water Connection

Copper piping must not be connected directly to AQUAPLATE® steel tanks. If copper outlet pipes are involved, there must be at least two metres of plastic pipe between the tank and the copper. Copper must not be used for recirculating water to an AQUAPLATE® steel tank.

STRUCTURAL SOLUTIONS

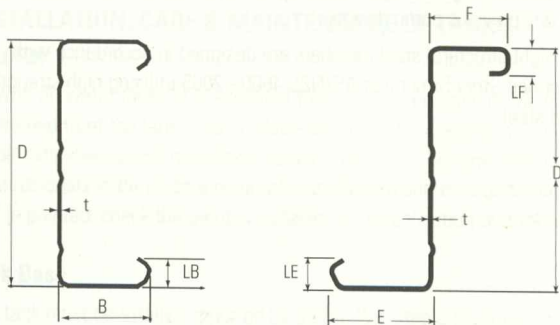
Zeds and Cee purlins are widely accepted by the construction industry and are highly efficient, economical and robust cladding support systems.

LYSAGHT SUPAZED® and LYSAGHT SUPACEE® purlins are the next steps forward in purlin and girt design, delivering more performance per weight of steel than any previous purlin design.

The lightweight structural steel members are designed in accordance with the Cold Formed Steel Structures AS/NZS 4600 - 2005 utilising high strength zinc-coated steel.

SUPACEES® AND SUPAZEDS®

The efficiency of the SUPAPURLIN® profiles delivers significant savings. Performance improvements can be achieved over traditional zed and cee purlin designs, when using LYSAGHT SUPAZED® and LYSAGHT SUPACEE® Purlins. The result is increased purlin spacing, increased purlin spans (frame or rafter spacing) and fewer rows of bridging.



t = thickness (base metal)

D = Depth

B = Flange width

LB = Lip height

E = Lower flange width

LE = Lip height

F = Upper flange width

LF = Lip height

DIMENSIONS FOR SUPAZED® PURLINS

Catalogue Number	t (mm)	D (mm)	Mass per unit length (kg/m)	E (mm)	LE (mm)	F (mm)	LF (mm)
SZ 15010	1.0	152	2.38	63	17	48	16
SZ 15012	1.2	152	2.89	66	18.5	49	16.5
SZ 15015	1.5	152	3.58	66.5	18	49.5	17
SZ 15019	1.9	152	4.51	67.5	19	50.5	18
SZ 15024	2.4	152	5.67	70	20	52	19
SZ 20012	1.2	203	3.62	76	19.5	62	19.5
SZ 20015	1.5	203	4.49	77	20	63	20
SZ 20019	1.9	203	5.73	79.5	21.5	63.5	21
SZ 20024	2.4	203	7.20	81.5	22	65	22
SZ 25015	1.5	254	5.16	78.5	19.5	67	20
SZ 25019	1.9	254	6.50	78.5	21	65	21
SZ 25024	2.4	254	8.16	80.5	22	66	22
SZ 30019	1.9	300	8.02	103.5	25	88	26
SZ 30024	2.4	300	10.09	104.5	26.5	87.5	27
SZ 30030	3.0	300	12.56	106.5	28	88	28
SZ 35024	2.4	350	12.20	131.5	28.5	114	31
SZ 35030	3.0	350	15.19	134	30	115	31
*SZ 40024	2.4	400	13.16	131.5	28.5	114	31
*SZ 40030	3.0	400	16.39	134	30	115	31
*SZ 40032	3.2	400	17.46	134.5	30.5	115.5	31

* Subject to enquiry

DIMENSIONS FOR SUPACEE® PURLINS

Catalogue Number	t (mm)	D (mm)	Mass per unit length (kg/m)	B (mm)	LB (mm)
SC 15010	1.0	152	2.38	57.5	17.5
SC 15012	1.2	152	2.89	60.5	18
SC 15015	1.5	152	3.58	61	18.5
SC 15019	1.9	152	4.51	62	19
SC 15024	2.4	152	5.67	63	20
SC 20012	1.2	203	3.62	70	21
SC 20015	1.5	203	4.49	70.5	21.5
SC 20019	1.9	203	5.73	73	23
SC 20024	2.4	203	7.20	74.5	24
SC 25015	1.5	254	5.16	72	22.5
SC 25019	1.9	254	6.50	72.5	23
SC 25024	2.4	254	8.16	74	24
SC 30019	1.9	300	8.02	97.5	27.5
SC 30024	2.4	300	10.09	100	28.5
SC 30030	3.0	300	12.56	100.5	29.5
SC 35024	2.4	350	12.20	124	33.5
SC 35030	3.0	350	15.19	125.5	34.5
*SC 40024	2.4	400	13.16	124	33.5
*SC 40034	3.0	400	16.39	125.5	34.5
*SC 40032	3.2	400	17.46	126.5	34.5

* Subject to enquiry

AVAILABILITY

	NSW	WA*	SA/NT	QLD	VIC/TAS
SC/SZ 150	Yes	-	Yes	Yes	Yes
SC/SZ 200	Yes	-	Yes	Yes	Yes
SC/SZ 250	Yes	-	Yes	Yes	Yes
SC/SZ 300	Yes	-	Yes	Yes	Yes
SC/SZ 350	Yes	-	Yes	Yes	Yes
*SC/SZ 400	-	-	Yes	Yes	-

* Subject to enquiry

Note: Extended lead times may apply. Contact your local Service Centre for availability.

Material Specification

LYSAGHT SUPAZED® and LYSAGHT SUPACEE® are roll-formed from GALVSPAN® steel complying with AS1397 - 2011 in the following grades:

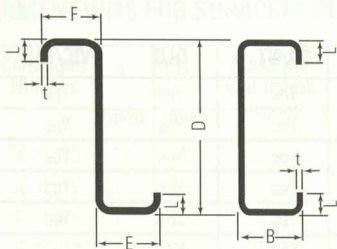
- 1.0mm BMT: AS 1397/G550 Z350
- 1.2mm BMT: AS 1397/G500 Z350
- 1.5, 1.9, 2.4, 3.0mm BMT: AS 1397/G450 Z350

ZED SECTIONS

LYSAGHT® Zed Sections feature one broad and one narrow flange, sized so that two sections of the same size fit together snugly, making them suitable for lapping. LYSAGHT® Zed Sections of the same depth and different thicknesses can be lapped in any combination.

CEE SECTIONS

LYSAGHT® Cee Sections have equal flanges and are suitable for simply supported spans. For shorter spans they may be used continuously over two or more spans with the ends butted, thus producing reduced deflection compared with simple spans. They cannot be lapped.



Catalogue Number	t (mm)	D (mm)	Mass per unit length (kg/m)	Zeds			Cees	
				E (mm)	F (mm)	L (mm)	B (mm)	L (mm)
Z/C10010	1.0	102	1.78	53	49	12.5	51	12.5
Z/C10012	1.2	102	2.10	53	49	12.5	51	12.5
Z/C10015	1.5	102	2.62	53	49	13.5	51	13.5
Z/C10019	1.9	102	3.29	53	49	14.5	51	14.5
Z/C15012	1.2	152	2.89	65	61	15.5	64	14.5
Z/C15015	1.5	152	3.59	65	61	16.5	64	15.5
Z/C15019	1.9	152	4.51	65	61	17.5	64	16.5
Z/C15024	2.4	152	5.70	66	60	19.5	64	18.5
Z/C20015	1.5	203	4.49	79	74	15.0	76	15.5
Z/C20019	1.9	203	5.74	79	74	18.5	76	19.0
Z/C20024	2.4	203	7.24	79	73	21.5	76	21.0
Z/C25019	1.9	254	6.50	79	74	18.0	76	18.5
Z/C25024	2.4	254	8.16	79	73	21.0	76	20.5
Z/C30024	2.4	300	10.09	100	93	27.0	96	27.5
Z/C30030	3.0	300	12.76	100	93	31.0	96	31.5
Z/C35030	3.0	350	15.23	129	121	30.0	125	30.0

AVAILABILITY

	NSW ⁴	WA ³	SA/NT	QLD	VIC/TAS
C 75	-	-	Yes (SA Only)	Yes	-
C/Z 100	Yes	Yes	Yes	Yes	Yes
C/Z 150	-	Yes	Yes	Yes	Yes
C/Z 200	-	Yes	Yes	Yes	Yes
C/Z 250	-	C 250 yes (Z250 ¹)	Yes ²	Yes	Yes
C/Z 300	-	Yes	Yes ²	Yes ¹	Yes ¹
C/Z 350	-	Yes	Yes ²	Yes ¹	Yes ¹

¹ Extended lead times may apply. Contact your local service centre for availability.

² Price and availability subject to application. Extended lead times apply.
Contact your nearest Lysaght service centre for availability.

³ A turn down lip are subject to enquiry on C/Z 150, C/Z 200, and C 250 purlins.
Minimum order quantities are required.

⁴ For purlin availability in New South Wales, please see LYSAGHT SUPAZED®
and LYSAGHT SUPACEE® Purlins and Girts

Material Specification

LYSAGHT® Zed and Cee sections are roll-formed from GALVSPAN® steel complying with AS1397 - 2011. In the grades shown, the numbers prefixed with G indicate minimum yield stress in MPa. The numbers prefixed with Z indicate minimum coating mass in g/m².

- 1.0mm BMT: G550, Z350*

- 1.2mm BMT: G500, Z350*

- 1.5, 1.9, 2.4 & 3.0 mm BMT: G450, Z350*

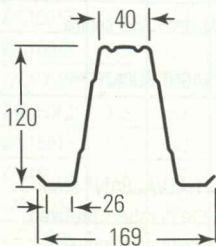
* All BMTs in Townsville have Z450 coating.

TOPSPAN® SECTIONS

BlueScope Lysaght manufactures a range of light steel TOPSPAN® sections, all produced from TRUECORE® or ZINCALUME® steel. Being lighter than timber, they offer an economical alternative that will nest together making storage, transport, carrying and handling easier. Consistent straightness simplifies alignment, sections can be lapped, and fastening is quick and easy using self-drilling screws.

Versatile TOPSPAN® profiles are a lightweight steel alternative to timber battens or the smaller light gauge purlins. Their applications include sheds, garages, carports, ceiling and roof battens, as well as racking, fencing and handyman projects.

TOPSPAN® 120



LYSAGHT TOPSPAN® 120 is an improved light gauge purlin for use as a substitute for the smaller traditional purlin profiles. The top hat shaped profile has web stiffening and top flange grooves to improve stiffness.

It is commonly used in the rural, residential and small commercial market for shed, garage and awnings where longer spans or strength is required. TOPSPAN® 120 is also used in flooring and shelving applications.

Material specifications

TOPSPAN 120® light steel sections are made from ZINCALUME® aluminium/zinc alloy coated steel complying with AS1397 G550, AZ150 (550 MPa minimum yield stress, 150 g/m² minimum coating mass).

Base Metal Thickness (mm)	0.70	0.90	1.00
Yield Strength (MPa)	550	550	550
Coating Mass (g/m ²)	150	150	150
Mass (kg/m)	2.07	2.64	2.93

Maximum Span

Point Load = 1.4 kN (strength criteria only) Maximum Span(mm)

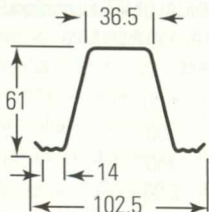
Section	TS12070	TS12090	TS12010
Single span	3200	5600	6800
2-span Continuous	4200	6000	6000
2/3 span Lapped Continuous	4600	7000	7500

LYSAGHT TOPSPAN® 120 SECTION PROPERTIES –

Product	Base Metal Thickness t (bmt) (mm)	Area mm ²	Mass per unit length (kg/m)	Second Moment of Area (Full)		Shear centre to centroid distance X ₀ (mm)
				I _x 10 ⁶ mm ⁴	I _y 10 ⁶ mm ⁴	
TS 12070	0.70	255	2.07	0.486	0.491	80.87
TS 12090	0.90	329	2.64	0.630	0.638	80.87
TS 12010	1.00	365	2.93	0.694	0.701	80.87

Product	Section Modulus (Full)		Radius of Gyration		Torsion Constant J mm ⁴	Warping Constant I _w 10 ⁶ mm ⁶	Mono-symetry Constant B _y (mm)
	Z _x 10 ³ mm ³	Z _y 10 ³ mm ³	r _x (mm)	r _y (mm)			
TS 12070	5.77	7.64	43.4	43.5	42.26	319.9	187.2
TS 12090	7.48	9.81	43.8	44.1	88.7	422.1	187.4
TS 12010	8.25	10.92	43.6	43.3	123.2	457.0	187.2

TOPSPAN® 61



LYSAGHT TOPSPAN® 61 is an economical, light weight steel section. Being strong and rigid, the LYSAGHT TOPSPAN® 61 section may be used for many applications as an alternative to light gauge purlins and girts of steel or timber.

Material specifications

TOPSPAN® 61 light steel sections are made from ZINCALUME® aluminium/zinc alloy coated steel complying with AS1397 G550, AZ150 (550 MPa minimum yield stress, 150 g/m² minimum coating mass) or AS1397 G500, AZ150 (500 MPa minimum yield stress, 150 g/m² minimum coating mass).

Base Metal Thickness (mm)	0.6	0.75	1.0	1.2
Yield Strength (MPa)	550	550	550	500
Coating Mass (g/m ²)	150	150	150	150
Mass (kg/m)	0.95	1.18	1.56	1.87

Maximum Span

Point Load = 1.1 kN (strength criteria only)

Maximum Span(mm)

Section	TS6160	TS6175	TS6110	TS6112
Single span	1400	2400	3600	5000
2-span Continuous	1800	2600	4000	5000
2/3 Lapped Continuous span	2000	2700	4200	5600

Point Load = 1.4 kN (strength criteria only)

Maximum Span(mm)

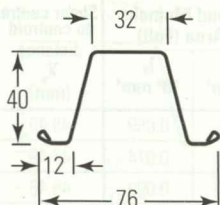
Section	TS6160	TS6175	TS6110	TS6112
Single span	1100	1800	3000	4000
2-span Continuous	1300	2000	3400	4500
2/3 Lapped Continuous span	1500	2200	3500	4600

LYSAGHT TOPSPAN® 61 SECTION PROPERTIES –

Product	Base Metal Thickness t (bmt) (mm)	Area mm ²	Mass per unit length (kg/m)	Second Moment of Area (Full)		Shear centre to centroid distance X ₀ (mm)
				I _x 10 ⁶ mm ⁴	I _y 10 ⁶ mm ⁴	
TS 6160	0.60	117	0.95	0.094	0.059	46.49
TS 6175	0.75	146	1.18	0.117	0.074	46.49
TS 6110	1.00	195	1.56	0.157	0.099	46.49
TS 6112	1.20	234	1.87	0.188	0.119	46.49

Product	Section Modulus (Full)		Radius of Gyration		Torsion Constant J mm ⁴	Warping Constant I _w 10 ⁶ mm ⁶	Mono-symmetry Constant β _y (mm)
	Z _x 10 ³ mm ³	Z _y 10 ³ mm ³	r _x (mm)	r _y (mm)			
TS 6160	1.849	1.976	28.31	22.58	14.08	10.750	115.9
TS 6175	2.312	2.437	28.39	22.63	27.42	13.468	115.9
TS 6110	3.083	3.239	28.37	22.62	65.00	17.957	115.9
TS 6112	3.698	3.951	28.32	22.58	112.70	21.500	115.9

TOPSPAN® 40



LYSAGHT TOPSPAN® 40 steel roof batten is an economical alternative to timber battens for residential tile or steel roofs.

Material specifications

TOPSPAN® 40 roofing battens are made from TRUECORE® steel (aluminium/zinc alloy coated) complying with AS1397 G550 - AZ150 (550 MPa minimum yield stress, 150 g/m² minimum coating mass).

Base Metal Thickness	0.55 (mm)	0.75 (mm)
Yield Strength	550 (MPa)	550 (MPa)
Coating Mass	150 (g/m ²)	150 (g/m ²)
Mass	0.67 (kg/m)	0.91 (kg/m)

Maximum Span

Maximum Span(mm)

Point Load =1.1 kN (strength criteria only)

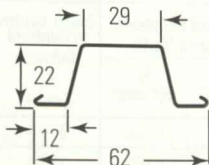
Section	TS4055	TS4075
3 span continuous	1200	1800

LYSAGHT TOPSPAN® 40 SECTION PROPERTIES –

Product	Base Metal Thickness t (bmt) (mm)	Area mm ²	Mass per unit length (kg/m)	Second Moment of Area (Full)		Shear centre to centroid distance X ₀ (mm)
				I _x 10 ⁶ mm ⁴	I _y 10 ⁶ mm ⁴	
TS 4055	0.55	83	0.67	0.039	0.020	31.84
TS 4075	0.75	113	0.91	0.054	0.028	31.84

Product	Section Modulus (Full)		Radius of Gyration		Torsion Constant J mm ⁴	Warping Constant I _w 10 ⁶ mm ⁶	Mono-symetry Constant B _y (mm)
	Z _x 10 ³ mm ³	Z _y 10 ³ mm ³	r _x (mm)	r _y (mm)			
TS 4055	1.082	0.969	21.87	15.75	8.37	3.418	80.43
TS 4075	1.475	1.322	21.84	15.72	21.23	4.661	80.43

TOPSPAN® 22



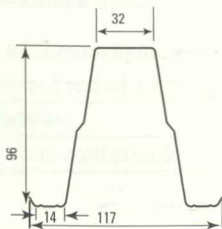
LYSAGHT TOPSPAN® 22 ceiling batten is an economical alternative to timber battens.

Material specifications

TOPSPAN® 22 ceiling battens are made from TRUECORE® steel (aluminium/zinc alloy coated) complying with AS1397 G550, AZ150 (550 MPa minimum yield stress, 150 g/m² minimum coating mass).

Base Metal Thickness	0.42 (mm)
Yield Strength	550 (MPa)
Coating Mass	150 (g/m ²)
Mass	0.35 (kg/m)

TOPSPAN® 96



LYSAGHT TOPSPAN® 96 is a 96mm deep profile used as a roof purlin or wall girt. It is largely used in the rural shed market.

Material specifications

TOPSPAN® 96 light steel sections are made from ZINCALUME® aluminium/zinc alloy coated steel complying with AS1397 G550, AZ150 (550 MPa

minimum yield stress, 150 g/m² minimum coating mass) or AS1397 G500, AZ150 (500 MPa minimum yield stress, 150 g/m² minimum coating mass).

Base Metal Thickness (mm)	0.75	1.0	1.2
Yield Strength (MPa)	550	550	500
Coating Mass (g/m ²)	150	150	150
Mass (kg/m)	1.68	2.22	2.66

Maximum Span

Point Load =1.4 kN

(Strength criteria only)

Maximum Span(mm)

Section	TS9675	TS9610	TS9612
Single span	3000	5000	6500
2-span Continuous	3300	4500	4500
2/3 span Lapped Continuous	3500	5800	6800

LYSAGHT TOPSPAN® 96 SECTION PROPERTIES –

Product	Base Metal Thickness t (bmt) (mm)	Area mm ²	Mass per unit length (kg/m)	Second Moment of Area (Full)		Shear centre to centroid distance X ₀ (mm)
				I _x 10 ⁶ mm ⁴	I _y 10 ⁶ mm ⁴	
TS 9675	0.75	208	1.68	0.205	0.242	71.76
TS 9610	1.00	277	2.22	0.273	0.323	71.76
TS 9612	1.20	322	2.66	0.328	0.388	71.76

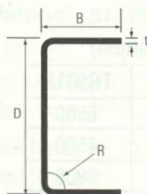
Product	Section Modulus (Full)		Radius of Gyration		Torsion Constant J mm ⁴	Warping Constant I _w 10 ⁶ mm ⁶	Mono-symetry Constant B _y (mm)
	Z _x 10 ³ mm ³	Z _y 10 ³ mm ³	r _x (mm)	r _y (mm)			
TS 9675	3.533	4.922	31.43	34.19	38.91	55.08	160.6
TS 9610	4.711	6.563	31.43	34.19	92.22	73.44	160.6
TS 9612	5.653	7.875	31.93	34.73	159.4	88.12	160.6

COLD FORM SECTIONS

Cold Formed steel channels and angles are roll-formed from zinc coated and uncoated material. These sections have many uses in the construction, general fabrication and home handyerson fields.

Please check with your local Lysaght branch for availability in your area.

PLAIN CHANNELS - DIMENSIONS & PROPERTIES



Tolerances:

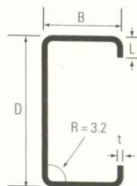
Web: + 2 mm - 1 mm for LC 12730, LC 15230
± 1 mm for all other sections.

Flange: ± 2 mm

Length: ± 15 mm

Catalogue Number	Nominal Dimensions				Section Area mm ²	Mass	
	D (mm)	B (mm)	R (mm)	t (mm)		Galv. (kg/m)	Black (kg/m)
LC05130	51	25	3.2	3.0	270	2.15	2.12
LC06425	64	23	2.5	2.5	250	2.00	1.96
LC07630	76	38	3.2	3.0	420	3.34	3.30
LC08330	83	34	3.2	3.0	420	3.34	3.30
LC08930	89	31	3.2	3.0	420	3.34	3.30
LC09530	95	37	3.2	3.0	465	3.70	3.65
LC10330	103	34	3.2	3.0	465	3.70	3.65
LC10230	102	55	3.2	3.0	600	4.78	4.71
LC12730	127	50	3.2	3.0	660	5.26	5.18
LC15230	152	51	3.2	3.0	735	5.86	5.77

LIPPED CHANNELS - DIMENSIONS & PROPERTIES



Tolerances:

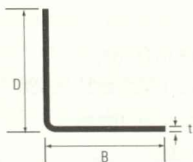
Web: ± 1 mm for LL 05116 to LL10230
 $+ 2$ mm -1 mm for LL 12725 to LL 25430

Flange: ± 1 mm for LL 05116 to LL 10230
 (within 1mm each side)
 $+ 2$ mm -1mm for LL 12725 to LL 25430
 (within 1mm each side).

Length: $+ 15$ mm - 0

Catalogue Number	Nominal Dimensions				Section Area mm ²	Mass	
	D (mm)	B (mm)	L (mm)	t (mm)		Galv. (kg/m)	Black (kg/m)
LL06425	64	38	13	2.5	363	2.90	2.85
LL07625	76	44	16	2.5	438	3.49	3.44
LL10225	102	51	18	2.5	550	4.39	4.32
LL10230	102	51	19	3.0	660	5.25	5.18
LL12725	127	51	18	2.5	612	4.89	4.81
LL12730	127	51	19	3.0	735	5.85	5.77
LL15230	152	64	21	3.0	900	7.16	7.07
LL20330	203	76	24	3.0	1140	9.07	8.95

PLAIN CHANNELS - DIMENSIONS & PROPERTIES



Tolerances:

Legs: ± 1.5 mm, equal within 1 mm for equal angles.

Length: $+ 15$ mm - 0

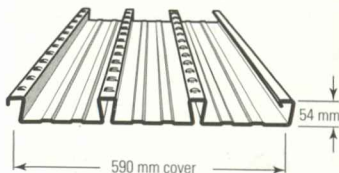
Catalogue Number	Nominal Dimensions			Section Area mm ²	Mass	
	D (mm)	B (mm)	t (mm)		Galv. (kg/m)	Black (kg/m)
LA4630	46	35	3.0	225	1.79	1.77
LA5130	51	30	3.0	225	1.79	1.77

Cold formed steel channels and angles are available either zinc coated or uncoated in base metal thicknesses (BMT) of 1.0 mm, 1.6 mm, 2.5 mm and 3.0 mm depending on section type.

STRUCTURAL STEEL DECKING

LYSAGHT BONDEK®

LYSAGHT BONDEK® profiled steel decking is a highly efficient, versatile and robust formwork, reinforcement and ceiling system for concrete slabs. It is a profile steel sheeting widely accepted by the building and construction industry to offer efficiency and speed of construction.



Physical Properties

Thickness (mm)	Mass		Yield Strength MPa	Coverage (m ² /t)
	(kg/m ²)	(kg/m)		
0.60	8.52	5.03	550	117.31
0.75	10.50	6.20	550	95.24
0.90*	12.48	7.36	550	80.16
1.00	13.79	8.14	550	72.52

* The availability of 0.9mm BONDEK® formwork is subject to enquiry.

Note: Self weight is given for Z350 coating class.

Specification

LYSAGHT BONDEK® steel decking is roll-formed from DECKFORM® zinc-coated, hot dipped, high-tensile steel, in base metal thicknesses (BMT) of 0.60, 0.75, 0.9 and 1.0mm. The steel strip conforms to AS1397 grade G550, Z350. (550 MPa minimum yield strength. 350g/m² minimum coating mass)

Interlocking Sheets

Method 1

Position BONDEK sheet parallel with previously-laid sheet. Interlock sheets by applying pressure to either position.



Method 2

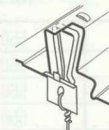
Position BONDEK sheet at an angle. Interlock sheets by lowering sheet through an arc.



BONDEK® Accessories

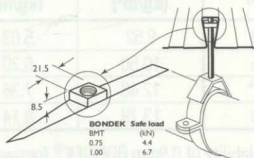
Bonfill

Polystyrene foam stops concrete and air entering ends of ribs. Stock length: 1200mm. Required: 300mm per sheet of BONDEK.



Bonwedge

Lightweight bracket for rods to suspend ceilings or services (other than fire sprinkler systems). Max. load: 100 kg

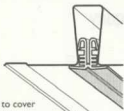


Bon-nut

Heavy duty square nut to suspend ceilings or services. Glued to a paper strip it makes insertion easy. Threads: M8, M10 and M12. M6 is available for light loads only (2.7 kN or less)

Bonstrip

Plastic trim to cover gaps formed by ribs. Used when underside of BONDEK forms an exposed ceiling. Stock length: 3000 mm. Allows Gyprock® to be fixed to BONDEK.



End plug

Polyethylene end plug stops concrete and air from entering end of BONDEK ribs.

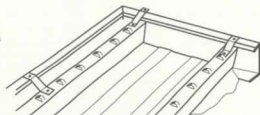


Post tensioning clip

Allows BONDEK composite slabs to be post-tensioned.

Sealing Tape

Tape is used to seal gaps to prevent leakage of wet concrete.



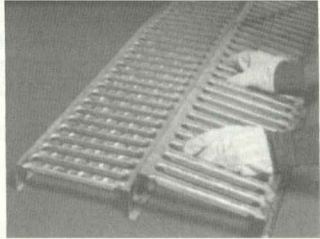
EDGEFORM

A galvanised section that creates a permanent formwork at the slab edges—cut, mitred and screwed on site.

LYSAGHT STEEL GRATING

LYSAGHT INTERLOK™ II steel grating is a roll-formed, interlocking grating system suitable for numerous applications such as walkways, catwalks, platforms, ramps, decking and for rack shelving.

It is available in two profiles, two thicknesses and two surfaces, and is nominally 225mm wide.



Material -

INTERLOK™ II is made from ZINCFORM® steel conforming to AS 1397-2011

Zinc-coated, and zinc/aluminium coated steel sheet G300, Z450, coating class in 1.2 mm thickness

(2.0mm subject to enquiry)

Stock Lengths -

6073mm, other lengths by arrangement

Surface Finishes -

Regular or anti-skid

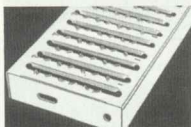
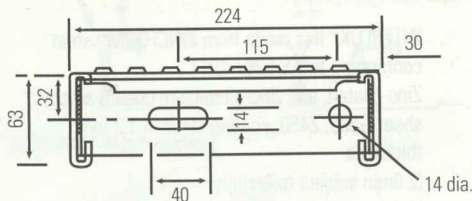
Leg shapes -

Double male or male/female

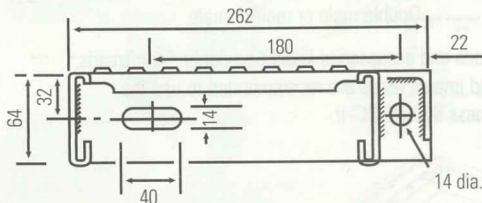
A range of stair treads and accessories is also available. Stair treads, landings and all load impact areas are recommended to use the 2.00mm BMT thickness INTERLOK™ II.

Catalogue Number	Thickness Finish (mm)	Dimensions (mm)				Mass per unit length (kg/m)	Mass per unit area (kg/m ²)
		A1	A2	B1	B2		
G06512	1.2	63	65	15	20	3.86	17.22
G06520	2.0	64	66	16	21	6.31	28.15

Note: Self weight is given for Z450 coating class.



Heavy Duty stair treads made from G06520 grating with welded 3.0mm carrier plates.



Extra Heavy Duty stair treads made from G06520 grating with welded 3.0mm carrier plates and floor plate nosing.

STRUCTURAL STEEL

This section covers the wide range of hot rolled structural steel shapes and sections available in Australia. They include Universal Sections, Taper Flange Beams, Parallel Flange Channels, Equal and Unequal Angles, Rounds, Squares and Flats.

These products are available through BlueScope Distribution, Metalcorp Steel and many other steel distributors Australia-wide.

BlueScope Distribution

www.bluescopedistribution.com.au

Tel Freecall: 13 72 82 Email: sales@bluescopesteel.com.au

Metalcorp Steel

www.metalcorpsteel.com.au

Tel Freecall: 1300 306 204 Email: sales@metalcorpsteel.com.au

OneSteel is the main manufacturer of these products which are readily available Australia-wide from steel stockists and distributors.

Generally the products are made to comply with AS/NZS 3679, and the OneSteel registered trademark for this grade of their products is 300PLUS®.

Tables of information are provided in this section as a guide to the range and specification of structural steel products generally available.

OneSteel offers detailed information on the size ranges, specifications and availability of their products, as well as technical advice and service, and it is recommended that any issues or queries to do with these products be raised directly with them or their appointed distributors.

Contact can be made as follows:

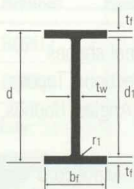
OneSteel Manufacturing

www.onesteel.com

Tel Freecall: 1800 1 STEEL (1800 1 78335)

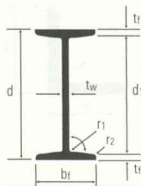
Email: onesteeldirect@onesteel.com

UNIVERSAL SECTIONS



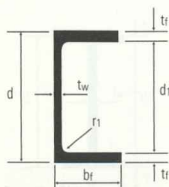
300PLUS® Steel Sections (kg/m)	Depth of Section d (mm)	Flange		Web Thickness t_w (mm)	Root Radius r_1 (mm)	Depth Between Flanges d_1 (mm)	Gross Area of Cross Section A_g (mm) ²
		Width b_f (mm)	Thickness t_f (mm)				
410 UB 59.7	406	178	12.8	7.8	11.4	381	7640
53.7	403	178	10.9	7.6	11.4	381	6890
360 UB 56.7	359	172	13.0	8.0	11.4	333	7240
50.7	356	171	11.5	7.3	11.4	333	6470
44.7	352	171	9.7	6.9	11.4	333	5720
310 UB 46.2	307	166	11.8	6.7	11.4	284	5930
40.4	304	165	10.2	6.1	11.4	284	5210
32.0	298	149	8.0	5.5	13.0	282	4080
250 UB 37.3	256	146	10.9	6.4	8.9	234	4750
31.4	252	146	8.6	6.1	8.9	234	4010
25.7	248	124	8.0	5.0	12.0	232	3270
200 UB 29.8	207	134	9.6	6.3	8.9	188	3820
25.4	203	133	7.8	5.8	8.9	188	3230
22.3	202	133	7.0	5.0	8.9	188	2870
18.2	198	99	7.0	4.5	11.0	184	2320
180 UB 22.2	179	90	10.0	6.0	8.9	159	2820
18.1	175	90	8.0	5.0	8.9	159	2300
16.1	173	90	7.0	4.5	8.9	159	2040
150 UB 18.0	155	75	9.5	6.0	8.0	136	2300
14.0	150	75	7.0	5.0	8.0	136	1780
150 UC 37.2	162	154	11.5	8.1	8.9	139	4730
30.0	158	153	9.4	6.6	8.9	139	3860
23.4	152	152	6.8	6.1	8.9	139	2980
100 UC 14.8	97	99	7.0	5.0	10.0	83.0	1890

TAPER FLANGE BEAMS



300PLUS® Steel Sections	Mass per Metre	Depth of Section d	Flange		Web Thickness t _w	Radii		Depth Between Flanges d ₁	Gross Area of Cross Sections A _g (mm) ²
			Width b _f	Thickness t _f		Root r ₁	Toe r ₂		
	(kg/m)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm) ²
125 TFB	13.1	125	65.0	8.5	5.0	8.0	4.0	108	1670
100 TFB	7.2	100	45.0	6.0	4.0	7.0	3.0	88	917

PARALLEL FLANGE CHANNELS

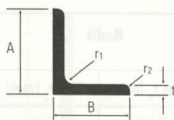


Steel Grade AS/NZS 3679.1-300	Mass per Metre (kg/m)	Depth of Section d (mm)	Flange		Web Thickness t_w (mm)	Root Radius (mm)	Depth Between Flanges d_1 (mm)	Gross Area of Cross Sections A_g (mm) ²
			Width b_f (mm)	Thickness t_f (mm)				
380 PFC	55.2	380	100	17.5	10.0	14.0	345	7030
300 PFC	40.1	300	90	16.0	8.0	14.0	268	5110
250 PFC	35.5	250	90	15.0	8.0	12.0	220	4520
230 PFC	25.1	230	75	12.0	6.5	12.0	206	3200
200 PFC	22.9	200	75	12.0	6.0	12.0	176	2920
180 PFC	20.9	180	75	11.0	6.0	12.0	158	2660
150 PFC	17.7	150	75	9.5	6.0	10.0	131	2250
125 PFC	11.9	125	65	7.5	4.7	8.0	110	1520
100 PFC	8.33	100	50	6.7	4.2	8.0	86.6	1060
75 PFC	5.92	75	40	6.1	3.8	8.0	62.8	757

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300PLUS® is a registered trade mark of OneSteel Manufacturing.

EQUAL ANGLES



Steel Grade AS/NZS 3679.1-300	Nominal Thickness (mm)	Mass Per Metre (kg/m)	Actual Thickness (t,mm)	Radii	
				Root r_1 (mm)	Toe r_2 (mm)
200 x 200	26	76.8	26.0	18.0	5.00
	20	60.1	20.0	18.0	5.00
	18	54.4	18.0	18.0	5.00
	16	48.7	16.0	18.0	5.00
	13	40.0	13.0	18.0	5.00
150 x 150	19	42.1	19.0	13.0	5.00
	16	35.4	15.8	13.0	5.00
	12	27.3	12.0	13.0	5.00
	10	21.9	9.50	13.0	5.00
125 x 125	16	29.1	15.8	10.0	5.00
	12	22.5	12.0	10.0	5.00
	10	18.0	9.50	10.0	5.00
	8	14.9	7.80	10.0	5.00
100 x 100	12	17.7	12.0	8.00	5.00
	10	14.2	9.50	8.00	5.00
	8	11.8	7.80	8.00	5.00
	6	9.16	6.00	8.00	5.00
90 x 90	10	12.7	9.50	8.00	5.00
	8	10.6	7.80	8.00	5.00
	6	8.22	6.00	8.00	5.00
75 x 75	10	10.5	9.50	8.00	5.00
	8	8.73	7.80	8.00	5.00
	6	6.81	6.00	8.00	5.00
	5	5.27	4.60	8.00	5.00

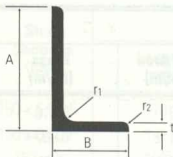
EQUAL ANGLES (continued)

Steel Grade AS/NZS 3679.1-300	Nominal Thickness (mm)	Mass Per Metre (kg/m)	Actual Thickness (t,mm)	Radii	
				Root r_1 (mm)	Toe r_2 (mm)
65 x 65	10	9.02	9.50	6.00	3.00
	8	7.51	7.80	6.00	3.00
	6	5.87	6.00	6.00	3.00
	5	4.56	4.60	6.00	3.00
55 x 55	6	4.93	6.00	6.00	3.00
	5	3.84	4.60	6.00	3.00
50 x 50	8	5.68	7.80	6.00	3.00
	6	4.46	6.00	6.00	3.00
	5	3.48	4.60	6.00	3.00
	3	2.31	3.00	6.00	3.00
45 x 45	6	3.97	6.00	5.00	3.00
	5	3.10	4.60	5.00	3.00
	3	2.06	3.00	5.00	3.00
40 x 40	6	3.50	6.00	5.00	3.00
	5	2.73	4.60	5.00	3.00
	3	1.83	3.00	5.00	3.00
30 x 30	6	2.56	6.00	5.00	3.00
	5	2.01	4.60	5.00	3.00
	3	1.35	3.00	5.00	3.00
25 x 25	6	2.08	6.00	5.00	3.00
	5	1.65	4.60	5.00	3.00
	3	1.12	3.00	5.00	3.00

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UNEQUAL ANGLES



Steel Grade AS/NZS 3679.1-300	Nominal Thickness (mm)	Mass Per Metre (kg/m)	Actual Thickness (t,mm)	Radii	
				Root r_1 (mm)	Toe r_2 (mm)
150 x 100	12	22.5	12.0	10.00	5.00
	10	18.0	9.50	10.00	5.00
150 x 90	16	27.9	15.8	10.00	5.00
	12	21.6	12.0	10.00	5.00
	10	17.3	9.50	10.00	5.00
	8	14.3	7.80	10.00	5.00
125 x 75	12	17.7	12.0	8.00	5.00
	10	14.2	9.50	8.00	5.00
	8	11.8	7.80	8.00	5.00
	6	9.16	6.00	8.00	5.00
100 x 75	10	12.4	9.50	8.00	5.00
	8	10.3	7.80	8.00	5.00
	6	7.98	6.00	8.00	5.00
75 x 50	8	7.23	7.80	7.00	3.00
	6	5.66	6.00	7.00	3.00
	5	4.40	4.60	7.00	3.00
65 x 50	8	6.59	7.80	6.00	3.00
	6	5.16	6.00	6.00	3.00
	5	4.02	4.60	6.00	3.00

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MERCHANT BAR PRODUCTS - ROUNDS & SQUARES

Steel Sections (mm)	Rounds			
	Length (m/t)	Cross Section (sq. mm)	Surface Area (sq. mm/m)	Mass (kg/m)
10	1612	79	31429	0.616
12	1126	113	37714	0.887
13	959	133	40857	1.04
14	827	154	44000	1.21
15	721	177	47143	1.39
16	633	201	50286	1.58
17	561	227	53429	1.78
18	500	255	56571	1.99
19	449	284	59714	2.23
20	405	314	62857	2.46
22	335	380	69143	2.98
24	282	453	75429	3.55
27	222	573	84857	4.49
30	180	707	94286	5.55
33	149	856	103714	6.71
36	125	1018	113143	7.99
39	107	1195	122571	9.38
42	92	1386	132000	10.9
45	80	1591	141429	12.5
48	70	1810	150857	14.2
50	65	1964	157143	15.4
56	52	2464	176000	19.3
60	45	2829	188571	22.2
65	38	3320	204286	26.0
75	29	4420	235714	34.7
90	20	6364	282857	49.9

Manufactured by OneSteel.

MERCHANT BAR PRODUCTS - ROUNDS & SQUARES

Steel Sections (mm)	Square Edge Flats and Slit Flats			
	Length (m/t)	Cross Section (sq. mm)	Surface Area (sq. mm/m)	Mass (kg/m)
150 x 5 SLTF	170	750	310000	5.89
150 x 6 SLTF	142	900	312000	7.07
150 x 8	106	1200	316000	9.42
150 x 10	85	1500	320000	11.8
150 x 12	71	1800	324000	14.1
150 x 16	53	2400	332000	18.8
150 x 20	42	3000	340000	23.6
150 x 25	34	3750	350000	29.4
180 x 6 SLTF	118	1080	372000	8.48
180 x 10 SLTF	71	1800	380000	14.1
180 x 12 SLTF	59	2160	384000	17.0
200 x 6 SLTF	106	1200	412000	9.42
200 x 8 SLTF	80	1600	416000	12.6
200 x 10 SLTF	64	2000	420000	15.7
200 x 12 SLTF	53	2400	424000	18.8
250 x 6 SLTF	85	1500	512000	11.8
250 x 8 SLTF	64	2000	516000	15.7
250 x 10 SLTF	51	2500	520000	19.6
250 x 12 SLTF	42	3000	524000	23.6
300 x 6 SLTF	71	1800	612000	14.1
300 x 8 SLTF	53	2400	616000	18.8
300 x 10 SLTF	42	3000	620000	23.6
300 x 12 SLTF	35	3600	624000	28.3

Manufactured by OneSteel.

REINFORCING BARS

Two types of class N hot-rolled reinforcing bars are currently produced in Australia. These are a quenched and tempered bar and micro-alloyed or conti-stretch bar.

Quenched and tempered rebar is available in straight lengths and sizes from 12mm to 40mm diameter.

Micro-alloyed or conti-stretch bar is available in straightened coil form and in sizes of 10mm, 12mm and 16mm diameter. These products are available through BlueScope Distribution, Metalcorp Steel and many other steel distributors Australia wide.

BlueScope Distribution

www.bluescopedistribution.com.au

Tel Freecall: 13 72 82

Email: sales@bluescopesteel.com.au

Metalcorp Steel

www.metalcorpsteel.com.au

Tel Freecall: 1300 306 204

Email: sales@metalcorpsteel.com.au

The main manufacturer of these products is OneSteel. A technical note on Bending, Rebending and Welding these bars is available from:

OneSteel Reinforcing

www.reinforcing.com

Tel: (02) 8424 9800

Email: 500plus@reinforcing.com

Reinforcing bar complies with Australian Standard, Steel Reinforcing Materials, AS/NZS 4671:2001, grade 500N in all respects including tensile properties, bending properties, chemical composition and deformation pattern. 500N reinforcing bar is fully weldable under the conditions of Australian Standard, AS1554 Part 3: 2002, Welding of Reinforcing Steel Structural Steel.

For details of reinforcing bars certified to comply to AS4671 by the Australian Certification Authority For Reinforcing Steels, refer to the ACRS website at www.acrs.net.au

Concrete is strong in compression but needs the addition of steel reinforcing bars to carry the tensile forces resulting from: the dead load of the member, the application of external loads, or from the shrinkage of the concrete as it dries out.

As determination of the amount and position of the reinforcement requires specialist knowledge, we suggest you visit the OneSteel Reinforcing website at www.reinforcing.com and use the reinforcement area calculator.

Once determined, the steel reinforcement must be accurately placed and firmly supported and tied to prevent displacement during the concreting operations. Tie wires used to bind the reinforcement in place should be trimmed off and bent back away from the concrete surface.

For slabs in domestic floors, driveways and paths, the reinforcement is used to control the cracking of the concrete surface. It should be located in the top third of the slab but with appropriate cover to protect it against corrosion.

DIMENSIONS & MASS OF REINFORCING BAR

Bar Size (mm)	Bar Type QT / MA / CS	Mass per metre (kg/m)	Cross-sectional area (mm ²)	Minimum hole dia for clearance (mm)
10	MA / CS	0.617	78.5	12
12	QT / MA / CS	0.888	113	15
16	QT / MA / CS	1.58	201	20
20	QT	2.47	314	25
24	QT	3.55	452	29
28	QT	4.83	616	34
32	QT	6.31	804	39
36	QT	7.99	1020	44
40	QT	9.86	1260	49

QT = Quenched and Tempered, MA = Microalloyed, CS = Conti-stretch

BENDING PROPERTIES

Diameter	AS4671 Requirements	AS3600 Limits (kg/m)	Galvanised Bars
≤ 16mm	4d x 90 deg	5d generally, but 4d for fitments	5d x 180 deg
≥ 20mm	4d x 180 deg	5d generally, but 4d for fitments	8d x 180 deg

Note: The bending limits shown in this column have been specified in AS 3600 to minimise spalling of the galvanised coating

REBENDING PROPERTIES

Diameter	AS4671 Requirements	QT Capability	MA / CS Capability	AS3600 Limits
$\leq 16\text{mm}$	4d	2d x 180 deg	3d x 180 deg	4d
$20 \geq d \leq 24$	Not Specified	3d x 180 deg		5d
$28 \geq d \leq 36$	Not Specified	6d		6d

QT = Quenched and Tempered, MA = Microalloyed, CS = Conti-stretch

Based on a 90 degree bend, ageing at 100°C for 1 hour and then rebent to straight as per AS4671.

Plain round bars - R250N Grade

Grade AS4671-R250N is available in 10,12,16, 20, 24, 28, 32 and 36mm diameters.

Material complying with AS3679.1, Grade 250 is deemed to comply with this designation.

Deformed rebar reinforcement - D250S Grade

Grade D250S to AS4671 available in 12mm diameter only for swimming pools.

Class L Ribbed Reinforcing Mesh - Refer to Concrete Section-Reinforcing Mesh for Concrete.

Deformed steel reinforcing bars for concrete

All details for Steel Reinforcing Bars for Concrete are contained in AS 4671.

500 PLUS® and TEMPCORE® are registered trademarks of OneSteel Reinforcing Pty Ltd.

REINFORCING MESH FOR CONCRETE (continued)

Mesh Specification		Approx mass of 2.4m x 6m		Cross-sectional area		
Product Code	Longitudinal Wires No x Size @ Pitch (mm) (mm)	Cross Wires No x Size @ Pitch (mm) (mm)	Area (kg/m ²)	Sheet (kg)	Longitudinal Wires (mm ² /m)	Cross Wires (mm ² /m)
SL62	10 x 6.00 @ 200 +4 x 6.75 @ 100	30 x 6.00 @ 200	2.2	33	141	141
SL52	10 x 4.77 @ 200 +4 x 6.00 @ 100	30 x 4.77 @ 200	1.4	20	89	89
SL63 (WA Only)	6 x 6.00 @ 300 +4 x 4.00 @ 100	30 x 6.00 @ 300	1.5 (2.3 sheet width)	21	94	94
SL53 (WA Only)	6 x 4.77 @ 300 +4 x 4.00 @ 100	20 x 4.77 @ 300	1.0 (2.3 sheet width)	15	60	60
Square Meshes (SL)						
SL81	25 x 7.60 @ 100	60 x 7.60 @ 200	7.1	105	454	454
Trench Meshes (TM) strip widths 200mm, 300mm, 400mm						
L12TM	3,4 or 5 x 11.90 @ 100	4.77 @ 300				
L11TM	3,4 or 5 x 10.70 @ 100	4.77 @ 300				
L8TM	3,4 or 5 x 7.60 @ 100	4.77 @ 300				

The main manufacturer of reinforcing mesh is OneSteel Reinforcing ONEMESH®. Information regarding location of stockists, availability of product range, technical information etc can be found in their respective web sites or by direct enquiry.

SURFACE PROTECTION GUIDE FOR STRUCTURAL STEEL

In selecting a suitable surface treatment, the following choices need to be made:

1. The appropriate Atmospheric Classification
2. The Level of Exposure of Structural Steelwork

Once this is complete, the appropriate specification can be easily selected by working through the following information.

It should be noted that steel does not require corrosion protection in many interior situations.

ATMOSPHERIC CLASSIFICATION

Mild

Areas remote from the coast, industrial activity and the tropics. Also, sparsely settled regions such as outback Australia and rural communities away from the coast.

Moderate

Areas which have light industrial pollution or very light marine influence, or both. Suburbs of cities on sheltered bays such as Melbourne, Adelaide and Hobart (except areas right near the coast) and most inland cities.

Tropical

Coastal areas of north Queensland, Northern Territory and northwest Western Australia, except where directly affected by salt spray.



Industrial

Areas around major industrial complexes such as Port Pirie and Newcastle. There are few such areas in Australia. Areas within major industrial complexes are beyond the scope of this booklet.

Marine

Areas influenced to a moderate extent by coastal salts. The extent depends on winds, topography and vegetation. For sheltered areas, such as those around Port Phillip Bay, this classification extends from 100m from the beach to 1km inland. However, for most ocean front areas, such as those that occur along the southwest corner of Western Australia, the southeast coast of South Australia, the New South Wales coast and the surf beach regions of Queensland, it generally extends from 1km from the coast to about 10km inland. Much of Perth, the Gold Coast, Wollongong, Sydney and Newcastle are in this zone. (Note: In exceptional circumstances, this area can extend 50km inland.)

Severe marine

Around sheltered bays, the region extends inland about 100m. In ocean fronted areas, the region extends from the beach front to 1 km inland. However, it is heavily dependent on prevailing winds, extent of wave and marine, surf and land topography.

NOTE: For further detail on these environments, please refer to the Australian Standard AS/NZS 2312:2002.

For specific guidance on extent of zones, contact Australian Corrosion Association (03) 9874 0800.

LEVELS OF EXPOSURE OF STRUCTURAL STEELWORK

1. Fully enclosed

Steelwork is sealed within the building envelope. Includes air conditioned buildings, sealed houses, etc.

2. Partially exposed

Steelwork is predominantly enclosed, but some exposure to the environment is inevitable. For example, warehouses with large doors, garages, roof steelwork above perforated eaves soffit sheeting, etc.

3. Fully exposed

In this instance, steelwork is exposed to elements such as sun, wind, rain, wind blown pollutants, etc. This includes roofed structures with no walls, balconies, open carports, etc.

EXCLUSIONS – Swimming pools, industrial activities involving contaminants.

SPECIFICATION SELECTION

Classification	1. Fully Enclosed	2. Partially Enclosed	3. Fully Exposed
Mild	A	A	B
Moderate	A	A	B
Tropical	A	B	B
Industrial	A	B	C
Marine	A	B#	D
Severe Marine	B	C	B

- Specification C may be required locally at zones extending 2 - 3 metres from openings, depending on conditions. (For instance, prevailing wind, size of opening and duration of exposure.)



LEVELS OF EXPOSURE TO CORROSION

INTERNATIONAL PROTECTIVE COATINGS

Specification	Dulux	International Protective Coatings	Jotun	Wattyl
A No treatment required	-	-	-	-
Hand/power tool clean to AS 1627.2 St1 (AS 1627.9 visual standard). One coat (50µm) alkyd primer (Zinc Phosphate)	Luxaprime Zinc Phosphate	Interprime 198	Jotaprime 250	1624 HB Primer
Abrasive blast to AS 1627.4 Sa2 1/2 (AS 1627.9 visual standard). One coat (75µm) inorganic Zinc Silicate to AS/NZS 3750 Part 15 types 1 to 6 (ES600 is type 4).	Zincanode 304	Interzinc 86	Jotaprime 15	Galvit ES600
Galvanised to AS 1650 Part 1;	-	-	-	-
or -----				
Abrasive blast to AS 1627.4 Sa2 1/2 (AS 1627.9 visual standard). One coat (75µm) inorganic Zinc Silicate, plus one coat (50µm) Acrylic Gloss;	75µm Zincanode 304	Interzinc 86 + Intercryl 853	Jotaprime 15 + Jotacote 604	Galvit ES600 + Industrial Acrylic
or -----				
Abrasive blast to AS 1627.4 Sa2 1/2 (AS 1627.9 visual standard). One coat (300µm) epoxy mastic.	40µm Dulux Weathershield	Interseal 670	Jotamastic 87	Epinel Mastic STC

NOTE: The above recommendations are only sufficient to protect steel members and an additional coating may be required to obtain the desired colour and gloss.

STRUCTURAL STEEL IN HOUSING

Steel beams are commonly used in home building to provide a safe and economic means of spanning wide openings, and supporting heavy loads.

This section contains useful excerpts from the OneSteel publication "Structural Steel in Housing" which has been compiled to assist builders, draftspersons and designers, and is obtainable from:

OneSteel

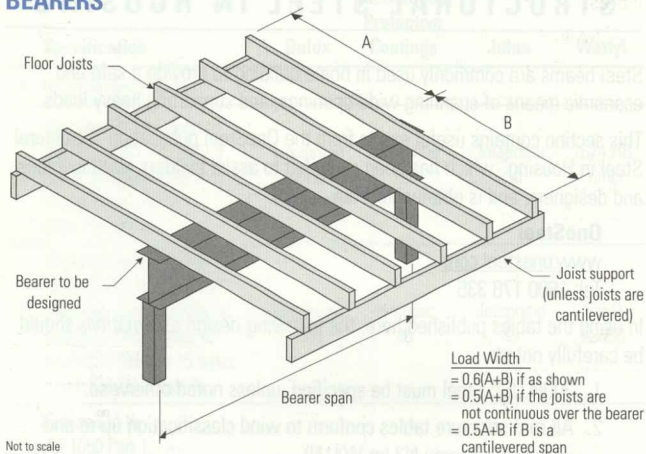
www.onesteel.com

Tel: 1800 178 335

In using the tables published here, the following *design assumptions* should be carefully noted:

1. 300PLUS® Steel must be specified, unless noted otherwise.
2. All roof structure tables conform to wind classification up to and including category N3 (or W41N).
3. All applied loads are uniformly distributed along the span of the member.
4. End support bearing distance for single spans is to be at least that of the width of the member or 70mm, whichever is less. For continuous spans, internal bearing is to be at least two times the width of the member.
5. Joist, bearers and lintels are to be restrained from lateral movement or twisting along their length by other construction, as set out by AS 4100. For example, this criterion is usually met where rafters or joists prevent the top flange of the member from moving laterally.
6. For continuous floor bearers, the variation in span length should not be more than 10%.
7. Effective spacing is a measure of the width of the load area being supported by the member.

BEARERS



Example: (Refer to diagram on above)

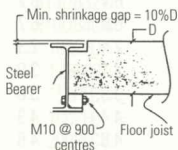
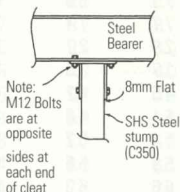
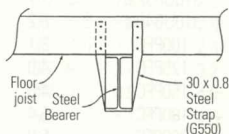
- Joists cantilevered
- Span of bearer = 5.0m
- $A = 5.6\text{m}$
- $B = 3.4\text{m}$
- Load width = $A^2 / 2B$
 $= 5.6^2 / (2 \times 3.4)$
 $= 4.6\text{m}$

Use a load width of 4.8 in the adjacent table: a 200UB18.2 will span 5.0m

Notes:

1. Allowance has been made in the table for a non-load bearing stud wall (not shown) within the floor area supported by the bearer.
2. The single span bearer case is shown. For continuous Bearers over multiple spans, the variation in span between supports should not be more than 10%.
3. The top flange of the bearer is assumed to be continuously laterally supported by floor joists spaced at 450mm centres.

CONNECTION EXAMPLES



Notes on Tables:

The tables apply for 300PL125 steel only for spans of up to 4.0m. For spans greater than 4.0m, the tables apply for 300PL125 steel only for spans of up to 4.0m. For spans greater than 4.0m, the tables apply for 300PL125 steel only for spans of up to 4.0m.

BEARER SUPPORTING A TIMBER FLOOR AND NON LOAD BEARING STUD WALL - SINGLE SPAN

Section Designation	Load Width (m)					
	1.8	2.4	3.0	3.6	4.2	4.8
MAXIMUM SPAN OF BEARER (m)						
125TFB	4.1	3.8	3.6	3.4	3.2	3.1
150UB14.0	4.5	4.2	4.0	3.8	3.7	3.6
180UB16.1	5.1	4.7	4.5	4.3	4.1	4.0
200UB18.2	5.6	5.2	5.0	4.7	4.6	4.4
200UB25.4	6.1	5.7	5.5	5.2	5.0	4.9
250UB25.7	6.7	6.3	6.0	5.8	5.6	5.4
250UB31.4	7.0	6.6	6.3	6.1	5.9	5.7
310UB32.0	7.7	7.3	6.9	6.7	6.4	6.2
310UB40.4	8.2	7.7	7.4	7.1	6.9	6.7
100PFC	3.1	2.9	2.7	2.5	2.4	2.3
125PFC	4.0	3.7	3.5	3.3	3.1	3.0
150PFC	4.8	4.5	4.2	4.0	3.9	3.8
180PFC	5.4	5.1	4.8	4.6	4.4	4.3
200PFC	5.8	5.4	5.2	5.0	4.8	4.6
230PFC	6.3	5.9	5.6	5.4	5.2	5.0
250PFC	7.0	6.6	6.3	6.1	5.9	5.7
300PFC	7.9	7.4	7.1	6.8	6.6	6.4

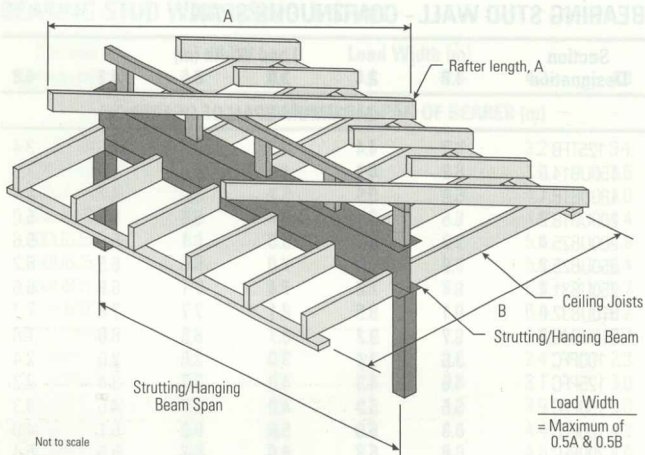
BEARER SUPPORTING A TIMBER FLOOR AND NON LOAD BEARING STUD WALL - CONTINUOUS SPAN

Section Designation	Load Width (m)					
	1.8	2.4	3.0	3.6	4.2	4.8
MAXIMUM SPAN OF BEARER (m)						
125TFB	4.7	4.4	4.2	3.9	3.6	3.4
150UB14.0	5.2	4.9	4.6	4.4	4.0	3.8
180UB16.1	5.9	5.5	5.2	5.0	4.7	4.4
200UB18.2	6.5	6.1	5.7	5.5	5.3	5.0
200UB25.4	7.2	6.7	6.3	6.1	5.8	5.6
250UB25.7	7.9	7.4	7.0	6.7	6.5	6.2
250UB31.4	8.4	7.8	7.4	7.1	6.8	6.6
310UB32.0	9.1	8.5	8.1	7.7	7.5	7.2
310UB40.4	9.7	9.2	8.7	8.3	8.0	7.8
100PFC	3.6	3.4	3.0	2.8	2.6	2.4
125PFC	4.6	4.3	4.0	3.7	3.4	3.2
150PFC	5.5	5.2	4.9	4.7	4.5	4.3
180PFC	6.3	5.9	5.6	5.3	5.1	4.9
200PFC	6.8	6.3	6.0	5.7	5.5	5.4
230PFC	7.4	6.9	6.5	6.3	6.0	5.8
250PFC	8.4	7.8	7.4	7.1	6.8	6.6
300PFC	9.3	8.8	8.3	8.0	7.7	7.5

Notes on Tables:

1. The tables apply for 300PLUS® steel only. For details of your nearest 300PLUS® structural steel supplier, call OneSteel Direct toll free on 1800 1 STEEL (1800 1 78335), or visit our website at www.onesteel.com

STRUTTING/HANGING BEAMS



Example: (Refer to diagram above)

- Required beam span = 4.5m
- A = 7.6m
- B = 7.4m
- Load width = $0.5A$
 $= 0.5 \times 7.6$
 $= 3.8\text{m}$

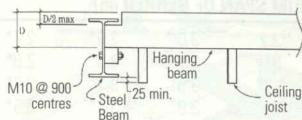
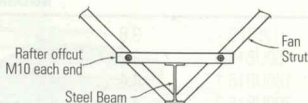
Use a load width of 4.2 in the adjacent table: a 200UB25.4 will span 4.7m and requires a M10 anchor rod.

Notes:

1. The roof load is assumed to be evenly distributed along the Strutting/Hanging Beam.

2. The bottom flange of the Strutting/Hanging Beam is assumed to be continuously laterally supported by ceiling joists at 600mm max centres.

CONNECTION EXAMPLES



STRUTTING/HANGING BEAM SUPPORTING A STEEL SHEET ROOF AND CEILING - NORMAL WIND N3

Section Designation	Load Width (m)					
	1.8	2.4	3.0	3.6	4.2	4.8
MAXIMUM SPAN OF BEARER (m)						
125TFB	4.4*	4.0*	3.7*	3.5*	3.3*	3.2*
150UB14.0	4.5*	4.1*	3.8*	3.6*	3.4*	3.2*
180UB16.1	5.0*	4.6*	4.2*	4.0*	3.8*	3.7*
200UB18.2	5.4*	5.0*	4.6*	4.4*	4.2*	4.0*
200UB25.4	6.9*	6.3*	5.9*	5.6*	5.3*	5.1*
250UB25.7	6.8*	6.2*	5.8*	5.5*	5.3*	5.0*
250UB31.4	-	7.1*	6.7*	6.3*	6.0*	5.8*
310UB32.0	-	7.1*	6.7*	6.4*	6.1*	5.8*
310UB40.4	-	-	8.0*	7.5*	7.2+	6.9+
310UB46.2	-	-	-	8.2*	7.8+	7.5+
100PFC	3.5	3.2*	2.9*	2.8*	2.6*	2.5*
125PFC	4.5*	4.1*	3.8*	3.6*	3.4*	3.2*
150PFC	5.7*	5.2*	4.9*	4.6*	4.4*	4.2*
180PFC	6.3*	5.7*	5.3*	5.0*	4.8*	4.6*
200PFC	6.6*	6.1*	5.6*	5.3*	5.1*	4.8*
230PFC	6.8*	6.2*	5.8*	5.5*	5.2*	5.0*
250PFC	-	-	7.4*	7.0*	6.6*	6.3+
300PFC	-	-	7.7*	7.3*	7.0*	6.7+

STRUTTING/HANGING BEAM SUPPORTING A TILED ROOF AND CEILING - NORMAL WIND N3

Section Designation	Load Width (m)					
	1.8	2.4	3.0	3.6	4.2	4.8
MAXIMUM SPAN OF BEARER (m)						
125TFB	3.8	3.5	3.2	3.0*	2.9*	2.7*
150UB14.0	3.9	3.6	3.3	3.1*	3.0*	2.8*
180UB16.1	4.4	4.0	3.7*	3.5*	3.3*	3.2*
200UB18.2	4.8	4.4	4.1*	3.8*	3.7*	3.5*
200UB25.4	6.1	5.6*	5.2*	4.9*	4.7*	4.5*
250UB25.7	6.0	5.5*	5.1*	4.9*	4.6*	4.4*
250UB31.4	6.9	6.3*	5.9*	5.6*	5.3*	5.1*
310UB32.0	6.9	6.4*	5.9*	5.6*	5.4*	5.2*
310UB40.4	-	7.5*	7.1*	6.7*	6.4*	6.1*
310UB46.2	-	8.2*	7.6*	7.2*	6.9*	6.6*
100PFC	3.0	2.8	2.5	2.4	2.3	2.2
125PFC	3.9	3.6	3.3	3.1*	2.9*	2.8*
150PFC	5.0	4.6	4.3*	4.0*	3.8*	3.6*
180PFC	5.5	5.0*	4.7*	4.4*	4.2*	4.0*
200PFC	5.8	5.3*	4.9*	4.6*	4.4*	4.2*
230PFC	6.0	5.5*	5.1*	4.8*	4.6*	4.4*
250PFC	7.6*	7.0*	6.5*	6.1*	5.8*	5.6*
300PFC	-	7.3*	6.8*	6.5*	6.1*	5.9*

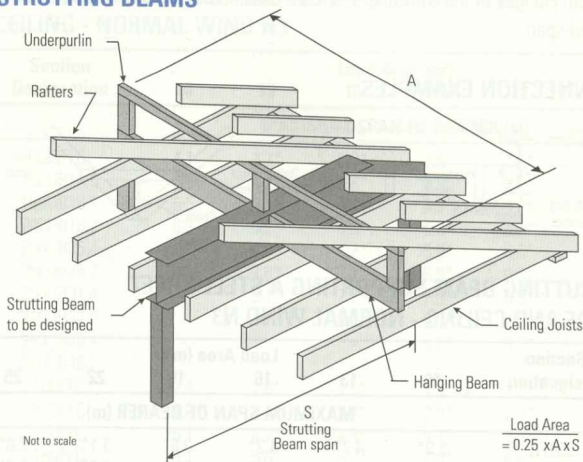
Notes on Tables:

No symbol next to the span indicates that only nominal holding down is required (uplift is less than 5kN).

* indicates a M10 holding down rod is required (uplift is between 5 and 19 kN)

+ indicates a M12 holding down rod is required (uplift is between 19 and 27kN)

STRUTTING BEAMS



Example: (Refer to diagram above)

- Spans $S = 6.1\text{m}$
- $A = 7.0\text{m}$
- Load width $= 0.25 \times A \times S$
 $= 0.25 \times 7.0 \times 6.1$
 $= 10.7\text{m}^2$

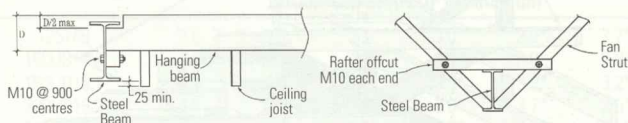
Use load area of 13 sq metres in the adjacent table a 200UB22.3 will span 6.4m and requires a M10 anchor rod.

Notes:

1. The length of the Rafters and Ceiling Joists are assumed to be within 15% of the strutting beam.

2. Both Flanges of the Strutting Beam are assumed to be fully restrained at mid-span.

CONNECTION EXAMPLES



STRUTTING BEAM SUPPORTING A STEEL SHEET ROOF AND CEILING - NORMAL WIND N3

Section Designation	Load Area (m ²)					
	10	13	16	19	22	25
MAXIMUM SPAN OF BEARER (m)						
125TFB	5.0*	4.7*	4.2*	3.6*	3.1*	2.8*
150UB14.0	5.7*	5.2*	4.6*	4.2*	3.9*	3.6*
180UB16.1	6.7*	6.2*	5.7*	5.2*	4.8*	4.5*
200UB18.2	7.5*	7.1*	6.7*	6.1*	5.7*	5.4*
200UB25.4	-	-	7.5*	7.2*	6.9*	6.7*
250UB25.7	-	-	8.6*	8.2*	7.8*	7.6*
250UB31.4	-	-	-	8.7*	8.4*	8.1*
310UB32.0	-	-	-	-	9.4*	9.1*
100PFC	3.5*	2.6*	2.1*	1.8*	1.5*	1.4*
125PFC	4.9*	4.5*	3.9*	3.3*	2.8*	2.5*
150PFC	6.1*	5.8*	5.4*	5.1*	4.9*	4.5*
180PFC	-	6.8*	6.4*	6.1*	5.8*	5.6*
200PFC	-	7.5*	7.1	6.7*	6.4*	6.2*
230PFC	-	-	7.9*	7.5*	7.2*	6.9*
250PFC	-	-	-	-	8.4*	8.1*
300PFC	-	-	-	-	-	-

STRUTTING BEAM SUPPORTING A TILED ROOF AND CEILING - NORMAL WIND N3

Section Designation	Load Area (m ²)					
	10	13	16	19	22	25
MAXIMUM SPAN OF BEARER (m)						
125TFB	4.1	3.7*	3.0*	2.5*	2.2*	2.0*
150UB14.0	4.8	4.2*	3.8*	3.2*	2.8*	2.3*
180UB16.1	5.5	5.1*	4.7*	4.3*	3.8*	3.4*
200UB18.2	6.3	5.9*	5.5*	5.0*	4.7*	4.4*
200UB25.4	7.1	6.6*	6.2*	5.9*	5.6*	5.5*
250UB25.7	8.1	7.6*	7.1*	6.8*	6.5*	6.2*
250UB31.4	-	8.1*	7.7*	7.3*	6.9*	6.7*
310UB32.0	-	-	8.6*	8.1*	7.8*	7.5*
310UB40.4	-	-	-	9.0*	8.6*	8.3*
310UB46.2	-	-	-	-	9.0*	8.7*
100PFC	2.4	1.8*	1.5*	1.3*	1.1*	-
125PFC	4.0	3.4*	2.7*	2.3*	2.0*	1.8*
150PFC	5.1	4.7*	4.4*	4.1*	3.5*	3.1*
180PFC	6.1	5.6*	5.3*	5.0*	4.6*	4.1*
200PFC	6.7	6.2*	5.8*	5.5*	5.3*	5.0*
230PFC	7.4	6.9*	6.5*	6.2*	5.9*	5.7*
250PFC	-	-	7.7*	7.3*	7.0*	6.7*
300PFC	-	-	-	8.5*	8.1*	7.8*

Notes on Tables:

No symbol next to the span indicates that only nominal holding down is required (uplift is less than 5kN).

* indicates a M10 holding down rod is required (uplift is between 5 and 19 kN)

LINTELS SUPPORTING ROOFS AND MASONRY WALL

Before using the table on the following page, please note the design assumptions made on *page 178*, along with the following points:

1. These span tables provide details for building houses using standard practices and traditional materials.
2. Point loads are not covered by these tables.
3. These tables cover normal loads (roof, ceiling and floors), which must be uniformly distributed, on the masonry over an opening.
4. A minimum of three courses of brickwork are required over the opening for load bearing walls.
5. For lintels to be used in a lower floor of two storey construction refer to as structural engineer.
6. Long Leg of angles must be vertical.
7. Each Angle or Flat can carry a maximum 110mm wall thickness.
8. For Clear span < 1000mm, minimum Bearing Length at each end = 100mm
9. For Clear span > 1000mm, minimum Bearing Length at each end = 150mm
10. All lintels should be propped during brickwork construction.
11. The maximum rafter spacing should not be greater than 600mm.
12. There must be at least three courses of brickwork over span opening.
13. All loads are uniformly distributed (point loads are not allowed).
14. The effective roof load width must not exceed 4.8m
15. For lintels supporting masonry in a lower floor of two storey construction, refer to a structural engineer.

CONSTRUCTION TYPES



Construction Type A:

Typical brick veneer construction with non load bearing brickwork and roof supported on internal timber or steel frame.



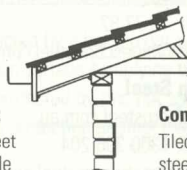
Construction Type B:

Cavity wall construction with timber or steel truss tiled roof supported equally on both leaves of brickwork.



Construction Type C:

Light weight metal sheet roof supported on single leaf of brickwork.



Construction Type D:

Tiled roof with timber or steel ceiling supported on single leaf of brickwork.

LINTELS SUPPORTING ROOFS & MASONRY WALLS

300PLUS® Steel Sections	Mass (kg/m)	Construction Type			
		A	B	C	D
MAXIMUM SPAN OF LINTEL (mm)					
90 x 90 x 6EA	8.22	3010	2050	2050	1570
90 x 90 x 8EA	10.6	3010	2170	2170	1810
100 x 100 x 6EA	9.16	3130	2290	2290	1810
100 x 100 x 8EA	11.8	3370	2410	2410	1930
125 x 75 x 6UA	9.16	3610	2530	2650	2050
150 x 90 x 8UA	14.3	4210	3370	3370	2770
150 x 100 x 10UA	18	4330	3490	3610	3010

STRUCTURAL & PIPELINE PRODUCTS

A comprehensive range of rectangular, square and circular hollow sections are supplied in Australia for construction, fluid and gas conveyance, architectural and other uses.

These are available through BlueScope Distribution, Metalcorp Steel and many other steel distributors Australia-wide.

BlueScope Distribution

www.bluescopedistribution.com.au

Tel Freecall: 13 72 82

Email: sales@bluescopesteel.com.au

Metalcorp Steel

www.metalcorpsteel.com.au

Tel Freecall: 1300 306 204

Email: sales@metalcorpsteel.com.au

There is also some availability directly from the manufacturers - Australian Tube Mills and Orrcon.

Australian Tube Mills

www.austubemills.com

Tel Freecall: 1800 281 424

Orrcon

www.orrcon.com.au

Tel: 61 7 3274 0500

Email: info@orrcon.com.au

These companies can provide details of the location of their appropriate stockists and distributors.

It is strongly recommended that any queries concerning suitability for application, availability of particular sizes, grades and finishes and other

specific detail, be referred to the manufacturers, who can provide authoritative information as well as technical service for their products.

The following tables should therefore be taken only as a general guide to hollow section availability.

Hollow sections are also available in a wide range of finishes, many of these being the manufacturer's branded products. The main ones are listed below, and for their availability on a particular section, reference should be made to the manufacturer's literature.

AUSTRALIAN TUBE MILLS

SupaGal®

Internal and external surfaces protected by a hot dip galvanised coating 100g/m² minimum coating mass each surface complying with Section 3 of AS/NZS 4792 (ZB 125/125). Weld protected by zinc hot spraying, and finished product is given a light over coat as protection against rust.

DuraGal® - No Internal Coat

External Surface - In line hot dipped galvanised over a prepared metal surface to produce a fully bonded coating with a minimum average coating mass of 100g/m² in accordance with AS/NZS 4792 ILG100.

DuraGal® - With Internal Coat

External Surface - as for DuraGal® above

Internal Surface - A 35 micron aim DFT of zinc phosphate is applied over a prepared metal surface equivalent to AS 1627.4 class 2.5.

Galtube® Plus

External Surface - in-line hot dip galvanised over a prepared metal surface, to produce a fully bonded coating with a minimum average coating mass of 125g/m², in accordance with AS/NZS 4792 ILG 125

Internal Surface - A 35 micron aim DFT of zinc phosphate paint applied over a prepared metal surface equivalent to AS 1627.4 class 2.5.

KleenKote®

External surface protected by an alkyd modified acrylic primer averaging 8-10 microns coating thickness (aim 12 microns).

Colour: typically RHS and SHS available in blue and black; CHS available in red.

Tubeline - Blue Plus

A smooth, even coat, 6 to 12, or 15 to 20 microns DFT of general purpose paint applied to external surface as a temporary rust preventative.

Tubeline - Red Painted

A smooth, even coat 6 to 12 microns DFT of general purpose paint applied to external surface as a temporary rust preventative.

Tubeline - Clear Coat

A smooth, even coat of clear polymer applied to the external surface to act as a temporary rust preventative.

Tubeline - No Oil or Paint

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

Tubeline - Galvanised

All surfaces are hot dip galvanised with a minimum average coating of 300g/m² in accordance with AS/NZS 4792 HDG300.

Hot Dipped Galvanised

Internal and external surfaces protected by a hot dip galvanised coating 300g/m² minimum coating mass each surface complying with section 2 of AS/NZS 4792 (HDG300). Finished product is given a clear polymer coat as protection against white rust.

LiteOil

External surface given a light oil coating to prevent short term corrosion in transit from the mill, through warehousing and distribution and on to the end user.

The coating is a mineral based oil, diluted with solvents and is easily removed by alkali solution, or kerosene.

Uncoated

Bare tubular steel products with no oil, paint, galvanised or other coating.

SupaGal®, DuraGal® and KleenKote® are registered trade marks of Australian Tube Mills.

ORRCON

ALLGAL®

External and internal surfaces electro galvanised with a total minimum zinc coating weight (total amount distributed over both surfaces) of 100g/m².

The welded area is recoated with a zinc/aluminium alloy to replace the material that the weld has burned away. The external surface of the hollow section is coated with a clear polymer coating called Clear-Tec.

SmartCOTE®

External coating of a water based primer, average coating thickness 7 – 15 microns. Colour: RHS blue, SHS and CHS black or red.

N.O.P.C.

Certain products also available with no oil, paint or coating.

ALLGAL® and SmartCOTE® are registered trade marks of Orrcon.

RECTANGULAR HOLLOW SECTIONS (RHS)

Available Grades : AS 1163-C350L0 & AS 1163 C350L0/C450L0 (DualGrade)

Available Finishes : Plain, Painted and Galvanised

(refer individual manufacturer's specifications)

8.0 METRE LENGTHS

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills	Orrcon
38 x 25 x 2.0	1.80	556	72	1.04		•
50 x 20 x 1.6	1.63	615	96	1.25	•	
2.0	1.99	503	96	1.53	•	
2.5	2.42	413	72	1.39	•	
3.0	2.83	353	72	1.63	•	
50 x 25 x 1.6	1.75	571	96	1.35	•	•
2.0	2.15	465	96	1.65	•	•
2.5	2.62	382	72	1.51	•	•
3.0	3.07	326	60	1.47	•	•
65 x 35 x 2.0	2.93	341	54	1.27	•	•
2.5	3.60	278	54	1.56	•	•
3.0	4.25	235	45	1.53	•	•
4.0	5.35	187	35	1.50	•	•
75 x 25 x 1.6	2.38	420	65	1.24	•	•
2.0	2.93	341	65	1.53	•	•
2.5	3.60	278	48	1.38	•	•
75 x 50 x 1.6	3.01	332	54	1.30	•	•
2.0	3.72	269	42	1.25	•	•
2.5	4.58	218	42	1.54	•	•
3.0	5.42	185	35	1.52	•	•
4.0	6.92	145	28	1.55	•	•

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8.0 METRE LENGTHS (RHS continued)

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills	Orcon
75 x 50 x 5.0	8.35	120	24	1.60	•	•
6.0	9.67	103	20	1.55	•	•
76 x 38 x 2.5	4.15	241	45	1.49	•	
3.0	4.90	204	40	1.57	•	
4.0	6.23	161	32	1.59	•	
100 x 50 x 1.6	3.64	275	32	0.93	•	•
2.0	4.50	222	32	1.15	•	•
2.5	5.56	180	32	1.42	•	•
3.0	6.60	152	32	1.69	•	•
3.5	7.53	133	24	1.45	•	•
4.0	8.49	118	24	1.63	•	•
5.0	10.3	97	18	1.49	•	•
6.0	12.0	83	15	1.44	•	•
102 x 76 x 3.5	9.07	110	20	1.45	•	
5.0	12.5	80	16	1.60	•	
6.0	14.7	68	12	1.41	•	
125 x 75 x 2.0	6.07	165	24	1.17	•	
2.5	7.53	133	24	1.45	•	•
3.0	8.96	112	20	1.43	•	•
4.0	11.6	86	15	1.40	•	•
5.0	14.2	70	15	1.70	•	•
6.0	16.7	60	12	1.60	•	•
127 x 51 x 3.5	9.07	110	21	1.52	•	
5.0	12.5	80	18	1.80	•	
6.0	14.7	68	14	1.64	•	

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8.0 METRE LENGTHS (RHS continued)

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills	Orrcon
150 x 50 x 2.0	6.07	165	21	1.02	•	•
2.5	7.53	133	24	1.45	•	•
3.0	8.96	112	21	1.50	•	•
4.0	11.6	86	15	1.40	•	•
5.0	14.2	70.2	15	1.71	•	•
6.0	16.7	59	15	2.04	•	•
150 x 76 x 5.0	16.4	61	12	1.57	•	•
6.0	19.4	52	9	1.40	•	•

8.0 & 12.0 METRE LENGTHS

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack - 8.0m lengths (tonnes)	Aus Tube Mills	Orrcon
150 x 100 x 4.0	14.8	68	12	1.42	•	•
5.0	18.2	55	12	1.74	•	•
6.0	21.4	46	9	1.54	•	•
8.0	27.7	36	6	1.33	•	
9.0	30.6	33	6	1.47	•	•
10.0	33.4	30	4	1.60	•	
200 x 100 x 4.0	17.9	56	8	1.15	•	•
5.0	22.1	45	8	1.41	•	•
6.0	26.2	38	8	1.67	•	•
8.0	33.90	30	6	1.63	•	
9.0	37.7	27	6	1.81	•	•
(12.0 metres) 10.0	41.3	24	2	0.99	•	

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8.0 & 12.0 METRE LENGTHS (RHS continued)

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack - 8.0m lengths (tonnes)	Aus Tube Mills	Orrcon
250 x 150 x 5.0	29.9	33	6	1.44	•	•
6.0	35.6	28	4	1.14	•	•
8.0	46.5	22	4	1.49	•	
9.0	51.8	19	4	1.66	•	•
(12.0 metres) 10.0	57.00	18	2	1.37	•	
(12.0 metres) 12.5	69.40	14	2	1.67	•	
(12.0 metres) 16.0	85.5	12	1	1.03	•	
300 x 200 x 6.0	45.0	22	1	0.54	•	•
(12.0 metres) 8.0	59.1	17	2	1.42	•	
(12.0 metres) 9.0	65.4	15	1	0.79	•	•
(12.0 metres) 10.0	72.7	14	2	1.74	•	
(12.0 metres) 12.5	89.0	11	1	1.07	•	
(12.0 metres) 16.0	111.00	9	1	1.33	•	
350 x 250 x 6.0	54.4	18	2	1.31	•	
(12.0 metres) 8.0	71.6	14	2	1.72	•	
(12.0 metres) 10.0	88.4	11	1	1.06	•	
(12.0 metres) 12.5	109.0	9	1	1.31	•	
(12.0 metres) 16.0	136.0	7	1	1.63	•	
400 x 200 x 8.0	71.60	14	2	1.72	•	
(12.0 metres) 10.0	88.40	11	1	1.06	•	
(12.0 metres) 12.5	109.00	9	1	1.31	•	
(12.0 metres) 16.0	136.00	7	1	1.63	•	
400 x 300 x 8.0	84.2	12	1	1.01	•	
(12.0 metres) 10.0	104.0	10	1	1.25	•	
(12.0 metres) 12.5	128.0	8	1	1.54	•	
(12.0 metres) 16.0	161.0	6	1	1.93	•	

SQUARE HOLLOW SECTIONS (SHS)

Available Grades : AS 1163 - C350LO & AS 1163 - C350LO/C450LO (Dual Grade)

Available Finishes : Plain, Painted or Galvanised

(refer individual manufacturer's specifications)

6.5 METRE LENGTHS

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills	Orrcon
13 x 13 x 1.8	0.57	1760	96	0.35	•	•
15 x 15 x 1.8	0.68	1468	100	0.44	•	•
20 x 20 x 1.6	0.87	1150	96	0.54	•	•
2.0	1.05	953	100	0.66	•	
25 x 25 x 1.6	1.12	890	100	0.73	•	•
2.0	1.36	733	100	0.88	•	•
2.5	1.64	610	100	1.07	•	•
3.0	1.89	529	100	1.23	•	•

8.0 METRE LENGTHS

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills	Orrcon
30 x 30 x 1.6	1.38	725	100	1.10	•	•
2.0	1.68	595	100	1.34	•	•
2.5	2.03	493	100	1.63	•	•
3.0	2.36	424	64	1.21	•	•
35 x 35 x 1.6	1.63	613	100	1.30	•	•
2.0	1.99	503	100	1.59	•	•
2.5	2.42	413	64	1.24	•	•
3.0	2.83	353	64	1.4	•	•

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8.0 METRE LENGTHS (SHS continued)

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills	Oricon
40 x 40 x 1.6	1.88	533	81	1.22	•	•
2.0	2.31	434	81	1.49	•	•
2.5	2.82	355	64	1.44	•	•
3.0	3.30	303	64	1.69	•	•
4.0	4.09	244	49	1.60	•	•
50 x 50 x 1.6	2.38	420	64	1.22	•	•
2.0	2.93	341	64	1.50	•	•
2.5	3.60	278	49	1.41	•	•
3.0	4.25	236	49	1.66	•	•
4.0	5.35	187	36	1.54	•	•
5.0	6.39	156	30	1.53	•	•
6.0	7.32	137	25	1.46	•	•
65 x 65 x 1.6	3.13	319	49	1.23	•	•
2.0	3.88	258	42	1.30	•	•
2.5	4.78	209	42	1.61	•	•
3.0	5.66	177	36	1.63	•	•
4.0	7.23	138	30	1.74	•	•
5.0	8.75	114	25	1.75	•	•
6.0	10.1	99	20	1.62	•	•
75 x 75 x 2.0	4.50	222	36	1.30	•	•
2.5	5.56	180	30	1.34	•	•
3.0	6.60	152	30	1.58	•	•
3.5	7.53	133	25	1.51	•	•
4.0	8.49	118	25	1.70	•	•
5.0	10.3	97	20	1.65	•	•
6.0	12.0	83	16	1.54	•	•

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8.0 METRE LENGTHS (SHS continued)

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills	Orrcon
89 x 89 x 2.0	5.38	186	25	1.08	•	•
3.5	9.06	110	20	1.45	•	•
5.0	12.5	80	16	1.60	•	•
6.0	14.6	68	12	1.41	•	•
90 x 90 x 2.0	5.45	183	20	0.87	•	
2.5	6.74	148	20	1.08	•	

8.0 & 12.0 METRE LENGTHS

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack - 8.0m lengths (tonnes)	Aus Tube Mills	Orrcon
100 x 100 x 2.0	6.07	165	20	0.972	•	•
2.5	7.53	133	20	1.20	•	•
3.0	8.96	112	20	1.43	•	•
4.0	11.6	86	16	1.49	•	•
5.0	14.2	70	12	1.37	•	•
6.0	16.7	60	12	1.61	•	•
8.0	21.40	47	9	1.54	•	
9.0	23.5	43	9	1.69	•	•
(12.0 metres) 10.0	25.60	39	6	1.84	•	
125 x 125 x 4.0	14.8	68	12	1.42	•	•
5.0	18.2	55	12	1.75	•	•
6.0	21.4	47	9	1.54	•	•
8.0	27.70	36	6	1.33	•	
9.0	30.6	33	8	1.96	•	•
10.0	33.40	30	4	1.07	•	

8.0 & 12.0 METRE LENGTHS

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack - 8.0m lengths (tonnes)	Aus Tube Mills	Orrcon
150 x 150 x 4.0	17.90	56	9	1.29	•	•
5.0	22.1	45.3	9	1.59	•	•
6.0	26.2	38.2	6	1.26	•	•
8.0	33.90	30	6	1.63	•	
9.0	37.7	26.6	6	1.81	•	•
(12.0 metres) 10.0	41.30	24	2	0.99	•	
200 x 200 x 5.0	29.9	33	6	1.44	•	•
6.0	35.6	28	4	1.14	•	•
8.0	46.50	21	4	1.49	•	
9.0	51.8	19.3	4	1.66	•	•
(12.0 metres) 10.0	57.00	18	2	1.37	•	
(12.0 metres) 12.5	69.40	14	2	1.67	•	
(12.0 metres) 16.0	85.50	12	1	1.03	•	
250 x 250 x 6.0	45.0	22.2	4	1.44	•	•
8.0	59.10	17	4	1.89	•	
9.0	65.9	15.2	2	1.05	•	•
(12.0 metres) 10.0	72.70	14	2	1.74	•	
(12.0 metres) 12.5	89.00	11	1	1.07	•	
(12.0 metres) 16.0	111.00	9	1	1.33	•	
300 x 300 x 6.0	53.7	19	1	0.64		•
(12.0 metres) 8.0	71.60	14	1	0.86	•	
(12.0 metres) 9.0	80.00	13	1	0.96		•
(12.0 metres) 10.0	88.40	11	1	1.06	•	
(12.0 metres) 12.5	109.00	9	1	1.31	•	
(12.0 metres) 16.0	136.00	7	1	1.66	•	

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8.0 & 12.0 METRE LENGTHS (SHS continued)

Size (mm) d x b x t	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack - 8.0m lengths (tonnes)	Aus Tube Mills	Orrcon
350 x 350 x 8.0	84.20	12	1	1.01	•	
(12.0 metres) 10.0	104.00	10	1	1.25	•	
(12.0 metres) 12.5	128.00	8	1	1.54	•	
(12.0 metres) 16.0	161.00	6	1	1.93	•	
400 x 400 x 6.0	73.30	14	1	0.59		•
(12.0 metres) 9.0	108.30	9	1	0.87		•
(12.0 metres) 10.0	120.00	8	1	1.44	•	
(12.0 metres) 12.5	148.00	7	1	1.77	•	
(12.0 metres) 16.0	186.00	5	1	2.23	•	

CIRCULAR HOLLOW SECTIONS (CHS)

Available Grades : AS 1163-C250L0

Available Finishes : Plain, Painted or Galvanised
(refer individual manufacturer's specifications)

6.5 METRE LENGTHS **Note:** M = Medium, H = Heavy

Nominal bore - Size (mm)	Wall thickness (mm)	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills	Orrcon
15 - 21.3	2.6M	1.20	834	217	1.69	•	
20 - 26.9	2.6M	1.56	642	127	1.29	•	•
	3.2H	1.87	535	127	1.54	•	
	4.0H	2.26	442	127	1.87	•	
25 - 33.7	3.2M	2.41	415	91	1.42	•	•
	4.0H	2.93	341	91	1.73	•	

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6.5 METRE LENGTHS (CHS continued) **Note:** M = Medium, H = Heavy

Nominal bore - Size (mm)	Wall thickness (mm)	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills	Orrcon
32 - 42.4	3.2M	3.09	323	61	1.23	•	•
	4.0H	3.79	264	61	1.50	•	•
40 - 48.3	3.2M	3.56	281	61	1.42	•	•
	4.0H	4.38	229	61	1.74	•	•
	5.4XH	5.71	175	61	2.26	•	
50 - 60.3	3.6M	5.03	199	37	1.21	•	•
	4.5H	6.19	161	37	1.49	•	
	5.4H	7.31	137	37	1.76	•	•
65 - 76.1	3.6M	6.44	155	37	1.55	•	•
	4.5H	7.95	126	37	1.91	•	
	5.9H	10.2	97.9	37	2.45	•	•
80 - 88.9	4.0M	8.38	119	19	1.03	•	•
	5.0H	10.3	96.7	19	1.27	•	•
	5.9H	12.1	82.8	19	1.49	•	
90 - 101.6	4.0M	9.63	104	19	1.19	•	•
	5.0H	11.9	84.0	19	1.47	•	•
100 - 114.3	4.5M	12.2	82.1	19	1.51	•	•
	5.4H	14.5	69.0	19	1.79	•	•
125 - 139.7	5.0M	16.6	60.2	13	1.40	•	•
	5.4H	17.9	55.9	13	1.51	•	•
150 - 165.1	5.0M	19.7	50.7	10	1.28	•	•
	5.4H	21.3	47.0	10	1.38	•	•

CIRCULAR HOLLOW SECTIONS (CHS)

Available Grades : AS 1163-C350L0

Available Finishes : Plain, Painted or Galvanised

(refer individual manufacturer's specifications)

6.5 METRE LENGTHS (Plain or Painted) **Note:** L = Light, XL = Extra Light

Nominal bore - Size (mm)	Wall thickness (mm)	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills	Orcon
20 - 26.9	2.0XL	1.23	813	127	1.02	•	•
	2.3L	1.40	714	127	1.16	•	•
25 - 33.7	2.0XL	1.56	641	91	0.92	•	•
	2.6L	1.99	503	91	1.18	•	•
32 - 42.4	2.0XL	1.99	503	61	0.79	•	•
	2.6L	2.55	392	61	1.01	•	•
40 - 48.3	2.3XL	2.61	383	61	1.03	•	•
	2.9L	3.25	308	61	1.29	•	•
50 - 60.3	2.3XL	3.29	304	37	0.79	•	•
	2.9L	4.11	243	37	0.99	•	•
65 - 76.1	2.3XL	4.19	239	37	1.01	•	•
	3.2L	5.75	174	37	1.38	•	•
80 - 88.9	2.6XL	5.53	181	19	0.68	•	•
	3.2L	6.76	148	19	0.84	•	•
90 - 101.6	2.6XL	6.35	157	19	0.78	•	•
	3.2L	7.77	129	19	0.96	•	•
100 - 114.3	3.2XL	8.77	114	19	1.08	•	•
	3.6L	9.83	102	19	1.21	•	•
125 - 139.7	3.0XL	10.1	99	13	0.85	•	•
	3.5L	11.8	85	13	0.99	•	•
150 - 165.1	3.0XL	12.0	83	10	0.78	•	•
	3.5L	13.9	72	10	0.91	•	•

LARGE CIRCULAR HOLLOW SECTIONS (CHS)

Suitable for Pressure & Structural Applications
Covering API 5LB, API 5LX42 & AS 1163 C350L0
(refer to OneSteel or Orrcon specifications)

12.0 METRE LENGTHS

Nominal Bore (mm)	Diameter (mm)	Thickness (mm)	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Aus Tube Mills	Orrcon
150	168.3	4.8	19.4	51.5	1	•	•
		6.4	25.6	39.1	1	•	•
		7.1	28.2	35.4	1	•	•
		11.0	42.7	23.40	1		•
200	219.1	4.8	25.4	39.4	1	•	•
		6.4	33.6	29.8	1	•	•
		8.2	42.6	23.5	1	•	•
250	273.1	4.8	31.8	31.4	1	•	•
		6.4	42.1	23.8	1	•	•
		9.3	60.5	16.5	1	•	•
		12.7	81.6	12.3	1		•
300	323.9	4.8	37.8	26.5	1		•
		6.4	50.1	20.0	1	•	•
		9.5	73.7	13.6	1	•	•
		12.7	97.5	10.3	1	•	•
350	355.6	4.8	41.5	24.1	1		•
		6.4	55.1	18.1	1	•	•
		9.5	81.1	12.3	1	•	•
		12.7	107.4	9.3	1	•	•

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12.0 METRE LENGTHS (CHS continued)

Nominal Bore (mm)	Diameter (mm)	Thickness (mm)	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Aus Tube Mills	Orrcon
400	406.4	4.8	47.5	21.0	1		•
		6.4	63.1	15.8	1	•	•
		9.5	93.0	10.8	1	•	•
		12.7	123	8.11	1	•	•
450	457.0	6.4	71.1	14.1	1	•	•
		9.5	105.0	9.52	1	•	•
		12.7	139.0	7.19	1	•	•
500	508.0	6.4	79.2	12.6	1	•	•
		9.5	116.8	8.6	1	•	•
		12.7	155.1	6.4	1	•	•
600	610.0	6.4	95.3	10.5	1		•
		9.5	140.7	7.1	1		•
		12.7	187.1	5.3	1		•

Note: Minimum order quantities may apply.

LARGE CIRCULAR HOLLOW SECTIONS (CHS)

Suitable for Structural Applications

Grade: AS 1163 C350LO **Finish:** Lightly oiled coating

12.0 METRE LENGTHS

Diameter (mm)	Thickness (mm)	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills
168.3	4.0	16.2	61.7	7	1.36	•
	5.0	20.1	49.8	7	1.69	•
	6.0	24.0	41.7	3	0.86	•
	8.0	31.6	31.6	3	1.14	•
	10.0	39.0	25.6	3	1.40	•
219.1	5.0	26.4	37.9	3	0.95	•
	6.0	31.5	31.7	3	1.13	•
	8.0	41.6	24.0	3	1.50	•
	10.0	51.6	19.4	1	0.62	•
	12.5	63.7	15.7	1	0.76	•
273.1	5.0	33.1	30.2	3	1.19	•
	6.0	39.5	25.3	3	1.42	•
	8.0	52.3	19.1	2	1.26	•
	10.0	64.9	15.4	1	0.78	•
	12.5	80.3	12.4	1	0.96	•

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12.0 METRE LENGTHS (CHS continued)

Diameter (mm)	Thickness (mm)	Nominal mass per metre (kg)	Nominal metres per tonne	Lengths per pack	Approx mass per pack (tonnes)	Aus Tube Mills
323.9	6.0	47.0	21.3	3	1.69	•
	8.0	62.3	16.0	1	0.75	•
	10.0	77.4	12.9	1	0.93	•
	12.5	96.0	10.4	1	1.15	•
355.6	8.0	68.6	14.6	1	0.82	•
	10.0	85.2	11.7	1	1.02	•
	12.5	106.0	9.45	1	1.27	•
	16.0	134.0	7.46	1	1.61	•
406.4	8.0	78.6	12.7	1	0.94	•
	10.0	97.8	10.2	1	1.17	•
	12.0	121.0	8.24	1	1.46	•
	16.0	154.0	6.49	1	1.85	•
457.0	10.0	110.0	9.07	1	1.32	•
	12.5	137.0	7.30	1	1.64	•
	16.0	174.0	5.75	1	2.09	•
508.0	10.0	123.0	8.14	1	1.47	•
	12.5	153.0	6.55	1	1.83	•
	16.0	194.0	5.15	1	2.33	•

PERMALITE® BUILDING SOLUTIONS

BlueScope Lysaght offers a range of tailored solutions comprising design, supply and construction abilities. These solutions deliver outstanding value and bring over 150 years of design and construction knowledge to every project.

BLUESCOPE PERMALITE® ALUMINIUM BUILDING SOLUTIONS (FOR SEVERE ENVIRONMENTS)

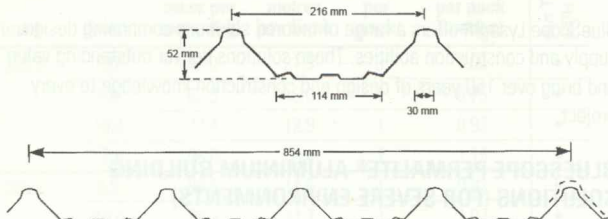
PERMALITE® Aluminium Building Solutions have been designed for highly aggressive, coastal or other severe environment applications.

PERMALITE® products are made from marine grade aluminium, roll formed to produce high performance cladding or extruded to produce purlins with a combination of strength and light weight. They provide exceptional durability in the toughest building environments and can be recycled at the end of their long working life.

The aluminium alloy used to produce all PERMALITE® cladding profiles, purlins and flashings was specifically developed for its resistance to corrosion in marine or industrial environments. PERMALITE® cladding is suitable for applications where corrosion protection is paramount, such as in chemical plants or industrial applications where sulphates, chlorides or other pollutants are likely to come in contact with the metal.

For further details on our PERMALITE® Aluminium Building Solutions, visit www.permalite.com.au or call **1300 850 389**.

PERMALITE ALSPAN®



PERMALITE ALSPAN® cladding profile features distinctive ribs and wide pans which offer a well defined presentation of large areas. It was designed specifically to provide a wide spanning capability, to have a high water carrying capacity and to accommodate construction and maintenance foot traffic.

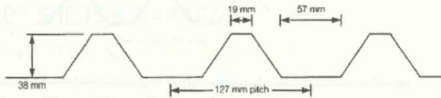
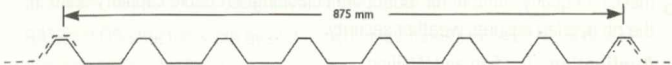
Application - Roofing and Walling

Finishes Available - Mill Finish, Stucco Embossed and Painted

Thickness - 0.70 and 0.90 mm

Material Specification - Marine grade aluminium alloy

PERMALITE LT7®



PERMALITE LT7® is the ultimate in cladding versatility, due to its strength, water carrying capacity, fixing economy and eave closure features. It is widely used for roofing and can be reversed to provide a bold wall effect.

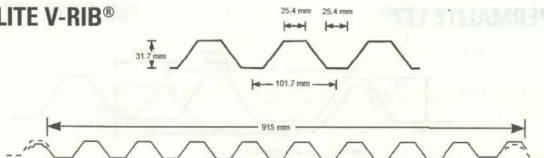
Application - Roofing and Walling

Finishes Available - Mill Finish, Stucco Embossed and Painted

Thickness - 0.70, 0.90 and 1.20 mm

Material Specification - Marine grade aluminium alloy

PERMALITE V-RIB®



PERMALITE V-RIB® provides a wide (915mm) cover and a symmetry which makes it equally suitable for roof or wall cladding. A double capillary drain in the rib overlap ensures weather security.

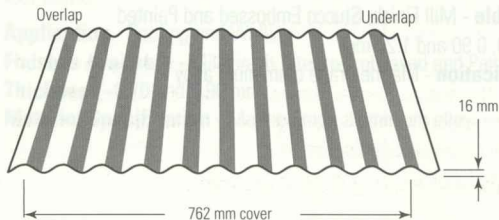
Application - Roofing and Walling

Finishes Available - Mill Finish, Stucco Embossed and Painted

Thickness - 0.70, 0.90 and 1.20 mm

Material Specification - Marine grade aluminium alloy

PERMALITE WAVELINE®



PERMALITE WAVELINE® is a corrugated aluminium cladding profile designed to provide lightweight and traditional roofing or walling for severe environment applications.

Application - Roofing and Walling

Finishes Available - Mill Finish and Painted

Thickness - 0.90mm

Material Specification - Marine grade aluminium alloy

BLUESCOPE LYSAGHT SPECIALIST BUSINESSES

RANBUILD® SHEDS & GARAGES

RANBUILD® is a wholly owned BlueScope Steel business and is a leader in the design and manufacture of prefabricated steel sheds using only the latest techniques and materials to produce versatile, high quality structures. Manufactured from LYSAGHT® steel building products, the extensive range of RANBUILD® structures are fully engineered to meet Australian Standards to ensure fast, low cost assembly and long term life.

RANBUILD® structures are available nationally through an extensive dealer network across Australia.

The RANBUILD® product range includes engineered solutions specifically developed for the agricultural, domestic, commercial and industrial sectors. The range includes prefabricated steel garages, barns, stables and farm sheds.

For further detail or to find your local dealer, visit www.ranbuild.com.au

THE ROOFING CENTRE TASMANIA

With a wealth of experience providing commercial, industrial and residential roofing solutions, The Roofing Centre Tasmania has branches in Hobart, Launceston and Devonport. It provides Lysaght products to handymen, owner builders, roofers and commercial builders.

For more information visit: www.roofingcentretas.com.au

KITELEY'S ROOFING WORLD

Kiteley's Roofing World is the largest single COLORBOND® domestic roof, gutter, fascia and safety-rail fixing company in NSW, and serves customers across the state. It services clients ranging from home owners to leading project builders and commercial property developers.

For more information visit: www.kiteleys.com.au

ADVANCED FENCING

Advanced Fencing is an Adelaide based fencing business specialising in the supply and installation of a wide range of fencing products, including Lysaght® fencing styles.

For more information visit: www.advancedfencing.com.au

METALFORM

Melbourne based Metalform Structures is not only one of Australia's largest purlin manufacturers, it is also a specialist and industry leader in the supply of special purlin sections.

The company works with engineers on major projects to provide purlin solutions beyond those available from conventional designs. Its products have been integral in projects ranging from desalination facilities, rail freight depots, shopping centres and coal mine conveyors.

For more information visit: www.metalform.net.au

PRACTICAL ADVICE ON USING STEEL

This section provides practical advice on using steel building products. It has been created to give information on the usage and application of steel products, and how to handle and install them correctly.

Here you can find information on On-Site Safety for Everyone, covering protective clothing, working at heights, and manual handling

Also included is information on Service Conditions and Suitable Products, which covers selecting the appropriate coated steel building product for the location of the intended building. Here you will also find information on Atmospheric Exposure Conditions and the Avoidance of Contact Between Incompatible Metals or Metal Roofing/Gutter Solutions.

This section also covers External Fasteners, providing the recommended fastener selection and usage for the range of coated steel building products.

You can also find in this section information on Soldering, Adhesives, Sealants, Welding and painting of Steel Sheet Products.

ON-SITE SAFETY FOR EVERYONE

BlueScope Steel holds the safety of every employee and those visiting our sites of key importance. While this safety message relates to employees and their families both at work and in the home environment, we also recommend this to our customers and to all who use our steel products. Nothing is more important at BlueScope Steel than the health and safety of our people.

Our focus is Zero Harm. It's the way we do business at BlueScope Steel. We will never stop pursuing our goal of Zero Harm.

BLUESCOPE STEEL SAFETY BELIEFS

- Working safely is a condition of employment
- Employee involvement is essential
- Management is accountable for safety performance
- All injuries can be prevented
- Training employees to work safely is essential
- All operating exposure can be safeguarded

PROTECTIVE CLOTHING

BlueScope Lysaght requires the following Clothing and Protective Personal equipment to be worn on its sites.

Eye Protection

Eye protection must be worn at all times within site buildings and in all other designated areas except while inside an office, amenity, cabin or fully enclosed vehicle. Prescription glasses must have side shields fitted.

Safety Helmets

Must be worn while inside any building or any industrial or construction work site with the exception of offices, amenities and cabins.

Footwear

Safety footwear is required to be worn while working in all sites. Fully enclosed footwear is required to be worn by visitors at all times whilst on site, in the yard and on green walkways.

Clothing

Employees and Contractors working in the plant are to wear prescribed industrial high visibility clothing. Clothing must fully cover the legs and arms.

Employees coming to and from work that need to enter the manufacturing area for any reason must wear enclosed footwear, long trousers or slacks and sleeved shirt or top. High visibility vests must be worn by visitors in work areas.

Gloves & Armguards

Gloves and Armguards must be worn at all times when handling product - this will include activities such as coil and sheet handling including samples and small pieces, strapping and the removal of strapping, and loading of finished products.

Employees should be encouraged to wear armguards whilst walking in areas with limited space and in the vicinity of sheet metal and coil products.

Hearing Protection

Hearing protection must be worn in sign-posted areas.

Sun Protection

Suitable protection against personal sun damage is required at all times. Sunscreens containing semi-conducting metal oxides such as titanium dioxide (TiO_2) and zinc oxide (ZnO) can accelerate the degradation of organic materials, including paint systems. Such sunscreens should be prevented from making contact with COLORBOND® steel.

Special Protective Equipment

Site Management, in consultation with the Safety Professional and OH&S Committee, shall determine any special protective equipment requirements to suit site processes and ensure compliance to the PPE Policy.

WORKING AT HEIGHTS

First you should try to bring the job to ground level so that there is no risk of falling.

IF YOU CAN'T!

Put up a solid barrier or handrail so you can't fall.

IF YOU CAN'T!

Use a platform to work from such as a scaffold or an elevated work platform (EWP).

IF YOU CAN'T!

Use a fall RESTRAINT system such as a purposely designed fixed length lanyard for the job that will stop you reaching the edge (note: some restraint systems may have energy absorbers fitted).

IF YOU CAN'T!

Use a fall ARREST system such as harness with personal lanyard or a retractable lanyard with an energy absorber that will arrest you should you fall, and You must have a fall rescue plan and be understood by all.

IF YOU CAN'T! - DON'T DO THE JOB! - GO SEE YOUR SUPERVISOR!

MANUAL HANDLING

This not only applies to the building construction site. Be it at home or in the office we often encounter manual handling issues. So consider the following and the affect they will have before lifting.

1 What am I about to do?

- Lift, carry or lower?

2 What are the hazards?

- People around you?
- Heavy Load?
- Awkward Posture?
- Repetitive Action?

3 What can I do to make the job safe?

- Split the load?
- Use a trolley or crane?
- Avoid reaching and twisting?
- Get some Help?

4 How do I plan to lift?

Check what I am about to move and where to. Remove obstacles. Look out for sharp edges and unstable loads.

5 Is my posture correct?

Check, breathe deeply, body weight evenly placed, knees not locked, back straight, shoulders relaxed, avoid jerking moves.

6 Now prepare to lift

Stand close to the object, grasp the object firmly, Lift with your legs not your back and keep the load close to your body.

SERVICE CONDITIONS AND SUITABLE PRODUCTS

(Information under this heading is derived in part from Appendix C to AS/NZS 2728:2007. Acknowledgement and thanks to Standards Australia).

In the selection of an appropriate coated steel building product, it is important to assess the atmospheric conditions expected in the location of the intended building. This includes an assessment of both macro and micro-environmental conditions.

On-site factors require additional consideration because a mildly corrosive atmosphere can be converted into an aggressive environment by rain, dew or humid conditions, and can thus affect the choice of a particular category of painted metallic coated product.

Typical on-site factors or types or microclimates which may cause a breakdown of protective coatings include:

- Industry Pollution
- Contamination from agricultural fertilisers or insecticides
- Damp locations not dried out by sunlight
- Exposure to sea breezes
- Alkaline or acidic fallout (eg fossil fuel combustion)
- Hot or cold surfaces
- Abrasion or impact
- Organic matter (leaves, etc)
- Unwashed Areas*

Prevailing winds which can transport contamination from one location to another also require consideration.

High levels of ultra-violet light and humidity have adverse effects on the performance of organic coatings and thus reduce their durability. Because of the effects of high humidity, the designer of a building should take special care to ensure that the effects of condensation are minimised.

It should also be borne in mind that bending or roll-forming operations will cause stressing and may cause cracking of paint films. In moderate exposure conditions, cracking does not adversely affect the expected life of a product. However, in severe environments products designed for such environments should be specified with more generous bend radii in order to ensure the required service life is achieved.

***Area Unwashed by Rain** - Particles of dust, salt and other grime settle on building cladding but are usually washed away by rain. However, some areas such as upper wall or upper garage door regions, under eaves, soffits, exterior ceilings, etc, remain unwashed because they are protected by overhangs (eaves, lintels). ZINCALUME® steel and COLORBOND® steel in such areas should be regularly maintained by washing with a fresh water and mild detergent solution followed by rinsing with fresh water to remove grime which could otherwise generate early corrosion. In hard-to-reach areas a hosing would be considered as a minimum requirement.

ATMOSPHERIC EXPOSURE CONDITIONS - STEEL CLADDING

PERFORMANCE OF STEEL ROOFING AND WALLING

General applications

The performance of steel roofing and walling can be maximised by choosing a material and design appropriate to the relevant environment.

Environmental factors

- 1 Atmospheric exposure conditions.
- 2 Unusually harsh service conditions due to the nature of the activity in a building, eg, intensive animal farming.

Atmospheric Exposure Conditions

In a country the size of Australia, with its wide variety of climatic conditions ranging from the tropical north to the alpine regions, and from the heavy surf characteristics of much of the coastline to the desert regions of the interior, it is clearly not possible in a brief general description to cover all possibilities in detail.

The following environmental descriptions and table are therefore intended to serve as **a guide only**. Consult with your roofing supplier or BlueScope Steel representative for the best advice on the most suitable choice of COLORBOND® steel and ZINCALUME® steel product.

In general, atmospheric exposure conditions can be categorised by five main groups; very severe marine, severe marine, marine, moderate and benign, as shown in the table below.

RECOMMENDED BLUESCOPE STEEL PRODUCT GUIDE FOR ROOFING IN MARINE ENVIRONMENTS

Marine Environment Severity	Distance from Breaking Surf*	Distance from Exposed Marine*	Distance from Calm Marine	Recommended Product
Very Severe Marine	0m - 100m	0m - 100m	N/A	COLORBOND® Stainless steel
Severe Marine	101m - 200m	101m - 200m	0m - 100m	COLORBOND® Ultra steel
Marine	201m - 400m	201m - 400m	101m - 200m	COLORBOND® steel
Moderate	401m - 1000m	401m - 1000m	201m - 1000m	COLORBOND® COLORBOND® Metallic steel ZINCALUME® AZ150 steel
Benign	1001m +	1001m +	1001m +	COLORBOND® steel COLORBOND® Metallic steel ZINCALUME® AZ150 steel

NOTE:

- Absolute performance is subject to local conditions (eg prevailing winds) and presence of unwashed areas
- Distance is as measured to the high water/tide mark
- The above table applies to salt marine influences only. For installations subject to severe or heavy industrial conditions, it is essential to consult your local BlueScope Steel Sales Office for advice on the appropriate product

* Definitions and examples of surf, exposed and calm marine are outlined in Technical Bulletin TB-35 "Australian Marine Classifications".

It is essential to consult BlueScope Steel or Steel Direct for advice on the correct product to use for very severe and severe conditions as well as placements in industrial environments that could be corrosive.

Fastener performance is also important to ensure the cladding system offers satisfactory performance.

UNUSUALLY HARSH SERVICE CONDITIONS

There are many activities carried out in sheds and industrial buildings that are quite severe in their effects on steel cladding products.

The micro-environment inside sheds for intensive animal farming provides an example of this. The products recommended by BlueScope Steel for best performance under these conditions are profiles rollformed from a heavy coating mass, zinc-coated base i.e. ZINCFORM® steel G300 or G550 (depending on profile), with a Z450 or Z600 coating class.

ZINCALUME® steel is not suitable for use in intensive animal farming environments, enclosed swimming pool buildings and fertiliser and storage buildings.

Any proposed structure for industrial activity involving acids, chemicals, heat and moisture, fossil fuel combustion etc, or any site immediately adjacent to such activity, should be referred to BlueScope Steel for specific recommendations on suitable product. This should include seeking advice on the design of purlins with downturned lips to avoid the build up of contaminants.

Note: *This information is an abridged version of BlueScope Steel Technical Bulletin TB-1a.*

Data provided is based on a relatively small section of AS/NZS 2179:1994 published Standards Australia. These two standards combine 'Metal Rainwater Goods' together with 'Selection and Installation of Metal Rainwater Goods'. All trades and professions associated with this subject should read and observe the practices and recommendations contained in this useful publication.

Drainage systems should be designed so that direct contact between two or more incompatible metals or alloys does not occur. Drainage from copper or copper alloy roofs, pipes, etc, must not be discharged onto or into aluminium alloy, zinc, zinc-coated or zinc/aluminium alloy-coated steel gutters, downpipes and the like.

The following tables are a guide only. Please refer to your fastener or accessory supplier or BlueScope Steel for further detail.

COMPATIBILITY OF DIRECT CONTACT BETWEEN METALS OR ALLOYS

ROOF DRAINAGE SYSTEM COMPONENTS & ANY CLADDING MATERIAL	ACCESSORIES OR FASTENER OR (UPPER SURFACE)		
	ZINCALUME®	GALVANISED (ZINC COATED STEEL)	ZINC
ZINCALUME®	YES	YES	YES
GALVANISED (ZINC COATED STEEL)	YES	YES	YES
ZINC	YES	YES	YES
COLORBOND®, COLORBOND® ULTRA, COLORBOND® METALLIC	YES	YES	YES
COLORBOND® STAINLESS STEEL	NO	NO	NO
STAINLESS STEEL	NO	NO	NO
ALUMINIUM ALLOYS	YES	YES	YES
COPPER & COPPER ALLOYS*	NO	NO	NO
LEAD	NO	NO	NO

* MONEL - COPPER/NICKEL ALLOY

COMPATIBILITY OF DIRECT CONTACT BETWEEN METALS OR ALLOYS

ROOF DRAINAGE SYSTEM COMPONENTS & ANY CLADDING MATERIAL	ACCESSORIES OR FASTENER OR (UPPER SURFACE)				
	COLORBOND® STAINLESS	STAINLESS STEEL	ALUMINIUM ALLOYS	COPPER & COPPER ALLOYS*	LEAD
ZINCALUME®	NO	NO	YES	NO	NO
GALVANISED (ZINC COATED STEEL)	NO	NO	YES	NO	NO
ZINC	NO	NO	YES	NO	NO
COLORBOND®, COLORBOND® ULTRA, COLORBOND® METALLIC	NO	NO	YES	NO	NO
COLORBOND® STAINLESS STEEL	YES	YES	NO	NO	NO
STAINLESS STEEL	YES	YES	NO	NO	NO
ALUMINIUM ALLOYS	NO	NO	YES	NO	NO
COPPER & COPPER ALLOYS*	NO	NO	NO	YES	NO
LEAD	NO	NO	NO	YES	YES

* MONEL - COPPER/NICKEL ALLOY

ACCEPTABILITY OF DRAINAGE FROM AN UPPER SURFACE TO A LOWER METAL SURFACE

LOWER ROOF DRAINAGE SYSTEM MATERIAL	UPPER CLADDING OR ROOF DRAINAGE SYSTEM MATERIAL				COLORBOND® STAINLESS
	ZINCALUME®	GALVANISED (ZINC COATED STEEL)	ZINC	COLORBOND®, COLORBOND® ULTRA, COLORBOND® METALLIC	
ZINCALUME®	YES	YES	YES	YES	YES
GALVANISED (ZINC COATED STEEL)	NO	YES	YES	NO	NO
ZINC	NO	YES	YES	NO	NO
COLORBOND®, COLORBOND® ULTRA, COLORBOND® METALLIC	YES	YES	YES	YES	YES
COLORBOND® STAINLESS STEEL	YES	YES	YES	YES	YES
STAINLESS STEEL	YES	YES	YES	YES	YES
ALUMINIUM ALLOYS	YES	YES	YES	YES	YES
COPPER & COPPER ALLOYS*	YES	YES	YES	YES	YES
LEAD	YES	YES	YES	YES	YES

* MONEL - COPPER/NICKEL ALLOY

ACCEPTABILITY OF DRAINAGE FROM AN UPPER SURFACE TO A LOWER METAL SURFACE

LOWER ROOF DRAINAGE SYSTEM MATERIAL	UPPER CLADDING OR ROOF DRAINAGE SYSTEM MATERIAL				GLAZED ROOF TILES, GLASS & PLASTIC
	STAINLESS STEEL	ALUMINIUM ALLOYS	COPPER & COPPER ALLOYS*	LEAD	
ZINCALUME®	YES	YES	NO	NO	YES
GALVANISED (ZINC COATED STEEL)	NO	NO	NO	YES	NO
ZINC	NO	NO	NO	YES	NO
COLORBOND® COLORBOND® ULTRA, COLORBOND® METALLIC	YES	YES	NO	NO	YES
COLORBOND® STAINLESS STEEL	YES	YES	YES	YES	YES
STAINLESS STEEL	YES	YES	YES	YES	YES
ALUMINIUM ALLOYS	YES	YES	NO	NO	YES
COPPER & COPPER ALLOYS*	YES	YES	YES	YES	YES
LEAD	YES	YES	YES	YES	YES

* MONEL - COPPER/NICKEL ALLOY

HANDLING AND SITE NOTES

INSTALLATION INSTRUCTION

Installation instructions for each LYSAGHT® roofing and walling product are provided online or in individual product literature titled “*LYSAGHT® Roofing and Walling Installation Manual*” available from www.lysaght.com

SAFETY ON SITE

It is commonsense to work safely, protecting yourself and workmates from accidents on the site. Safety includes the practices you use; as well as personal protection of eyes and skin from sunburn, and hearing from noise. Some sunscreens contain titanium oxides. These have been shown to break down some paint compounds and these should be avoided.

Occupational health and safety laws enforce safe working conditions in most locations. Laws in every state require you to have fall protection which includes safety mesh, personal harnesses and perimeter guardrails. We recommend that you are fully aware of all local codes of safe practice and you adhere strictly to all laws that apply to your site.

CARE AND STORAGE PRIOR TO INSTALLATION

Rain or condensation is easily drawn between the surfaces of stacked sheets by capillary action, or they can be driven in by wind. This trapped moisture cannot evaporate easily, so it can cause deterioration of the coating which may lead to reduced life-expectancy or poor appearance.

If materials are not required for immediate use, stack them neatly and clear of the ground. If left in the open, protect them with waterproof covers.

If stacked or bundled product becomes wet, separate it without delay, wipe it with a clean cloth and stack it to dry thoroughly.

HANDLING ON SITE

On large building projects you can reduce handling time by lifting bundles with a crane direct from the delivery truck onto the roof frame. Use a spreader bar for long sheets. For small to medium size projects, without mechanical handling facilities, you can unload sheets by hand and pass them up to the roof one at a time.

Handling Safety - Lysaght product may be sharp and heavy. It is recommended that heavy-duty cut-resistant gloves and appropriate manual handling techniques or a lifting plan be used when handling material.

Handle materials carefully to avoid damage: don't drag materials over rough surfaces or each other; carry tools, don't drag them; protect from swarf.

CUTTING SHEETS ON SITE

For cutting thin metal on site, we recommend a circular saw with a metal cutting blade because it produces fewer damaging hot metal particles (swarf) and a less resultant burr than a carborundum disc.

Cut metals over ground and not over other materials.

Sweep all metallic swarf and other debris from roof areas and gutters at the end of each day and at the completion of installation. Failure to do so can lead to surface staining when the metal particles rust.

WALKING ON ROOF SHEETING

It is important that you walk on roofing carefully, to avoid damage to either the roofing or yourself.

Generally, keep your weight evenly distributed over the soles of both feet to avoid concentrating your weight on either heels or toes. Always wear smooth soft-soled shoes; avoid ribbed soles that pick up and hold small stones, swarf and other objects.

When you walk parallel to the ribs:

- for ribbed roofing walk on at least two ribs or corrugations (CUSTOM ORB, CUSTOM BLUE ORB and SPANDEK);
- for pan-type roofing walk in the pans (LONGLINE 305, KLIP -LOK 406, KLIP -LOK 700HS, KLIP-LOK CLASSIC 700, SPANRIB, TRIMDEK, INTEGRITY 820).

When you walk across the ribs, walk over or close to the roofing supports. (Usually over fastener locations.)

Be careful when moving between supports. Do not walk in the pan immediately adjacent to flashings or translucent sheeting. Walk at least one pan away.

Always take particular care when walking on wet or newly laid sheets - particularly on steeply pitched roofs.

If there will be heavy foot traffic on a roof, provide a temporary walkway or working platform with consideration of hand rails to minimise damage.

CLEANING UP

Swarf (metal scraps and/or abrasive particles resulting from cutting and drilling) left on the surfaces of materials will cause rust stains which can lead to reduced life of the material.

- Sweep or hose all metallic swarf and other debris from roof areas and gutters at the end of each day and at the completion of the installation. Failure to do so can lead to blockages of water flow or surface staining (such as when the metal particles rust).
- If swarf has become stuck on a finish, it can be removed. Take great care not to remove the paint or the metal coatings.
- For critical applications inspect the job two weeks after completion, when rain or condensation will have caused any remaining swarf to rust, and thus highlight affected areas.

WARN OTHER CONTRACTORS

Many stains arising from swarf do so, not from the work of roofing-installers, but from other contractors working on the job. Similarly, problems can arise from contact with incompatible materials, like copper piping or chemically treated timber. Acid cleaning of bricks can also be a problem. Remember to warn them to walk on pans, not on the ribs. Architects and builders need to be aware of this, and warn contractors accordingly.

STRIPPABLE COATINGS

To provide temporary protection during production, handling and transport, some COLORBOND® steel products are coated with a plastic. This coating peels off easily when new, but it has a relatively short life, especially in sunlight. If you don't remove this coating at the time of installation, you may find it very hard to remove later on.

Please dispose of the plastic in an environmentally responsible manner.

EXTERNAL FASTENERS

When you select fasteners, you should consider the design life of the structure, because the fasteners and the cladding material should have similar life expectancies.

Fastener change to metric sizing

The Australian fastener industry is moving to a change in fastener description that will bring it into line with international markets. This is an on-going process as product requirements and design changes.

Traditionally self drilling fasteners have been described in gauge (outside thread diameter), by tpi (threads per inch) and by length (mm). The new changes will convert gauge to metric sizing (eg #12 is approx. M5.5)

MATERIALS FOR SCREWS

Screws are available in a variety of materials, finishes and colours to match COLORBOND® prepainted steel, and design. You should use screws to AS 3566:2002 Class 3 (or better). Additional information on fastener finishes is in the technical bulletin TB-16.

Product	Appropriate screw materials
For most external applications not closer than 400 metres from the ocean or severe marine influence: <ul style="list-style-type: none"> COLORBOND® or METALLIC ZINCALUME® AZ150 	AS 3566 Class 3
For severe exposure conditions: <ul style="list-style-type: none"> COLORBOND® (200 to 400 metres from marine environments) COLORBOND® ULTRA (100 to 200 metres from marine environments) 	AS 3566 Class 4 Where the colour match of fasteners is an overriding consideration, powder coated/ painted fasteners may be used.
For very severe exposure conditions: <ul style="list-style-type: none"> COLORBOND® STAINLESS 	Stainless steel

Stainless steel fasteners are only recommended for use with COLORBOND® Stainless.

Identification of screws

The format of the number code is:

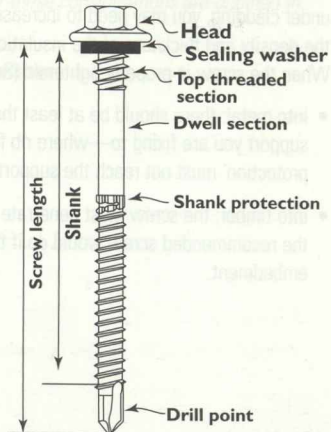
12	–	14	x	50
M6	–	11	x	50
Screw gauge (Thread outside diameter)		Thread pitch (threads per inch)		Overall length of the screw measured from under the head to the tip of the drill point (mm)
M refers to metric size				

Fasteners must have a coating system to meet AS 3566 Class 3 or AS 3566 Class 4.

Ripple Tek[®], AutoTek[®], Tek[®], Designer Heads[®] and RoofZips[®] are registered trademarks of ITW Buildex and are recommended for specific applications. Other equivalent quality fasteners which comply to the above standards are also recommended for use with lysaght roofing and walling products.

Where a screw penetrates roof sheeting (for fixing or stitching), a sealing washer is recommended. The sealing washer is to be an EPDM nonconductive rubber.

Where a screw penetrates the rib of the sheeting (as for roofing), the 'top thread section' feature is recommended to maximise resistance to water penetration.



Typical types of screws

Head	Shank	Drill point
Hexagon head with integrated metal washer   Hex. head with EPDM seal	Top Thread Section Extrudes sheeting towards the seal to maximise resistance to water penetration. Grips the sheeting for a secure connection. Stops sheeting from moving when walked on.	Self drilling for metal  RoofZip® point
Hexagon head with integrated metal washer   Hex. head with no seal	Dwell Section Prevents the sheeting from riding up during fixing and minimises distortion of the profile.	Self drilling for timber  Drill point Type 17
Wafer head   Wafer head with no seal	Shank Protection Enlarges the hole in the sheeting to minimise damage to the protective coating on the screw.	Self drilling for metal  Drill point Standard metal
Special self-sealing head   RippleZips® screw head with self-sealing head.		Self drilling for metal  Extended drill point
		Self drilling for metal  RippleZip® point

Fastener length with insulation, boards and packers

Where insulation (blankets or boards), foam packers or any other packer/board where the cladding screw penetrates through to the support is installed under cladding, you may need to increase the length of screws depending on the density and thickness of the insulation, board or packer.

When the screw is properly tightened (Section 3.6):

- into metal: there should be at least three threads protruding past the support you are fixing to—where rib fixing is done then the ‘shank protection’ must not reach the support (Figure 3.8.1);
- into timber: the screw must penetrate the timber by the same amount that the recommended screw would do if there were no insulation, i.e. same embedment.

- For deep insulation, board or packer the availability of a suitable screw, with all the recommended features and minimum specifications will need to be investigated. It may be necessary to increase the screw gauge accordingly or seek advice from the screw manufacturer. Site trial of screw fixing may need to be conducted to determine the suitability of the selected screw.

Fixing to steel thicker than 3mm

Use appropriate self-drilling screws with an extended drill point; or pre-drill hole and seek advice from the screw manufacturer on the appropriate screw specifications.

FASTENER SELECTION

The recommended fasteners and minimum specifications for a cladding are detailed in individual Lysaght Cladding brochures. In areas prone to cyclones special consideration is taken in the selection, design and installation of the complete roof structure. *Full details of these considerations are outlined in our Cyclonic Area Design Manual.*

Visit www.lysaght.com for more information.

ADHESIVES FOR JOINING STEEL SHEET PRODUCTS

In the manufacture of products from steel sheet, adhesives are playing an increasingly important role as the benefits of adhesive joining become more widely known and accepted, and as new adhesives are introduced. The progression from simple natural rubbers to adhesives and resins has seen the achievement of new dimensions in strength, flexibility and resistance to environmental conditions.

REASONS FOR USING ADHESIVES

Adhesive bonding is often a preferred method for joining and sealing steel sheet. It is particularly beneficial for bonding prepainted sheet.

Subject to a uniform surface condition, the performance of modern adhesives is both reliable and predictable, and joints of moderate strength can be produced. But as with any fastening method, there are limitations as well as advantages.

Advantages include:

- Uniform stress distribution.
- Vibration dampening.
- Seals as well as bonds.
- Joins other materials to steel.
- Joins thin steel sheets.
- High joint security when combined with mechanical or integral fastening.
- Smooth contoured outer surface.
- Reduces corrosion caused by galvanic cells.

Limitations include:

- Difficulty in the correct choice of adhesive from the large range available, although this gives more flexibility of choice to suit specific requirements.
- Need for careful surface preparation for some types.
- Relatively long curing times for some adhesives.
- Non-destructive inspection of joint is difficult.
- Jigs and fixtures may be needed.

Joint Design

To take full advantage of adhesives, joint design in steel sheet must be considered early in the development of the manufactured product. The two main aspects of study are joint bonding and service environment.

Joint loading must be known, including direction and type, ie. whether the loading is in compression, tension, shear or whether a cleavage or peel loading predominates.

Application

Adhesives are used both for joining steel sheet surfaces together and for affixing attachments.

Service environment must be known and the appropriate adhesive chosen to withstand all likely temperature, moisture or corrosive conditions. In many instances an adhesive can have the dual role of supporting the design load and acting as a sealant.

Adhesives may be combined with mechanical fastening or welding systems to give a highly desirable combination of strength combined with the advantage of load distribution over a wide area.

Common methods for applying adhesives include brush, spatula, rolled cartridge extrusion, pneumatic and electric hand guns and, for automated assembly lines, multi-nozzle applicators. Adhesives are often in tape form, with some double sided tapes in varying thicknesses offering high strength under many service conditions.

The complexity of the variations possible with the use of adhesives makes it mandatory for adhesive suppliers to be consulted in the design stage regarding both the product being made and the method of manufacture.

TYPES AND SELECTION

The variety of adhesives available to a manufacturer is rapidly increasing so it is important to understand the characteristics. The properties of an adhesive can be altered by a change in formulation from a basic type to suit many different requirements, and by mixing the basic types themselves to give a combination of desirable characteristics.

The basic types of adhesives can be broadly categorised into three main groups: **thermoplastic, thermoset, elastomeric.**

Thermoplastic adhesives

Thermoplastic adhesives soften when heated. The hot melt group needs heat for application whereas reactive acrylics, anaerobic and cyanoacrylates set at room temperature.

Hot melt adhesives - soften in the general working range of 170-200°C.

Available as tapes, films, powders, rods, pellets and blocks, they are applied by equipment such as hand-held or automated self-heating guns. At temperature, the adhesive flows onto the surfaces to be joined, giving adhesion and strength as cooling and hardening occurs. No chemical change takes place as the adhesive sets and so it will soften again if reheated.

In general terms, hot melt adhesives are less expensive than other adhesive types and have:

- Good flexibility
- Tolerance to surface condition (less surface preparation)
- High impact resistance
- Low creep strength

Differences in the formulation of hot melt adhesives means there is a wide range of strength properties.

Reactive acrylics - are two-pack adhesives and have the advantage of a simple no-mix application with each part applied to one of the faces to be joined, a rapid bond at ambient temperature, good mechanical properties, and a lesser need for surface preparation.

Anaerobic adhesives - set when starved of oxygen, such as between closely matching metal surfaces. They are stored in low density polyethylene containers permeable to oxygen to prevent setting before use. Anaerobics are often used to secure tightly fitting joints such as threaded fasteners, gaskets, keyways and splines.

Cyanoacrylates - polymerise or harden at room temperature when pressed into a thin film between two tightly fitting surfaces. The hardening is initiated by the presence of a very thin film of moisture always present on surfaces at room temperature.

Both anaerobics and cyanoacrylates produce a high strength bond in tension or shear but are very low in cleavage or peel loadings.

Thermoset adhesives

Thermoset adhesives, for example, the well known epoxy group, undergo chemical change during hardening at room temperature for the two-pack,

or elevated temperature for single-pack types. They will not soften when reheated. Characteristics are:

- High strength bonds (often called structural adhesives).
- High creep strength.
- Low impact resistance.
- Less flexible bond than thermoplastic bond.

Elastomeric adhesives

Elastomeric adhesives are the synthetic rubber-based group and usually set with the evaporation of a solvent. They can also be formulated as contact types which produce instant adhesion when adhesive coated surfaces are brought together.

SURFACE PREPARATION

The object of surface preparation is to remove a sufficient degree of contamination from a surface at a processing cost, compatible with the bond strength required from most adhesives, not only for the initial bond strength but also for the durability of the bond when exposed to normal environmental conditions.

BlueScope Steel organic finished steel sheets usually require only a solvent wipe. Uncoated and metal coated steels invariably require more cleaning to remove any oil and dirt contamination and oxide layers from the surface, the degree of removal depending on the adhesive to be used.

Mechanical cleaning, abrasive blasting and chemical etching can also be used for surface preparation of adhesive joints. Because of the many possible differences in both surfaces and adhesives, the adhesive manufacturers' directions should be followed explicitly.

Any calculations for bond areas to give the required joint strength must make allowances for variations in surface treatment likely to be encountered in normal production conditions.

SPECIAL NOTE ON THE SOLDERING OF ZINCALUME® STEEL

Although it is possible to solder ZINCALUME® steel, the process is impractical in the field and is not recommended.

As indicated, alloy solder in a joint is primarily a low mechanical strength sealer capable only of holding joint members in place. Where any significant strength is required the joint needs to be mechanically fastened (screwed, riveted) or integrally formed (seamed) prior to sealing. For situations where soldering would formerly have been considered, suitable polymeric sealants are available for use in conjunction with mechanical or other fastening systems. The ZINCALUME® steel coating is a zinc/aluminium alloy. Essentially due to the aluminium content (55%) special solder alloys, fluxes, techniques and high soldering temperatures are required for soldering ZINCALUME® steel.

To ensure that the most up-to-date information on soldering ZINCALUME® steel is obtained, advice should be sought from BlueScope Steel.

SEALANTS FOR ZINCALUME® STEEL AND COLORBOND® STEEL

The sealant industry in Australia produces a wide variety of building sealants which together embrace a multitude of end use applications and an even greater range of specific conditions.

BlueScope Steel considers that NEUTRAL CURE silicone rubber sealants form the most suitable class of sealants for the applications in which its products will be exposed.

Neutral cure silicone rubber sealants meet the necessary requirements of:

- Providing good adhesion to the clean surface of BlueScope Steel exterior finished products.
- Not requiring a primer except in extreme service conditions. Resisting extremes of both heat and cold while retaining good flexibility.
- Providing very high resistance to the damaging effects of ultra-violet rays (in sunlight) hence achieving long life compatible with the performance of BlueScope Steel exterior finished products.

Any other generic type of sealant considered should possess similar properties to neutral cure silicone rubber if long term performance is required.

WELDING

There is a wealth of welding and joining information available for those manufacturing or fabricating steel products. *The Welding Technology Institute of Australia (WTIA)* is a non-profit organisation whose mission is "to assist in making Australian industry locally and globally competitive in welding related activities".

Among the services provided to industry are concise technical publications, known as Technical Guidance Notes, covering a variety of specific welding applications. Additionally, videos are available covering a wide variety of welding topics.

Listed is an abbreviated list of Technical Notes and Videos available.

For further information, call the WTIA on 1800 620 820, (02) 9748 4443

or fax on (02) 9748 2858, visit www.wtia.com.au or email info@wtia.com.au

Codes	Titles
TN01	The Weldability of Steels (2006)
TN02	Successful Welding of Aluminium (2006)
TN03	Care & Conditioning of Arc Welding Consumables (2006)
TN04	The Industry Guide to Hardfacing for the Control of Wear (2006)
TN05	Flame Cutting of Steels (1994)
TN06	Control of Lamellar Tearing (1985)
TN07	Health & Safety in Welding (2004)
TN08	Economic Design of Weldments (1979)
TN09	Welding Rates in Arc Welding Processes: Part 1 MMAW (1979)
TN10	Fracture Mechanics (2002)

- TN11 Commentary AS/NZS 1554 Structural Steel Welding (2004)
- TN12 Minimising Corrosion in Welded Steel Structures (1996)
- TN13 Stainless Steels for Corrosive Environments (2000)
- TN14 Design and Construction of Welded Steel Bins (1984)
- TN15 Welding and Fabrication of Quenched and Tempered steel (1996)
- TN16 Welding Stainless Steels (1985)
- TN17 Automation in Arc Welding (1986)
- TN18 Welding of Castings (1987)
- TN19 Cost Effective Quality Management for Welding (1995)
- TN20 Repair of Steel Pipelines (2004)
- TN21 Submerged Arc Welding (1999)
- TN22 Welding Electrical Safety (2003)
- TN23 Environmental Improvement Guidelines (2002)

BASIC TRAINING MANUALS (WTIA)

- Manual Metal Arc Welding
- Aluminium Welders Training Manual

Also refer to BlueScope Steel's Technical Bulletin TB-21 "Resistance Spot Welding of BlueScope Steel Metallic-Coated Steel Sheet (2004)"

PAINTING OF ZINC-COATED & ZINCALUME® STEEL SHEET

The painting of ZINCALUME® steel or galvanised steel for either decoration or added protection can be easily and effectively carried out, providing certain basic requirements are observed. Ordinary painting techniques and readily available appropriate paints should be used, but care must be taken in the choice of paint to ensure its suitability for the application in the field; (see Section 1) or in the factory (see Section 2).

Painting in the field requires air drying paints. The table opposite summarises the general approach to the field painting of BlueScope Lysaght sheet products.

Painting in the factory, normally on a line designed specifically for the purpose and using elaborate cleaning and pretreatment, usually requires specialist paints systems.

Selection of paint for factory use is dictated by the final use and exposure conditions, and should be chosen in consultation with a reputable paint manufacturer. Interior exposure tends to be less severe than exterior, but many corrosive interior conditions are encountered, eg in washing machine cabinets.

Selection of paint for field use should take into account the severity of the environment in which the paint will be exposed, eg. rural, coastal, industrial or special conditions.

SECTION 1 - FIELD PAINTING

For satisfactory priming, the surface to be painted must be clean and dry. Dirt should be removed by washing with water containing a little kitchen detergent, and any loose corrosion product removed by the use of a soft nylon bristle brush. Brushing should remove as little of the existing metallic coating as possible.

GENERAL APPROACH TO THE FIELD PAINTING OF ZINC-COATED OR ZINCALUME® STEEL.

Cleaning

1. Remove dirt by washing with water.
2. Wipe off greasy deposits with paint thinners.
3. Remove any corrosion product by wire brushing, taking care not to unnecessarily remove any of the metal coating.

Priming and Finishing

1. Select paint system with due regard to environmental requirements.
2. Follow the paint manufacturer's instructions explicitly.
3. Do not mix different proprietary brands of primer and finisher.
4. Apply two finishing coats in addition to the primer. Principal exception is zinc-dust/zinc-oxide coatings applied to galvanized steel where two coats in total is usually sufficient.
5. Finishing coats may be applied directly to ZINCANNEAL® steel without priming, but when the two pack type etch primer is used, the overall protection given by the paint system is very much improved.
6. Care should be taken to provide adequate ventilation as some volatile compounds may be toxic.
7. Where possible, contact with the skin should be avoided.

Weathering, formerly considered to improve long term paint adhesion, has since been found to give inconsistent results and is no longer recommended. One exception to this is for water-based acrylic-type paint, where two weeks weathering makes painting easier by improving the wettability of the surface. The choice of paint, as stated earlier, depends principally on the environmental conditions.

Use of the recommended brands should produce a satisfactory result provided care is taken to follow the manufacturers mixing and application instructions. The mixing of different brands of priming and finishing coats should be avoided.

A minimum of two finishing coats in addition to the priming coat is advised. Spray painting can be used providing an experienced applicator is employed and the paint is suitable for this method of application.

At all times it is important to avoid excessive paint build up, as may occur in the valleys of formed roofing panels.

SECTION 2 – FACTORY PAINTING

The range of metallic coated products produced by BlueScope Steel can all be successfully factory painted. From powder coating to the application of water based acrylics, with the right advice exceptional finishes can be achieved.

Usually, pretreatment is applied to the article after forming and immediately before painting, but the practice of prepainting before forming is increasing. This latter procedure requires special attention to the type and efficiency of the pretreatment system used and also to the selection of appropriate finish coats. Should forming occur after painting, it is often more economical to use prepainted sheet or strip, such as COLORBOND® steel.

A wide variety of basic paint types are available for factory finishing, but it is important to select the most appropriate paint for the particular application. Usually this involves consultation with a reputable supplier in the field, and it

is advisable that the supplier's recommendations and directions for the paint systems be incorporated into an integrated process and paint technique. As with 'field' painting, any doubts or queries should be referred to the supplier.

The technique of post-forming painted strip requires special, flexible paint systems and this technique should only be considered in close consultation with a paint manufacturer experienced in this particular field.

COLORBOND® STEEL

In many instances, it is possible - and desirable - to avoid either field or factory painting. COLORBOND® prepainted steel is available in a wide range of roofing and cladding profiles or as coil or sheet for fabrication.

OVERPAINTING AND RESTORATION OF COLORBOND® STEEL

COLORBOND® prepainted steel for exterior applications is zinc/aluminium alloy-coated or zinc coated steel sheet that is painted on one of BlueScope Steel's continuous strip coating lines. The paint system used is specially formulated for the intended purpose and is oven-cured during the production process.

Several different but related circumstances are encountered in the maintenance of COLORBOND® steel surfaces:

Restoration the repair of COLORBOND® steel surfaces.

Overpainting the complete overpainting of the surface, as in the case of normal maintenance after years of service, or where a change of colour is desired.

Accessory Painting or Match Painting the application of colour-matched paint of unpainted small accessory items to match the COLORBOND® steel colour being used on the building. Such small accessories may include gutter corners, down pipes, fastener heads, windows, pergolas, fascias, and gutter brackets.

Minor Scratches and Blemishes

if the scratches cannot be seen from the road and/or they are less than 2mm in width **they should be left alone.**

Galling

generally only superficial damage caused by surfaces rubbing together as a result of vibration and interwrap movement during transport

Detailed recommendations for overpainting and/or restoring COLORBOND® steel are documented in BlueScope Steel Technical Bulletin TB-2.

MAINTENANCE

Factors that most affect the long life of a roof (or wall) are original design, the environment of the installation, and the maintenance of the installation. Maintenance is probably the biggest factor.

Maintenance includes:

- Regular inspection for problems before they become major corrosion sites;
- Regular washing down, especially near coastal or industrial influences;
- Removal of leaves and other debris from gutters, downpipes, leaf-guards, slots, holes and other overflow devices;
- Keep walls free of soil, concrete and debris near the ground;
- Don't overspray pesticide.

Maintenance of COLORBOND® pre-painted steel

The paint system on COLORBOND® steel sheet is very durable. Simple maintenance of the finish enhances its life and maintains attractiveness for longer periods.

Where the paint finish is naturally washed by rainwater (roofs, for example) there is usually no additional maintenance needed. However areas to be washed include soffits, wall cladding under eaves, garage doors, and the underside of eave gutters.

Washing should be done at least every six months and more frequently in coastal areas where sea spray is prevalent, and in areas where high levels of industrial fallout occur. Avoid accumulation of salty deposits or industrial dirt.

Establish a regular routine for washing COLORBOND® prepainted steel products. Often garage doors can be washed with clean water at the same time as your car is being washed. Guttering and eaves can be hosed down when windows are being cleaned. Walls can be hosed down (if water restrictions permit) while watering the garden.

Where regular maintenance doesn't remove all the dirt, wash the surface with a mild solution of pure soap or nonabrasive non-ionic kitchen detergent in warm water. Use a sponge, soft cloth or soft bristle nylon brush; be gentle to prevent shiny spots. Thoroughly rinse off the detergent with clean water.

Never use abrasive or solvent cleaners (like turps, petrol, kerosene and paint thinners) on COLORBOND® steel surfaces.

SUSTAINABILITY

Sustainability is about maintaining the quality of the natural environment while providing for human needs. In terms of how BlueScope Steel operates, this means minimising any negative effects the business has on the environment and society, whilst ensuring economic viability in the long-term. This 'triple bottom line' can be thought of as people, planet and product.

Sustainability is one of the major issues of our world today. As governments, businesses and communities the world over try to solve social, economic and environmental challenges, trying to achieve sustainability will affect our lives on a day-to-day basis.

Sustainability is becoming increasingly important to BlueScope Steel and its customers. BlueScope Steel takes sustainability very seriously and is continuing to look for ways to reduce its environmental footprint and develop products that can be used to help create a sustainable built environment.

LIFE CYCLE OF STEEL

One of the best ways to evaluate the environmental sustainability of any good or service is to use a life cycle approach. This means that impacts or effects are assessed over the entire life of the product, from cradle-to-grave - accounting for impacts associated with raw material extraction; product manufacture; product use; disposal or recovery at the end-of-life; and any transport.

RAW MATERIALS IN STEEL

BlueScope Steel uses virgin materials, including iron ore, coke, fluxes and scrap steel, to produce their range of steel products. Scrap is an important ingredient as it maintains the thermal balance of the steelmaking vessel. It also makes steel one of the few materials in the world to have guaranteed recycled content.

WATER USE

Water is an important component in the steelmaking process. Predominantly due to the implementation of a major water-recycling programme in late 2006, only 2% of the water required for processes at Port Kembla Steelworks comes from potable municipal supply.

MANUFACTURING – EFFICIENT PRODUCTION

BlueScope Steel has made a commitment to continually improve the company's environmental footprint and minimising waste is a key to being sustainable. For example, slag that is generated in the steelmaking process is an important raw material input to the concrete industry as a cement substitute.

Additionally, BlueScope Steel is developing new ways to reduce the amount of steel needed to perform specific functions, called dematerialisation. For example, residential roofing that was once 0.55mm thick is today made from high strength COLORBOND® steel which 0.42mm thick, a 24% reduction without any loss in performance.

STEEL AND TRANSPORT

Steel products are lightweight compared to many other materials used for the same purpose. Therefore the advantages of using steel may start before materials even reach the construction or manufacturing site.

1 kg of steel would likely clad approximately nine times the area that 1 kg of roof tiles could (see table below). This means that more flat steel can be transported in each load than many other materials that can be used for the same purpose.

The unit mass (kg/m²) of different roofing materials

ROOFING MATERIAL	UNIT MASS kg/m ²
Concrete roof tiles	44
Fibre cement roofing @ 6 mm	19
Fibre cement sheet roofing @ 7 mm (commercial/industrial)	14
Hardwood roofing @ 10 mm	8.5
Steel roofing @ 0.5 mm (residential)	4.9
Steel roofing @ 0.53 mm (commercial/industrial)	5.6
Synthetic rubber membrane roofing @ 1.5mm	1.84
Terracotta roof tiles	49

Source: **Lawson, B. (1996)** *Building Materials Energy and the Environment: Towards Ecological Sustainability. The Royal Australian Institute of Architects, ACT, Australia.*

USE OF STEEL:

Design for Climate

It is now widely accepted that the changes to the composition of the Earth's atmosphere due to human activities, such as deforestation, industrialisation and urbanisation has affected, and will continue to affect many aspects of local, regional and global climate. For each of the elements of Australia's harsh climate, BlueScope Steel products offer a way to avoid or mitigate some of the impacts now, and in the future.

Temperature range, rainfall frequency and intensity, storm severity, cyclonic activity and bushfire frequency and intensity are all predicted to change across Australia over the coming decades. Steel products can be used in new construction and retrofit projects to help mitigate these expected changes. For instance, BlueScope Steel roofing and cladding

with Thermatech® solar reflectance technology reduces the amount of solar radiation (and consequently heat) absorbed into buildings and independent testing has found steel products to be more resistant to fire than other materials used for the same purpose.

Design for Sustainability

The sustainability advantages of including steel products in sustainable designs are manifested at every stage of a development's life – from construction, to use, to eventual decommissioning

Potential key advantages of incorporating steel products over the life cycle of a development

Building Life Cycle Attribute	Properties of steel	Key Advantage
TRANSPORTATION		
	Lightweight	Potentially reduced transport costs due to decreased number of loads and/or reduced fuel consumption.
CONSTRUCTION		
Waste	Prefabricated and pre-cut components	Less waste on-site; waste produced off-site can be recovered and reused.
On-site safety		Safer building sites.
Construction time and cost	Lightweight	Easier to assemble; reduced construction time; may reduce construction costs.
		Reduced need for heavy lifting equipment; may reduce construction time and cost.

Foundations		
On-site disturbance		Option to use pillar (suspended floor) construction; leads to less damage to site and potentially reduced landscaping costs.
Off-site disturbance		Less disruption of nearby built and natural environments e.g., noise, traffic, sedimentation.
Materials use	High strength	Material efficiency - fewer resources required; cost effective.
	High strength-weight ratio	Potential reuse of existing structures.
	Dematerialisation	Innovation has allowed reduction in thickness and increased manufacturing efficiency.
USE		
Adaptability	High strength-weight ratio	Large internal volumes are more easily redefined. Ability to reduce the overall mass of a building.
Ventilation		One-room-thick designs; good cross-ventilation; improved indoor air quality (IAQ); good light penetration; passive solar heating and passive cooling.

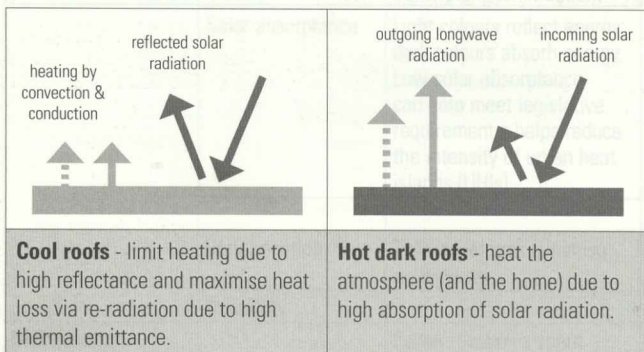
Thermal comfort and energy consumption	Design flexibility	Flexibility in design and aesthetics of decking and eaves to suit the climate zone.
	Low thermal mass	Roof retains low levels of heat from solar radiation compared to high thermal mass materials then enables reverse mass and lightweight construction.
	Solar absorptance	Light colours reflect energy; dark colours absorb energy. Low solar absorptance can help meet legislative requirements; helps reduce the intensity of urban heat islands (UHIs).
	Prefabrication	Tight envelopes minimise air leakage.
	Durability	
	Maintenance	Fewer resources spent on maintenance and replacement.
Internal air quality (IAQ)	Likely to emit less VOCs and formaldehyde than other materials used for the same purpose	Better IAQ; health benefits for occupants.

Water harvesting	Food-grade polymer lining steel tanks	Reduces pressure on mains supply for irrigation, toilet flushing, etc; water may be suitable for potable use; reduces stormwater flows.
END-OF-LIFE		
Reuse	Long lifespan	Designs for disassembly and reuse.
Recycling	100% recyclable	Reduces waste to landfill.

Cool Roofs

Cool roofs help maintain thermal comfort and minimise energy demand in buildings as well as reduce the intensity of Urban Heat Islands. Cool roofs have high solar reflectivity, and preferably, high thermal emittance.

High solar reflectivity means that less energy is absorbed into the roof initially. This reduces the heat that can move from the roof to the atmosphere by convection and conduction – the surface temperature of a cool roof can be up to 39°C less than a dark coloured roof.



BlueScope Steel produces a range of roofing products with high solar reflectance that can be integrated into designs to improve thermal comfort. The solar reflectance of COLORBOND® steel for roofing has been improved due to the addition of Thermatech® solar reflectance technology to all 20 standard COLORBOND® steel colours at no additional cost to consumers.

The Building Code of Australia (BCA) and New South Wales BASIX classify roof colour based on solar absorptance – the inverse of reflectance – expressed as a ratio between 0 and 1. Solar absorptance values are based on as-new / unweathered product. A value of 0 indicates that a roof absorbs

none of the incoming solar radiation, whereas a value of 1 would mean that a roof absorbs 100% of the incoming radiation.

Three classes have been established by the building codes, and by choosing colours in the lightest two categories, designs may qualify for an insulation concession in warm climates under deemed-to-satisfy provisions. For most Australian climates, the use of these products may also improve the energy performance of a modelled design – when modelling tools are used to demonstrate compliance.

BCA 2010 Roofing Solar Absorptance

Product	Very LightSolar Absorptance <0.4	Light Solar Absorptance <0.6
Standard COLORBOND® steel	Classic Cream™	Paperbark®
	Surfmist®	Evening Haze®
		Shale Grey™
		Sandbank®
		Dune®
		Windspray®
COLOROND® Metallic steel		Pale Eucalypt®
		Citi®
		Axis®
		Conservatory®
		Skybridge®
COLORBOND® Coolmax® steel	Whitehaven™	Cortex®

BASIX residential Roofing Solar Absorptance [NSW Class 1, 2, 4 & 10 Buildings]

Product	Very LightSolar Absorptance <0.4	Light Solar Absorptance <0.6
Standard COLORBOND® steel	Classic Cream™	Windspray®
	Surfmist®	Pale Eucalypt®
	Paperbark®	Bushland®
	Evening Haze®	Headland®
	Shale Grey™	Wilderness®
	Sandbank®	Jasper®
	Dune®	Manor Red®
COLOROND® Metallic steel		Citi®
		Axis®
		Conservatory®
		Skybridge®
		Cortex®
COLORBOND® Coolmax® steel	Whitehaven™	
Metallic Coated Steel	ZINCALUME® steel	

HEALTHY INDOOR SPACES

Pre-painted BlueScope Steel products are classified as low VOC (Volatile organic compounds) emitting, resulting in better indoor air quality, protecting the health of building occupants.

MEETING GREEN STAR™ REQUIREMENTS

Launched in 2002, and endorsed by the World Green Building Council, the Green Building Council of Australia (GBCA) is a national, not-for-profit organisation that aims to develop a sustainable property industry in Australia by encouraging the adoption of green building practices. To this end, the GBCA developed Green Star™ as a national rating scheme to evaluate the environmental design and achievements of buildings. As a responsible steel maker, BlueScope Steel's high strength steel can help accrue Green Star points. The steel credit (Mat-6) focuses on encouraging environmentally responsible production, design and fabrication methods that result in the efficient use of steel as a building material.

There are nine categories that make up each Green Star™ tool. Once all credits in each category are claimed and verified, a percentage score is calculated, and Green Star™ environmental weighting factors applied. Weighting factors vary according to State and Territory, to reflect the diversity of environmental concerns across Australia. The result is a weighted score out of 100. There are three levels of achievement:

- ◇ 4 Star Green Star™ Certified Rating (score 45-59) signifying Best Practice;
- ◇ 5 Star Green Star™ Certified Rating (score 60-74) signifying Australian Excellence; and
- ◇ 6 Star Green Star™ Certified Rating (score 75-100) signifying World Leadership.

Green Star™ certification is a formal process certified by the GBCA, although any developer can use the Green Star™ tools as a guide to track and improve the environmental performance of their project.

In Office v3 the materials that make up the building envelope account for 21 of the 141 points available across the nine categories. Of the 21 points in the Materials category, Steel accounts for a maximum of two points.

The Steel credit (Mat-6) focuses on encouraging environmentally responsible production, design and fabrication methods that result in efficient use of steel as a building material set out below, and is sourced from a responsible steel maker (defined as steelmakers with ISO 14001 certification and worldsteel Climate Action Program membership). BlueScope Steel is a responsible steelmaker, therefore BlueScope Steel products meet the mandatory requirements of the credit.

RECYCLABILITY

Recyclability refers to how effectively and efficiently a product or material can be recycled into a new product. Steel is theoretically 100% recyclable: if recovered at the end of each use phase, the life cycle of steel is potentially endless. Recycling prevents the waste of potentially useful materials; reduces consumption of raw materials and energy; and reduces pollution. Scrap steel is an important component in all steel products, which means that steel is one of the only materials in the world to have guaranteed recycled content.

For further information visit <http://sustainability.bluescopesteel.com.au> or call 1800 800 789

REDUCING OUR ECOLOGICAL FOOTPRINT

Our ecological footprint is the measure of the impact our lifestyle has on the environment. It estimates the amount of land or space that is required to provide the resources needed to support our standard of living. The size of our house, the amount of energy we use, the kind of transport we use, the amount of waste we produce, and even the kinds of food we eat, all affect the size of our footprint. The average Australian footprint is around seven hectares per person, which is one of the highest in the world and compares to just 0.5 of a hectare in a poor country like Bangladesh, or 1.2 hectares in China. If everyone in the world had an ecological footprint as big as ours, we would need at least four more planet Earths to accommodate them.

Fortunately there are many things we can do to reduce the size of our ecological footprint and ease the stress on Earth's fragile eco-systems.

Australians dump about 10 million tonnes of waste each year of which more than half is made up of food scraps or garden waste. Instead of dumping these scraps they can be made into compost for your garden to add vitality to the soil, especially if you grow your own vegetables. Compost can be used as a potting mix for raising seeds, as a fertiliser for container plants, vegetables, ornamental shrubs or trees, and as a top dressing for lawns.



HOW TO MAKE COMPOST

Choose a composting system that suits you - an open heap, an enclosure, or a bin with lots of air holes (available at most garden shops) and select a sunny, well-drained location. Start with a 10-15 cm layer of twigs, sticks and dry leaves and lay this as a base which will provide drainage and aeration. You can then add a range of organic materials including kitchen scraps and some manures. Keep a sealed bucket in the kitchen for food scraps including coffee grounds, tea bags, fruit and vegetable peelings and other scraps such as eggshells and fish bones. Keep grass clippings, raked leaves, etc. in piles so you can add them in layers together with weeds (but no oxalis, onion or nutgrass bulbs) and garden prunings. Add the organic materials in layers no more than 10 cm deep, alternating between nitrogen rich (food scraps, manure etc.) and nitrogen poor (twigs, dry leaves etc.). Shredded newspaper and pizza boxes can also be added. Dog and cat faeces are a source of parasites and should not go into the compost.

Ensure that each layer is as slightly wet and occasionally add a thin (3-5 cm) layer of soil to keep microbe levels up. Also add a sprinkling of lime, dolomite or wood ash after layers of manure and food and cover the heap with a hessian sack. When the heap is full you can start a second heap, leaving the first to break down; or remove the enclosure from the heap and relocate it next to the original heap. Start the new heap by forking the top uncomposted material into the enclosure. The finished compost at the bottom of the original heap is ready to use.

For further information visit <http://sustainability.bluescopesteel.com.au> or call 1800 800 725

HOW TO MAKE A WORM FARM

Worm farms are another great way of turning kitchen waste into useful fertiliser, especially for people who live in units or houses with a small yard. Worms can eat the equivalent of their body weight in food scraps a day producing castings that are a rich soil conditioner or plant food. You can use small containers (such as a styrofoam box) with drainage, or buy a commercially produced worm farm from a garden shop or nursery. Put the container in a shaded position that will not get too hot or too cold. Worms prefer temperatures between 20 and 25°C. Place a few sheets of moistened newspaper on the base of the tray and add a layer of bedding - a mixture of shredded newspaper and either composted horse or cow manure, worm castings or coco peat to a depth of 10-15cm. Add soil for grit, then add water so that the mixture is as wet as a lightly squeezed sponge. You will need from 1000 to 2000 worms, which can be purchased from some garden nurseries or through advertisements under 'worms' in the Yellow Pages. There is no need to bury them - they will quickly move away from the light. Cover with a damp hessian sack or newspaper and leave for a week. This allows the worms to adapt to their new home. Begin adding small amounts of food scraps in shallow troughs. Only add more food scraps when the worms have worked through the existing scraps. After a number of months, you will be able to increase the amount of food. Worms will also eat shredded egg cartons, cardboard and paper. Add small sprinklings of lime if a lot of acidic materials (fruit peelings, etc.) are used. Shredding food scraps will speed up the worm system.

When the entire container has been converted to castings (vermicast or worm manure) empty the contents onto a table and leave it for a few minutes to allow the worms to burrow away from the surface. Scrape away the castings, layer by layer until you are left with a ball of worms, ready to use again. The castings can then be added to potting mix or used as plant food.

OTHER WAYS TO REDUCE WASTE

1. Reduce, reuse and recycle whenever possible.
2. Don't use plastic shopping bags. Keep re-useable calico bags in the car for when you shop. And put fruit and vegetables straight into the supermarket trolley rather than in individual plastic bags. Decline a plastic bag if you are only buying one or two items that you can easily carry.
3. Buy in bulk.
4. Only buy items in recyclable packaging, including cardboard, glass or steel cans and decline over-packaged goods.
5. Put a "No Junk Mail Please" notice on your mail box.
6. Reuse milk cartons and cans to plant and grow seedlings.
7. Reuse newspaper and cardboard (old pizza boxes are ideal) for weed control by laying them beneath a layer of mulch in the garden.
8. Rather than sending old or unwanted goods to the tip, have a garage sale. One person's junk is another's treasure.
9. If you are renovating, ask your builder to resell or reuse items.
10. Take your own mug to work rather than use disposable cups for tea or coffee.

WATER CONSERVATION

Ours is the driest inhabited continent, yet Australians are among the highest users of water. A simple thing like rinsing dishes under a running tap can use six litres of water a minute, which is as much water as people in some poorer countries use in a day. Plug the sink and use the cold water from the hot tap as rinse water while you are waiting for the hot water to come through. Other things you can do to conserve water, are:

1. Take shorter showers. Three minutes under the shower should be long enough.
2. Turn off the tap while cleaning your teeth or shaving.
3. Put a bucket under the shower while you are waiting for the water to get hot and use it for watering your pot plants.
4. Fit water saving valves to your taps.
5. Don't put the washing machine on until you have a full load.
6. Fit a water saving device to your toilet cistern or put a brick in the cistern to reduce the volume of water.
7. Fit a AAA rated shower head.
8. When you buy a new washing machine or dishwasher, make sure it has a 5 star rating
9. Use 'grey' water from your washing machine to water your garden. You can install a manually operated water diverter under the laundry tub.
10. Water the garden only in the early morning or late afternoon. In the heat of the day water will evaporate rapidly.
11. Water longer, but less frequently. Plants will become tougher and their roots will grow deeper into the soil.
12. Install a rainwater tank or ask BlueScope Water about a rainwater harvesting system or a grey water recycling system.

ENERGY CONSERVATION

Reducing the amount of energy you use will help reduce greenhouse gas emissions, the cause of global warming, as well as saving you money. Small changes in the way we use energy can make a big difference.

1. Turn off lights when not in use.
2. Use energy-efficient fluorescent light globes.
3. Install a solar hot water system.
4. When buying new appliances, check their energy rating.
Further information available at www.energyrating.gov.au
5. Insulate walls and ceilings and seal gaps around external windows and doors to reduce heat loss or gain.
6. Shade north facing external walls with deciduous trees, pergolas or window shades.
7. Use public transport, cycle or walk to work. Try to have at least one 'car free' day each week.
8. Have your car serviced regularly.
9. Use the washing machine on a cold water cycle and use the drier only as a last resort.
10. Turn off computers, stereos, television or video players at the wall rather than leaving them on stand-by.

HERITAGE CONSERVATION

GIVING THE PAST A FUTURE

Throughout Australia 'the things we want to keep' have been evaluated. The memorable features of the built environment - whether they be a slab homestead, a shearing shed, a High Victorian town hall, a cast iron bridge, an Edwardian foundry, or a 1920s department store - can be important for a variety of reasons. These may derive from aesthetic, historic, cultural, social, spiritual or scientific/technical significance - and this should be clearly evident in a tangible way.

Such places enrich our lives, providing a sense of connection with the Australia's history and identity. They are often part of a broader context, elements in familiar and highly regarded townscapes and landscapes.

All levels of government have formally identified the heritage significance of the built environment and listed key examples. Before any work is commenced to a recognised heritage item, one must, through due process, establish what must be kept and what can be altered.

REGULAR MAINTENANCE

Many older structures were built to last, and have robust stone footings, solid brick walls, hardwood framing, cedar window sashes, and roofs of slate or galvanised iron. Such elements can often survive for hundreds of years with simple maintenance. Typical problems include rising and descending damp. Rising damp can be addressed by improved ground drainage and sub-floor ventilation and, on occasion, the introduction of an impervious damp-proof course. Descending damp (typically rain) reveals the importance of keeping the roof and the stormwater system in good working order, as well as ensuring that the protective coatings (such as paint) on exposed surfaces are kept in good condition. One must check regularly for termite activity.

A MARRIAGE OF THE NEW AND THE OLD

Every building requires significant re-investment every 20 to 30 years. While a building's heritage significance is a given, the usefulness of the building and the likely return on capital are other important considerations. When retention cannot be justified, the quality elements - fine joinery, hardwood posts, hand-made bricks, etc. - should be recycled.

The mid-twentieth century solution of converting historic buildings into museums is rarely plausible today. It is essential that we find new uses and new roles for many of our important older buildings to survive. Adaptive re-use, out of necessity, involves some acceptable modification of the existing entity and perhaps sympathetic extensions, to breathe new life into the place. While the replacement of a 'missing tooth' will doubtless replicate historic detail, more substantial works should use a contemporary vocabulary, as 'repro' often looks wrong in the end product. A spirit of adventure, allied with real design skills, and an appreciation of the original building are required to achieve a successful result, ideally valued in its own right 25 years hence.

The sensible re-use of existing buildings often represents best sustainable practice.

WHERE TO GET ASSISTANCE

- State heritage agency
- a registered architect with relevant experience

It is important that advisors have:

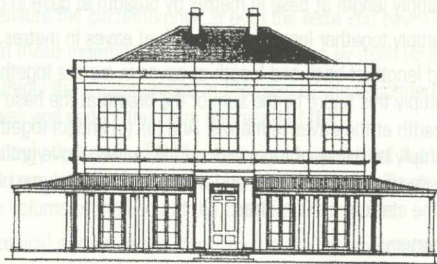
- a good understanding of heritage issues,
- design qualifications,
- construction experience.

An understanding of the philosophies behind current heritage conservation practice can be gained by studying the Australia ICOMOS Burra Charter, in particular its illustrated version. The Australian Heritage Directory is another useful resource, available on the internet (www.heritage.gov.au).

The Federal Government and a number of the States offer modest financial assistance to owners of heritage properties from time to time. Rate and land tax relief may also be available. Your State heritage agency will have the details.

Howard Tanner

Howard Tanner is chairman of Tanner Architects in Sydney; he is the national president of the Australian Institute of Architects, and a member of the Australian Heritage Council.



Rockwall House, Potts Point, Sydney 1831-7
Drawing Courtesy Tanner Architects

USEFUL RURAL INFORMATION

DETERMINING THE QUANTITY OF HAY IN A STACK

Formulae for the exact calculation of the capacity of a haystack are rather complicated for general use. These formulae are used because of the fact that a haystack is irregular in shape and dimensions. However, since the volume of hay per tonne varies greatly with the age of the hay and its degree of settling, formulae which are not so accurate, but are sufficient for practical purposes, are given below. These will enable the farmer to obtain a reasonable estimate of the amount of fodder available in both rectangular and circular stacks.

CUBIC CONTENTS OF A RECTANGULAR STACK

To determine the volume of a rectangular stack:

- (a) Multiply length at base in metres by breadth at base in metres.
- (b) Multiply together length and breadth at eaves in metres.
- (c) Add length at base and length at eaves in metres together and multiply this figure by the sum of the breadth at the base and the breadth at the eaves in metres. Add (a), (b) and (c) together and multiply by the height in metres of the eaves above ground level. Divide this product by six, and the result is the volume of the body of the stack in cubic metres.

For the top portion:

- (d) Multiply together the length and breadth in metres at the eaves.
- (e) Multiply the breadth in metres at the eaves by the sum of the length at the eaves and length along the ridge in metres.

Add (d) and (e) together, multiply by the height of the ridge above the eaves in metres and divide by six. This gives the volume of the portion above the eaves which when added to the volume of the body gives the total volume of the stack.

Example: Consider a rectangular stack the dimensions of which are: 12m by 6m at base; 15m by 7m at the eaves; 9m long at the ridge; eaves 3m above the ground; ridge 3m vertically above the eaves.

Cubic Contents of a Regular Stack

Volume of base or body =	Volume of portion above eaves =
(a) $12 \times 6 = 72$	(d) $15 \times 7 = 105$
(b) $15 \times 7 = 105$	(e) $7 \times (15 + 9) = 7 \times 24 = 168$
(c) $(12 + 15) \times (6 + 7) = 27 \times 13 = 351$	(d) + (e) = 273
(a) + (b) + (c) = 528	$\frac{273 \times 3}{6} = 136.5$ cubic metres
$\frac{528 \times 3}{6} = 264$ cubic metres	Total volume = 400.5 cubic metres

CUBIC CONTENTS OF A CIRCULAR STACK

To determine the volume of a circular stack:

- Measure the circumference at both the base and eaves in metres.
- Add these together and multiply this figure by itself (ie square it).
- Multiply the circumference at the base by the circumference at the eaves and deduct this from the result of (b).
- Multiply the result of (c) by the height in metres of the eaves above the base and divide the result by thirty-eight. The figure obtained is the volume of the body of the stack in cubic metres.

For the top conical portion of the stack, square the circumference in metres at the eaves and multiply the height in metres of the top or peak above the eaves. Divide by thirty eight and the result obtained is the volume in cubic metres of the top portion. By adding the volume of the base and top together, the total content of the stack is obtained.

Example: Consider a circular stack with circumference at ground level 18m, at the eaves 21m and 3m high at the eaves and 2m at the top from the eaves. Applying the formula:

Cubic Contents of a Circular Stack

Volume of body of stack	Volume of conical top
$= [(18 + 21) \times (18 + 21) - (18 \times 21)] \times \frac{3}{38}$	$= \frac{21 \times 21 \times 2}{38}$
$= (1521 - 378) \times \frac{3}{38}$	$= \frac{882}{38}$
$= 1143 \times \frac{3}{38}$	$= 23 \text{ cubic metres}$
$= 90.2 \text{ cubic metres}$	Total volume = 113.2 metres

APPROXIMATE CONTENT OF HAYSTACK

After a paddock has been cut, the farmer will usually know, either from experience or from rough guides such as the amount of twine used, about how much hay is to be stacked.

The size of the haystack built should be in accordance with the expected yield. Stacks are usually about as high above the eaves as below when built in correct proportions, and the following table gives an idea of the content of various sized stacks.

Mass per stack of hay

Average width (m)	Average length (m)	Height to eaves (m)	Height of ridge (m)	Mass per stack (tonnes)
3	6	2.5	1	1.5
3	6	3	1.5	2
4	8.5	3	3	4
5	9	3.5	3	6
6	15	4	3	15

Approximate number of cubic metres per tonne of hay

Period	Oats		Wheat		Lucerne (m) ³
	Sheaf (m) ³	Loose (m) ³	Sheaf (m) ³	Loose (m) ³	
Freshly stacked	10	11	11	14	11 - 13
One month after stacking	8.5	10	10	11	10 - 11
One year after stacking	8.5	9	9	10	8.5 - 10

STOCK BREEDING TABLE

Date of Service	Expected Date of Parturition					
	Mares (340 days)*	Cows (283 days)*	Ewes (150 days)*	Does (147 days)*	Sows (116 days)*	Bitches (63 days)*
1 Jan	7 Dec	11 Oct	31 May	28 May	27 Apr	5 Mar
8 "	14 "	18 "	7 "	4 June	4 May	12 "
15 "	21 "	25 "	14 "	11 "	11 "	19 "
22 "	28 "	1 Nov	21 "	18 "	18 "	26 "
29 "	4 Jan	8 "	28 "	25 "	25 "	2 Apr
5 Feb	11 "	15 "	5 July	2 July	1 June	9 "
12 "	18 "	22 "	12 "	9 "	8 "	16 "
19 "	25 "	29 "	19 "	16 "	15 "	23 "
26 "	1 Feb	6 Dec	26 "	23 "	22 "	30 "
5 Mar	8 "	13 "	2 Aug	30 "	29 "	7 May
12 "	15 "	20 "	9 "	6 Aug	6 July	14 "
19 "	22 "	27 "	16 "	13 "	13 "	21 "
26 "	1 Mar	3 Jan	23 "	20 "	20 "	28 "
2 Apr	8 "	10 "	30 "	27 "	27 "	4 June
9 "	15 "	17 "	6 Sep	3 Sep	3 Aug	11 "
16 "	22 "	24 "	13 "	10 "	10 "	18 "
23 "	29 "	31 "	20 "	17 "	17 "	25 "
30 "	5 Apr	7 Feb	27 "	24 "	24 "	2 July
7 May	12 "	14 "	4 Oct	1 Oct	31 "	9 "
14 "	19 "	21 "	11 "	8 "	7 Sep	16 "
21 "	26 "	28 "	18 "	15 "	14 "	23 "
28 "	3 May	7 Mar	25 "	22 "	21 "	30 "
4 June	10 "	14 "	1 Nov	29 "	28 "	6 Aug

Date of Service	Expected Date of Parturition					
	Mares (340 days)*	Cows (283 days)*	Ewes (150 days)*	Does (147 days)*	Sows (116 days)*	Bitches (63 days)*
11 June	17 May	21 March	8 Nov	5 Nov	5 Oct	13 Aug
18 "	24 "	28 "	15 "	12 "	12 "	20 "
25 "	31 "	4 Apr	22 "	19 "	19 "	27 "
2 July	7 June	11 "	29 "	26 "	26 "	3 Sep
9 "	14 "	18 "	6 Dec	3 Dec	2 Nov	10 "
16 "	21 "	25 "	13 "	10 "	9 "	17 "
23 "	28 "	2 May	20 "	17 "	16 "	24 "
30 "	5 July	9 "	27 "	24 "	23 "	1 Oct
6 Aug	12 "	16 "	3 Jan	31 "	30 "	8 "
13 "	19 "	23 "	10 "	7 Jan	7 Dec	15 "
20 "	26 "	30 "	17 "	14 "	14 "	22 "
27 "	2 Aug	6 June	24 "	21 "	21 "	29 "
3 Sep	9 "	13 "	31 "	28 "	28 "	5 Nov
10 "	16 "	20 "	7 Feb	4 Feb	4 Jan	12 "
17 "	23 "	27 "	14 "	11 "	11 "	19 "
24 "	30 "	4 July	21 "	18 "	18 "	26 "
1 Oct	6 Sep	11 "	28 "	25 "	25 "	3 Dec
8 "	13 "	18 "	7 Mar	4 Mar	1 Feb	10 "
15 "	20 "	25 "	14 "	11 "	8 "	17 "
22 "	27 "	1 Aug	21 "	18 "	15 "	24 "
29 "	4 Oct	8 "	28 "	25 "	22 "	31 "
5 Nov	11 "	15 "	4 Apr	1 Apr	1 Mar	7 Jan
12 "	18 "	22 "	11 "	8 "	8 "	14 "
19 "	25 "	29 "	18 "	15 "	15 "	21 "
26 "	1 Nov	5 Sep	25 "	22 "	22 "	28 "
3 Dec	8 "	12 "	2 May	29 "	29 "	4 Feb
10 "	15 "	19 "	9 "	6 May	5 Apr	11 "
17 "	22 "	26 "	16 "	13 "	12 "	18 "
24 "	29 "	3 Oct	23 "	20 "	19 "	25 "
31 "	6 Dec	10 "	30 "	27 "	26 "	4 Mar

* Average length of gestation period may be subject to slight variation in individual cases.

CAPACITY OF TANKS – CALCULATIONS

Square or Rectangular Section - All dimensions in metres:

Length x breadth x depth = capacity in kilolitres.

Circular Section - Capacity in kilolitres given by either of the following rules.

- Exact formula capacity = $\frac{\pi D^2 h}{4}$
- Approximate formula capacity = $\frac{8C^2 h}{100}$
- Approximate formula capacity = $\frac{4D^2 h}{5}$

Where capacity is in kilolitres and:

C = circumference in metres

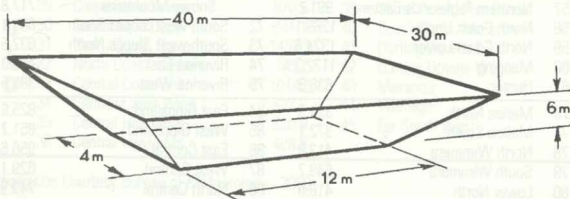
D = diameter in metres

h = height in metres

Example: Capacity of a tank with a diameter 2m and height 2m

$$\text{Approximate capacity} = \frac{4D^2 h}{5} = \frac{4 \times 2^2 \times 2}{5} = 6.4 \text{ kilolitres}$$

HOW TO MEASURE DAMS OR TANKS



In order to calculate the amount of excavation required or the capacity of a dam or tank, as illustrated, the following formula should be used.

$$\begin{aligned}
 \text{(a) Length at bottom multiplied by width at bottom} &= 12 \times 4 = 48 \\
 \text{(b) Length at top multiplied by width at top} &= 40 \times 30 = 1200 \\
 \text{(c) Sum of the lengths multiplied by sum of the widths} &= 52 \times 34 = 1768 \\
 &\text{(a) + (b) + (c) = 3016} \\
 \text{(d) (a) + (b) + (c) multiplied by the depth and divided by six} &= \frac{3016 \times 6}{6} = 3016\text{m}^3
 \end{aligned}$$

1 cubic metre is equal to 1 kilolitre.

AVERAGE DISTRICT RAINFALL THROUGHOUT AUSTRALIA

State	Map No.	District	Annual fall (mm)	Map No.	District	Annual fall (mm)
N S W	46	Western Far North West	234.4	62	Central Tablelands North	672
	47	Western Lower Darling	275	63	Central Tablelands South	807.6
	48	Western Upper Darling	368	64	Central Western Slopes North	614.1
	49	Western SW Plains	349	65	Central Western Slopes South	609.6
	50	Central Western Plains South	483.2	66	Metropolitan East	1111.9
	51	Central Western Plains North	479	67	Metropolitan West	960.4
	52	North-west Plains West	529.3	68	Illawarra	1089.6
	53	North-west Plains East	613.7	69	South Coast	898.2
	54	North-west Slopes North	702.4	70	Southern Tablelands, Goulburn, Monaro	705.9
	55	North-west Slopes South	674.6	71	Southern Tablelands, Snowy Mountains	717.8
	56	Northern Tablelands Western	832.9	72	South-west Slopes South	881.1
	57	Northern Tablelands Eastern	991.2	73	South-west Slopes North	632.5
	58	North Coast Upper	1269.1	74	Riverina East	468.3
	59	North Coast Lower	1324.8	75	Riverina West	380.5
	60	Manning	1132.3			
	61	Hunter	838.3			
V I C	76	Mallee North	334.9	84	East Gippsland	825.6
	77	Mallee South	372.1	85	West Gippsland	851.7
	78	North Wimmera	413.8	86	East Central	956.6
	79	South Wimmera	549.7	87	West Central	629.1
	80	Lower North	418.8	88	North Central	749.9
	81	Upper North	536.7	89	Western Plains	626.8
	82	Lower North-east	900.8	90	West Coast	782.3
	83	Upper North-east	985.7			

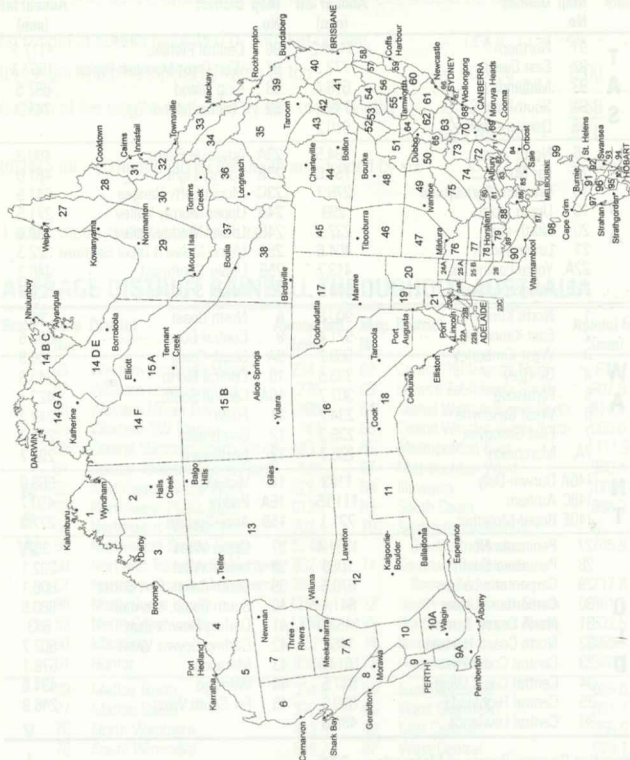
AVERAGE DISTRICT RAINFALL THROUGHOUT AUSTRALIA (cont.)

State	Map No.	District	Annual fall (mm)	Map No.	District	Annual fall (mm)
TAS	91	Northern	1144.2	96	Central Plateau	1117.2
	92	East Coast	773.3	97	West Coast Mountain Region	1567.3
	93	Midlands	616.4	98	King Island	897.5
	94	South-east	749.6	99	Flinders Island	741.3
	95	Derwent Valley	910.2			
SAA	16	North-west	184.5	23A	Adelaide Plains	488.8
	17	Far North	159.6	23B	County Light	481.6
	18	Western Agricultural	278.7	23C	Mount Lofty Ranges	641.6
	19	Upper North	299	24A	Upper Murray Valley	271.5
	20	North-east	232.2	24B	Lower Murray Valley	394.8
	21	Lower North	404.6	25A	Murray Mallee & Upper Southeast	322.3
	22A	Yorke Peninsula	413.7	25B	Upper Southeast	446.3
	22B	Kangaroo Island	563.8	26	Lower Southeast	620.8
WA	1	North Kimberley	900.6	8	North Coast	380
	2	East Kimberley	571.4	9	Central Coast	697.5
	3	West Kimberley	568.2	9A	South Coast	766.9
	4	De Grey	333.5	10	Central North	349.6
	5	Fortescue	307.7	10A	Central South	423.1
	6	West Gascoyne	234.7	11	Eucla	243.2
	7	East Gascoyne	235.3	12	South-east	251.7
	7A	Murchison	236.7	13	North-east	294.7
NT	14GA	Darwin-Daly	1183	14F	Victoria	568.8
	14BC	Arnhem	1110.5	15A	Barkly	430.7
	14DE	Roper-McArthur	721.1	15B	Alice Springs	277.3
QLD	27	Peninsula North	1331.4	37	Upper West	357
	28	Peninsula South	1080	38	Lower West	232.1
	29	Carpentaria Lower	670.5	39	South Coast, Port Curtis	806.1
	30	Carpentaria Upper	641.1	40	South Coast, Moreton	980.8
	31	North Coast, Barron	1453.3	41	Darling Downs East	663
	32	North Coast, Herbert	1453	42	Darling Downs West	602.7
	33	Central Coast East	1014.6	43	Maranoa	576.1
	34	Central Coast West	647.5	44	Warrego	434.6
	35	Central Highlands	620.9	45	Far South West	248.9
	36	Central Lowlands	489.6			

Information Courtesy Bureau of Meteorology - 2008

Please refer to map over page for "Map No." references.

AUSTRALIAN RAINFALL DISTRICTS



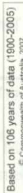
AREA COASTLINE TROPICAL AND TEMPERATE ZONES

State or Territory	Estimated Area		Length of coastline (km)	Percentage of total area in	
	Total (km) ²	Percentage of total area		Tropical Zone	Temperate Zone
New South Wales	800650	10.41	2000	—	100
Victoria	227400	2.96	1900	—	100
Queensland	1730650	22.50	7000	54	46
South Australia	983500	12.79	3800	—	100
Western Australia	2529900	32.89	12900	37	63
Tasmania	68400	0.89	2800	—	100
Northern Territory	1349100	17.54	5400	81	19
Australian Capital Territory (a)	2400	0.03	50	—	100
Australia	7692000	100	35850	39	61

(a) includes Jervis Bay Territory

Source: Geoscience Australia

Australian Median Rainfall
Annual



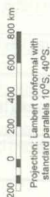
CLIMATE CLASSIFICATION OF AUSTRALIA

Major classification groups



Based on a modified Köppen classification system
Based on a standard 30-year climatology (1961-1990)
© Commonwealth of Australia, 2005

Climate classification of Australia



MAJOR DAMS AND RESERVOIRS IN AUSTRALIA

(H/E = hydro-electricity, FC = flood control and/or mitigation, WS = water supply, Gigalitres = 1000 megalitres)

Name (Year of Competition)	Location and nearest town	Gross capacity gigalitres	Height of wall m	Purpose
NEW SOUTH WALES				
Eucumbene (1958)	Eucumbene River Cooma	4,798	116	Part of Snowy Mountains H/E Scheme
Hume (1936, 1961)	Murray River, near Albury	3,038	51	Irrigation, water supply, H/E
Warragamba (1960)	Warragamba River,	2,057	142	Water supply Sydney, H/E
Menindee Lakes (1960)	Darling River, near Menindee	1,794	18	Irrigation
Burrendong (1967)	Macquarie River near Wellington	1,677	76	Irrigation, FC
Blowering (1968)	Tumut	1,628	112	H/E, irrigation
Copeton (1976)	Gwydir River, Inverell	1,364	113	Irrigation
Wyangala (1936, 1971)	Lachlan River, Cowra	1,220	85	Irrigation, stock, etc
Burrinjuck (1927, 1956)	Murrumbidgee River, Yass	1,026	79	Irrigation, H/E
Talbingo (1971)	Tumut River, Tumut	921	162	H/E
Jindabyne (1967)	Snowy River, Cooma	688	72	H/E
Lake Victoria (1928)	Murray River, near SA border	680	—	Conserves supply for SA
Keepit (1960)	Namoi River, Tamworth	423	55	Conservation, irrigation H/E
Split Creek (1988)	Manilla River, Namoi Valley, Tamworth	372	66	Irrigation
Windamere (1984)	Cudgegong River, near Mudgee	368	69	Irrigation
Glennies Creek (1983)	Hunter Valley, near Singleton	284	65	Irrigation, industrial, mining, water supply
Glenbawn (1958, 1987)	Hunter River, near Scone	759	100	Conservation, irrigation, FC
Tantangara (1960)	Murrumbidgee River, Cooma	254	45	H/E
Avon (1927)	Avon River, Mittagong	214	72	Water supply for Sydney
Grahamstown (1969)	Grahamstown, near Newcastle	153	12	Industrial, mining, water supply
Lake Brewster (1952)	Lachlan River, near Hillston	150	—	Irrigation

MAJOR DAMS AND RESERVOIRS IN AUSTRALIA (continued)

(H/E = hydro-electricity, FC = flood control and/or mitigation, WS = water supply, Gigalitres = 1000 megalitres)

Name (Year of Competition)	Location and nearest town	Gross capacity gigalitres	Height of wall m	Purpose
NEW SOUTH WALES (continued)				
Liddell (1968)	Gardiner Creek, near Muswellbrook	148	43	Cooling water for thermal electricity generation, WS
Tallowa (1976)	Shoalhaven River, near Nowra	115	43	WS for Sydney, H/E
Googong (1979)	Queanbeyan River	125	62	Canberra region
VICTORIA				
Dartmouth (1979)	Mitta Mitta River	4000	180	Irrigation, water supply, H/E
Eildon (1927, 1955)	Upper Goulburn River, Alexandra	3390	79	Irrigation, H/E
Thomson (1984)	Thomson River, near Moe	1175	164	Irrigation, water supply
Waranga (1910)	Near Rushworth (Swamp)	411	12	Irrigation
Mokoan (1971)	Winton Swamp, near Benalla	365	10	Irrigation, water supply
Rocklands (1953)	Glenelg River, Hamilton	348	28	Domestic and stock water supply
Eppalock (1964)	Campaspe River, Bendigo	312	45	Irrigation, water supply
Cardinia (1973)	Cardinia Creek, near Emerald	289	86	Water supply for Melbourne
Upper Yarra (1957)	Warburton	207	89	Water supply for Melbourne
Blue Rock (1984)	Tanjil River, near Moe	200	75	Industrial, mining, WS
Glenmaggie (1927, 1958)	Macalister River, Sale	190	37	Irrigation
Cairn Curren (1956)	Loddon River, near Newstead	148	44	Irrigation
Yarrowonga (1939)	Murray River	117	22	Irrigation
Toolondo (1952, 1960)	Natural depression, near Horsham	107	—	Domestic and stock water supply
Winneke (1980)	Sugarloaf Creek,	100	89	Water supply

MAJOR DAMS AND RESERVOIRS IN AUSTRALIA (continued)

(H/E = hydro-electricity, FC = flood control and/or mitigation, WS = water supply, Gigalitres = 1000 megalitres)

Name (Year of Competition)	Location and nearest town	Gross capacity gigalitres	Height of wall m	Purpose
QUEENSLAND				
Burdekin (1987)	Burdekin River, near Townsville	1860	55	Irrigation, water supply
Fairbairn (1972)	Nogoa River, Central Qld, Emerald	1440	49	Irrigation, industrial
Wivenhoe, (1986)	Brisbane River, near Ipswich	1150	59	H/E, FC, water supply
Somerset (1959)	Stanley River	893	50	WS for Brisbane, H/E
Fred Haigh (1974)	Kolan River, near Gin Gin	586	52	Irrigation
Proserpine Dam (1989)	Proserpine River, near Bowen, Qld	500	51	Water supply, irrigation
Ross River (1974)	Near Townsville	417	35	FC, water supply
Tinaroo Falls (1958)	Barron River, Mareeba	407	47	Irrigation, H/E
Awoonga High Dam (1985)	Boyne River, near Gladstone	250	45	Industrial, mining, water supply
Glenlyon (1976)	Pike Creek, near Stanthorpe	261	62	Irrigation
Boondooma (1983)	Boyne River, near Proston	212	64	Irrigation, water supply
North Pine (1975)	North Pine, near Brisbane	205	44	Water supply
Wuruma (1968)	Nogo River, near Eidsvold	194	46	Irrigation
Koombooloomba (1961)	Tully River, Innisfail	212	52	H/E, irrigation
Callide Dam (St. II) (1986)	Callide Creek, near Biloela	127	35	Irrigation, water supply, industrial, mining
Julius (1977)	Leichhardt River, near Mt Isa	127	35	Water supply, mining
Bjelke Petersen (1988)	Barker Creek, near Murgon, Qld	125	43	Irrigation
Leslie Dam (St II) (1985)	Sandy Creek, near Warwick	108	34	Water supply, irrigation
Lake Moondarra (1957)	Leichhardt River, near Mt Isa	107	27	Water supply, mining, industrial
Eungella (1969)	Broken River Collinsville	131	49	Water supply, irrigation, industrial, mining
Beardmore (1972)	Balonne River	101	15	Water supply, irrigation

MAJOR DAMS AND RESERVOIRS IN AUSTRALIA (continued)

(H/E = hydro-electricity, FC = flood control and/or mitigation, WS = water supply, Gegalitres = 1000 megalitres)

Name (Year of Competition)	Location and nearest town	Gross capacity gegalitres	Height of wall m	Purpose
TASMANIA				
Lakes Gordon and Pedder (1974)				
Gordon	South west	11316	140	H/E
Scotts Peak (1973)	(Queenstown)		43	
Serpentine (1971)		2960	38	
Edgar (1993)			17	
Miena (1967)	Great Lake, Launceston	3356	28	Storage for H/E
Lake St Clair (1938)	Central Plateau	est 2000	3	Natural storage for H/E
Crotty Dam (1990)	King River, near Queenstown, Tas	1091	83	H/E
Mackintosh (1981)	Mackintosh River, near Queenstown		75	H/E
Tullibardine (1981)	Tullibardine River near Queenstown	949	25	H/E
Lake Echo (1956)	Queenstown	725	19	H/E
Lower Pieman (1985)	Pieman River, near Queenstown	641	122	H/E
Lake King William (Clark) (1949, 1966)	Derwent River, Queenstown	541	67	H/E
Arthur's Lake (1965)	Source of Lake River, near Great Lake, Launceston	511	17	H/E
Devils Gate (1969)	Forth River, near Devonport	180	84	H/E
Rowallan (1967)	Mersey River	131	43	H/E
Bastyan (1983)	Pieman River, near Queenstown	124	75	H/E
Cethana (1971)	Forth River, near Devonport	109	110	H/E

MAJOR DAMS AND RESERVOIRS IN AUSTRALIA (continued)

(H/E = hydro-electricity, FC = flood control and/or mitigation, WS = water supply, Gigalitres = 1000 megalitres)

Name (Year of Competition)	Location and nearest town	Gross capacity gigalitres	Height of wall m	Purpose
NORTHERN TERRITORY				
Darwin River (1972)	Darwin River	259	31	Water supply for Darwin
WESTERN AUSTRALIA				
Lake Argyle (Ord) (1972)	Ord River, near Wyndham	5797	99	Irrigation, FC, H/E
South Dandalup (1973)	Pinjarra	208	43	Water supply for Perth
Wellington (1933, 1944, 1960)	Collie	185	37	Water supply, irrigation, H/E
Serpentine (1961)	Perth	185	55	Water supply for Perth
Harding (1985)	Harding River, Pilbara	114	42	Water supply, industrial, mining

Note:

This information was compiled from the "Register of Dams in Australia", which lists some 260 dams completed between 1857 and 1988. Of these some 132 have a wall height above 40 metres which places them in a significant category. However, due to space restrictions we have listed only those with a reservoir gross capacity above 100,000 $10^{(3)}$ M $^{(3)}$ (100 gigalitres). We acknowledge the assistance from the "Australian National Committee on Large Dams".

AERIAL AGRICULTURE

Aircraft are widely used in Australia for top dressing and seeding, for spraying and dusting of crops and pastures, and for pest and vermin extermination.

Aircraft are permitted to take off from, or land at, any place that is suitable for use as an aerodrome with safety being the paramount consideration. This means that landing areas may be determined by the operator, providing they meet the minimum requirements specified by the Civil Aviation Safety Authority (CASA).

Paragraph 92(1) "Use of Aerodromes" of the Civil Aviation Regulations (CAR) states:

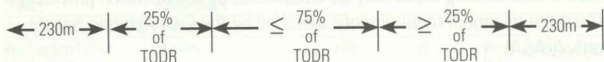
- (1) A person must not land an aircraft on, or engage in conduct that causes an aircraft to take off from, a place that does not satisfy one or more of the following requirements:
 - (a) the place is an aerodrome established under the Air Navigation Regulations;
 - (b) the use of the place as an aerodrome is authorised by a certificate granted, or registration, under Part 139 of CASR.
 - (c) the place is an aerodrome for which an arrangement under section 20 of the Act is in force and the use of the aerodrome by aircraft engaged in civil air navigation is authorised by CASA under that section;
 - (d) the place (not being a place referred to in paragraph (a), (b) or (c) is suitable for use as an aerodrome for the purposes of the landing and taking-off of aircraft;

and, having regard to all the circumstances of the proposed landing or take-off (including the prevailing weather conditions), the aircraft can land at, or take-off from, the place in safety.

Use of landing areas other than aerodromes is not recommended for aircraft with a MTOW (Maximum Take Off Weight) greater than 5700 kg.

DIMENSIONS - AGRICULTURE DAY OPERATIONS ONLY

Approach and take-off area Clear of objects above slope 5%	Clearway	Fly-over area	30m	Clear of objects above slope 2.5%	Clear of objects above slope 5%	45m
		Runway strip				
		Runway 10m wide				
		Runway strip				
		Fly-over area				



(TODR - Take Off Distance Required)

RECOMMENDED MINIMUM PHYSICAL CHARACTERISTICS OF LANDING AREAS

- **Runway width** - for other than agricultural operations, a minimum width of 15 metres is recommended, although aeroplanes with a MTOW below 2000 kg can be operated safely on runways as narrow as 10 metres provided there is no or only light cross-wind. For agricultural operations, a 10 metre wide runway is the recommended minimum.
- **Runway Length** - for agricultural day operations, the minimum runway length is the greater of 75% of the take-off distance specified in the aeroplane's flight manual or approved performance chart for the prevailing conditions with the balance as clearway or the landing distance so specified.
- **Longitudinal Slope** - for agricultural operations, the slope should not exceed 12.5% for day and 2% for night operations: where the overall slope exceeds 2% the runway should only be used for one-way operations - downhill for take-off and uphill for landing.
- **Transverse Slope** - for agricultural day operations, the transverse slope should not be more than 3% over the runway and 5% over the runway strip.

RECOMMENDED MINIMUM PHYSICAL CHARACTERISTICS OF LANDING AREAS

- A pilot should not use a landing area or have an aeroplane engine running unless the aeroplane is clear of all persons, animals, vehicles or other obstructions.
- A pilot should not use a landing area without taking all reasonable steps to ensure the physical characteristics and dimensions are satisfactory. For aerial work and charter operations the operator should provide evidence to the pilot on the suitability of a landing area prior to its use.
- **Runway lengths** calculated for take-offs and landings should be increased by 50% for agricultural operations on one-way runways at night.
- **Geographic Location** - a landing area should not be located:
 - (a) within the area or in such close proximity as to create a hazard to aircraft conducting a published instrument approach, excluding the holding pattern; or
 - (b) within any area where the density of aircraft movements makes it undesirable; or
 - (c) where take-off or landing involving flight over a populated area creates an unnecessary hazard.
- Except in an emergency, the consent of the owner/occupier is required before a landing area may be used.
- If the proposed landing area is located near a city, town or populous area or any other area where noise or other environmental considerations make aeroplane operations undesirable, the use of such a landing area may be affected by the provisions of Commonwealth or State environmental legislation. It is the responsibility of the pilot and/or operator to conform with these requirements.
- A method of determining the surface wind at a landing area is desirable. A windsock is the preferred method.

- The surface of a landing area should be assessed to determine its effect on aeroplane control and performance. For example, soft surfaces or the presence of long grass (over 150mm) will increase take-off distances while moisture, loose gravel or any material that reduces braking effectiveness will increase landing distances.

SURFACE TESTING OF A LANDING AREA

- **Rough Surfaces** - the presence of holes, cracks and ruts will degrade aeroplane performance and handling and increase the possibility of structural damage. The smoothness of the runway can be tested by driving a stiffly sprung vehicle along the runway at a speed of at least 75kph. If this is accomplished without discomfort to the occupants, the surface can be considered satisfactory.
- **Soft, Wet Surfaces** - a test vehicle as indicated in the table below should be driven in a zig-zag pattern at a speed not exceeding 15kph along the full length and width of the runway. Particular attention should be paid to suspect areas with possibly three passes over these areas. If tyre imprints exceed the depth of 25mm the surface is not suitable for aircraft operations represented by the test vehicle. Experience may prove that for a certain type of aircraft (eg an aircraft with small wheels or high tyre pressure) operations are unsafe with a lesser imprint. Testing with a crowbar should also be done in several places along the runway to ensure that a dry surface crust does not conceal a wet base

User Aircraft Weight	Suggested Vehicle to be used for test
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1. MTOW not exceeding 2000kg	Fully laden utility, 4WD, station sedan
2. MTOW 2001kg to 3400kg	Fully laden 1.5 tonne truck or lightly laden 3 tonne truck
3. MTOW 3401kg to 5700kg	Fully laden 3 tonne truck

Attention should also be given to the remainder of the strip as this area is provided for run-off in the event of an abnormal take-off or landing

Note: We reiterate these excerpts cover **Agriculture Day Operations** only and acknowledge the assistance of the **Civil Aviation Safety Authority Australia**.

Responsibility for aviation in Australia is shared between the Civil Aviation Safety Authority and Air Services Australia. Civil Aviation Regulations and other information relevant to aircraft operation can be viewed on the CASA web site, www.casa.gov.au. Air Services Australia manages air space and provides air navigation and rescue services. More information at www.airservicesaustralia.com

It is recommended the latest detail is obtained from the CASA prior to runway design and installation.

CONCRETE

The Cement Concrete & Aggregates Australia (CCAA) is a national, non-profit organisation sponsored by the cement industry. Publications and information on the making and uses of concrete are available from the Regional Office of the Association in each State. The organisation's website can be located at www.concrete.net.au

SPECIFYING CONCRETE QUALITY

Concrete should be specified so that it will possess both adequate strength and durability (ie. resistance to environmental agents and wear). The quality of concrete is dependent on the quality of materials used, the standard of workmanship in placing, and the care with which the concrete is compacted, finished and cured.

Required quality (strength and curing period) is specified in AS 3600 "Concrete Structures". This depends on exposure classification and for external members should be determined by a qualified specialist. Appropriate compressive strengths and curing periods for some common cases and cover to reinforcement, are shown in the following table.

Member	Strength (grade MPa)	Curing period (days)	Cover (mm)
Residential slab-on-ground floors, footings in non-aggressive soils, footpaths, and residential driveways.	20	3	20*
Industrial floors (internal) subject to			
• light traffic only	25	3	20*
• medium traffic	32	7	20*
External members			
• within 1km of coast	40	7	45
• 1 to 50 km of coast	32	7	30
Elements in aggressive environments, eg marine conditions.	Obtain specialist advice.		

Note: * Where cover is measured to face against soil, increase the dimension shown by – 10mm if concrete surface protected by damp-proof membrane, or 20mm otherwise.

CONCRETE SUPPLY AND MANUFACTURE

Pre-mixed concrete

The easiest way to obtain good quality concrete is to purchase it from a pre-mixed concrete supplier. Pre-mixed concrete is generally specified as “normal-class”. The purchaser has to nominate:

- The appropriate strength grade (one of N20, N25, N32, N40 or N50)
- Appropriate slump (one of 20 to 110 in 10mm increments) usually 80mm
- Appropriate maximum nominal size of aggregate (one of 10, 14, or 20mm) usually 20mm
- Method of placement (eg direct from truck, by pump)
- Whether or not project assessment is required to be carried out by the supplier (not usual for small projects)

If required the purchaser may also nominate:

- An early strength requirement for early stripping of formwork and air-entrainment for freeze-thaw resistance. However, these would normally be specified only where required by special conditions.

Site mixed concrete

This should not normally be used for structural projects. Suggested mixes for some applications are shown in the following table.

Use	Nominal proportions by volume cement	Materials required for one cubic metre of cement			Max added water per bag cement (litres)
		Cement bags	Sand (m) ³	Coarse aggregate (m) ³	
Mass footings, light duty driveways and paths	2:5:8	8	0.5*	1	20
Fence posts, floors and wearing surfaces	2:3:6	10.5	0.5*	1	20

Note: *When ordering sand, allow 15-20% extra to the above figure for losses & bulking of sand.

MATERIALS

Cement - Type GP (General purpose portland) and Type GB (General purpose blended) can be used. Other types are available but are used for special applications. Masonry cement should not be used to make concrete. Cement is available in multi-layer paper bags:

1 bag = 40kg

25 bags = 1 tonne

Sand - Must be clean and free from clay, earth, humus, salt or other deleterious material. A coarse, well-graded (ie from coarse to fine) sand is preferable.

Coarse aggregate - May be river gravel or crushed stone. Material should be clean, hard, impervious and free from organic matter. For most work a well-graded material 10 to 20mm is suitable.

Water - Water should be clean and fresh. Generally mains water is satisfactory but bore water should be checked.

STORAGE OF MATERIALS

- Cement must be kept dry, Stack off the ground and away from exterior walls. Cover so as to allow only limited air circulation but preventing condensation. Use on first in/first out basis.
- Aggregates should be stored on firm, hard surfaces and kept separate from each other.

MATERIALS

Concrete should be mixed in power-operated or hand mixer. Mixers should not be overfilled and should revolve at speeds recommended by the maker. A minimum mixing time of two minutes after the addition of the last ingredients should be allowed.

Proportions should be controlled by mass or volume batching. When volume batching, proportions should be measured in boxes or buckets. Do not use

shovelfuls as shovelfuls of cement, sand and coarse aggregate are not equal. Ingredients should be added to the mixer in the following order:

- (a) Half to two-thirds of the water,
- (b) Coarse aggregate,
- (c) Sand,
- (d) Cement,
- (e) Final water sparingly added until desired workability is reached.

Higher strengths and better durability are achieved by using as little water as possible.

CONCRETE CONSTRUCTION

Formwork

The quality and rigidity of the formwork is reflected in the trueness of line and the surface finish exposed after the formwork is stripped. Some of the points to watch are:

- Formwork should be well braced, and rigid enough to remain true to line and level during the concreting operations.
- Joints between boards and at corners should be sealed to prevent loss of cement paste from the concrete, (causes honeycombing).
- Formwork should be treated with a form-release agent to prevent concrete adhering to the form.
- Formwork should not be removed until the concrete has gained sufficient strength to carry the imposed loads. This will be longer in cold than in warm weather and will be affected by cement type.

Reinforcement

Concrete is strong in compression but needs the addition of steel reinforcing bars to carry the tensile forces resulting from: the dead load of the member, the application of external loads, or from the shrinkage of the concrete as it dries out.



Determination of the amount and position of the reinforcement requires specialist knowledge, we suggest you visit the OneSteel Ltd website at www.reinforcing.com and use the reinforcement area calculator. Once determined, the steel reinforcement must be accurately placed and firmly supported and tied to prevent displacement during the concreting operations. Tie wires used to bind the reinforcement in place should be trimmed off and bent back away from the concrete surface.

For slabs in slab-on-ground floors, driveways and paths, the reinforcement is used to control the cracking of the concrete surface. It should be located in the top third of the slab but with appropriate cover to protect it against corrosion.

Placing

Concrete should be poured as soon as possible after arriving at the site.

The concrete should be deposited in the forms as close as possible to its final location. Avoid flowing it along the forms, as this can lead to segregation.

The concrete should be spread by shovel and worked thoroughly into place, ramming with shovel or rod. Concrete should be compacted preferably by mechanical vibrators. Immersion vibrators should be used only for sections over 200mm deep and beam/screed vibrators for slabs. On small jobs where these are not available, use tamping with rods and screed boards.

Finishing of horizontal surfaces

Many surface finishes and textures are possible. The type of surface finish should be chosen with regard to its use.

Curing

The action of retaining water in the concrete so that it can react chemically with the cement to bond the aggregates together is known as curing. This process enables concrete to reach its potential strength, ensures the surface is as hard as possible and minimises the tendency for cracking.

Curing is most simply done by covering or encasing the member immediately after finishing with a plastic sheet secured to seal the surface from the atmosphere. This should be kept in place for three to seven days.

Alternatively, the surface of the concrete should be kept continuously wet for three to seven days.

SLAB-ON-GROUND-FLOORS

Site considerations

Residential slab-on-ground floors are suitable for use on flat sites or on sites with moderate slopes (up to 1 in 5) by using cut-and-fill techniques. For more steeply sloping sites, split level or suspended floors formed with BONDEK® structural decking should be considered.

Foundation material should be checked. Stable materials (eg. rock, sand, sandy clay) pose no constraints but expansive soils (eg. heavy plastic clays) and soils with low bearing capacity (eg. soft alluvial clays, peaty soils) may cause problems for all footing systems and should be investigated by a specialist consultant. Properly designed slabs are suited for use on expansive soils and those with low bearing capacity, and are covered in AS 2870.

It is important to check the site drainage and the position of water courses during heavy rain. Low-lying sites should be avoided or built up to avoid flooding. Dish drains and sloped paving should be used to keep surface run-off away from a slab-on-ground floor and foundation under it.

Construction considerations

The construction area should be cleared of all vegetable matter and the associated layer of topsoil.

In a cut-and-fill situation, any fill should be well compacted in shallow layers using hand-operated vibrating rollers or mechanical tampers. To prevent water vapour rising through the slab, a polyethylene sheet vapour barrier should be laid immediately under the slab and any beams or thickenings.

The sheet should be purpose-made concrete underlay polyethylene of minimum thickness 0.2mm. Penetrations should be sealed with pressure sensitive tape. Joints should be lapped 200mm.

- Design of the slab and reinforcement details must conform to local building regulations and should follow AS 2870 "Residential Slabs and Footings - constructions". In most areas it is desirable to minimise the risk of termites gaining entry to the building by following the recommendations of AS 3660.1.
- Slab-on-ground construction should follow the preceding recommendations for concrete construction in general.

Landscaping

Large trees should not be planted close to any building. Where gardens are adjacent to the walls they should be kept well below the damp-proof course or the floor level. The ground in a one metre wide strip out from the walls should fall at least 25 mm away from the walls.

STANDARD REINFORCING BARS

Bar size (mm)	Bar Type (TC/MA*)	Mass per metre (kg/m)	Cross-sectional area (mm ²)	Minimum hole dia** for clearance (mm)
10	MA	0.617	78.5	12
12	TC & MA	0.888	113	15
16	TC & MA	1.58	201	20
20	TC	2.47	314	25
24	TC	3.55	452	29
28	TC	4.83	616	34
32	TC	6.31	804	39
36	TC	7.99	1020	44
40	TC	9.86	1260	49

* TC = TEMPCORE, MA = MICROALLOYED

** This is the diameter of hole that will allow a bar of nominal size shown to pass through assuming the bar is at maximum size tolerance. Smaller hole sizes may be possible depending on the dimensions of the actual bar. Tolerance on mass per metre is +/- 4.5% for all sizes. 2.5% is added to cover rolling margin and associated costs.

DEFORMED STEEL REINFORCING BARS FOR CONCRETE

All details for Steel Reinforcing Bars for Concrete are contained in AS 1302.

REINFORCING FABRIC FOR CONCRETE

Reinforcing fabric is manufactured in accordance with AS 1304 from hard-drawn steel wire conforming with AS 1303. Standard sheets are cut flush at the sides and have equal overhangs at the ends.

RIBBED REINFORCING MESH (GRADE 500)

Product Code	Mesh Specification				Approx. Mass of 2.4m x 6m sheets		Nominal cross-sectional area	
	Longitudinal Wires		Cross Wires		area ² kg/m ²	sheet kg	Longitudinal mm ² /m	Cross Wires mm ² /m
	No	x size mm	@ pitch mm	No	x size mm	@ pitch mm		

Rectangular Meshes

RF1218	25	x	11.90	@	100	30	x	7.60	@	200	10.5	157	1112	227
RF1118	25	x	10.70	@	100	30	x	7.60	@	200	8.8	130	899	227
RF1018	25	x	9.50	@	100	30	x	7.60	@	200	7.3	109	709	227
RF918	25	x	8.60	@	100	30	x	7.60	@	200	6.3	93	581	227
RF818	25	x	7.60	@	100	30	x	7.60	@	200	5.3	79	454	227
RF718	25	x	6.75	@	100	30	x	7.60	@	200	4.6	67	358	227

Square Meshes (with edge lapping wires)

SL102	10	x	9.60	@	200	30	x	9.50	@	200	5.6	80	354	354
	+4	x	6.75	@	100									
SL92	10	x	8.60	@	200	30	x	8.60	@	200	4.6	66	290	290
	+4	x	6.00	@	100									
SL82	10	x	7.60	@	200	30	x	7.60	@	200	3.6	52	227	227
	+4	x	5.37	@	100									

Product Code	Mesh Specification				Approx. Mass of 2.4m x 6m sheets		Nominal cross-sectional area	
	Longitudinal Wires		Cross Wires		area kg/m ²	sheet kg	Longitudinal mm ² /m	Cross Wires mm ² /m
	No	x size @ pitch mm	No	x size @ pitch mm				

Square Meshes (with edge lapping wires)

SL72	10 x 6.75 @ 200 +4 x 4.77 @ 100	30 x 6.75 @ 200	2.8	41	179	179
SL62	10 x 6.00 @ 200 +4 x 4.24 @ 100	30 x 6.00 @ 200	2.2	33	141	141
SL52	10 x 4.77 @ 200 +4 x 4.00 @ 100	30 x 4.77 @ 200	1.4	20	89	89
SL63 WA only	10 x 6.00 @ 200 +4 x 4.00 @ 100	20 x 6.00 @ 200	1.5 (2.3m Sheet Width)	21	94	94
SL53 WA only	10 x 4.75 @ 200 +4 x 4.00 @ 100	20 x 4.75 @ 200	1.0 (2.3m Sheet Width)	14	60	60

Square Meshes

SL81	25 x 7.60 @ 100	60 x 7.60 @ 100	7.1	105	454	454
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Trench Meshes (strip widths 200mm, 300mm, 400mm)

L12TM	3,4 or 5 x 11.90 @ 100	— 4.77 @ 300				
L11TM	3,4 or 5 x 10.70 @ 100	— 4.77 @ 300				
L8TM	3,4 or 5 x 7.60 @ 100	— 4.77 @ 300				

Note: Not all products available in all states.

MASONRY - BRICKWORK AND BLOCKWORK

Masonry walls are commonly built using clay bricks, calcium silicate bricks or concrete bricks and blocks. In addition to the more routine uses, masonry walls offer properties such as high sound absorption coefficients, high sound transmission loss, and good thermal insulation and fire resistance.

Information is available from the Clay Brick and Paver Institute (most States) and the Concrete Masonry Association of Australia (most States).

DESIGN

The design of masonry structures is regulated by Australian Codes and Standards and Building Regulations of State Governments. As with any other structure, design should be entrusted to a competent person experienced in such work and in the requirements of the applicable Codes, Standards and Regulations.

Points requiring special attention in design include the provision of control joints and other movement and crack control measures, the design of lintels over wall openings, and proper lateral support of loadbearing elements.

SPECIFICATION FOR BUILDING WALLS

Modular planning

To achieve economy in construction, walls should be dimensioned to suit brick or block sizes.

Dimensions

Manufacturing dimension of bricks and blocks are 10mm less than nominal dimensions to allow for a standard 10mm mortar joint.

Laying

All manufacturers recommend that bricks and blocks should be laid as dry as possible. They should never be wetted to control suction prior to application of mortar. Keep units as dry as possible on the site. At the stoppage of work, the tops of the walls should be covered to prevent moisture entering cores.

All joints are to be fully bedded except in the special situation where blockwork is face-shell bedded to prevent entry of water.

Support of walls during construction

All walls must be braced during construction against lateral loads, especially wind loads, to ensure that adverse or unsafe conditions do not arise in the wall. The height of unbraced free-standing walls should be limited during construction to the heights specified in the appropriate State Building Regulations.

Damp-proof courses

Damp-proof courses should be provided in accordance with recognised practice.

External finish

If single-leaf clay or concrete block external walls are to be constructed they should be coated with an approved waterproofing film such as acrylic paint and protected by wide eaves overhangs.

MORTAR MIX

Mortar for brickwork and blockwork is made up from a mixture of cement, lime and sand, with sufficient water to provide a workable consistency. Material proportions are varied to suit the job, the most commonly used being:

1 Cement : 1 lime : 6 sand

Where higher strength or impermeability is required, mortars richer in cement can be used. Lime-rich mortars should only be used where strength is not important.

If cement other than portland cement is used, the mix proportions will need to be varied. For example, if a blended cement is used the common mix should be:

1 blended cement: 1 lime: 5 sand

For calcium silicate bricks and concrete masonry, the manufacturers recommend the use of a particular mortar consisting of one part cement to five parts sand with the addition of Calsil Mortarbond to provide workability and water retention.

Quantities

To lay 2000 standard size bricks use, approximately one cubic metre of mortar. To make the quantity requires six bags cement, six bags lime and one cubic metre of sand for the 1:1:6 mix.

WALL TIES

Normal cavity walls are tied with wall ties spaced 600mm apart, both vertically and horizontally. Some situations, however, do require special tying. For information refer to the appropriate SAA Code.

Height, mm (based on 100mm high initial)		Length, mm (based on 60mm length)		No. of bricks	
Height (mm)	Approx. No. of bricks	Height (mm)	Approx. No. of bricks	Height (mm)	Approx. No. of bricks
1000	1000	1000	1000	1000	1000
1200	1200	1200	1200	1200	1200
1400	1400	1400	1400	1400	1400
1600	1600	1600	1600	1600	1600
1800	1800	1800	1800	1800	1800
2000	2000	2000	2000	2000	2000

BRICKWORK DIMENSIONS FOR MODULAR BRICKS

Modular brick dimensions are in even 100mm increments, therefore all dimensions can be extrapolated from the following table:

MODULAR BRICK

Size: 290 x 90 x 90mm

No. of bricks per course	Wall length mm	Opening size mm	Height mm
1	290	310	100
$1\frac{1}{3}$	390	410	200
$1\frac{2}{3}$	490	510	300
2	590	610	400
	etc	etc	etc

Note: Wall panels are 10mm shorter and openings 10mm longer than figures below.

BLOCKWORK DIMENSIONS

Blocks, like modular bricks, are in dimensions which follow a simple arithmetic progression; therefore all dimensions required can be extrapolated from the following table:

No. of bricks	Length, mm (based on 400mm lengths)				Height, mm (based on 200mm high units)	
	Full blocks	+ Fractional blocks			No. of courses	Height (mm)
		1/4	1/2	3/4		
1	400	500	600	700	1	200
2	800	900	1000	1100	2	400
3	1200	1300	1400	1500	3	600

BRICKWORK DIMENSIONS

Metric Standard Brick: 230 x 110 x 76mm

Joints: 10mm Vertical Gauge: 7 course = 600mm

No. of bricks	Length (mm)	Opening (mm)	Height (mm)	No. of bricks	Length (mm)	Opening (mm)	Height (mm)
1	230	250	86	14	3350	3370	1200
1.5	350	370		14.5	3470	3490	
2	470	490	172	15	3590	3610	1286
2.5	590	610		15.5	3710	3730	
3	710	730	257	16	3830	3850	1372
3.5	830	850		16.5	3950	3970	
4	950	970	343	17	4070	4090	1457
4.5	1070	1090		17.5	4190	4210	
5	1190	1210	429	18	4310	4330	1543
5.5	1310	1330		18.5	4430	4450	
6	1430	1450	514	19	4550	4570	1629
6.5	1550	1570		19.5	4670	4690	
7	1670	1690	600	20	4790	4810	1714
7.5	1790	1810		20.5	4910	4930	
8	1910	1930	686	21	5030	5050	1800
8.5	2030	2050		21.5	5150	5170	
9	2150	2170	772	22	5270	5290	1886
9.5	2270	2290		22.5	5390	5410	
10	2390	2410	857	23	5510	5530	1972
10.5	2510	2530		26	6230		2229
11	2630	2650	943	26.5	6350		
11.5	2750	2770		27	6470		2314
12	2870	2890	1029	27.5	6590		
12.5	2990	3010		28	6710		2400
13	3110	3130	1114	28.5	6830		
13.5	3230	3250					



No. of bricks	Length (mm)	Opening (mm)	Height (mm)	No. of bricks	Length (mm)	Opening (mm)	Height (mm)
29	6950		2486	39	9350		3343
29.5	7070			39.5	9470		
30	7190		2572	40	9590		3429
30.5	7310			40.5	9710		
31	7430		2657	41	9830		3514
31.5	7550			41.5	9950		
32	7670		2743	42	10070		3600
32.5	7790			42.5	10190		
33	7910		2829	43	10310		3686
33.5	8030			43.5	10430		
34	8150		2914	44	10550		3772
35	8390		3000	44.5	10670		
35.5	8510			45	10790		3857
36	8630		3086	45.5	10910		
36.5	8750			46	11030		3943
37	8870		3172	46.5	11150		
37.5	8990			47	11270		4029
38	9110		3257	47.5	11390		
38.5	9230			48	11510		4114

ELECTRICITY

FUNDAMENTAL UNITS

Ampere is the unit in which electric current flow is measured.

Ohm is the unit in which resistance to the flow to of an electric current is measured.

Volt is the unit of electric pressure. A pressure of 1 volt is required to force a current of 1 ampere through a resistance of 1 ohm.

Watt is the unit of power or rate of doing work.

$$\text{watts} = \text{volts} \times \text{amperes}$$

Kilowatt hour - For commercial purposes electrical energy is charged in units of 1000 watt hours, and is called the kilowatt hour.

$$kWh = \frac{\text{volts} \times \text{amperes} \times \text{hours}}{1000} \quad \text{or} \quad \frac{\text{watts} \times \text{hours}}{1000}$$

Example: To find the cost of burning five 60 -watt lamps for ten hours, assuming the cost per unit to be seven cents:

$$\text{Cost} = \frac{60 \times 5 \times 10 \times 7c}{1000}$$

The normal voltage for household appliances is 240; for 3-phases motors, etc., it is 415.

SAFETY PRECAUTIONS

One of the main advantages of electricity is that there is nothing complicated about its use. It is a good servant, but this does not mean you can abuse it.

Fortunately, fatal electrical accidents have been few compared with fatal accidents from other causes. But a few is still too many and these can be avoided by the observance of simple safety precautions.

FLEXIBLE CORD CORE COLOURS

In the past, the requirements concerning the identification of the conductors of flexible cords have provided that the colour green shall be used to identify the earthing conductor and that current - carrying conductors shall not be green. A new system of Australian colour coding of flexible conductor cords conforms to overseas practice. The earthing conductor is coloured green/yellow.

The colours of the cores of the old and new flexible cords are:

<u>Old Cords</u>	<u>New Cords</u>
Red	Brown
Black	Blue
Green or green/yellow	Green/yellow

In three-pin plugs and cord extension sockets, the green/yellow earthing core must be connected to the earth terminal (or the green core in old cords). The earth terminal is marked E, EARTH and in modern plugs is also marked with a green colour. No other conductor may be connected to this terminal.

ELECTRICAL INSTALLATION

It is illegal for any person other than a licensed electrician or a person in the employment of and under the supervision of a licensed electrician to carry out any electrical wiring work, including the installation, repair or replacement of power points, dimmers, light fittings, etc.

- **DO NOT** interfere with the fixed wiring in your home. If you do, you not only break the law, you run the risk of serious accident.
- **DO** have your installation checked by a licensed electrician if signs of wear and tear appear. Your local electricity supply authority will also inspect the installation if you suspect it is faulty.

- **DO** inspect the main earth wire connection regularly. The earth wire should be connected to a rod driven directly into the ground and also to the water pipe system, except that in older installations it might be connected to the water pipe system only. Remember that an effective main earthing system is essential for personal safety.
- **DO** arrange to have electrical repairs carried out by an electrical contractor as a matter of urgency if the earth wire or its connection is found to be damaged or disconnected.
- **DO** arrange for an electrical contractor to modify the main earthing system, if it is not connected to a driven rod, prior to any work being carried out on the water pipe system involving the use of non-metallic pipes or fittings.

FLEXIBLE CORDS

Flexible cords can cause electrical fatalities.

- **DO** consider replacing old or damaged cord extension sockets with new shrouded types that help prevent accidental contact with the plug pins.
- **DO** make sure that all flexible cords are correctly connected. If in even the slightest doubt, consult an electrician. Incorrect connection of the earthing core in flexible cords has accounted for almost half of the domestic fatalities associated with flexible cords.
- **DO** treat extension cords with respect. As they are often subjected to rough treatment and are used in awkward work situations, they should be inspected regularly.

Either buy ready-made extension cords or have them made up by an electrician. The do-it-yourself approach might have fatal consequences.

- **DO** read and follow the instructions carefully when using a flexible cord wound on a reeling or coiling device. If used coiled up it may overheat and melt the insulation.

- **DO NOT** dismantle, repair, or attempt to adjust contacts on cord fittings while the cord is switched on or plugged in. There is a golden rule which says switch off the electricity then pull the plug out.
- **DO NOT** join cords by twisting and taping. Makeshift joints are dangerous. If it is necessary to join two lengths of cord a correctly attached three-pin plug and shrouded cord extension socket should be used.
- **DO NOT** use cords which are frayed, badly worn, or perished or which have chipped, cracked or broken fittings. Replace them now, later may be too late.
- **DO** make sure that any cord you use is suitable in type and size for the job it has to do.

NEVER assemble extension cords from two-core cables. Even if intended for use with a double insulated appliance, it is certain that the extension cord will be used inadvertently to supply single insulated equipment which must be earthed by a three-core cord for safety.

EQUIPMENT REQUIRED TO BE EARTHED

All equipment that is not double insulated is required to be earthed. All equipment that is double insulated is required to be marked with the symbol  or with the words DOUBLE INSULATED.

- **DO** make sure that all electrical appliances and other equipment that is not double insulated are fitted with three-core supply flexible cord and three-pin plug.

OVERSEAS TYPE PLUGS

Two-pin parallel pin overseas type plugs are not suitable for connection to electricity supply in Australia, because they have a small resistance between pins and the edge of the plug body, and are considered to be dangerous.

- **DO** replace overseas type plugs with Australian approved plugs.
- **DO NOT** bend or twist pins of two-pin overseas type plugs to fit Australian power points.

PORTABLE APPLIANCES IN EARTHED SITUATIONS

Portable appliances commonly used in earthed situations include electric tools and welders, washing, polishing and ironing machines, mixers, blenders, kettles, toasters, irons, room heaters and any other appliances used in the kitchen, bathroom or laundry, or out-of-doors.

- **DO** use a portable safety switch to guarantee against serious electric shock.
- **DO** find out from a licensed electrician whether the power point to which you normally connect these appliances is effectively earthed.
- **DO** make sure the flexible cord is properly connected.
- **DO NOT** under any circumstances connect the appliance to a two-pin power point or a lampholder.
- **DO NOT** use portable electric tools outdoors while barefooted. Bare feet, minimum clothing and wet skin lower body resistance, thus increasing the amount of shock current if an accident should occur.

The growing use of light metal ladders around the home gives cause for some further safety reminders. Remember when working from metal ladders that you are in metallic contact with the ground or wall (ie, earthed). Therefore even simple operations such as changing a lamp should be performed with care. Also keep well clear of overhead wires when moving metal ladders.

OUTSIDE THE HOME

- **DO** take immediate action should you see overhead wires which have sagged or fallen. Keep well clear. Stand guard to warn others of the danger. Send somebody to inform the police or the electricity supply authority. Make sure somebody remains on guard until the supply authority's repair people arrive. In particular, remember that both ends of a broken wire may be alive and need to be guarded.
- **DO** take extreme care when climbing on a roof, ladder, tree, etc., near overhead electrical wires. Touching these wires may mean death. Be careful when painting or carrying out repairs near electric wires.
- **DO** take extreme care when operating mobile cranes, tip trucks or tall agricultural machinery, or when upending long pipes, boatmasts or erecting aerials or lengths of guttering in the vicinity of overhead power lines.

MAINTENANCE

- **DO NOT** expect that electrical equipment you use every day will last forever.
- **DO** arrange for your electrical equipment to be regularly checked by the manufacturer or a qualified electrician.
- **DO NOT** use any electrical equipment if there is any doubt about its safe condition.
- **DO NOT** dismantle or attempt to repair or adjust internal parts of any electrical equipment or flexible cord while it is plugged into a power outlet. Disregard of this rule can prove fatal. Each year someone makes the fatal mistake of disregarding this rule.
- **DO** ensure that all repairs of electrical equipment are carried out by a qualified electrician.

DANGER SIGNALS

- **DO** act immediately if the following danger signals appear. Call your electricity supply authority or a licensed electrical person without delay.
- An electric shock, however slight, is a warning that something is wrong with the installation or appliance. If you do not have it fixed the next shock may be fatal.
- When a fuse blows or circuit breaker trips repeatedly there is a fault somewhere...in the permanent wiring, an appliance, or the flexible cord.
- Sparking, spluttering or overheating at the fittings of a flexible cord or at the power point show that the cord connections or the power point are faulty. These symptoms are frequently accompanied by a crackling noise in the radio and interference lines on a TV screen.

Some Additional Safety Hints

- Cylinders and tanks are never filled to capacity and always contain a reserve of gas. The reserve is necessary for the expansion of gas. The reserve is necessary for the expansion of gas. The reserve is necessary for the expansion of gas.
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LIQUEFIED PETROLEUM GAS (LPG)

When used properly and handled with appropriate care, LP gas is a safe, clean, efficient and convenient source of energy. It is used for domestic, leisure, commercial, industrial, and agricultural applications and as an automotive fuel.

Information about LP gas and appliances and equipment is available from the Australian Liquefied Petroleum Gas Association (ALPGA), 30 George Street, Redfern, NSW 2016 or at www.lpgaaustralia.com.au

Liquefied Petroleum Gas (LP gas) is composed predominantly of the following hydrocarbons or a mixture of all or any of them: propane, butane or propylene. The main supply sources of LP gas are extractions from natural gas or a by-product from oil refineries.

When compressed moderately at normal temperature it becomes a liquid. When gas is withdrawn, the pressure drops and the liquid reverts to a gas. This means it can be stored and transported as a liquid and burnt as gas.

As the expansion ratio of gas from liquid is 270:1, LP gas has a significant advantage in that a large quantity of liquid may be transported in a small space.

LP gas is odourised with a distinctive smell (like rotting cabbage) to assist in the detection of leaks.

Cylinders and tanks are never filled to capacity; and ullage (vapour space) of approx. 15% of the container volume is necessary for the expansion of the liquid gas under possible temperature increases. The vapour pressure is dependent on the ambient temperature; for instance, commercial propane exerts a pressure at 15 degrees Celsius of approximately 760 kPa. As gas is drawn from a container, the pressure in the vapour space is reduced and more liquid boils off and will continue to do so until the cylinder is empty or the withdrawal is discontinued. This re-establishes an equilibrium condition with the LP gas exerting a vapour pressure related to its temperature.

Tanks and cylinders are fitted with a relief device. It is important that the containers always be stored or transported in a vertical position so that the relief valve connects to the gas space, not to the liquid space in the vessel.

Various standards and codes for the safe and efficient use of LP gas are published by Standards Australia and the ALPGA. State governments also have regulations controlling LP gas matters, either gazetting the codes of the SAA or ALPGA or including the requirements for these codes in their respective LP gas regulations. If in doubt on the requirements of any Standard or Code, contact ALPGA.

All LP gas cylinders must be stamped to indicate they have been checked at a test station. Reinspection and restamping at a test station must be carried out every ten years. 3T05 stamped on a cylinder means it was tested March 2005 and by March 2015 it must be retested and restamped. It is illegal to fill a cylinder outside of the ten-year period since its last test.

Adequate ventilation with gas burning appliances is essential, particularly in caravans and marine craft where the free volume is limited.

All installation and repair work shall must be carried out and checked by an authorised or licensed LP gas installer to the requirements of Gas Installations Code AG601.

Some Additional Safety Hints

- All appliances and equipment must be maintained in a serviceable condition and the overall installation must be checked regularly for leaks with a detergent or soap solution, not with a naked flame.
- All appliances should meet LP gas industry approval requirements.
- The uses of unflued water heaters or space heaters in caravans and marine craft is prohibited.

- Cylinder valves shall be kept closed when the installation is not in use. This is of particular importance during the refuelling of caravans and marine craft. Never use any gas appliance including refrigerator in a moving vehicle.
- In the event of accidental gas leaks or fire, close cylinder valve(s) until hazard is removed.
- Close valves and fit gas tight sealing plug to all spare cylinders whether full or empty.
- Valves on caravan cylinders must be closed during transit.

GAS HAND CUTTING NOZZLES

Standard Nozzle

Plate thickness (mm)	Nozzle size	Pressure		Speed Acet & LP Gas (mm/min)
		Oxygen (kPa)	Acet & LP Gas (kPa)	
6	8	200	100	450
12	12	200	100	380
20	12	250	100	340
25	15	220	100	320
40	15	350	100	270
50	15	400	100	240
75	15	450	100	180
100	20	400	100	150
125	20	450	100	150
150	20	520	100	130

MASS DENSITIES OF MATERIALS

Mass densities shown in this selective list may vary, depending on material composition. Where calculations need to be precise, exact density factors should be obtained from manufacturers or other appropriate sources.

Material	kg/m ³	Material	kg/m ³
Aluminium , rolled	2710	Nails , wire, bags	1201
Bitumen , prepared	1362	Paper : printing, reels	897
Bolts and nuts , bags	1201	writing	961
Brass , cast	8330	Petrol	689-769
Bricks (common burnt clay)		Pine : Kauri, QLD	481
stacked	1602-1920	New Zealand	609
brickwork	1920	Oregon	529
Cement : bags	1281	Pipes : cast iron; stacked	961-1281
slurry	1442	earthenware, loose	320
Coal , loose lumps	897	wrought iron, 9.5mm stacked	3204
slurry	993	Plywood	481-641
Coke	481-561	Pulp , wood: dry	561
Concrete , reinforced:		Rubber : processed sheet	1121
2 per cent steel	2420	sponge	48-160
Copper , drawn or sheet	8938	Sand : saturated	1922
Cyprus wood	593	undisturbed dry	1682
Douglas fir	529	Sawdust	208
Earth : dry, loose	1280	Screws , iron, packs	1602
moist, loose	1440-1600	Slag wool	224-288
Galvanized steel , sheet, bundles	897	Snow : fresh	96
Glass , plate	2787	wet compact	320
Grain : wheat	770	Steel , low carbon	7850
barley	625	Straw , compressed bales	304
oats	416	Sulphate of ammonia , bags	641
rye	721	Tyres , rubber	176-256
Gypsum , plaster	737	Waste paper	352
Ice	913	Water : fresh	1001
Iron , cast	7208	salt	1009-1201
Lead , cast or rolled	11325	Wire : iron, coils	1185
Lime , hydrate, gables	513	rod, coils	801
Lime mortar : dry	1650	rope, coils	1442
wet	1748	Wool : compressed bales	769
Magnesite	3044	uncompressed	208
Mapie : Canadian	737	Zinc : cast	6804
English	689	rolled	7192

GEOMETRY AND MENSURATION

Circle	<p>Circumference = diameter $\times \frac{22}{7}$, (or 3.1416)</p> <p>Area = diameter² $\times 0.7854$</p> <p>Area of sector of circle = length of arc $\times$ half radius.</p> <p>Area of segment of circle = area of sector, less area of triangle</p> <p>Side of square of area equal to circle = 0.862 diameter of circle</p> <p>Diameter of circle equal in area to square = 1.1284 side of square</p>
Sphere	<p>Surface area = 3.1416 $\times$ diameter²</p> <p>Volume = 0.5236 diameter³</p>
Areas generally	<p>Square, rectangle, rhombus or rhomboid = base $\times$ height</p> <p>Triangle = half base $\times$ perpendicular height</p> <p>Trapezoid = half sum of two parallel sides $\times$ height</p> <p>Area of any figure of four or more unequal sides is found by dividing it into triangles, finding areas of each, and adding together.</p> <p>Regular polygon (inscribed circle) =</p> <p>half radius of circle $\times$ length of one side $\times$ number of sides</p> <p>Parabola = base $\times$ height $\times \frac{2}{3}$</p> <p>Ellipse = long axis $\times$ short axis $\times 0.7854$</p>
Cubes	a = length of one side, volume = a^3 , surface area = $6a^2$.
Rectangular Prism	<p>Volume = area of base $\times$ height = $bl \times h$</p> <p>Total surface area = $2(bl + lh + bh)$</p>
Regular Prism	<p>Volume = $\frac{1}{2} n \times r \times a \times h$, where n = number of sides,</p> <p>r = radius of inscribed circle, a = length of side</p>
Cylinder (Right Circular)	<p>Volume = 0.7854 $\times$ diameter² $\times$ height.</p> <p>Lateral surface area = 3.1416 $\times$ diameter $\times$ height</p> <p>Total surface area = 3.1416 (diameter $\times$ height) + 1.5708 diameter²</p>
Any Prism or Cylinder	<p>Volume = $h \times$ area of base.</p> <p>Lateral surface area = length of cylinder $\times$ perimeter of normal section</p>
Regular Pyramid or Cone	<p>Volume = $\frac{1}{3}$ (area of base $\times$ height).</p> <p>Lateral surface area of regular figure $\frac{1}{3}$ = (perimeter of base $\times$ slant height)</p>
Any Pyramid or Cone	Volume = $\frac{1}{3}$ (area of base $\times$ distance from vertex to plane of base)
Frustum of any Pyramid or Cone	Volume = $\frac{h}{3} (A_1 + A_2 + \sqrt{A_1 A_2})$, where A_1 and A_2 are the areas of bases made by parallel planes.

AREAS AND CIRCUMFERENCES OF CIRCLES

Diameter	Area	Circumference	Diameter	Area	Circumference
1	0.7854	3.1416	51	2042.8	160.22
2	3.1416	6.2832	52	2123.7	163.36
3	7.6086	9.4248	53	2206.2	166.50
4	12.566	12.566	54	2290.2	169.65
5	19.635	15.708	55	2375.8	172.79
6	28.274	18.850	56	2463.0	175.93
7	38.485	21.991	57	2551.8	179.07
8	50.266	25.133	58	2642.1	182.21
9	63.617	28.274	59	2734.0	185.35
10	78.540	31.416	60	2827.4	188.50
11	95.003	34.558	61	2922.5	191.64
12	113.10	37.699	62	3019.1	194.78
13	132.73	40.841	63	3117.3	197.92
14	153.94	43.982	64	3217.0	201.06
15	176.72	47.124	65	3318.3	204.20
16	201.06	50.266	66	3421.2	207.35
17	226.98	53.407	67	3525.7	210.49
18	254.47	56.549	68	3631.7	213.63
19	283.53	59.690	69	3739.3	216.77
20	314.66	62.832	70	3848.5	219.91
21	346.36	65.974	71	3959.2	223.05
22	380.13	69.115	72	4071.5	226.20
23	415.48	72.257	73	4185.4	229.34
24	452.39	75.398	74	4300.9	232.48
25	490.88	78.540	75	4417.9	235.62
26	530.93	81.682	76	4536.5	238.76
27	572.56	84.823	77	4656.6	241.90
28	615.75	87.965	78	4778.4	245.04
29	660.52	91.106	79	4901.7	248.19
31	764.77	97.390	81	5153.0	254.47
32	804.25	100.53	82	5281.0	257.61
33	855.30	103.67	83	5410.6	260.75
34	907.92	106.81	84	5541.8	263.89
35	962.12	109.96	85	5674.5	267.04
36	1017.9	113.10	86	5808.8	270.18
37	1075.2	116.24	87	5944.7	273.32
38	1134.1	119.38	88	6082.1	276.46
39	1194.6	122.52	89	6221.2	279.60
40	1256.6	125.66	90	6361.7	282.74
41	1320.3	128.81	91	6503.9	285.89
42	1385.4	131.95	92	6647.6	289.03
43	1452.2	135.09	93	6792.9	292.17
44	1520.5	138.23	94	6939.8	295.31
45	1590.4	141.37	95	7088.2	298.45
46	1661.9	144.51	96	7238.2	301.59
47	1734.9	147.66	97	7389.8	304.74
48	1809.6	150.80	98	7543.0	307.88
49	1885.7	153.94	99	7697.7	311.02
50	1963.5	157.08	100	7854.0	314.16

SQUARES, CUBES, SQUARE ROOTS & CUBE ROOTS

n	n ²	n ³	√n	∛n	n	n ²	n ³	√n	∛n
1	1	1	1.000	1.000	51	2 601	132 651	7.141	3.708
2	4	8	1.414	1.260	52	2 704	140 608	7.211	3.733
3	9	27	1.732	1.442	53	2 809	148 877	7.280	3.756
4	16	64	2.000	1.587	54	2 916	157 464	7.348	3.780
5	25	125	2.236	1.710	55	3 025	166 375	7.416	3.803
6	36	216	2.449	1.817	56	3 136	175 616	7.483	3.826
7	49	343	2.646	1.913	57	3 249	185 193	7.550	3.849
8	64	512	2.828	2.000	58	3 364	195 112	7.616	3.871
9	81	729	3.000	2.080	59	3 481	205 379	7.681	3.893
10	100	1 000	3.162	2.154	60	3 600	216 000	7.746	3.915
11	121	1 331	3.317	2.224	61	3 721	226 981	7.810	3.936
12	144	1 728	3.464	2.289	62	3 844	238 328	7.874	3.958
13	169	2 197	3.606	2.351	63	3 969	250 047	7.937	3.979
14	196	2 744	3.742	2.410	64	4 096	262 144	8.000	4.000
15	225	3 375	3.873	2.466	65	4 225	274 625	8.062	4.021
16	256	4 096	4.000	2.520	66	4 356	287 496	8.124	4.041
17	289	4 913	4.123	2.571	67	4 489	300 773	8.185	4.062
18	324	5 832	4.243	2.621	68	4 624	314 432	8.246	4.082
19	361	6 859	4.359	2.668	69	4 761	328 509	8.307	4.102
20	400	8 000	4.472	2.714	70	4 900	343 000	8.367	4.121
21	441	9 261	4.583	2.759	71	5 041	357 911	8.426	4.141
22	484	10 648	4.690	2.802	72	5 184	373 248	8.485	4.160
23	529	12 167	4.796	2.844	73	5 329	389 017	8.544	4.179
24	576	13 824	4.899	2.884	74	5 476	405 224	8.602	4.198
25	625	15 625	5.000	2.924	75	5 625	421 875	8.660	4.217
26	676	17 576	5.099	2.962	76	5 776	438 976	8.718	4.236
27	729	19 683	5.196	3.000	77	5 929	456 533	8.775	4.254
28	784	21 952	5.292	3.037	78	6 084	474 552	8.832	4.273
29	841	24 389	5.385	3.072	79	6 241	493 039	8.888	4.291
30	900	27 000	5.477	3.107	80	6 400	512 000	8.944	4.309
31	961	29 791	5.568	3.141	81	6 561	531 441	9.000	4.327
32	1 024	32 768	5.657	3.175	82	6 724	551 368	9.055	4.344
33	1 089	35 937	5.745	3.208	83	6 889	571 787	9.110	4.362
34	1 156	39 304	5.831	3.240	84	7 056	592 704	9.165	4.380
35	1 225	42 875	5.916	3.271	85	7 225	614 125	9.220	4.397
36	1 296	46 656	6.000	3.302	86	7 396	636 056	9.274	4.414
37	1 369	50 653	6.083	3.332	87	7 569	658 503	9.327	4.431
38	1 444	54 872	6.164	3.362	88	7 744	681 472	9.381	4.448
39	1 521	59 319	6.245	3.391	89	7 921	704 969	9.434	4.465
40	1 600	64 000	6.325	3.420	90	8 100	729 000	9.487	4.481
41	1 681	68 921	6.403	3.448	91	8 281	753 571	9.539	4.498
42	1 764	74 088	6.481	3.476	92	8 464	778 688	9.592	4.514
43	1 849	79 507	6.557	3.503	93	8 649	804 357	9.644	4.531
44	1 936	85 184	6.633	3.5320	94	8 836	830 584	9.695	4.547
45	2 025	91 125	6.708	3.557	95	9 025	857 375	9.747	4.563
46	2 116	97 336	6.782	3.583	96	9 216	884 736	9.798	4.579
47	2 209	103 823	6.856	3.609	97	9 409	912 673	9.849	4.595
48	2 304	110 592	6.928	3.634	98	9 604	941 192	9.899	4.610
49	2 401	117 649	7.000	3.659	99	9 801	970 299	9.950	4.626
50	2 500	125 000	7.071	3.684	100	10 000	1 000 000	10.00	4.642

TRIGONOMETRIC RATIOS

Degrees	Angle		Chord	Sine	Tangent	Co-tangent	Cosine	1.414	1.5708	90°
	Radians	0								
1	0.0175	0.017	0.0175	0.0175	0	∞	0.9998	1.402	1.5533	89
2	0.0349	0.035	0.0349	0.0349	0.0349	28.6363	0.9994	1.389	1.5359	88
3	0.0524	0.052	0.0523	0.0524	0.0524	19.0811	0.9886	1.377	1.5184	87
4	0.0698	0.070	0.0698	0.0699	0.0699	14.3007	0.9976	1.364	1.5010	86
5	0.0873	0.087	0.0872	0.0875	0.0875	11.4301	0.9962	1.351	1.4835	85
6	0.1047	0.105	0.1045	0.1051	0.1051	9.5144	0.9945	1.338	1.4661	84
7	0.1222	0.122	0.1219	0.1228	0.1228	8.1443	0.9925	1.325	1.4486	83
8	0.1396	0.140	0.1392	0.1405	0.1405	7.1154	0.9903	1.312	1.4312	82
9	0.1571	0.157	0.1564	0.1584	0.1584	6.3138	0.9877	1.299	1.4137	81
10	0.1745	0.174	0.1736	0.1763	0.1763	5.6713	0.9848	1.286	1.3963	80
11	0.1920	0.192	0.1908	0.1944	0.1944	5.1446	0.9816	1.272	1.3788	79
12	0.2094	0.209	0.2079	0.2126	0.2126	4.7046	0.9781	1.259	1.3614	79
13	0.2269	0.226	0.2250	0.2309	0.2309	4.3315	0.9744	1.245	1.3439	77
14	0.2443	0.244	0.2419	0.2493	0.2493	4.0108	0.9703	1.231	1.3265	76
15	0.2618	0.261	0.2588	0.2679	0.2679	3.7321	0.9659	1.218	1.3090	75
16	0.2793	0.278	0.2756	0.2867	0.2867	3.3874	0.9613	1.204	1.2915	74
17	0.2967	0.296	0.2924	0.3057	0.3057	3.2709	0.9563	1.190	1.2741	73
18	0.3142	0.313	0.3090	0.3249	0.3249	3.0777	0.9511	1.176	1.2566	72
19	0.3316	0.330	0.3256	0.3443	0.3443	2.9042	0.9455	1.161	1.2392	71
20	0.3491	0.347	0.3420	0.3640	0.3640	2.7475	0.9397	1.147	1.2217	70
21	0.3665	0.364	0.3584	0.3839	0.3839	2.6051	0.9336	1.133	1.2043	69

22	0.3840	0.382	0.3746	0.4040	2.4751	0.9272	1.118	1.1868	68
23	0.4014	0.399	0.3907	0.4245	2.3559	0.9205	1.104	1.1694	67
24	0.41899	0.416	0.4067	0.4452	2.2460	0.9135	1.089	1.1519	66
25	0.4363	0.433	0.4226	0.4663	2.1445	0.9063	1.075	1.1345	65
26	0.4538	0.450	0.4384	0.4877	2.0503	0.8988	1.060	1.1170	64
27	0.4712	0.467	0.4540	0.5095	1.9626	0.8910	1.045	1.0996	63
28	0.4887	0.484	0.4695	0.5317	1.8807	0.8829	1.030	1.0821	62
29	0.5061	0.501	0.4848	0.5543	1.8040	1.8746	1.015	1.0647	61
30	0.0536	0.518	0.5000	0.5774	1.7321	0.8660	1.000	1.0472	60
31	0.5411	0.534	0.5150	0.6009	1.6643	0.8572	0.985	1.0297	59
32	0.5585	0.551	0.5299	0.6249	1.6003	0.8480	0.970	1.0123	58
33	0.5760	0.568	0.5446	0.6494	1.5399	0.8387	0.954	0.9948	57
34	0.5934	0.585	0.5592	0.6745	1.4826	0.8290	0.939	0.9774	56
35	0.6109	0.585	0.5592	0.7002	1.4281	0.8192	0.923	0.9599	55
36	0.6283	0.618	0.5878	0.7265	1.3764	0.8090	0.908	0.9425	54
37	0.6458	0.635	0.7018	0.7536	1.3270	0.7986	0.892	0.9250	53
38	0.6632	0.651	0.6157	0.7813	1.2799	0.7880	0.877	0.9076	52
39	0.6807	0.668	0.6293	0.8098	1.2349	0.7771	0.861	0.8901	51
40	0.6981	0.684	0.6428	0.8391	1.1918	0.7660	0.845	0.8727	50
41	0.7156	0.700	0.6561	0.8693	1.1504	0.7547	0.829	0.8552	49
42	0.7330	0.717	0.6691	0.9004	1.1106	0.7431	0.813	0.8378	48
43	0.7505	0.733	0.6820	0.9325	1.0724	0.7314	0.797	0.8203	47
44	0.7679	0.749	0.6947	0.9657	1.0355	0.7193	0.781	0.8029	46
45°	0.7854	0.765	0.7071	1.0000	1.0000	0.7071	0.765	0.7854	45°
								Chord	Radians
								Sine	Degrees
								Tangent	Angle
								Cosine	
								Co-tangent	

CONVERSION FACTORS

Factors listed are based on Australian Standard 1376 "Conversion Factors" and where not exact have been rounded to six significant figure.

To convert from	Convert to	Multiply by
acre	hectare	0.404 686
acre foot	cubic metre	1 233.48
atmosphere	millibar	1 013.25
atmosphere	pascal	101 325
barrel	litre	159.113
barrel (US)	litre	158.987
barrel, dry (US)	cubic metre	0.115 627
British thermal unit	joule	1 055.06
British thermal unit	kilowatt. hour	0.000 293
British thermal unit	megajoule	0.001 055
Btu per cubic foot	kilojoule per cubic metre	37.258 9
Btu per gallon	kilojoule per litre	0.232 080
Btu per hour	watt	0.293 071
Btu per pound	kilojoule per kilogram	2.326
Btu per square foot hour F	watt per square metre. kelvin	5.678 26
bushel	litre	36.368 7
bushel (US)	litre	35.239 1
cubic foot	cubic metre	0.028 317
cubic foot per second	cubic metre per second	0.028 317
cubic inch	cubic centimetre	16.387 064
cubic inch	cubic millimetre	16387.1
cubic yard	cubic metre	0.764 555
fathom	metre	1.828 8
fluid ounce	millilitre	28.413 1
foot	metre	0.304 8
foot per minute	metre per minute	0.304 8
foot per minute	metre per second	0.005 08
foot per second	metre per second	0.304 8
foot pound force	joule	1.355 82
foot pound force per second	watt	1.355 82
furlong	metre	201.168
gallon	litre	4.546 09
gallon (US)	litre	3.785 41
gravity (standard)	metre per second per second	9.806 65
horse-power	kilowatt	0.745 700
hundredweight	kilogram	50.802 3
inch	metre	0.025
inch	micrometre	25400.00

To convert from	Convert to	Multiply by
inch	millimetre	25.4
inch mercury	kilopascal	3.386 38
inch water gauge	kilopascal	0.248 642
kilowatt hour	megajoule	3.6
knot (international)	kilometre per hour	1.852
mile	kilometre	1.609 344
mile per gallon	litre per 100 kilometre	divide 2.28481 by mile per gallon
mile per hour	kilometre per hour	1.609 344
millimetre mercury	kilopascal	0.133 322
millimetre water gauge	pascal	9.789 04
ounce	gram	28.349 5
ounce per square foot	gram per square metre	305.152
ounce per square yard	gram per square metre	33.905 7
pint	litre	0.568 261
pound	kilogram	0.453 592 37
pound force	newton	4.448 22
pound force foot	newton.metre	1.355 82
pound force inch	newton.metre	0.112 985
pound force per square inch	kilopascal	6.894 76
pound force per square inch	megapascal	0.006 895
pound force per square inch	pascal	6 894.76
pound per acre	kilogram per hectare	1.120 85
pound per cubic foot	kilogram per cubic metre	16.018 5
pound per foot	kilogram per metre	1.488 16
pound per gallon	kilogram per litre	0.099 776
pound per square foot	kilogram per square metre	4.882 43
square foot	square metre	0.092 903
square foot per gallon	square metre per litre	0.020 436
square foot per ton	square metre per tonne	0.091 436
square inch	square centimetre	645.16
square inch	square millimetre	645.16
square mile	square kilometre	2.5899 99
square yard	square metre	0.836 127
superficial foot	cubic metre	0.002 360
ton	tonne	1.016 .5
ton, freight (40ft3)	cubic metre	1.132 67
ton, register (100 ft3)	cubic metre	2.831 68
ton force foot	kilonewton metre	3.037 03
ton force per square inch	megapascal	15.444 3
ton per cubic yard	tonne per cubic metre	1.328 94
yard	kilometre	0.000 914

AUSTRALIA

Australia comprises a land area of 7,682,300 square kilometres. The land lies between latitudes 10°41' north (Cape York) and 43°39' south (South East Cape, Tasmania) and between longitudes 113°09' west (Steep Point) and 153°39' east (Cape Byron).

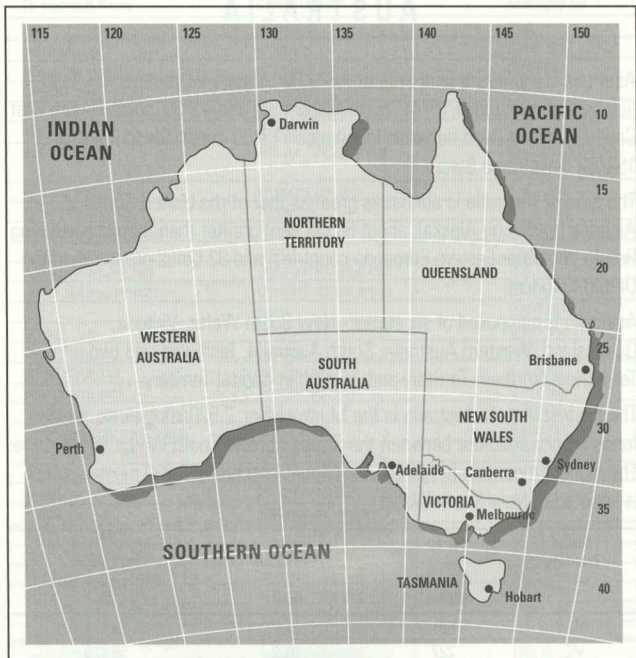
The area of Australia is almost as great as that of the United States of America (excluding Alaska), about 50 per cent greater than Europe (excluding Russia and other Eastern European countries) and 32 times greater than the United Kingdom.

Australia is composed of six states - New South Wales, Victoria, Queensland, Western Australia, South Australia, Tasmania and two Territories: Northern Territory and Australian Capital Territory.

The longest river in Australia is the Murray River, 2,520 kilometres, which forms a natural border between the States of New South Wales and Victoria. The highest mountain in Australia is Mount Kosciusko, 2,230 metres, which is situated in New South Wales.

State/ Territory	Area (000km ²)	Length of Coastline (km)	Estimated resident population September 2011 ('000)
NSW	801	2007	7317.5
VIC	227	1868	5640.9
QLD	1724	6973	4599.4
SA	979	3816	1659.8
WA	2527	12889	2366.9
TAS	65	2833	511.0
NT	1336	5437	231.2
ACT	(a) 2.4	(a) 54	366.9
Aust.	7692	35877	22696

Note: (a) Includes Jervis Bay Territory
Source: Australian Bureau of Statistics



DISTANCES BETWEEN AIRPORTS (NEAREST 5 KILOMETRES)

Distances shown are those of the most probably selected direct or indirect commercial flights following the prescribed airline routes used by major and commuter airlines. Source: 'Great Circle Distances based on the International Reference Spheroid' as made available to the editor by former Australian company Ansett Airlines of Australia.

PERTH

2120 **ADELAIDE**

2885 2610 **DARWIN**

3435 1315 1300 **ALICE SPRINGS**

2705 645 3255 1955 **MELBOURNE**

3175 1055 3665 2370 475 **LAUNCESTON**

3320 1260 3870 2570 615 145 **HOBART**

3090 970 3585 2285 470 945 1085 **CANBERRA**

3285 1165 3220 2020 705 1180 1320 235 **SYDNEY**

3600 1485 3540 2340 1025 1500 1640 555 320 **TAMWORTH**

3725 1605 3660 2460 1145 1620 1765 675 440 185 **COFFS HARBOUR**

3595 1475 3530 2330 1015 1490 1630 545 310 625 750 **DUBBO**

3070 1005 3620 2320 365 840 980 160 365 685 805 675 **WAGGA WAGGA**

4030 1910 2850 2245 1375 1850 1990 980 745 510 320 765 1110 **BRISBANE**

4550 2430 3370 2335 1895 2370 2510 1500 1265 1025 840 1285 1630 520 **ROCKHAMPTON**

3960 1845 2940 2700 1330 1805 1945 915 680 600 415 860 1045 90 610 **COOLANGATTA**

4970 2850 2020 1450 2485 2960 3100 1920 1685 1620 1435 1880 2050 1110 600 1205 **TOWNSVILLE**

4825 2710 2350 1780 2170 2650 2790 1780 1545 1305 1120 1565 1910 800 280 890 320 **MACKAY**

5420 330 1680 1455 2765 3240 3380 2370 2135 1900 1715 2155 2500 1390 880 1480 285 615 **CAIRNS**

DARWIN

1760 **KARRATHA**

195 1575 **PORT HEDLAND**

1310 1245 2885 **PERTH**

DISTANCES BY ROAD BETWEEN CITIES AND SELECTED TOWNS

Distances shown are by the shortest practical route between centres but do not necessarily represent distances by normally recommended roads. Main sealed roads formed the basis for most calculations. Information courtesy of NRMA.

PERTH		QUEENSTOWN	
725	NORSEMAN	182	BURNIE
2250	3112 BROOME	229	52 DEVONPORT
410	685 ALBANY	254	148 LAUNCESTON
2710	1977 4221 2653 ADELAIDE	256	326 279 198 HOBART
2388	1669 3857 2346 307 PORT AUGUSTA		
4160	3641 1864 4570 3027 2720 DARWIN		
3614	2147 2724 3879 1533 1226 1494 ALICE SPRINGS		
3434	2709 4981 337 724 1031 3751 2257 MELBOURNE		
2934	2215 4403 2892 395 546 3422 1772 526 MILDURA		
3729	3010 5198 3687 1190 1341 3970 2723 656 795 CANBERRA		
4105	3246 5242 3923 1414 1577 4007 2947 860 1019 285 SYDNEY		
3339	2619 4462 3296 1295 950 3203 2368 1131 826 767 780 BOURKE		
2805	2086 4274 2763 508 417 3137 1643 821 295 1090 1160 531 BROKEN HILL		
3545	2826 5014 3503 912 1157 3877 2383 304 611 352 559 840 906 ALBURY		
4347	3628 4670 4305 2044 1959 3420 2766 1699 1730 1249 964 1053 1542 1523 BRISBANE		
4347	4267 4172 4944 2378 2598 2939 2490 2002 1997 1898 1603 1394 2181 2162 639 ROCKHAMPTON		
5278	4553 3749 5238 3235 2890 2511 2081 2732 2727 2620 2335 1940 2727 2253 1371 730 TOWNSVILLE		
5624	4899 4095 5584 3581 3236 2857 2427 3078 3033 2966 2681 2286 3073 1869 1717 1076 346 CAIRNS		
4797	4072 2850 4757 3422 2409 1593 1183 2743 2410 2377 2392 1612 2399 2452 1820 1326 898 1244 MT ISA		

GLOSSARY OF TERMS - PART 1

METALLURGICAL TERMS

AGEING - Changes in the properties of steel occurring with the passage of time affecting the mechanical properties of a metal or alloy. Usually accelerated by an increase in temperature, and so may be natural or artificial.

ABRASION RESISTANCE - Resistance to frictional rubbing, as distinct from resistance to knocks and impacts.

ACCELERATED WEATHERING - Laboratory tests designed to simulate, but at the same time intensify and accelerate, the destructive action of natural weathering.

ANNEALING - A process involving heating and cooling, applied usually to induce softening. The term annealing is also used to cover treatments to:

- Remove stresses,
- Alter mechanical or physical properties,
- Produce a definite microstructure, and
- Remove dissolved gases.

BACKING COAT - See "wash coat".

BEND TEST - A test of ductility where (at ordinary temperature), a test piece must withstand, without fracture, bending through a specified angle around a specified diameter, eg:

- 0t - flat bend on itself
- 1t - bend around thickness of sheet.

BRAZING - Joining metals by fusion of a non-ferrous filler metal with a melting point above approximately 450 degrees Celsius, but lower than those of the metals being joined. The filler metal flows by capillary action between the surfaces to be joined.

BRONZE WELDING - Similar to brazing but the joint is characterised by a substantial external fillet of filler metal.

CAMBER - The deviation of a side edge of metal sheet or strip from a straight line. The measurement is taken on the concave side using a straight edge.

CARBON STEEL - A steel, free from intentionally added alloying elements, depending for its properties substantially upon its carbon content alone. Manganese up to 1% is not regarded as removing the steel from this designation.

CENTRE BUCKLE - (full centre) An out-of-flat condition caused by selective elongation of part of the strip width so that the centre of the sheet is longer than the edges.

CHALKING - A chalk-line formation on the surface of an organic coating caused by the breakdown of the surface layer of resin, releasing pigment particles and fillers normally bound by the resin. This normally occurs after long term exposure to sunlight.

CHATTER - A transverse series of marks or lines in either the metal surface of the paint film caused by vibration or eccentric rolls in processing equipment.

COATING CLASS - Coating Class is designated by the specified coating type and the minimum mass of coating on both sides of the sheet measured by the triple spot test as detailed in Australia Standard 1397, eg AZ150, aluminium/zinc coating with a minimum coating of 150 g/m².

COATING MASS - The ability of a metallic-coated sheet and strip product to withstand corrosion in a particular environment is a function of the amount (and type) of coating on the surface of the steel base. This is quantified as the "coating mass" and is the mass of coating on both sides of the steel base expressed in grams per square metre (g/m²).

COIL - A rolled up length of strip. This word was previously used to describe strip itself.

COIL SET - A tendency of a length of strip to maintain the curved shape of the coil from which it was cut.

COLD ROLLING - Is the reduction of hot-rolled pickled steel strip to a specified thickness, using a series of stands of rolls reducing the thickness progressively. This distorts the grain structure of the steel significantly and therefore a loss of ductility results.

CONVERSION COATING - A chemical treatment which, by reaction with the surface of the strip, converts it to a non-metallic and non-conductive surface for improved paint adhesion and corrosion resistance. See also "chromating" and "phosphating".

CORROSION - Destruction of a metal by electro-chemical reaction with its environment.

CUPPING TEST - A test of the ductility of metal sheet or strip obtained by measuring the depth of bulge which can be formed before fracture.

DECARBURISATION - In steel, partial or complete loss of carbon by chemical reaction.

DEEP DRAWING - Forming cup-shaped articles, shells or deeply recessed parts by using a punch to force sheet metal into or through a die.

DRY FILM THICKNESS - The thickness of the dried paint film on the surface of primer under the top coat. It is measured in micrometers.

DUCTILITY - Relative ability of a metal to deform from a flat condition into a more complex shape without fracture, formability, workability.

ELASTICITY - That property of a material which causes it to resume its original form after removal of a load.

ELASTIC LIMIT - The maximum stress to which a material may be subjected without any permanent strain remaining upon complete release of stress.

ELONGATION - In tensile testing, the increase in the gauge length measured after fracture of the test specimen within the gauge length, usually expressed as a percentage of the original gauge length.

FABRICATING PERFORMANCE - Is the end-use performance of a BlueScope Steel product for application requiring bending, drawing, pressing, welding or painting. Note the numbering system is arbitrary and only compares BlueScope Steel products against each other.

FATIGUE - A condition in metals resulting from fluctuating stresses, leading to failure at a stress substantially below the normal tensile strength of the material. Fatigue failures invariably manifest themselves in the progressive development of a crack, generally undetected until after complete failure has taken place, since they occur without prior visible strain. Fatigue cracks commonly originate at some point of local and predominantly tensile stress concentration, either at the surface (sharp re-entrant corners, tool marks, scratches, etc) or in the interior (flakes, forging bursts, or inclusions) of the stressed component.

Where cracks develop under the combined effect of fluctuating stress and corrosive environment, the subsequent failure is termed corrosion fatigue.

FINISH - Finish refers to the degree of smoothness of lustre of the sheet.

FLATNESS - Flatness of sheet metal may be best defined as the absence of any waviness or buckles. The out-of-flatness of a sheet is the measured height of the buckles from a flat surface on which the sheet is lying.

FLUTING - The tendency to form a series of near parallel kinks or creases in sheet metal during curving or bending. The creases occur at right angles to the direction of curving and are associated with non-uniform yielding of metal causing localised deformation.

FORMABILITY - The relative ease with which a metal can be shaped through plastic deformation.

FREQUENCY - The number of complete cycles of current per second taken by alternating current.

GALVANISING - The process of applying a coating of zinc to a surface of iron or steel to provide a corrosion resistant surface.

Zinc may be applied by electroplating or more commonly by drawing the steel strip continuously through a molten zinc bath. A similar process is used for the manufacture of ZINCALUME®, the strip being drawn through a coating bath of zinc/aluminium alloy. Solid state diffusion (sherardising) or spraying are not usually termed galvanising.

GLOSS - The degree to which a painted surface possesses the property of reflecting light in a mirror-like (specular) manner. COLORBOND® steel surfaces are produced in 10%, 25% and 80% gloss. Building materials are all 25% gloss (semi-gloss).

GRADE-OF:

- Of BlueScope Steel from which steel products are produced.
- Of product within the BlueScope Steel product range to distinguish base types, eg. Hot-Rolled "Formable Grade".

HARDNESS - The resistance offered by a metallic material to plastic deformation by indentation or penetration. The above defines hardness as it is commonly measured in metals. Quantitatively it has no absolute significance, but serves for purposes of comparison between materials of similar type (in particular, of similar elastic properties). It is more specifically referred to as indentation hardness or penetration hardness.

HEAT TREATMENT - An operation or combination of operations involving the heating or cooling of a metal or alloy in the solid state for the purpose of obtaining certain desired conditions or properties.

Heating for the sole purpose of hot working is excluded from the meaning of this definition.

HYDROGEN EMBRITTLEMENT - Brittleness induced in steel due to absorption of hydrogen. This commonly occurs in pickling and electroplating operations. In the heat affected zones of welds, it can lead to cracking. Hydrogen embrittlement is particularly detrimental in steels of high hardness, and may be removed by annealing in the range 200 to 750 degrees Celsius.

HUNTERLAB - Is a colour difference meter which gives an accurate numerical measurement of colour differences between the painted steel sheet under test and an approved colour standard. The meter measures colour as seen in normal daylight similar to how the human eye responds to colour. The units are AE.

INDUCED CURRENT - The electric current produced by moving a conductor in a magnetic field.

KILLED STEEL - A steel with deoxidants such as aluminium or silicon added before casting molten steel to remove oxygen and so prevent evolution of carbon monoxide and chemical segregation during cooling.

LOCK-FORMING - The forming of two adjacent edges prior to interlocking.

LOCK-SEAMING - The closing of a tight seam of lock-formed edges of sheet metal, for example Pittsburg lock-seam, grooved single lock-seam, Snap Lockseam.

LUSTRE - Lustre finish is a smooth finish for electroplating achieved by using specially prepared rolls. Some surface preparation by the plater may be necessary.

MATT - Cold-rolled products are available with either matt or lustre finish. The matt finish is produced by rolling with mechanically roughened rolls. This finish is preferred for lacquer or paint finishes and is beneficial during drawing operations when used with a lubricant. This finish can be assumed when no surface is specified.

MECHANICAL PROPERTIES - Properties relating to the behaviour of materials under load in conventional mechanical tests, such as elastic moduli, tensile strength, elongation, hardness.

MINIMISED SPANGLE - The formation of normal zinc spangle is inhibited in cooling or by bath control. Skin-passing metallic-coated steel sheet and strip will smooth the surface, and is often done in conjunction with minimised spangle treatment.

NORMALIZING - Heating steel to, and if necessary holding at, a suitable temperature above the transformation range, followed by cooling in a still atmosphere to ambient temperature, in order to produce a medium-to-fine pearlite microstructure.

The effect of normalizing is generally to refine the grain size, render the structure more uniform, and improve the mechanical properties.

PASSIVATION - A surface treatment to give greater resistance to storage corrosion in which the protection is afforded by conversion coatings and films.

PHOSPHATING - Phosphating treatments produce adherent non-metallic conversion coatings which convert the galvanized surface to an insoluble complex, thick enough to provide good adhesion for subsequent paint films.

PICKLING - Removal of oxide films from metal by immersion in an acid. The process is applied particularly to scale removal from metal prior to operations such as cold rolling, wire drawing and electroplating, and in general is carried out in dilute solutions of the mineral acids, often with additions of organic material (inhibitors) to restrain the rate of attack on the metal. Absorption of hydrogen may occur in pickling of steel causing embrittlement of hard steels, and necessitating low temperature annealing for its removal.

PRESSING - Is a metal working process in which a flat blank, constrained between two surfaces, is forced by a punch to take a required shape.

PRIMER - The first coat of a painting system applied to an unpainted surface. It normally has very good adhesion and corrosion inhibitive properties.

PROOF STRESS - That stress at which a material exhibits a specific limiting permanent set. The proof stress of a material is found by observing, usually from a stress-strain diagram, the stress at which the predetermined permissible elongation (usually of the order of 0.1% or 0.2%) occurs.

RECRYSTALLATION - The reformation to "round" ferrite grains flattened during rolling. This occurs at temperatures above 725°C, either immediately after hot rolling or during annealing after cold reduction.

RESQUARED - This term describes a sheet which has been sheared to accurate dimensional limits as a last operation in its production. The name is derived from early guillotining operations necessary to achieve the required tolerance.

ROLLING DIRECTION - The main direction in which strip has been rolled.

Associated terms used are:

- Longitudinal - in the rolling direction
- Transverse - right angles to the rolling direction

ROLL-FORMING - Process by which metal is unwound from coiled strip and passed through a number of pairs of metal profile rolls.

Each role pair is designed to progressively develop a profile by predetermined increments.

SCALE - Layers of iron oxide formed on the surface of hot steel when oxygen in the air combines with iron from the steel.

SHEET - A flat rolled steel product of any width and thickness cut into lengths and stored in a flat condition. Previously the official designation was "cut lengths". Note - this is not to be confused with plate.

SKIN-PASSING - A light cold rolling operation (about 1-2 per cent of cold work) which removes the yield point in steel which otherwise causes coil break, fluting or stretcher strain in subsequent operations. It can also be used to:

- Modify surface, for example, by reducing surface roughness for bright (lustre) qualities or by specially controlled roughening for matt finish for drawing qualities, and
- Flatten strip being rolled.

SOLDERING - Joining of metals by fusion with alloys that have relatively low melting points, most commonly lead and/or tin base alloys, which are known as soft solders.

Joining with higher melting point alloys, sometimes termed hard solders at temperatures over 450 degrees Celsius, is generally termed brazing.

SPANGLE - Grain or crystal of zinc, or zinc/aluminium as appearing on hot-dip metallic coated steel.

STRAIN AGEING - Ageing which occurs subsequently to the cold working of an alloy. Strain ageing in steel is predominantly due to uncombined nitrogen, and results in a marked decrease in ductility.

STRESS RELIEVING - Heating a metal to, and if necessary holding at some temperature generally below the recrystallisation range, followed by uniform cooling, for the sole purpose of removing internal stresses.

STRETCHER STRAIN MARKINGS - Characteristic surface markings, usually of a parallel sided diagonal pattern, which appear during the early stages of the plastic deformation of mild steel and certain copper-base alloys. Their production is associated with sudden extension at the yield point. In steel, they are alternatively called Luders Lines.

STRETCHER LEVELLED - Stretcher levelled, as applied to sheets, indicates a standard of flatness. The term originated from an early method of obtaining flatness. This was by gripping the ends of the sheet and stretching it to remove surface waves and buckles.

STRIP - A continuously rolled flat product of any width and thickness, supplied rolled up into and stored in coil form. Previously, the official designation was "coil" used for both the strip and the rolled-up product.

TEMPER - To modify hardness of metals.

- Adjustment of hardness of heat treated articles by controlled heating after quenching.
- Increase of hardness by cold rolling. The degree of cold rolling is variable depending on the required hardness and is more than that of skin-passing.

TEMPER ROLLING - Is a cold-rolling operation which adjusts the metallurgical properties of cold rolled strip and at the same time enhances surface texture and flatness.

TENSILE STRENGTH OR ULTIMATE TENSILE STRENGTH - If a prepared sample of steel is strained in a tensile testing machine until it breaks, then the ultimate tensile strength of the material is obtained by dividing the maximum observed load by the original cross-sectional area of the sample.

TENSILE TEST - A standard sample of material is placed between two jaws and drawn apart in a tensile testing machine until fracture.

TERNE - Refer Metallic coated.

VITREOUS ENAMELLING - Refer Cold-Rolled General Information page.

WASH COAT - The coating applied to the back or unexposed side of the painted strip. There are standard wash coat colours for COLORBOND® steel products.

YIELD POINT - The stress at which a material permanently deforms.

YIELD STRENGTH - Strength at which steel first exhibits plastic strain.

GLOSSARY OF TERMS - PART 2

BUILDING & ENGINEERING TERMS

ACCESSORIES - Gutters, ridge capping, ventilators, flashings, downpipes, brackets and their fixings.

ANGLE BRACE - A brace that goes from corner to corner in framing. A tie to strengthen the angles of framing.

APRON FLASHING - Sheet used to prevent water from percolating through where a vertical surface pierces a roof.

AS - Australian Standard published by Standards Australia.

ASTRAGAL - A small moulding with a semi-circular section projecting above the surface, similar to a bead. A metal strap used to fasten downpipes to walls.

BACKING - The dihedral angle of a hip. Shaping the top of a hip to conform to the roof planes.

BALUSTRADE - A series of balusters in the one flight or along a landing.

BARGE BOARD, VERGE OR GABLE BOARDS - The inclined timbers on the gable ends which are fixed to the rafters and cover the ends of the roof timbers.

BARGE CAPPING - A protective timber or metal capping for a bargeboard.

BARGE FLASHING - A flashing used between a bargeboard or barge capping and the roofing material to prevent the ingress of moisture.

BASE METAL THICKNESS - (B.M.T.) The metal thickness before any subsequent coating.

BT - Boundary trap.

BATTENS - Narrow pieces fixed to walls to receive sheeting or on roofs to receive tiles, slates, etc.

BEARERS - Members supporting the joists in steel, timber framed or brick dwellings.

BEARING - That part of the beam resting on the supports.

BEARING PLATE - A stone or metal plate carrying the weight of a beam, etc.

BELL ROOF - A roof shaped like a bell by fixing false feet to the foot of the rafters.

BOX GUTTER - A gutter formed in the shape of a trough. It is formed between a roof surface and a parapet wall or between two roof surfaces.

BRACKET - The ornamental return piece fixed to the face of the string in a stair. A right angle support with angle brace; usually used to support a shelf, etc.

BRIDGING - The use of stiffening members between deep floor joists and purlins to limit lateral deflection.

BRICK VENEER - A brick facing applied to the outside of a timber structure.

BUILDING PAPER - A waterproof paper used in construction work for insulation or as an undercover for roofs as a protection against weather.

BUILD-UP RIB - A rib or member that is built up of several thicknesses, usually in brick bond.

BULLNOSE - The edge of a piece of timber, shaped to a quarter circle. A small metal plane with its cutter close to the fore end, used for cleaning up rebates.

CAMBER - To fix a horizontal structural member with a rise at its centre to counteract sagging.

CANT - To incline on an angle other than a right angle.

CANTILEVER - Beams that are supported at one end only as for a shop awning.

CAPILLARY WATER - Water drawn upwards into soil pores and held by surface tension.

CAT LADDER - A ladder fixed vertically to a wall.

CEILING BATTEN - A light timber or steel member fixed to ceiling joists to which the ceiling lining is then fixed.

CEILING JOIST - Light member across a room to carry the ceiling sheeting.

CELLAR - An underground room in a basement used for storage.

CHALK LINE - A long line or string used for setting out long straight lines. When coated with chalk, the ends are held taut, while the centre is lifted away from the surface and allowed to spring back, thus leaving a chalked line on the surface.

CHAMFER - A 45 degree bevel cut on the arris of timber, sometimes stopped before reaching the end of the timber. When the amount removed is unequal on each face it is called a splay or bevel.

CHORD - The horizontal member in a bowstring truss. A straight line drawn across a circle with each end touching the circumference.

CLADDING - The outer non-loadbearing covering of the external walls of a framed building or structure, applied for weatherproofing and sometimes decorative purposes. Also called 'External cladding' or 'wall cladding'.

CLEAR SPAN - The clear horizontal distance or space between faces of the supports of an arch, beam, truss or roof structure. It is always less than the effective span.

COMPOSITE - A type of construction made up of different materials or of different members in conjunction to improve strength or resistance to stresses.

COMPUTER-AIDED DESIGN (CAD) - The application of computer technology to the design of products, including buildings and structures, using interactive programs.

CONCEALED GUTTER - A gutter which is hidden from view except from above. Also called 'hidden gutter' or 'Secret gutter'.

CONDENSATION GROOVE - A groove formed for the purpose of collecting condensation on the inside of sashes to allow the moisture to escape to the outside, as in the bottom rail of a skylight.

CORNICE - The mould at the junction between the wall and the ceiling.

CORRUGATED - Sheet shaped into a sinusoidal, or circular curve.

COVER - The width of the profile less the lap.

CRAMPING-UP - The act of tightening up the joints in framing by means of cramps.

CREEP - Increasing deformation under constant load.

CREST - The top surface of a rib.

DAR - Dressed all round.

DECK - Predominantly flat profile roofing or cladding, also referred to as tray.

DEFORMED SHANK NAIL - Includes nails with annular, spiral or deformed shanks.

DE-INDEXING - The releasing of interlocking profiled sheets.

DISTRIBUTED LOAD - A design load, not necessarily uniform, which is spread over an area of surface, expressed in kilograms per square metre (kg/m^2); or along a length of a structural member, expressed in kilograms per metre run (kg/m). See also: Uniformly distributed load.

DOME - A curved roof, semi-circular in elevation over a square, hexagonal, octagonal, or other shaped plan.

DORMER - A window projecting from a roof surface.

DOWNPIPE (DP) - A metal or plastic pipe for conveying rainwater, either externally or internally, from a roof or gutter to a stormwater drain, sump, tank, ground level, or another part of a building. Downpipes are manufactured in 'rectangular' or 'round' cross-sections and are usually installed externally, but sometimes internally or in concealed positions. Also called 'Downspout' or 'Rainwater pipe'.

DOWNTURN - That part of the trough of a sheet turned down into a gutter.

DUTCH GABLE - A roof frame type that is partially hipped but which terminates as a gable.

EAVES - The lower edge of a roof slope.

EAVES GUTTER - An external gutter at the lower edge of a roof - also known as spouting.

ELASTIC LIMIT - The stage at which a noticeable permanent set occurs when the material is loaded.

ELEVATION - The part of a drawing which shows the front view giving length and height.

END LAP - In roofing, the distance by which the upper sheet, tile or other unit of roofing overlaps the top end of the one immediately below it to provide weatherproofing. See also: side lap.

END SPAN - A span which is part of a continuous roof, beam or slab only at its interior support. Therefore, an end span is often shorter and more heavily reinforced than interior spans.

FACTOR OF SAFETY - An arranged increase in size or strength of the member above that at which it is known to fail.

FALL - The slope (pitch) of a flat or low slope surface, such as a roof, gutter, or paving.

FASCIA - The upright board fixed to the feet of the rafters to carry the guttering. Any wide board fixed on edge. (Timber or steel)

FASTENER - A nail, screw or rivet used to fasten metal roofing or cladding to the structure.

FIBRE CEMENT - A building board composed of cellulose fibres and cement.

FIXING - The device used to fix or clip metal roof flashings.

FLASHINGS - Galvanized steel, lead, zinc sheet, etc. used to prevent water seeping through to an interior surface. Lead, however, should not be used with ZINCALUME steel sheet.

FOOTING - The lowest part of a building, an enlargement at the base of a wall to distribute the load over a greater area.

FOUNDATION - The soil or strata which supports the lowest part of a building - ie. the footings.

GABLE - The triangular end of a building above the plate line with the rafters meeting the apex at the ridge.

GABLE ROOF - A roof having two slopes only with a gable at each end.

GALVANISING - The process in which steel is coated to prevent corrosion by dipping it into a molten zinc bath.

GCI - Galvanised corrugated iron, the old term for zinc-coated corrugated steel sheet and now usually but inaccurately used for corrugated ZINCALUME zinc/aluminium alloy-coated steel.

GIRT - Horizontal members in a wall used to support wall sheeting.

GRADE - The mechanical strength of a metal expressed in yield strength and measured in MPa.

GUTTER - The spouting, or valley gutter, a channel formed to collect and carry away rain water off a roof.

GYPSUM BOARD - A wallboard made from plaster of paris and covered with a stiff paper.

HAMMER BEAM - The lower cantilever member in the roof truss of the same name.

HIP - The external angle formed on a roof where two inclined surfaces meet.

HIPPED ROOF - A roof with its ends inclined as well as its sides.

HIP RAFTER - The inclined member at the intersection of two roof surfaces.

JACK RAFTER - The rafters running from a wall plate to the end of a ridge (sometimes called crown end rafters).

JAMBS - The vertical sides of openings or the vertical timbers fixed to the jambs of the opening.

JOISTS - A horizontal structural member of timber or steel, spanning a room either to carry the floor or the ceiling.

KING POST - The central vertical member of a roof truss, that from the centre of the tie beam to the apex of the roof.

KNEE - A curve in a handrail, convex on top and shaped in the form of a human knee.

LAP (OVERLAP) - The length by which one material overlaps another for structural or functional purposes. See also: End lap; Side lap.

LEAN-TO OR SKILLION - A roof with only one slope, formerly when used against another building, but now applied to any roof with a single slope.

LEEWARD SIDE - The side facing away from the prevailing wind.

LINTEL - A horizontal member, timber, steel or concrete, across an opening, usually to carry the wall above.

LIMIT STATE:

SERVICEABILITY LIMIT STATE - The condition when a building becomes unfit for its intended use due to deformation or deflection.

ULTIMATE LIMIT STATE - The condition when a building is permanently deformed or becomes unstable.

LIVE LOAD - A moving or variable load on a floor or beam.

LONG-RUN - Roofing and cladding in one length without transverse laps.

MANSARD ROOF - A form of roof having a break in the slope, the lower part being steeper than the upper.

MONOSLOPE ROOF (MONOPITCH ROOF) - A planar roof with a constant slope and without ridge. Also called 'Single pitch(ed) roof'. See also: Lean-to roof; Skillion roof.

MULLION - The vertical dividing member in a window or door frame.

NOBLE METAL - A metal that is less active or likely to corrode when compared to others.

NOGGING - Horizontal pieces fixed between studs for bracing and to which plaster sheeting, skirting, etc. can be fixed.

OIL CANNING - Distortion in the form of waviness of centre fullness in a profiled sheet.

PAN - The flat portion between the ribs in a profiled metal sheet.

PARAPET GUTTER - A gutter or water channel formed against a parapet wall at the bottom of a roof slope.

PARTY WALL - A wall between two adjoining properties, built half on one and half on the other; a wall separating one house from another.

PENETRATION - A projection through a roof or wall, eg. vent pipe or air-conditioning unit.

PERMEABLE MEMBRANE - Sheet material that allows the passage of water vapour, also known as 'breather type'.

PITCHED ROOF - A common type of roof with two sloping surfaces of more than 10° of angle meeting at a central ridge.

PLASTERBOARD - A wall board made of plaster and covered on both sides with heavy paper.

PLATE - A horizontal member in structural framework, a level piece that carries the vertical pieces.

PLUMB - To make perpendicular; in a perpendicular position.

PORTAL FRAME - A structural frame of steel, reinforced concrete or timber constructed with rigid joints for stability without diagonal bracing. It has either two upright members rigidly connected at the top to a straight, sloping or curved third member, or a pair of rigidly jointed vertical columns and sloping roof members, jointed at the apex.

PONDING - Undrained water retained on a roof surface due to permanent deflection or deformation of a roof.

PREPAINTED - Base metal strip or sheet painted on, or laminated with a film, added to give protection or aesthetic appeal prior to subsequent forming or shaping.

PROFILED SHEETING - Metal sheeting produced with corrugations or ribs to increase its strength.

PURLIN - A horizontal member placed at right angles to and spanning across rafters or roof trusses to which the sheet roof covering or cladding is attached.

RAFTERS - The inclined members of a roof between the plate and the ridge which support the roof covering.

RAINWATER HEAD - An external box capable of collecting rainwater from a gutter. (Also called Rain Head)

RAINWATER PIPE (RWP) - See downpipe.

RETURN PERIOD - The average number of years within which a given wind gust or rainfall is expected to be equalled or exceeded.

RIB - A longitudinal upstand produced by roll-forming folding or crimping.

RIDGE (ROOF RIDGE) - The highest part (or apex) of a pitched roof, usually forming a horizontal line.

RIDGE CAPPING - A covering over the ridge to provide a continuous cover and effective weather seal between the two slopes. For sheet roofing shaped metal is used.

RISE - The vertical distance through which an element rises, such as the rise of a roof, arch, stair, or step.

ROOF TRUSS - A framed construction in a roof.

SACRIFICIAL PROTECTION - The coupling of two metals so that one is sacrificed by electrolytic corrosion in order to protect the other.

SARKING - A layer of timber boarding, covering the rafters underneath roofing tiles or slates of a pitched roof, to provide a moisture and thermal barrier.

SARKING MEMBRANE - A pliable, water-resistant membrane for use beneath the external roof or wall covering to collect and discharge any water that may penetrate, or water vapour that may form. Now often combined with reflective foil to provide thermal insulation benefits. Commonly abbreviated to 'Sarking'.

SAW TOOTH ROOF - A roof that in profile is the shape of the teeth of a saw. A trussed construction.

SCISSORS TRUSS - A roof truss so named because of its resemblance to a pair of scissors.

SECRET FIXING - The fixing of joinery in such a manner that on completion the method of fixing is not visible on the face.

SIDE LAP - In roofing, the distance by which the upper sheet, tile or other unit of roofing overlaps the side of the one immediately below it to provide weatherproofing.

SKEW - At an angle or out of square.

SKEW NAILING - Nails driven in at an angle to the surface to give greater holding power.

SKILLION ROOF (SKILLION) - A monoslope (single pitched) roof without a ridge or peak, providing the main roof or part of a roof.

SKIRTING - The moulded baseboard around a room.

SPAN - The horizontal distance between two supports as the springing points in an arch.

SPIGOT - The plain or specially formed end of a pipe for insertion into a socket or coupling to form a joint.

SPOUTING - See Guttering.

SPREADER - A piece of perforated horizontal piping connected to the foot of a downpipe from a higher roof to evenly spread rainwater over a lower roof.

STANCHION - A vertical steel or iron support for a beam

TAPER(ED) FLANGE BEAM - A rolled structural I-section with flanges that are tapered and rounded at the ends.

TIE ROD - A structural member in tension, such as a metal rod or bar serving as a tie, often threaded to enable on-site adjustment of tension.

TILE BATTEN (TILING BATTEN) - A light steel or timber member fixed to the tops of rafters or trusses to which the roofing materials may be fastened.

TILTING BATTEN - A batten cut diagonally from a 75mm x 38mm timber and used at the eaves to tilt the bottom cause of tiles so that the ones immediately above will have a firm seating.

TRANSOM - The horizontal dividing member in a window or door frame.

TRUSS - A triangulated frame for carrying a roof over a large span.

TRUSSED BEAM - A beam formed of two timbers with triangulated strutting between, formed to distribute the load.

TUDOR ROOF - A steeply pitched roof with dormers on one or both sides.

UB - Universal beam.

UC - Universal column.

UNIFORMLY DISTRIBUTED LOAD (UDL) - A superimposed design load which is assumed to be distributed evenly over an area of surface or a length of structural member.

VALLEY - The angle formed by two internal slopes of a roof.

VALLEY BOARDS - Boards nailed to the surface of the roof at the internal intersection of two roof surfaces.

VALLEY RAFTER - The inclined member in a roof at the internal intersection of two roof surfaces.

VERGE - The overhanging edge of the roof covering at a gable.

WEB - The vertical portion of a rolled steel section, extruded section, girder or truss which connects the top and bottom flanges or the top and bottom chords. A web may be a solid plate, a perforated plate, or a lattice.

WEB HOLE - Joints in brickwork left free of mortar or a small hole bored through a trench in a window sill to allow the escape of water.

WIND LOAD - The forces on a building or structure due to wind pressure.

ZED-PURLIN - A pressed metal purlin with a cross-section in the shape of the letter Z. Also spelled 'Z-purlin'.

SPECIAL NOTE:

The "Terms" listed are an abridged version of those more commonly used within the steel, building and engineering industry as applied to this booklet. A complete "Glossary of Building Terms" published jointly by Standards Australia and Suppliers Index can be purchased from the Standards Association.

The Editor.

USEFUL WEBSITES

BlueScope Lysaght

<http://www.lysaght.com>

BlueScope Steel

<http://www.bluescopesteel.com.au>

COLORBOND® Steel

<http://www.colorbond.com>

Australian Building Codes Board (ABCB)

<http://www.abcb.gov.au>

Responsible for creating consistent building codes, standards, and regulations to meet community expectations for health, safety and amenity in the design, construction and use of buildings.

Australian Bureau of Agricultural and Resource Economics (ABARE)

<http://www.abare.gov.au>

An Australian government agency that conducts independent economic research and analysis.

Australian Bureau of Meteorology

<http://www.bom.gov.au>

Responsible for understanding Australia's weather and climate, and providing meteorological, hydrological and oceanographic services including forecasts and weather warnings.

Australian Bureau of Statistics

<http://www.abs.gov.au>

Conducts a national census every five years and provides statistics for use by governments, business and the media, including Household Expenditure and Economic Activity surveys.

Australian Certification Authority for Reinforcing Steels

<http://www.acrs.net.au>

Administers an industry-based, third-party product certification scheme for steel reinforcement and prestressing strand.

Australian Commonwealth Government Entry Point

<http://www.australia.gov.au>

Links to information and services on 700 Australian Government websites as well as selected state and territory resources.

Australian Heritage Directory

<http://www.environment.gov.au/heritage>

Australian Steel Institute (ASI)

<http://www.steel.org.au>

As the peak industry association representing the Australian steel industry, increases the awareness of the benefits of steel and promotes Australian made steel as the material of choice.

Australian Transport Safety Bureau (ATSB)

<http://www.atsb.gov.au>

Australia's prime agency responsible for improving transport safety and public confidence and for transport safety investigations.

Australian Women in Agriculture

<http://www.awia.org.au>

Promotes the advancement of women in agriculture.

Building Products Innovation Council (BPIC)

<http://www.bpic.asn.au>

Promotes the efficient and innovative use of building products within a nationally consistent regulatory environment.

Building Sustainability Index (BASIX)

<http://www.basix.nsw.gov.au>

Cement Concrete & Aggregates Australia (CCAA)

<http://www.concrete.net.au>

Peak body representing the cement, pre-mixed concrete and extractive industries.

Civil Aviation Safety Authority (CASA)

<http://www.casa.gov.au>

Provides leadership in aviation safety.

Cooperative Research Centre for Construction Innovation

<http://www.construction-innovation.info>

A national research, development and implementation centre focused on the needs of the property, design, construction and facility management sectors.

Commonwealth Scientific & Industrial Research Organisation (CSIRO)

<http://www.csiro.au>

Conducts industrial research and development programmes to improve the economic and social performance of Agribusiness, Energy and Transport, Environment and Natural Resources, Health, Information, Communication and Services, Manufacturing and Mineral Resources, and improve Australia's quality of life.

Department of Agriculture Fisheries and Forestry

<http://www.daff.gov.au>

Useful information on a range of relevant topics for primary producers.

Department of Climate Change and Energy Efficiency

<http://www.climatechange.gov.au>

Provides a 'whole of government' approach to climate change matters.

Department of Sustainability, Environment, Water, Population and Communities

<http://www.environment.gov.au>

Develops and implements national policy, programs and legislation to protect and conserve Australia's environment and heritage and to promote Australian arts and culture.

Ecospecifier

<http://www.ecospecifier.com.au>

An extensive database, decision making guide, project case-studies and training documents to assist eco-design.

Energy Smart

<http://www.energysmart.com.au>

Provides NSW builders and homeowners with advice on cost reductions and energy savings in buildings.

Green Building Council of Australia (GBCA)

<http://www.gbcaus.org.au>

Committed to the creation of a green building rating tool, economic incentives, government initiatives and programmes, new technologies and industry knowledge to achieve greater sustainability in buildings.

HIA GreenSmart

<http://www.greensmart.com.au>

Educates builders, designers, product manufacturers and consumers about the benefits of environmentally responsible housing.



Landcare Australia

<http://www.landcareaustralia.com.au>

Supports Landcare and Coastcare movements across Australia by raising funds and awareness, and helps governments, companies and communities become partners in awareness campaigns and environmental repair projects.

National Association of Steel Framed Housing (NASH)

<http://www.nash.asn.au>

Promotes the use of steel framing in housing.

National Association for Sustainable Agriculture Australia (NASAA)

<http://www.nasaa.com.au>

Supports growers and retailers of organic crops to achieve certification and maintain standards.

National Built Environment Rating System (Nabers)

<http://www.nabers.com.au>

A performance-based rating system that measures a building's overall environmental performance during operation.

National Farmers' Federation

<http://www.nff.org.au>

Provides information on national issues and links to State farming organisations.

Nationwide House Energy Rating Scheme (Nathers)

<http://www.nathers.gov.au>

Enables the design of a home to be assessed by skilled professionals using sophisticated computer modelling programmes to improve the quality of design and as a means of achieving building approvals.

National Trust Australia

<http://www.nationaltrust.com.au>

The national secretariat representing the eight state and territory National Trusts. Links to state and territory sites.

Society for Responsible Design (SRD)

<http://www.srd.org.au>

Combines society and industry efforts to improve products and services through environmentally and socially responsible design practices.

Standards Australia

<http://www.standards.org.au>

Facilitates standardisation solutions to meet community expectations for a safe and sustainable environment and enhance Australia's economic efficiency and international competitiveness.

Australian Institute of Architects

<http://www.architecture.com.au>

National body for Australia's architects.

Welding Technology Institute of Australia

<http://www.wtia.com.au>

Provides technical assistance, library and information services for the welding industry.

Your Home: Design for Lifestyle and the Future

<http://www.yourhome.gov.au>

A guide to environmentally sustainable house design and construction.

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