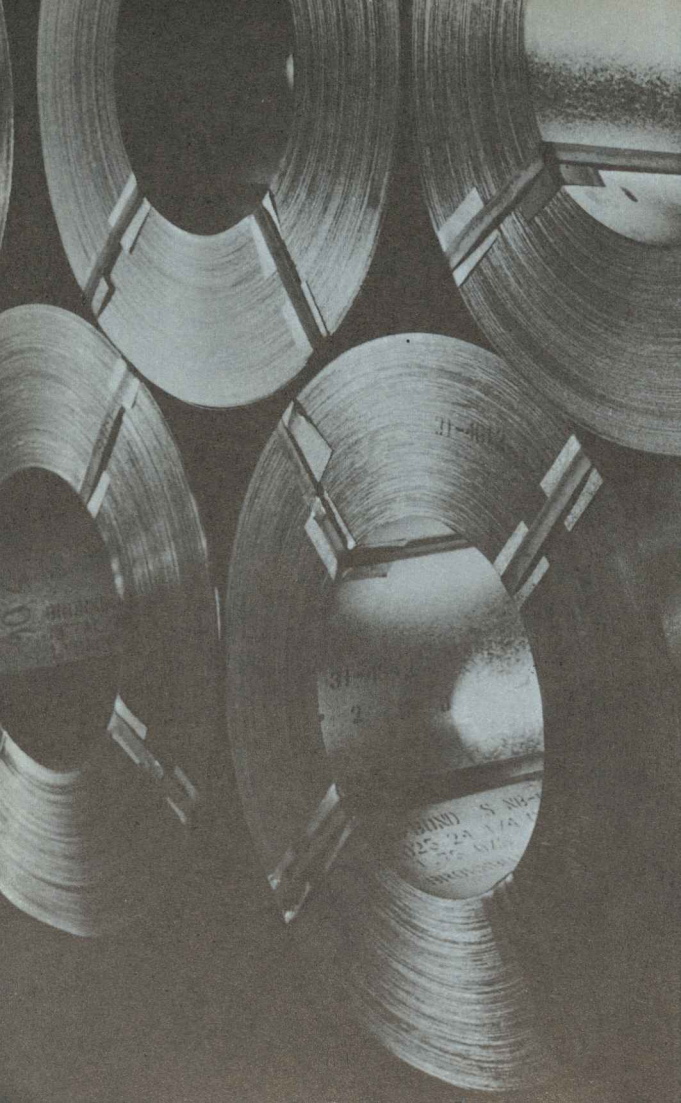
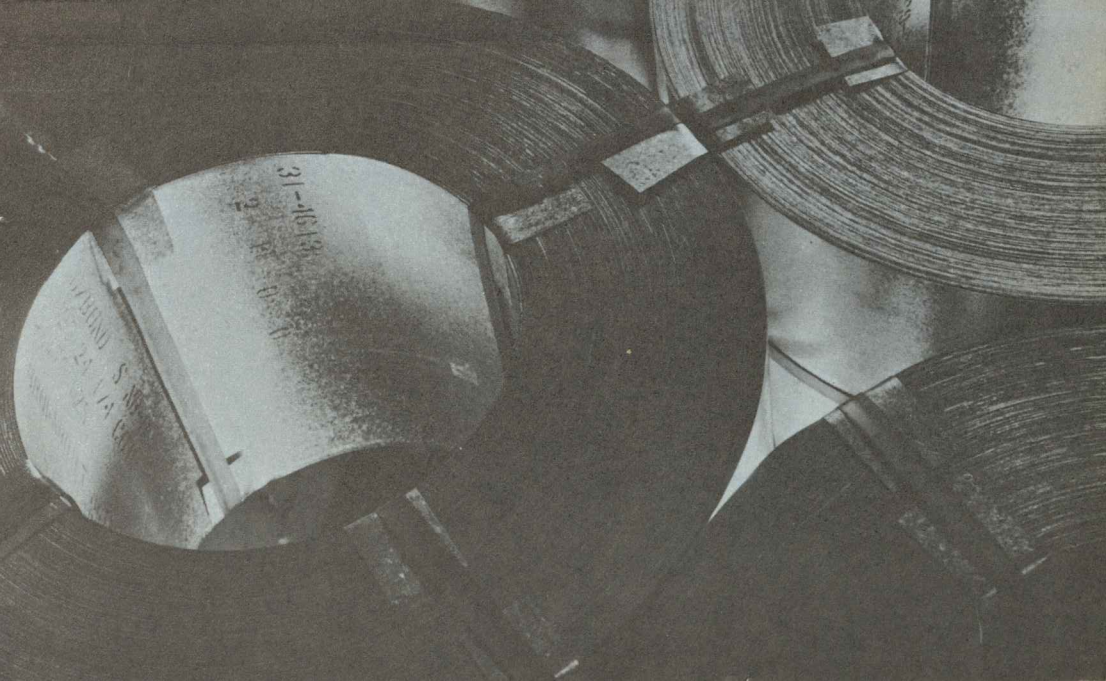


LYSAGHT REFEREE

24TH EDITION

PRICE $1.00





LYSAGHT REFEREE

24th EDITION

JOHN LYSAGHT (Australia) LIMITED
Head Office and Service & Sales Division H.Q.
50 Young Street, Sydney
G.P.O. Box 196, Sydney, N.S.W. 2001

Export Department
44-46 Young Street, Sydney
G.P.O. Box 196, Sydney, N.S.W. 2001

LYSAGHT BROWNBUILT INDUSTRIES
DIVISION OF JOHN LYSAGHT (Australia) LIMITED
Head Office
44-46 Young Street, Sydney
G.P.O. Box 196, Sydney, N.S.W. 2001

With Compliments . . .



JOHN LYSAGHT (Australia) LIMITED

As with previous editions this copy of the "Lysaght Referee" is presented without charge.

It is the last edition to be printed expressing values in the Imperial System, and should be retained as a reference.

MANUFACTURING PLANTS

JOHN LYSAGHT (Australia) LIMITED

Sheet Manufacturing Division

Springhill Works
Springhill Road, Wollongong, N.S.W.
P.O. Box 77, Port Kembla, N.S.W. 2505

C.R.M. Works
Port Kembla Road, Port Kembla, N.S.W.
P.O. Box 77, Port Kembla, N.S.W. 2505

Westernport Steelworks

Lysaght Information Centre
17 High Street
Hastings, Victoria 3915

LYSAGHT BROWNBUILT INDUSTRIES

Works
Ingall Street, Mayfield, N.S.W.
P.O. Box 589, Newcastle, N.S.W. 2300

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Sutherland, N.S.W. 2232

Norcal Road
Nunawading, Victoria 3131

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Steel Service Centre
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Organic Finishes Division

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P.O. Box 329, Crows Nest 2065
Electrical Steel Division

767-773 Hunter Street, Newcastle West
P.O. Box 201, Newcastle West 2302
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Organic Finishes Division

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Building Products

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P.O. Box 176, Manuka, A.C.T. 2603
Building Products
Brownbuilt Steel Equipment

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Brownbuilt Steel Equipment

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P.O. Box 145, Sunshine 3020
Steel Service Centre

LYSAGHT BROWNBUILT INDUSTRIES

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Organic Finishes Division

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P.O. Box 857, Townsville 4810
Steel Service Centre

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Service & Sales Division
Organic Finishes Division
Steel Service Centre

LYSAGHT BROWNBUILT INDUSTRIES

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Building Products

Cnr. Peel and Bowen Streets, O'Connor
P.O. Box 55, Palmyra 6157
Brownbuilt Steel Equipment

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JOHN LYSAGHT (Australia) LIMITED

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P.O. Box 164, Glenorchy 7010
Service & Sales Division
Organic Finishes Division
Steel Service Centre

Off Kelsey's Tier Road, Spreyton, Devonport
P.O. Box 593, Devonport 7310
Steel Service Centre

LYSAGHT BROWNBUILT INDUSTRIES

97A Grove Road, Glenorchy
P.O. Box 164, Glenorchy 7010
Building Products

1-3 Bowen Road, Moonah 7009
Brownbuilt Steel Equipment

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Steel Service Centre

LYSAGHT BROWNBUILT INDUSTRIES

Cnr. Coonawarra and Bombing Roads, Winnellie, Darwin
P.O. Box 4594, Darwin 5794
Building Products

OVERSEAS

UNITED KINGDOM

John Lysaght (Australia) Limited
14/15 Cockspur Street, London SW1

NEW ZEALAND

John Lysaght (New Zealand) Ltd.
Huddart Parker Building, Post Office Square
Wellington, New Zealand
G.P.O. Box 341, Wellington, New Zealand

FIJI

John Lysaght (South Pacific) Ltd.
Lakeba Street, Samabula, Suva
P.O. Box 91, G.P.O. Suva

MALAYSIA

John Lysaght (Malaysia) Sendirian Berhad
Jalan Sungei Besi
Kuala Lumpur
P.O. Box 115, Kuala Lumpur

SINGAPORE

John Lysaght (S.E. Asia) Private Ltd.
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P.O. Box 3, Jurong Town, Singapore 22

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John Lysaght (Rabaul) Pty. Ltd.
Malaguna Road, Rabaul
P.O. Box 62, Rabaul

NEW CALEDONIA

Sicotec S.A.
Perimetre Ducos, Baie De Numbo
Noumea

FOREWORD

For many years the Lysaght Referee has enjoyed the reputation of being one of the handiest and most useful reference books available to the architect, builder, farmer, plumber, student, and country storekeeper.

It is with special pride that John Lysaght (Australia) Limited presents this completely revised and up-to-date 24th edition.

Compiled by an expert staff and from recognised authoritative sources, the user will find it a mine of practical information, the greatest care having been taken throughout to ensure the accuracy of the data and tables supplied. At the same time, no responsibility can be accepted for any errors that may have escaped the attention of the editors, nor is any originality claimed for any information contained in its pages that may be readily obtainable elsewhere. The Company will be glad to receive suggestions for inclusion in later editions.

JOHN LYSAGHT (Australia) LIMITED

50 YOUNG STREET, SYDNEY

AUSTRALIA GOES METRIC

As this could conceivably be the last issue of the Lysaght Referee where values are presented in the Imperial System, it is suggested that this copy be preserved for reference purposes.

1972.

LYSAGHT — 1857-1972

Over 110 years ago a young man named John Lysaght acquired a small galvanizing works in Bristol, England. He later added a sheet rolling mill and quickly began exporting corrugated galvanized steel to Australia where it proved to be the most popular of all roofing materials.

Most of the stimulus for Lysaght growth came from Australia and well before the end of the century, Australia provided three-quarters of the total market for the company's corrugated steel.

Steel is the raw material for the production of steel sheet. Once Australia could produce this, it was natural enough that John Lysaght (Australia) Limited should begin the manufacture of steel sheet.

The first Australian galvanized steel sheet made by Lysaght was produced in 1921. Today, John Lysaght (Australia) Limited operates at the Company's Springhill Works, Port Kembla, N.S.W., one of the biggest single galvanizing works in the world. This works, together with the C.R.M. plant (wholly owned by the Company), has enabled the Sheet Manufacturing Division, centred at Port Kembla, to produce steel sheet at an annual rate of over one million tons.

The greatest period of expansion by the Company in Australia came in the 1950s when big investment was required to cope with the demands of Australia's burgeoning manufacturing industries and new developments in steel sheet as a building material.

The Company's major markets now include the automotive, building, general manufacturing, container, appliance and rural industries.

Australians, per capita, are the biggest consumers of galvanized steel in the world, and no social history of this country could be written which ignored the part

that Lysaght products played in Australian building, both domestic and commercial, rural and industrial.

The Company sells its steel sheet not only in those countries of South-East Asia and the Pacific which are accepted as Australia's natural trading partners, but in the markets of Northern Europe and the Americas, as well as Africa and the Middle East. In fact, sales of steel sheet are made to scores of countries and new markets are constantly being evaluated.

To keep pace with the growing demand for sheet steel products, John Lysaght (Australia) Limited, now in its 51st year of manufacturing in Australia, is currently undertaking the construction of a new production complex at Westernport, Victoria, to supplement its existing plants at Port Kembla, N.S.W.

To illustrate the changes which have occurred since the manufacture of Coated & Uncoated Sheet Products first commenced in Australia, the reproductions that appear on pages 10 to 14 are taken from the 12TH EDITION of THE REFEREE which was issued in 1921 following commissioning of Newcastle Works of John Lysaght (Aust.) Ltd.

LYSAGHT'S AUSTRALIAN WORKS

NEWCASTLE, N.S.W.



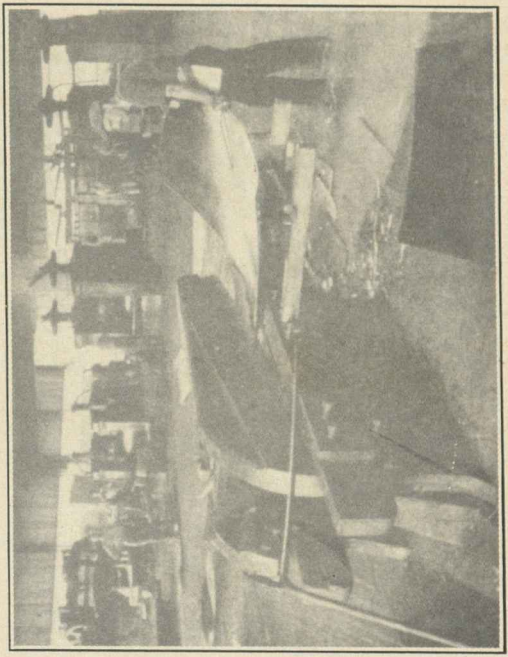
A NEW era in the history of LYSAGHT'S GALVANIZED IRON has now been entered upon.

Operations on an extensive scale have been commenced at Lysaght's Newcastle Works, and the sheets produced, both Black and Galvanized, have already won the highest approval of discriminating judges.

Illustrations in this edition will give some idea of the modern methods and machinery that are employed, and permission to inspect the works will be granted to approved applicants, if made to the Head Office, 8 Spring Street, Sydney.

Reproduced from the 12TH EDITION of THE REFEREE.

Lysaght's Newcastle Works.

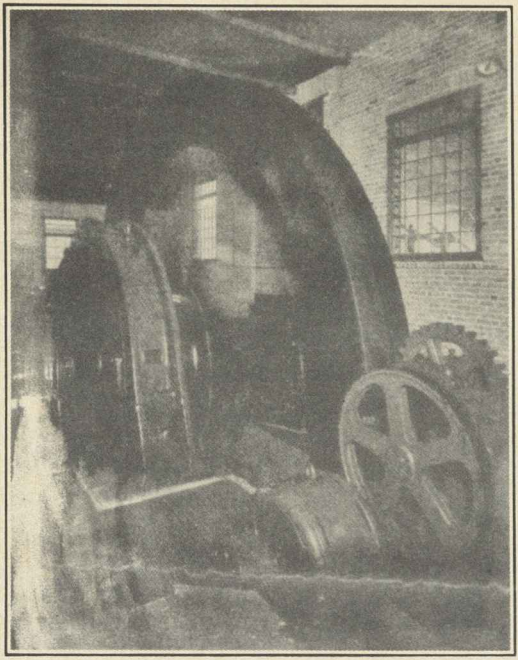


"SHEET SHEARING"
(with view of Rolling Mills in background.)

A skilled operator by means of this machine will trim sheets to required size with a remarkable degree of exactness.

Reproduced from the 12TH EDITION of THE REFEREE.

Lysaght's Newcastle Works.

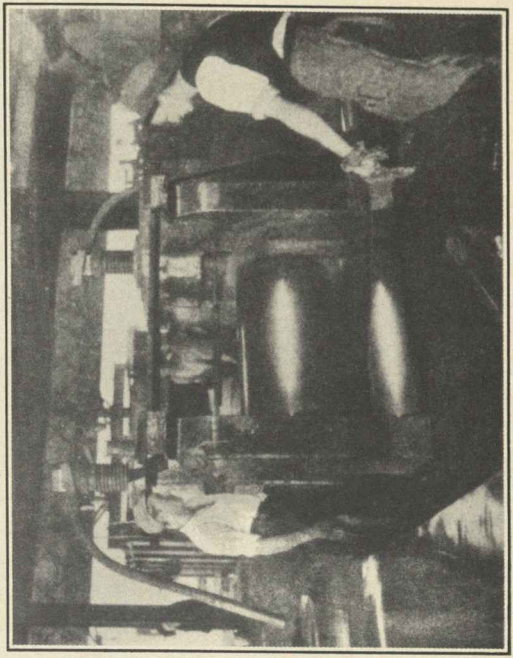


The LARGEST FLY WHEEL in the Southern Hemisphere

34ft. in diameter, 160 tons weight, driven by 1,300 K.W. motor, developing sufficient power to drive eight Rolling Mills.

Reproduced from the 12TH EDITION of THE REFEREE.

Lysaght's Newcastle Works.

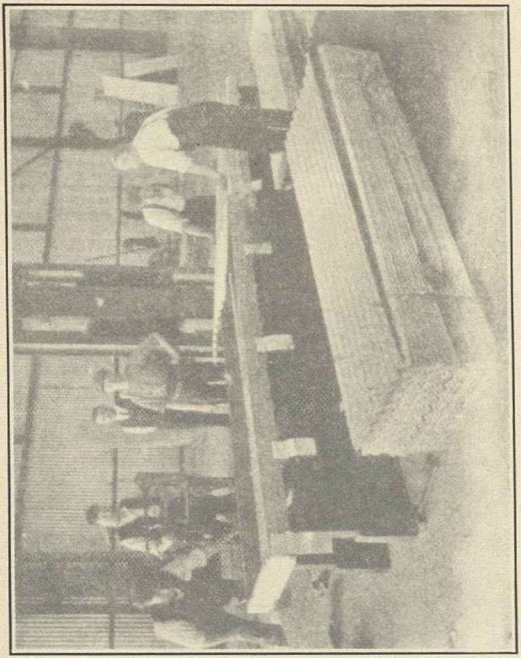


"COLD ROLLING."

One of the processes essential to a good Black or Galvanized Sheet.

Reproduced from the 12TH EDITION of THE REFEREE.

Lysaght's Newcastle Works.



"PACKING"

(A section of the Packing Shop.)

Note the care and supervision exercised to ensure that only perfect sheets are packed, and that the weight and count of sheets are correct.

Reproduced from the 12TH EDITION of THE REFEREE.

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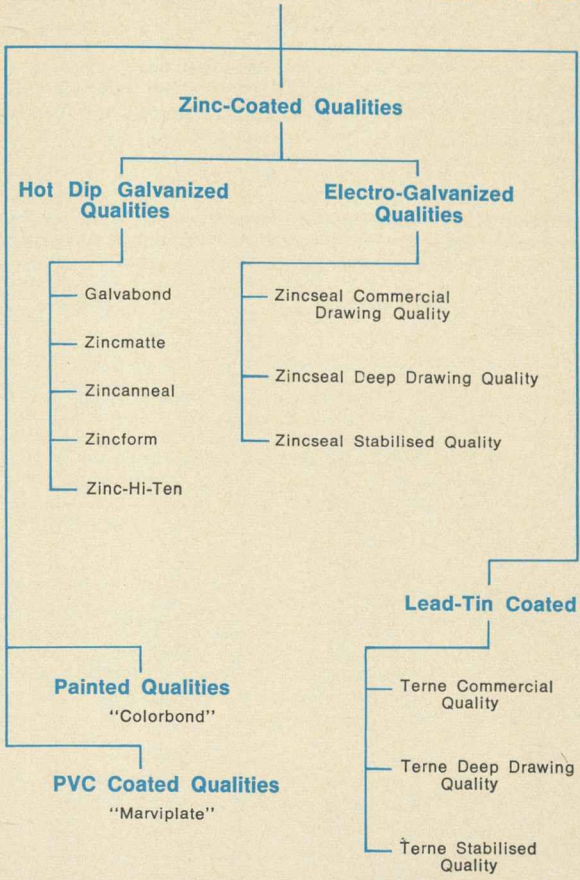


ZINC-COATED FLAT QUALITIES

INTRODUCTION

The Zinc-coated Flat Qualities marketed by John Lysaght (Australia) Limited, fall into two broad categories, depending on the method by which the coating is applied.

The first group includes those produced by the continuous hot-dip galvanizing process, and the second group includes those coated by the electro-galvanizing process. Although the objective in both the hot-dip and electro-galvanizing processes is to apply zinc as a protective coating to cold reduced steel strip, there are fundamental differences in the approach by which this is achieved.

With hot-dip galvanizing the preheated strip is coated as it passes through a bath of molten zinc. This process is more suited to the production of the heavier coating weights. Much lower coating weights may be achieved in the electro-galvanizing process as the zinc coating is deposited by electrolytic means which is subject to finer control. The process has the added advantage that the mechanical properties of the incoming strip remain unaffected.

Of all Lysaght Flat Zinc-coated Qualities, by far the most commonly used, for general fabricating purposes, is Galvabond. As there are certain applications which call for specialised characteristics which cannot be provided in Galvabond, a range of supplementary hot-dip qualities has been evolved to meet these requirements. This includes —

Zincmatte

Zincanneal

Zincform

Zinc-Hi-Ten

Zincmatte and the Zincanneal qualities are basically similar to Galvabond in so far as they are intended as general purpose fabricating qualities, but differ in the important detail that their surfaces have been modified from that of the familiar spangled pattern of Galvabond to a smooth matt finish capable of taking high gloss paints without any surface irregularities being apparent. Zincanneal may be painted directly but Zincmatte requires pretreatment to ensure adhesion of the finishing coat.

Zincform and Zinc-Hi-Ten are not intended as general purpose qualities but have been developed to meet market requirements where the emphasis is on strength rather than general formability.

Due to their higher coating weights, qualities produced by the hot-dipped process have superior corrosion resistance to those produced by electro-galvanizing.

Qualities produced by the electro-galvanizing process are —

Zincseal Commercial Drawing Quality

Zincseal Deep Drawing Quality

Zincseal Stabilised Quality.

The forming characteristics of the Zincseal group are closely related to equivalent Lysaght uncoated qualities, as the similarity in names is intended to imply. The coating weight applied to the Zincseal group gives excellent protection during storage and fabrication and to some degree in service, provided the manufactured article is painted. As normally supplied, Zincseal qualities have the added advantage of "direct on" paintability.

A summary comparing the major characteristics of various zinc-coated qualities is set out on pages 22 & 23.

A GENERAL GUIDE TO COMPARATIVE FEATURES

QUALITY	GALVABOND	ZINCMATTE	ZINCANNEAL	ZINCFORM	ZINC-HI-TEN	ZINCSEAL
PROCESS	HOT-DIP	HOT-DIP	HOT-DIP	HOT-DIP	HOT-DIP	ELECTRO-LYTIC
Characteristics						
1) Main Feature	General Purpose	Smooth Surface	For Direct On Paint-ability	Improved Strength	High Strength	Protection during Fabrication – Direct On Paintability.
2) Corrosion Resistance	Good to Excellent*	Good	Fair to Good*	Very good to Excellent*	Very Good	Low
3) Surface Finish	Bright Spangled	Smooth	Smooth Matt	Bright Spangled	Bright Spangled	Smooth Matt
4) Paintability	Pretreatment required	Pretreatment required	Direct On	Pretreatment required	Pretreatment required	Direct On
Suitable Operations						
Roll-Forming—Bending	Excellent	Excellent	Moderate	Excellent	Restricted	Excellent
Pressing—Drawing	Very Good	Very Good	Moderate	Not Recom-mended	Unsuitable	Excellent

Lock-Forming	Excellent	Excellent (non temper rolled re-commended)	Not Recom-mended	Not Recom-mended	Unsuitable	Excellent
Soldering	Excellent	Excellent	Good	Excellent	Excellent	Excellent
Welding	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Coating	Zinc	Zinc	Zinc-iron alloy	Zinc	Zinc	Zinc
Nominal Coating Weight oz/sq ft—total both sides	1.00, 1.25, 1.75	1.00	0.5, 1.00	1.25, 1.75	1.25	0.06, 0.10
Thickness Range	0.0100–0.125	0.0240–0.063	0.0200–0.063	0.013–0.031	0.030–0.125	0.0120–0.063
Colour	Silver Grey	Silver Grey	Grey	Silver Grey	Silver Grey	Grey
Length	Cut Lengths & Coil	Cut Lengths & Coil	Cut Lengths & Coil	Coil only	Cut Lengths & Coil	Cut Lengths & Coil
Australian Standard Specification	G 24–1967 Commercial Grades A & B	G 24–1967 Commercial Grades A & B		G 24–1967 Commercial Grades A & B		

*Depends on coating weight selected.

GALVABOND

Galvabond is a general purpose zinc-coated flat quality and is the most widely used of the Lysaght zinc-coated qualities. It is suitable for a broad range of applications demanding a high standard of formability, coating adhesion and resistance to corrosion. Several optional coating weights are available to suit specific applications.

In the standard coating weight of 1.25 oz/sq ft, Galvabond will permit severe forming (including lock-forming) and many drawing operations. For the more critical drawing or spinning operation it is often possible to modify the properties to suit the application. The heavier coating weights, while giving excellent protection against aggressively corrosive conditions, are not guaranteed for close forming.

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 under Painting (page 137) and in the Technical Information leaflet — Painting, available from any State Office of John Lysaght (Australia) Limited. Where higher standards of paint finish are required, alternative qualities (such as Zincmatte or Zincanneal) are available.

APPLICATIONS

Galvabond is a general purpose zinc-coated flat quality, with a range of optional coating weights and a capacity to permit many forming operations. Typical applications are:—

Bus body framework
Cable Ladders
Containers
Door Channels
Guttering and drainpipes
Metal Signs
Meter Boxes
Motor Housings

Ducting
Expanded Metal
Fascias and Trims
Garage Doors
Garbage Cans
Poultry Feeding Equipment
Ridging and Valleys
Washing Machine Components
Wheelbarrows

ZINCMATTE

Zincmatte is a corrosion-resistant flat quality with a coating modified to produce a smooth, silver-grey surface with a virtual absence of visible spangle pattern. Zincmatte is intended for high gloss paint finishes, but pretreatment is necessary to promote paint adhesion. Where pretreatment involving phosphating is intended, Zincmatte should be ordered unchromated and oiled.

Zincmatte in its basic form will permit a wide range of forming and drawing operations; more critical applications should be discussed with John Lysaght (Australia) Limited, as it is often possible to modify properties to suit particular purposes.

Soldering and welding, if carried out according to recommended practices, present no difficulties.

APPLICATIONS

Surface smoothness, the capacity to take high quality paint finishes, and good resistance to corrosion make Zincmatte suitable for both painted and unpainted applications. Among these are:—

Automotive Body Components
Washing Machine Components
Garage Doors
Window Fittings
Switchgear Cabinets

ZINCANNEAL

Modification by a post galvanizing heat treatment, which converts the coating into a zinc-iron alloy, gives Zincanneal its distinctive smooth grey surface with a complete absence of spangle appearance. The coating which possesses good adherence to the steel base, pro-

vides a corrosion-resistant surface which may be painted 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 is available in coating weights of 0.5 oz/sq ft and 1.0 oz/sq ft. The lighter coating weight has advantages in formability but must be painted for applications involving exterior exposure. If conditions of exposure are severe, Zincanneal 1.0 oz/sq ft should be used.

The mechanical properties of the base are such that Zincanneal permits many bending and forming operations, but as the zinc-iron alloy coating has only limited ductility, powdering will occur if the deformation becomes excessive. The lighter coating weight 0.5 oz/sq ft being thinner, gives a better performance under exacting deformation.

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

APPLICATIONS

The direct paintability of Zincanneal to a smooth high gloss finish, combined with the corrosion resistance of the unpainted reverse side, makes this quality suitable for:—

Signs & Number Plates
Exterior Cladding
Van & Bus Bodies
Garage Doors
Hot Water Tank Jackets
Air Conditioners
Commercial Refrigerators & Freezers
Cool Room Panels
Domestic & Industrial Louvres
Acoustic Ceiling Tiles

ZINCFORM

Zincform is an alternative quality to Galvabond where increased minimum strength is desirable. Because it was

specifically developed for roll-formed products, such as decking and cladding, it is available in coil form only. It is not recommended for applications where spring-back or fluting are critical, e.g. Rima machines, or applications such as drawing, pressing or lockforming.

Zincform has a bright, relatively smooth appearance with a spangled surface pattern. It has excellent corrosion resistance and may be readily soldered, welded or painted. Pretreatment or priming is necessary to promote paint adhesion.

Zincform is also available in two coating weights, 1.75 oz/sq ft or 1.25 oz/sq ft. The heavier coating is recommended for roof decking and rainwater goods.

APPLICATIONS

Zincform is specifically produced to meet the requirements of a wide range of roll-formed products.

Typical applications are:—

Decking & Cladding
Gutters & Downpipes
Ridge Capping
Structural Sections

ZINC-HI-TEN

Zinc-Hi-Ten is a flat zinc-coated quality produced to meet a specific market demand for a high strength galvanized sheet with very good corrosion resistance. Careful design will often make it possible to achieve savings in costs by allowing the substitution of lighter gauge Zinc-Hi-Ten for the heavier gauges otherwise required in Galvabond. 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.

While it is not intended for the same wide range of applications as Galvabond, Zinc-Hi-Ten has been used successfully in many roll-forming and bending operations.

Zinc-Hi-Ten 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 Zinc-Hi-Ten is usually used in a lighter gauge without any loss of structural strength. The technique of forming Zinc-Hi-Ten consists mainly in making provision for more liberal radii of bends, for slightly increased die clearances, and for more springback.

Zinc-Hi-Ten 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 Galvabond. Priming or pretreatment is necessary before painting to achieve satisfactory adhesion.

APPLICATIONS

The specialised properties of Zinc-Hi-Ten make it suitable for a number of applications including:—

Structural Decks
Tubing
Silo Straps
Shipping Containers
Fence Droppers
Automobile Window Winders
Windmill Blades

ZINCSEAL

Zincseal is an electro-galvanized flat sheet quality, with a light zinc coating which provides excellent resistance to corrosion during storage and fabricating operations. In this respect the "dry" (i.e. unoiled) Zincseal sheets are definitely superior to uncoated sheet as the necessity for oiling in-process stock is eliminated. Electro-galvanized sheets are not intended as a substitute for hot-dipped galvanized sheet in corrosive environments.

Because of the relative thinness of the electro-coating, its fine-grained structure and the ductility of pure zinc, Zincseal can be subjected to all normal fabricating processes, such as deep drawing, spinning and pressing, without the coating showing any tendency to flake or peel. In fact some operation such as drawing are

facilitated because the zinc coating acts as a lubricant and die lives are increased.

The phosphate coating applied to Zincseal qualities during processing allows the direct application of high gloss paint finishes without priming. For applications involving exterior exposure an etch primer coat is recommended for added protection.

Appreciably enhanced corrosion resistance is obtained when suitable paint is applied to Zincseal. And the total service life is considerably greater than the sum of the separate lives of the zinc and the paint coatings.

Zincseal qualities offer the following advantages:—

(a) A zinc coating sufficient to provide protection during storage and fabrication and an added degree of protection in service under paint.

(b) Forming and drawing characteristics equivalent to those of the majority of Lysaght uncoated cold reduced low carbon qualities.

(c) A smooth phosphated surface suitable for the direct on application of high gloss finishes.

The three Zincseal qualities

Zincseal CDQ (Commercial Drawing Quality)

Zincseal DD (Deep Drawing Quality)

Zincseal ST (Stabilised Quality)

cover the whole range of forming and drawing operations, from moderate deformation to those of the most demanding nature involving a considerable degree of stretch forming.

Both Zincseal CDQ and DD are processed to be free from stretcher strain at the time of shipment, but freedom from stretcher strain during pressing may only be assured by effective roller levelling before pressing. Zincseal ST should be specified when continuing freedom from stretcher strain is required.

The zinc coating of Zincseal is tightly adherent and its ductility more than matches that of the steel base in drawing and forming operations.

Zincseal is readily welded and soldered but in these operations care must be taken to avoid damage to the light zinc coating.

Zincseal is normally supplied in the phosphated condition for direct on finishing with high gloss paints. The phosphate film is very durable and no loss of adhesion is experienced after forming or, in many cases, after drawing operations. If, however, the film should be damaged by severe working, paint adhesion may be restored by etch priming. Cleaning after fabrication is usually limited to wiping off process oils or any lubricant applied during fabrication.

APPLICATIONS

Zincseal's direct on paintability, smoothness of surface and excellent drawability make it most suitable as a replacement for uncoated steel sheets in a considerable range of products. Among many applications for Zincseal are:—

Switchgear Cabinets
Flexible Tubing
Fluorescent Lights
Convection Heaters
Bathroom Cabinets
Automotive Components
Kitchen Furniture
Stove Parts
Machinery Covers
Office Furniture
Partitioning
Drying Cabinets
Doors
Space Heaters
Bus & Van Bodies
Lift Doors & Panels
Acoustic Ceiling Tiles
Plasterers' Angles

FLAT ZINC-COATED SECONDS & MILL REJECTS

The strict inspection standards applied to Lysaght Flat Zinc-Coated qualities, result in the re-classification of some material falling outside the acceptable limits for primes, as Leopard (or seconds) and Mill Rejects.

In view of the suitability of these classifications for a wide range of applications Leopard (or seconds) and Mill Rejects are made available to customers.

Second quality sheet with a spangled pattern similar to Galvabond in appearance is marketed under the brand name of Leopard. Other second quality flat zinc-coated sheet is marketed under the original quality name followed by the word "Seconds" e.g. Zincanneal Seconds.

Mill Rejects are identified as either:—

Galvanized Mill Rejects (Spangled Product)

Zincmatte Mill Rejects (Non Spangled Product)

Zincanneal Mill Rejects (Modified Coating)

ZINC-COATED FLAT QUALITIES

APPROXIMATE WEIGHT PER SHEET IN LB AND SHEET COUNT PER NOMINAL TON
(For coating weight of 1.25 oz/sq ft)

Gauge	Length	Width									
		24″		30″		36″		42″		48″	
		Sheet Weight	Sheet Count	Sheet Weight	Sheet Count	Sheet Weight	Sheet Count	Sheet Weight	Sheet Count	Sheet Weight	Sheet Count
10 BG	72 Inches	62.1	36	77.7	29	93.2	24	108.7	21	124.3	18
12 BG		49.5	45	61.8	36	74.2	30	86.6	26	98.9	23
14 BG		39.4	57	49.2	46	59.1	38	68.9	33	78.7	28
16 BG		31.5	71	39.4	57	47.3	47	55.2	41	63.1	36
18 BG		25.2	89	31.5	71	37.8	59	44.0	51	50.4	44
20 BG		20.1	111	25.2	89	30.2	74	35.2	64	40.3	56
22 BG		16.2	138	20.3	111	24.3	92	28.4	79	32.4	69
24 BG		13.0	172	16.3	138	19.6	115	22.8	98	26.1	86
26 BG		10.5	213	13.2	170	15.8	142	18.4	122	21.2	106
26 Comm.		8.9	251	11.2	201	13.4	167	15.6	143	17.8	126
28 BG		8.6	261	10.7	209	12.9	174	15.0	149	17.2	131
30 BG		7.0	322	8.7	257	10.4	215	12.2	184	13.9	161
10 BG	84 Inches	72.5	31	90.6	25	108.7	21	126.9	18	145.0	15
12 BG		57.7	39	72.1	31	86.6	26	101.0	22	115.4	19
14 BG		45.9	49	57.4	39	68.9	33	80.4	28	91.9	24
16 BG		36.8	61	46.0	49	55.2	41	64.4	35	73.6	30
18 BG		29.4	76	36.7	61	44.0	51	51.4	44	58.7	38
20 BG		23.5	95	29.4	76	35.2	64	41.1	55	47.0	48
22 BG		18.9	118	23.6	95	28.4	79	33.1	68	37.8	59
24 BG		15.2	147	19.0	118	22.8	98	26.6	84	30.4	74

26 BG		12.3	182	15.4	146	18.4	122	21.5	104	24.6	91
26 Comm.		10.4	215	13.0	172	15.6	143	18.2	123	20.8	108
28 BG		10.0	224	12.5	179	15.0	149	17.5	128	20.0	112
30 BG		8.1	276	10.2	221	12.2	184	14.2	158	16.2	138
10 BG		82.8	27	103.6	22	124.3	18	145.0	15	165.7	14
12 BG		65.9	34	82.4	27	98.9	23	115.4	19	131.9	17
14 BG		52.5	43	65.6	34	78.7	28	91.9	24	105.0	21
16 BG		42.0	53	52.6	43	63.1	36	73.6	30	84.1	27
18 BG		33.6	67	42.0	53	50.4	44	58.7	38	67.1	33
20 BG	96	26.8	83	33.6	67	40.3	56	47.0	48	53.7	42
22 BG	Inches	21.6	104	27.0	83	32.4	69	37.8	59	43.2	52
24 BG		17.4	129	21.7	103	26.1	86	30.4	74	34.8	64
26 BG		14.0	159	17.6	128	21.1	106	24.6	91	28.1	80
26 Comm.		11.9	188	14.9	151	17.8	126	20.8	108	23.8	94
28 BG		11.4	196	14.3	157	17.2	131	20.0	112	22.9	98
30 BG		9.3	241	11.6	193	13.9	161	16.2	138	18.6	121
10 BG		93.2	24	116.5	19	139.8	16	163.1	14	186.4	12
12 BG		74.2	30	92.7	24	111.3	20	129.8	17	148.4	15
14 BG		59.1	38	73.8	30	88.6	25	103.4	22	118.1	19
16 BG		47.3	47	59.1	38	71.0	32	82.8	27	94.6	24
18 BG		37.8	59	47.2	47	56.6	40	66.1	34	75.5	30
20 BG	108	30.2	74	37.7	59	45.3	49	52.8	42	60.4	37
22 BG	Inches	24.3	92	30.4	74	36.5	61	42.6	53	48.6	46
24 BG		19.6	115	24.4	92	29.3	76	34.2	65	39.1	57
26 BG		15.8	142	19.8	113	23.7	95	27.6	81	31.6	71
26 Comm.		13.4	167	16.7	134	20.1	112	23.4	96	26.8	84
28 BG		12.9	174	16.1	139	19.3	116	22.5	100	25.7	87
30 BG		10.4	215	13.0	172	15.7	143	18.3	123	20.9	107

ZINC-COATED FLAT QUALITIES (Continued)

APPROXIMATE WEIGHT PER SHEET IN LB AND SHEET COUNT PER NOMINAL TON
(For coating weight of 1.25 oz/sq ft)

Gauge	Length	Width									
		24″		30″		36″		42″		48″	
		Sheet Weight	Sheet Count	Sheet Weight	Sheet Count	Sheet Weight	Sheet Count	Sheet Weight	Sheet Count	Sheet Weight	Sheet Count
10 BG	120 Inches	103.6	22	129.4	17	155.3	14	181.2	12	207.1	11
12 BG		82.4	27	103.0	22	123.6	18	144.2	16	164.9	14
14 BG		65.6	34	82.0	27	98.4	23	114.8	20	131.2	17
16 BG		52.6	43	65.7	34	78.8	28	92.0	24	105.1	21
18 BG		42.0	53	52.4	43	62.9	36	73.4	31	83.9	27
20 BG		33.6	67	41.9	53	50.3	45	58.7	38	67.1	33
22 BG		27.0	83	33.8	66	40.5	55	47.3	47	54.0	41
24 BG		21.7	103	27.2	83	32.6	69	38.0	59	43.4	52
26 BG		17.6	128	22.0	102	26.3	85	30.7	73	35.1	64
26 Comm.		14.9	151	18.6	121	22.3	100	26.0	86	29.7	75
28 BG		14.3	157	17.9	125	21.4	104	25.0	90	28.6	78
30 BG		11.6	193	14.5	154	17.4	129	20.3	110	23.2	97
10 BG		113.9	20	142.4	16	170.9	13	199.4	11	227.8	10
12 BG		90.7	25	113.3	20	136.0	16	158.7	14	181.3	12
14 BG		72.2	31	90.2	25	108.3	21	126.3	18	144.4	16
16 BG		57.8	39	72.3	31	86.7	26	101.2	22	115.6	19

18 BG		46.2	49	57.7	39	69.2	32	80.8	28	92.3	24
20 BG	132	36.9	61	46.1	49	55.4	40	64.6	35	73.8	30
22 BG	Inches	29.7	75	37.2	60	44.6	50	52.0	43	59.4	38
24 BG		23.9	94	29.9	75	35.8	63	41.8	54	47.8	47
26 BG		19.3	116	24.1	93	29.0	77	33.8	66	38.6	58
26 Comm.		16.4	137	20.4	110	24.5	91	28.6	78	32.7	69
28 BG		15.7	142	19.6	114	23.6	95	27.5	81	31.4	71
30 BG		12.8	176	16.0	140	19.1	117	22.3	100	25.5	88
10 BG		124.3	18	155.3	14	186.4	12	217.5	10	248.6	9
12 BG		98.9	23	123.6	18	148.4	15	173.1	13	197.8	11
14 BG		78.7	28	98.4	23	118.1	19	137.8	16	157.5	14
16 BG		63.1	36	78.8	28	94.6	24	110.4	20	126.2	18
18 BG		50.4	44	62.9	36	75.5	30	88.1	25	100.6	22
20 BG	144	40.3	56	50.3	45	60.4	37	70.5	32	80.5	28
22 BG	Inches	32.4	69	40.5	55	48.6	46	56.8	39	64.8	35
24 BG		26.1	86	32.6	69	39.1	57	45.6	49	52.1	43
26 BG		21.1	106	26.3	85	31.6	71	36.9	61	42.1	53
26 Comm.		17.8	126	22.3	100	26.8	84	31.2	72	35.7	63
28 BG		17.2	131	21.4	104	25.7	87	30.0	75	34.3	65
30 BG		13.9	161	17.4	129	20.9	107	24.4	92	27.8	80

26 gauge Commercial is a gauge that has long been established as one desirable from the commercial viewpoint. It is lighter than 26 BG and, hence, its use results in the production of more sheets per ton. The use of 26g. Comm. is not recognised for such qualities as Zincanneal or Zincmatte.

TERNE SHEET

The designation Terne Sheet refers to steel sheets which have been coated with terne alloy by the hot-dip process. Terne alloy is defined as an alloy of lead and tin with no exact specified composition other than that a tin content of up to 25% is permitted for ease of manufacture. In practice, the tin content is normally within a range of 10-15%. Terne Sheet, whilst not intended for general corrosion resistant applications, does offer a protective coating with a number of special features, some of which are enumerated below:—

1. In petrol tank construction a lead-tin coating has value in connection with the possibility of reducing frictional sparks in the neighbourhood of petrol vapours. Another important advantage of Terne Sheet in this application is that, even if the fuel tank is severely dented, the coating will not flake or powder so that there is no risk of particles of the coating clogging fuel lines, etc.

2. Soldering is greatly facilitated; the coating being composed of lead and tin (as is commercial solder) it is consequently natural that it should solder easily.

3. Drawing operations are made easier because the coating acts as an excellent lubricant and reduces friction and wear on the dies to a minimum.

4. Terne Sheet provides a good surface for painting, the only preparation normally needed is degreasing.

Terne Sheets are produced in three qualities:—

Terne Commercial Quality.

Terne Deep Drawing Quality.

Terne Stabilized Quality.

COLORBOND

Colorbond is a high quality prepainted steel sheet or coil which can be fabricated into an end product without further treatment. Produced on a high speed continuous coil coating line, Colorbond is available with a base of cold reduced uncoated or zinc-coated steel.

A wide range of colour-coating finishes and gloss levels has been developed for all types of applications, both interior and exterior. These paints can be applied on either one or both sides of steel coil in the same or different colours.

Colorbond can be drawn, roll-formed, lock-formed, stamped or brake pressed without damage to the coating. In fact, the paint surface or coating aids, in some fabricating techniques, by acting as a lubricant and can measurably increase die life.

Colorbond is available in widths from 1 in to 48 in and in thicknesses from 0.012 in to 0.050 in. Other thicknesses may be available on application.

Typical Colorbond Coating Materials and Applications

Generally speaking, the end product dictates what paint finish or type of coating is needed and the following briefly outlines the most frequently used coatings and their characteristics.

INTERIOR APPLICATIONS

ACRYLICS.— Acrylics are hard mar-resistant coatings which are used for selected applications in the building, lighting and appliance industries. They are not as flexible or formable as vinyls but have excellent resistance to heat and chemicals, in particular, household stains, acids, alkalis and detergents. On galvanized steel they are normally supplied over a corrosion-inhibitive primer.

Typical Applications.— Fluorescent light fittings, appliances such as washing machines, refrigerators, water heaters, etc.

COLORBOND (Cont.)

INTERIOR APPLICATIONS

VINYL.— This paint system has been developed for indoor applications which demand a high degree of formability and/or corrosion resistance.

Typical Applications.— Recommended for automotive components, seam tubing, light fittings, curtain rods, shelving, metal furniture and applications involving severe fabrication.

SPOT WELDABLE PRIMER.— This is an epoxy primer with suitable formulation to allow spot-welding without the need for removing the primer from the weld area.

Typical Applications.— Such items as bus body parts, washing machine parts; in fact, wherever spot-welding is required.

EPOXY PRIMERS.— There are several epoxy primers available. These can be overpainted with most stoving or air-drying finishes. They may be obtained with either red oxide or zinc chromate as the corrosion inhibitor. Zinc chromate is more suitable when light colours are used for overpainting. The primers serve to give additional corrosion resistance both before and after overpainting.

Typical Applications.— In some applications where small production runs of a wide colour range are carried out it is more convenient to paint after forming rather than use prepainted stock. Preprimed material is ideal for these applications as its use makes it possible to combine the superior pretreatment and adhesion advantages of coil coating with the flexibility required for short-run production.

STRIPPABLE COATING.— This is a clear coating which has excellent cohesive properties. It is ideal for protecting metals of a high surface finish during fabrication, after which it may be peeled off, leaving a scratch free surface.

COLORBOND (Cont.)

EXTERIOR APPLICATIONS

VINYL.— Developed specifically for exterior applications, this paint system provides excellent corrosion resistance and durability. It also possesses outstanding flexibility in fabricating operations, particularly roll-forming and drawing.

Typical Applications.— General exterior uses are:— cool-room panelling, swimming pool components and exterior applications involving severe fabrication.

SILICONE POLYESTERS.— Developed specifically for exterior applications, this premium quality paint system provides outstanding resistance to fading and chalking, coupled with excellent corrosion resistance. It has sufficient flexibility to withstand the general fabrication associated with building products and, in particular, roll-forming. Silicone Polyesters are applied over a corrosion inhibitive primer.

Typical Applications.— General exterior use for wall cladding, roofing shapes, rainwater goods — where a superior degree of fade and chalk resistance combined with outstanding durability is required.

MARVIPLATE

Marviplate is manufactured by bonding a film of polyvinyl chloride to the surface of either plain or galvanized steel sheet.
Marviplate may be fabricated into a wide range of products by drawing, roll- or lock-forming, spinning, stamping or brake pressing without any further finishing treatment.
The polyvinyl chloride coating is highly resistant to fading and discoloration and will withstand most common chemicals and corrosive atmospheres.
A wide range of styles and finishes are available for both interior and exterior applications.
Further details are available from any state office of John Lysaght (Australia) Limited.

SUMMARY OF UNCOATED SHEET QUALITIES

Hot Rolled Qualities

- HR Commercial Quality
- HR Pickled Commercial Quality
- HR Drawing Quality
- HR C15
- HR C20
- HR C30
- HR C65
- HR Ly-Ten
- HR LPG Cylinder Steel

Cold Reduced Qualities

- CR Lynamel Decarburized Enamelling Quality
- CR Commercial Drawing Quality
- CR Deep Drawing Quality
- CR Stabilised Quality
- CR C20
- CR C65
- CR Ly-Ten
- CR LPG Cylinder Steel
- Electrical Steel

HOT ROLLED UNCOATED FLAT QUALITIES

Lysaght hot rolled qualities are produced from selected slab steel by the continuous rolling process.

As rolling takes place at temperatures in excess of those at which oxidation occurs, hot rolled qualities, unless pickled, characteristically carry a surface scale.

Hot rolled cut lengths and coil may be supplied in the as-rolled condition or with such subsequent treatments as pickling, annealing, oiling, side trimming, temper rolling, stretcher levelling or resquaring, depending on the quality and the customer's specified requirements.

John Lysaght (Australia) Limited hot rolled products are marketed as the following qualities:

HR CQ	Hot Rolled Commercial Quality
HR P CQ	Hot Rolled Pickled Commercial Quality
HR DQ	Hot Rolled Drawing Quality
HR C15	Hot Rolled Sheet, Nominal Carbon Content 0.15%
HR C20	Hot Rolled Sheet, Nominal Carbon Content 0.20%
HR C30	Hot Rolled Sheet, Nominal Carbon Content 0.30%
HR C65	Hot Rolled Sheet, Nominal Carbon Content 0.65%
HR LY-TEN	Hot Rolled Low-Alloy High-Tensile Quality
HR LPGC	Hot Rolled Liquefiable Petroleum Gas Cylinder Quality

HR CQ, HR P CQ and HR DQ may be ordered to AS G16-1967;

HR LPGC to AS B239 — Grades 5 and 6. Other world standards also apply.

There are no relevant Australian standards for HR C15, HR C20, HR C30 and HR C65.

Hot Rolled Seconds and Mill Rejects are also available.

GENERAL GUIDE TO COMPARATIVE FEATURES

	HR CQ	HR P CQ	HR DQ
Surface	Not pickled	Pickled and oiled	Pickled and oiled
Formability	Forming and bending (not recommended for pressing because of surface oxide)	Simple pressing	Moderate drawing
Welding	Excellent	Excellent	Excellent
Thickness Cut Lengths Coil	 0.062in–0.125in 0.062in–0.125in	 0.062in–0.187in 0.062in–0.187in	 0.075in–0.187in 0.075in–0.187in
Applications	Items not requiring a quality finish	Items not requiring a quality finish	Drawn items where appearance is not of prime importance
Australian Standard Specifications	AS G16/HR4	AS G16/HRP4	

	HR C15	HR C20	HR C30
Surface	Pickled and oiled	Pickled and oiled	Not pickled
Formability	Moderate drawing	Moderate forming and bending	Limited forming and bending
Welding	Excellent	Excellent	Satisfactory
Thickness Cut Lengths Coil	 0.062in–0.187in 0.062in–0.187in	 0.062in–0.187in ——	 0.062in–0.125in ——
Applications	Primarily designed for automobile wheel centres	Automobile chassis and frames, lamp standards, etc.	Items requiring greater strength and stiffness with limited formability
Australian Standard Specifications	——	——	——

GENERAL GUIDE TO COMPARATIVE FEATURES (Cont.)

	HR C65	HR LY-TEN	HR LPGC
Surface	Not pickled	Not pickled	Pickled and oiled
Formability	Limited forming and bending	Moderate forming and bending	Moderate drawing
Welding	Limited	Excellent	Excellent
Thickness Cut Lengths Coil	0.078in–0.125in ——	0.085in–0.125in ——	0.088in–0.125in ——
Applications	Items requiring fully hardenable steel which retains a good cutting edge or abrasion resistance	Items requiring higher tensile strength, improved resistance to abrasion and atmospheric corrosion	Primarily designed for cylinders for liquefiable petroleum gas
Australian Standard Specifications	——	——	AS B239 Grades 5 and 6

HR CQ
HOT ROLLED COMMERCIAL QUALITY

DESCRIPTION

HR CQ, available in both cut lengths and coil, is supplied in the as-rolled condition with a minimum of adherent surface oxides. Some minor surface faults may be included.

It is suitable for normal bending, forming and welding operations and for applications where the presence of oxides and some surface imperfections are not objectionable. It is not recommended for items requiring a quality finish.

HR CQ sheet should meet minimum bend tests, but is not subject to other mechanical test requirements.

APPLICATIONS

HR CQ is typically used for
Heavy-gauge drums and tanks
Shelving
Piping
Concrete mixers
Light structural members
Concrete formwork.

HR P CQ
HOT ROLLED
PICKLED COMMERCIAL QUALITY

DESCRIPTION

HR P CQ, supplied in both cut lengths and coil, has similar mechanical properties to HR CQ and is suitable for the same types of forming and working operations. It may be used for some simple pressing applications. The surface is free from oxides and is oiled.

APPLICATIONS

HR P CQ is typically used for
Rolling stock
Automotive components
Rotary mowers
Agricultural machinery.

HR DQ
HOT ROLLED DRAWING QUALITY

DESCRIPTION

HR DQ, available in both cut lengths and coil, is intended for moderate drawing and severe forming applications where the surface finish is not of prime importance and some surface imperfections can be tolerated.

To prevent excessive die scoring, HR DQ is only supplied pickled, free from any surface oxides. Cut lengths are normally oiled; coil always oiled.

APPLICATIONS

HR DQ is typically used for
Sealed unit housings
Hydraulic jacks
Automotive brake components
Clutch parts
Compressors.

HR C15
HOT ROLLED SHEET, NOMINAL CARBON CONTENT 0.15%

DESCRIPTION

HR C15 is a heavy gauge product suitable for drawn components requiring some additional strength compared to the normal drawing grades.
HR C15 cut lengths and coil are supplied pickled and oiled unless otherwise specified.

APPLICATIONS

Automobile wheel centres and similar products are the main applications.

HR C20
HOT ROLLED SHEET, NOMINAL CARBON CONTENT 0.20%

DESCRIPTION

HR C20, available in cut lengths only, is suitable for moderate forming and bending operations. It is not recommended for drawing.
The increased carbon content, as compared with HR C15, gives greater mechanical strength and hardness, but tends to lower formability.
HR C20 is supplied pickled and oiled unless otherwise specified.

APPLICATIONS

HR C20 is typically used for automobile chassis frames and components, and lamp standards.

HR C30
HOT ROLLED SHEET, NOMINAL CARBON CONTENT 0.30%

DESCRIPTION

HR C30, available in cut lengths only, has a carbon content which provides greater strength and stiffness as compared with HR C20, while retaining limited formability. The mechanical properties vary with gauge and rolling conditions.

APPLICATIONS

HR C30 is typically used for light structural members and similar components.

HR C65
HOT ROLLED SHEET, NOMINAL CARBON CONTENT 0.65%

DESCRIPTION

HR C65, supplied in cut lengths only, is primarily intended for applications requiring a good cutting edge or resistance to abrasion.

As normally supplied, it is incapable of withstanding a significant amount of cold working. If ordered pickled and annealed it will be suitable for simple cold forming, but for substantial deformation it should be hot worked and radii should be liberal.

APPLICATIONS

HR C65 is typically used for

Agricultural machinery

Cane knives

Garden tools

Machetes

Plough discs

Shovels

HR LY-TEN
HOT ROLLED
LOW-ALLOY HIGH-TENSILE QUALITY

DESCRIPTION

HR Ly-Ten is a hot rolled low-alloy product, which combines high tensile strength with

1. improved resistance to atmospheric corrosion
2. greater impact resistance
3. high endurance limits
4. greater abrasion resistance
5. improved workability and weldability when compared to ordinary carbon grade steels of similar tensile strength.

HR Ly-Ten, available in cut lengths only, is normally used for applications which require heavier gauges than can be produced by cold reduction, or where the surface finish of the manufactured article is not critical, allowing the use of the cheaper hot rolled quality.

Careful basic design is essential to take full advantage of the enhanced properties of HR Ly-Ten. Advice should be sought from John Lysaght (Australia) Limited in applications for which this quality is used.

APPLICATIONS

HR Ly-Ten is typically used for
Chassis frames
Truck bodies
Rail trucks
Containers.

HR LPGC
HOT ROLLED LIQUEFIABLE
PETROLEUM GAS CYLINDER QUALITY

DESCRIPTION

HR LPGC is a hot rolled low-alloy steel quality produced specifically for the manufacture of liquefiable petroleum gas cylinders.

It is normally supplied pickled and oiled and is available in cut lengths only.

A final heat treatment must be carried out in accordance with Australian Standard B115 to develop the requisite mechanical properties.

APPLICATIONS

Liquefiable petroleum gas cylinders.

COLD REDUCED FLAT QUALITIES

Lysaght Cold Reduced qualities are produced by a rolling process at temperatures substantially below that at which scaling or oxidation may occur, resulting in a smooth, matt surface which is suitable for most finishing operations.

The raw material for cold reduction is pickled, hot rolled coil. A continuous rolling operation reduces the thickness of this coil from between 50-80% to achieve the desired final thickness.

Rolling is usually followed by annealing, temper rolling, roller levelling, oiling, etc., to develop the properties required for the end use. These properties are superior to those of hot rolled qualities.

Most cold reduced qualities are supplied in either cut lengths or coil.

John Lysaght (Australia) Limited cold reduced products are marketed as the following qualities, each with a particular suitability to certain selected end applications:

CR CDQ	Cold Reduced Commercial Drawing Quality
CR CDQ NT	Cold Reduced Commercial Drawing Quality, Not Temper Rolled
CR DD	Cold Reduced Deep Drawing Quality
CR DD NT	Cold Reduced Deep Drawing Quality, Not Temper Rolled
CR ST	Cold Reduced Stabilized Quality
CR C20	Cold Reduced Quality, Nominal Carbon Content 0.20%

CR C65	Cold Reduced Quality, Nominal Carbon Content 0.65%
CR LY-TEN	Cold Reduced Low-Alloy High-Tensile Quality
LYNAMEL	Cold Reduced Decarburized Enamelling Quality
CR LPGC	Cold Reduced Liquefiable Petroleum Gas Cylinder Quality

CR CDQ, CR CDQ NT, CR DD, CR DD NT and CR ST may be ordered to AS G16-1967; CR LPGC to AS B115 Grades 5 and 6. Other world standards also apply.

There are no relevant Australian standards for CR C20, CR C65, CR Ly-Ten or Lynamel.

Cold Reduced Seconds and Mill Rejects are also available.

GENERAL GUIDE TO COMPARATIVE FEATURES

	CR CDQ	CR CDQ NT	CR DD	CR DD NT
Surface	Full finish	General purpose finish	Full finish	General purpose finish
Formability	Moderate drawing	Moderate drawing	Deep drawing	Deep drawing
Welding	Excellent	Excellent	Excellent	Excellent
Thickness Cut lengths Coil	0.012in–0.125in 0.020in–0.080in	0.017in–0.125in 0.020in–0.080in	0.024in–0.062in 0.024in–0.062in	0.024in–0.062in 0.024in–0.062in
Applications	Exposed panels	Non-exposed panels	Exposed panels	Non-exposed panels
Australian Standard Specifications	AS G16/CR3/FF AS G16/CR4/FF	AS G16/CR3/GP/NT	AS G16/CR2/FF	AS G16/CR2/GP/NT

GENERAL GUIDE TO COMPARATIVE FEATURES (Cont.)

	CR ST	CR C20	CR C65
Surface	Full finish	General purpose finish	General purpose finish
Formability	Severe drawing and stretch forming	Moderate forming and pressing	Limited forming and pressing
Welding	Excellent	Excellent	Limited
Thickness Cut lengths Coil	 0.024in–0.110in 0.024in–0.062in	 0.031in–0.112in 0.031in–0.112in	 0.039in–0.125in ———
Applications	Exposed panels	Items requiring greater strength and stiffness with limited formability e.g. structural members	Items requiring fully hardenable steel which retains a good cutting edge or abrasion resistance
Australian Standard Specifications	AS G16/ CR1/FF	———	———

	CR LY-TEN	LYNAMEL	CR LPGC
Surface	General purpose finish	General purpose finish	General purpose finish
Formability	Moderate forming and pressing	Deep drawing	Moderate drawing
Welding	Excellent	Excellent	Excellent
Thickness Cut lengths Coil	 0.039in–0.099in ———	 0.031in–0.080in ———	 0.062in–0.125in ———
Applications	Items requiring high-tensile strength and improved resistance to abrasion and atmospheric corrosion	Items intended for vitreous enamelling including "direct on" cover coats	Primarily designed for cylinders for liquefiable petroleum gas
Australian Standard Specifications	———	———	AS B239 Grades 5 and 6

CR CDQ
COLD REDUCED
COMMERCIAL DRAWING QUALITY

DESCRIPTION

CR CDQ, available in both cut lengths and coil, is intended for pressings of moderate severity. It is subject to ageing after final processing, but freedom from stretcher strain can be obtained by flex-rolling immediately prior to pressing.

CR CDQ is produced to full finish standard and guaranteed to this standard for exposed panels. A marginal relaxation of surface standard is normal for less critical applications.

CR CDQ may be ordered to Special Surface Inspection when a premium surface is required; or to Bright Finish or Special Bright Finish.

APPLICATIONS

CR CDQ is typically used for

Interior automotive panels

Refrigerator wrappers

Washing machine wrappers

Office furniture

General pressings and spun components.

CR CDQ NT
COLD REDUCED
COMMERCIAL DRAWING QUALITY
NOT TEMPER ROLLED

DESCRIPTION

CR CDQ NT, available in both cut lengths and coil, is a non-temper rolled Commercial Drawing Quality with an added margin of drawability.

CR CDQ NT is suitable for pressings of moderate severity, but should only be used for non-exposed

panels because of severe stretcher straining when pressed. It is not subject to ageing until cold worked.
The surface of CR CDQ NT is guaranteed to be free only from defects likely to lead to difficulty in forming or pressing.
Reasonable sheet flatness may be anticipated but, with the omission of temper rolling, conformity with flatness tolerances cannot be assured.

APPLICATIONS

CR CDQ NT is typically used for automotive floor panels and similar non-exposed panels, spun components and similar applications.

CR DD
COLD REDUCED DEEP DRAWING QUALITY

DESCRIPTION

CR DD, available in both cut lengths and coil, is suitable for all but the most severe deep drawing operations. It is subject to ageing after final processing, but freedom from stretcher strain can be obtained by flex-rolling immediately before pressing.
The surface is produced to full finish standard and is suitable for external panels. For electroplated finishes Bright Finish or Special Bright Finish can be provided.

APPLICATIONS

CR DD is typically used for
Interior and exterior automotive panels
General pressings and spun components.

CR DD NT
COLD REDUCED DEEP DRAWING QUALITY NOT TEMPER ROLLED

DESCRIPTION

CR DD NT, available in both cut lengths and coil, is intended for more severe applications than CR CDQ NT.

It should only be used for non-exposed panels where stretcher straining can be tolerated. The surface is free from defects likely to lead to difficulties in forming or pressing.

Reasonable sheet flatness can be expected but, with the omission of temper rolling, conformity with normal flatness tolerances cannot be assured.

APPLICATIONS

CR DD NT is typically used for automotive floor panels and other non-exposed panels, general spun components and similar applications.

CR ST
COLD REDUCED STABILIZED QUALITY

DESCRIPTION

CR ST, available in both cut lengths and coil, is a stabilized steel processed to develop non-ageing characteristics and the highest degree of drawability. It is guaranteed to be free from ageing characteristics and from stretcher straining under normal storage conditions.

CR ST is suitable for the most demanding drawing operations, particularly those involving a considerable amount of stretch forming. The exceptional uniformity of this quality can be used to advantage in many applications since there is no necessity to alter press settings to compensate for variations in sheet properties.

CR ST is inspected to full finish standard and guaranteed to this standard for all exposed parts, but because of the nature of the basic steel used, it is not always possible to achieve a surface finish comparable to CR CDQ and CR DD.

APPLICATIONS

CR ST is typically used for automotive panels and components.

CR C20
COLD REDUCED SHEET, NOMINAL CARBON CONTENT 0.20%

DESCRIPTION

CR C20 is suitable for moderate forming and pressing where some additional strength or hardness (wear resistance) compared to lower carbon qualities is desirable. It is supplied to "general purpose surface", and is available in cut lengths and coil.

APPLICATIONS

CR C20 is typically used for lightweight moulds and structural members.

CR C65
COLD REDUCED SHEET, NOMINAL CARBON CONTENT 0.65%

DESCRIPTION

CR C65 is produced with a nominal carbon content of 0.65% and possesses a high degree of hardenability. It is available in cut lengths only.
CR C65 shows improved cold working characteristics over hot rolled annealed C65 and because of its excellent hardenability, is particularly suited for applications requiring hard-wearing surfaces or cutting edges. The sheet is free of surface oxides, thus considerably reducing tool and die wear during fabrication.
CR C65 is supplied in the annealed condition and must be heat treated to develop its full hardness.

APPLICATIONS

CR C65 is typically used for
Shovels
Plough discs
Cane knives and other hard-wearing surfaces and cutting edges.

CR LY-TEN
COLD REDUCED
LOW-ALLOY HIGH-TENSILE QUALITY

CR Ly-Ten is a cold reduced low-alloy quality produced in cut lengths and coil, with a superior surface finish to its hot rolled equivalent. It combines high-tensile strength with

1. improved resistance to atmospheric corrosion
2. greater impact resistance
3. high endurance limits
4. greater abrasion resistance
5. improved workability and weldability when compared to ordinary carbon grade steels of similar tensile strength.

Significant weight reductions, of particular consequence in the transport industry, may be achieved by careful attention in basic design to exploit the improved properties of Ly-Ten.

When substituting lighter gauge Ly-Ten sheet, the section profile must be suitably designed to provide rigidity. Advice should be sought from John Lysaght (Australia) Limited in applications for which this quality is used.

APPLICATIONS

Agricultural:	Tractors, farm implements, hoppers, bins
Construction:	Buildings, guard rails, storage tanks
Containers:	Shipping containers
Electrical:	Transformers and generator tanks, lighting standards
Mining:	Mine cars, hoppers, fan blades, bins
Shipping:	Small craft, barges
Transport:	Trailers, truck bodies, buses, railway rolling stock.

LYNAMEL
DECARBURIZED ENAMELLING QUALITY

DESCRIPTION

Lynamel is a cold reduced decarburized drawing quality produced for vitreous enamelling.
Lynamel exhibits high resistance to warpage during firing. It has excellent enamelling characteristics either for "direct on" or two coat applications.
Single "direct on" cover coats are possible with suitable techniques.

APPLICATIONS

All vitreous enamelling applications.

CR LPGC
COLD REDUCED
LIQUEFIABLE GAS CYLINDER QUALITY

CR LPGC is a cold reduced low-alloy steel quality, available in cut lengths only, produced specifically for the manufacture of welded liquefiable petroleum gas cylinders.
It is supplied in the spherodized annealed condition for easy fabrication.
A final heat treatment must be given after fabrication in accordance with Australian Standard B115 to develop the requisite mechanical properties.

APPLICATIONS

Liquefiable petroleum gas cylinders.

HOT ROLLED & COLD REDUCED
SECONDS & MILL REJECTS

The strict inspection standards applied to Lysaght Hot Rolled and Cold Reduced steel sheet result in the re-classification of some material falling outside the acceptable limits for primes, as seconds and mill rejects.
In view of the suitability of steel sheet of these classifications for a wide range of applications hot

rolled and cold reduced seconds and mill rejects are made available to customers.
Seconds retain their original quality designation e.g.

HR DQ Seconds,
CR DD Seconds.

Mill rejects are identified as Hot Rolled or Cold Reduced Mill Rejects.

ELECTRICAL STEEL QUALITIES

Lysaght cold reduced non-oriented electrical steels provide a range of grades to meet the varied requirements of the electrical industry. The cold reduced grades were introduced to replace the hot rolled grades previously produced and provide a number of advantages, including a better surface, closer gauge control and higher stacking factor.

All grades are available as wide or slit coil and in sheet form.

Heat treated laminations are also available from the Sankey Division of John Lysaght (Australia) Limited. Details of these are given in the Sankey Electrical Steel Laminations catalogue, copies of which are available on request.

BIRMINGHAM GAUGE

The standard gauge table used for Steel Sheets is known as the Birmingham Gauge, or BG. It must not be confused with either the Birmingham Wire Gauge (BWG) or the Standard Wire Gauge (SWG). Wherever the word gauge is used in these pages the Birmingham Gauge is implied.

It is useful to remember that —

10 BG is 1/8″ thick

16 BG is 1/16″ thick

and that for every increase of 6 in the number of the gauge the thickness of the sheet is reduced by a half.

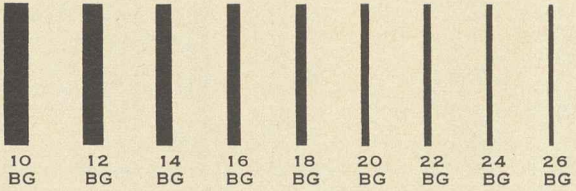


Illustration showing the approximate thickness of sheets according to the Birmingham Gauge.

Birmingham Gauge Table

Gauge No.	Thickness		lb per sq ft	Gauge No.	Thickness		lb per sq ft
	in	mm			in	mm	
8	.1570	3.988	6.406	20	.0392	0.996	1.599
9	.1398	3.551	5.704	21	.0349	0.886	1.424
10	.1250	3.175	5.100	22	.0312	0.792	1.273
11	.1113	2.827	4.541	23	.0278	0.706	1.134
12	.0991	2.517	4.043	24	.0247	0.627	1.008
13	.0882	2.240	3.600	25	.0220	0.559	0.898
14	.0785	1.994	3.203	26	.0196	0.498	0.800
15	.0699	1.775	2.852	27	.0174	0.442	0.710
16	.0625	1.588	2.550	28	.0156	0.396	0.636
17	.0556	1.412	2.268	29	.0139	0.353	0.567
18	.0495	1.257	2.020	30	.0123	0.312	0.502
19	.0440	1.118	1.795	31	0.110	0.279	0.449

STEEL SHEETS

Comparison of Sheet and Wire Gauges

Gauge Name	Birmingham Gauge (BG)	U.S. Mnfrs. Standard Gauge	Birmingham Wire Gauge (Stubs') (BWG)	Standard Wire Gauge (British) (SWG)	U.S. Steel Wire Gauge	Galv. Sheet Gauge (Japanese)
Principal Use	Steel Sheets, etc.	Steel Sheets, etc.	Steel Wire, Shts.,etc.	Steel Wire, Shts.,etc.	Steel Wire	Galv. Steel Sheets
Gge. No.	Thickness or Diameter in Inches					
4/0	.5416	—	.454	.400	.3938	
3/0	.5000	—	.425	.372	.3625	
2/0	.4452	—	.380	.348	.3310	
0	.3964	—	.340	.324	.3065	
1	.3532	—	.300	.300	.2830	.2812
2	.3147	—	.284	.276	.2625	.2656
3	.2804	.2391	.259	.252	.2437	.2500
4	.2500	.2242	.238	.232	.2253	.2344
5	.2225	.2092	.220	.212	.2070	.2187
6	.1981	.1943	.203	.192	.1920	.2031
7	.1764	.1793	.180	.176	.1770	.1875
8	.1570	.1644	.165	.160	.1620	.1719
9	.1398	.1495	.148	.144	.1483	.1562
10	.1250	.1345	.134	.128	.1350	.1406
11	.1113	.1196	.120	.116	.1205	.1250
12	.0991	.1046	.109	.104	.1055	.1094
13	.0882	.0897	.095	.092	.0915	.0937
14	.0785	.0747	.083	.080	.0800	.0781
15	.0699	.0673	.072	.072	.0720	.0703
16	.0625	.0598	.065	.064	.0625	.0625
17	.0556	.0538	.058	.056	.0540	.0562
18	.0495	.0478	.049	.048	.0475	.0500
19	.0440	.0418	.042	.040	.0410	.0437
20	.0392	.0359	.035	.036	.0348	.0375
21	.0349	.0329	.032	.032	.0317	.0344
22	.0312	.0299	.028	.028	.0286	.0312
23	.0278	.0269	.025	.024	.0258	.0281
24	.0247	.0239	.022	.022	.0230	.0250
25	.0220	.0209	.020	.020	.0204	.0219
26	.0196	.0179	.018	.018	.0181	.01875
27	.0174	.0164	.016	.0164	.0173	.01719
28	.0156	.0149	.014	.0148	.0162	.01562
29	.0139	.0135	.013	.0136	.0150	.01406
30	.0123	.0120	.012	.0124	.0140	.01250
31	.0110	.0105	.010	.0116	.0132	.01094
32	.0098	.0097	.009	.0108	.0128	.01016
33	.0087	.0090	.008	.0100	.0118	.00937
34	.0077	.0082	.007	.0092	.0104	.00859
35	.0069	.0075	.005	.0084	.0095	.00781
36	.0061	.0067	.004	.0076	.0090	.00703

GLOSSARY OF TERMS

Ageing.— Changes in the properties of steel occurring with the passage of time either at ambient or higher temperatures.

Ageing may be natural or artificial as defined below.

Natural Ageing:

Spontaneous changes in the properties of steel occurring at ambient temperature and usually following solution treatment.

Artificial Ageing:

Changes in the properties of steel occurring consequent upon its being held at some elevated temperature after solution treatment.

Annealing.— A process involving heating and cooling, applied usually to induce softening.

The term "annealing" is also used to cover treatments:—

(a) to remove stresses,

(b) to alter mechanical or physical properties,

(c) to produce a definite microstructure, and

(d) to remove dissolved gases.

Bend Test.— A test of ductility, wherein a test piece must withstand, without fracture, bending through a specified angle around a specified radius at ordinary temperatures.

Brazing.— Joining metals by fusion of a non-ferrous filler metal with a melting point above approx. 450°C, but lower than those of the metals being joined.

The process may be accomplished by means of a torch (torch brazing), in each case with an appropriate flux, or by dipping in a molten flux bath (dip or flux brazing).

Carbon Steel.— A steel, free from intentionally added alloying elements, depending for its properties substantially upon its carbon content alone.

Camber.— Camber is the greatest deviation of a side edge of a sheet from a straight line. The measurement of a camber must be taken on the concave side with a straight-edge which is in the same plane as the sheet.

Commercial Flatness.— Commercial flatness is the normal standard of flatness to which sheets are supplied and this is usually obtained by temper rolling and/or roller levelling.

Corrosion.— Destruction of a metal by electrochemical 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.

Decarburization.— 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.

Ductility.— That property of a material which permits plastic deformation before fracture.

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.

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 a corrosive environment the subsequent failure is termed corrosion fatigue.

Finish.— Finish refers to the degree of smoothness or 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.

Galvanizing.— The process of applying a coating of zinc to a surface of iron or steel to provide a corrosion resistant surface.

Zinc coating may be applied by hot-dipping, electroplating, solid state diffusion (sherardizing) or spraying; the last two are not usually termed galvanizing.

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°C.

Mechanical Properties.— Properties relating to the behaviour of materials under load in conventional mechanical tests, such as elastic moduli, tensile strength, elongation, hardness.

Normalizing.— Heating steel to, and if necessary holding at, a suitable temperature above the transformation range, followed by cooling in a still atmosphere at 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. In hyper-eutectoid plain carbon steels, however, heating to the temperature and for the time necessary for complete solution of all carbides may result in excessive austenitic grain growth, and the treatment confers no benefit.

The heat-treatment cycle described, when applied to certain alloy steels, results in "air-hardening" with the production of martensite. Such steels cannot be "normalized".

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.

Pipe.— An axial cavity formed (especially in ingots) during the final stages of solidification creates a void, in the vicinity of which is concentrated a large proportion of the low-melting-point inclusions. Pouring technique and the design of moulds have a strong influence on the occurrence and extent of pipes, but the concentration of impurities (central segregation) cannot be completely avoided with "dirty" metal.

Resquared.— This term describes a sheet which has been sheared to accurate dimensional limits as a last operation in its production.

Stretcher Levelled.— Stretcher levelled, as applied to sheets, indicates a standard of flatness. The term originated from an early method of obtaining flatness, that is, by gripping the ends of the sheet and stretching it to remove surface waves and buckles.

Soldering.— Joining of metals by fusion with alloys that have relatively low melting points, most commonly lead-base or tin-base alloys, which are known as soft solders.
Joining with higher melting point alloys, sometimes termed hard solders at temperatures over 450°C, is generally termed brazing.

Stress Relieving.— Heating a metal to, and if necessary holding at some temperature generally below the recrystallization range, followed by uniform cooling, for the sole purpose of removing internal stresses.

Stretcher Strain Markings.— Characteristic surface markings, usually of a wedge-shaped pattern, which appear during the early stages of the plastic deformation of mild steel and certain copper-base alloys. Their production is associated with the sudden extension at the yield point. In steel, they are called alternatively "Luders Lines".

Temper.— A term used to indicate stages in the cold rolling of ferrous metals, e.g. quarter-hard temper, half-hard temper.

Temper Rolling.— Temper rolling, sometimes referred to as "skin passing", is a relatively light cold rolling pass given to sheets to overcome the tendency to stretcher-strain or to impart a desired amount of stiffness.

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.

LYSAGHT BROWNBUILT INDUSTRIES

ZINC-COATED STEEL ROOFING AND WALL CLADDINGS

Zinc-coated roofing and wall cladding has had a long association with the Australian building industry and its advantages need no stressing. Its familiarity should not, however, be allowed to obscure even greater advantages derived from recent developments.

New Profiles.— Many modern profiles have been added to the range. Their benefits are individually discussed in following pages. Even the traditional plain corrugated sheet has been modernised.

Long Lengths.— Lysaght Brownbuilt roofing and walling profiles are manufactured in long lengths so that on most applications one sheet will cover from ridge to gutter. The advantages of these long length sheets include neater appearance, reduced handling and fixing costs, wider spacing for supports, the elimination of end laps.

Improved Weather and Corrosion Resistance.— Galvanized sheet combines the high mechanical strength of steel with the corrosion resistance of zinc. Anti-capillary side laps and a new screw-and-integral-washer fastening have been designed to ensure weather-tightness. In some profiles, fastenings are attached from below the surface of the cladding, avoiding the need for piercing. Exterior Marviplate has been developed to withstand severe conditions of exposure met in marine and industrial atmospheres.

Colour.— Colorbond and Exterior Marviplate sheets feature organic coatings applied under carefully controlled factory conditions that ensure performance and maximum life.

A full range of colour matched accessories and fastenings is available.

Strength and Fire Resistance.— Of the many roofing and walling materials now available, zinc-coated steel remains the strongest. It will not flap, distort or blow off in winds of gale force. It offers high fire resistance: it will not crack or explode and being continuous prevents entry of flying sparks.

Thermal Insulation.— The Commonwealth Experimental Building Station has carried out very extensive studies of the thermal behaviour of buildings, and it has found that the major factor controlling internal room temperatures is the heat capacity or mass of the building. The material used for roof sheathing has little or no effect on room temperature or personal comfort. The full findings are published in C.E.B.S. Technical Study No. 34. "The Thermal Behaviour of Dwellings", from which the following passage is quoted: "It was popularly believed that a galvanized iron roof caused a house to be hotter than it would be if sheeted with asbestos or roofed with clay tiles. This view is not supported by the results obtained".

Roofing Performance (Standards).— Lysaght Brownbuilt roofing and fixing procedures comply with the requirements of the Australian Standard CA 42 — 1968, "Design and Installation of Self-Supporting Metal Roofing Without Transverse Laps". The requirements of this Standard include stringent proof tests to measure the ability of the roofing medium to withstand simulated wind uplift loads and superimposed concentrated loads.

Service.— Lysaght Brownbuilt building profiles are now manufactured in every State and are available through leading building material merchants, either in stock sizes or on prompt delivery, factory cut to a customer's own precise needs. A full range of accessories and fasteners is also available. Lysaght Brownbuilt State Offices will supply, upon request, detailed technical literature for specific products and expert technical advice regarding any particular individual problems which may occur.

ZINC-COATED STEEL ROOFING AND WALLING SELECTION GUIDE

New Homes.— One of the most extensive home building innovations of recent years has been the increased use of very low-pitched or flat roofs. It is in this area of design that the greater flexibility of steel over other materials has proved a significant factor. It is this flexibility that allows steel to be used successfully at lower pitches than most other roofing products, without even taking into account its other inherent advantages of greater strength, excellent fire resistance, etc. In designs where a nearly flat roof is required, Lysaght Klip-Lok or Brownbuilt Decking is the obvious choice since they allow pitches as low as 1°. Where the pitch is still low, but not as critical, other Lysaght Brownbuilt profiles, such as Custom Orb, Trimdek or Spandek may be used. In home construction the use of low-pitched roofing gives the dual advantage of design freedom with cost saving in structural framing.

Home Extensions.— With steel sheet roofing it is nearly always possible to add extensions beneath the existing roof eaves and yet still maintain sufficient ceiling height to meet building regulations. By avoiding the necessity to interfere with the existing roof structure and drainage, major cost savings are possible. Where the roof slope must be kept to a minimum, Lysaght Klip-Lok or Brownbuilt Decking are the most suitable profiles. Where there is sufficient height to permit a slightly steeper roof fall, Lysaght Brownbuilt Custom Orb, Spandek and Trimdek make excellent choices.

Carports, Garages, Roofed Outdoor Areas.— Where a flat roof is desired, use Lysaght Klip-Lok or Brownbuilt Decking if long spans are necessary. Use Custom Orb, Spandek or Trimdek where slightly more roof fall is possible. It should be noted that all these products have an underside which may be left exposed if desired, thus avoiding unnecessary additional costs where a ceiling is not required.

Fences, Privacy Screens.— Lysaght Brownbuilt Custom Orb, Trimdek, V-Crimp, California Panel Range are all suitable, and may be used horizontally or vertically to achieve a variety of pleasing effects. Each of these products is easily attached to conventional timber or metal framework.

Colour.— Standard finish for all Lysaght Brownbuilt roofing and walling profiles is a hot dipped zinc coating. But with colour such an important consideration in so many applications, most Lysaght Brownbuilt roofing and walling profiles are also available with a factory applied painted finish (Colorbond). The added protection provided by this paint coating provides a substantial increase in trouble-free working life.

In addition to Colorbond, Exterior Marviplate Building Shapes are also available in a selected colour range.

Exterior Marviplate has been developed to provide a building material which will withstand the most severe conditions of exposure including those stemming from industrial or marine sources. It is manufactured by bonding specially formulated heavy-duty PVC film to one or both sides of galvanized steel sheet.

A range of Lysaght Brownbuilt roofing and walling profiles is roll-formed from Exterior Marviplate, together with a variety of matching fasteners and accessories.

The Colorbond paint system used for exterior applications is a specially formulated silicone polyester. The choice of profiles in this material is matched by an attractive range of colours, all of which have been extensively tested so as to produce those best able to withstand the often severe effects of the Australian climate. In addition, a full range of colour and material matching accessories is available. Since colour and, often, a number of colours used in the same building or location is being increasingly used in modern design schemes, the wide range and variety offered in Lysaght Brownbuilt prepainted and prelaminated profiles and accessories is often a significant factor in the choice of building materials.

Farm Buildings.— Lysaght Brownbuilt Custom Orb and Wall-Clad are recommended as the most suitable materials for the roofing and walling of sheds, barns and other farm buildings. Custom Orb is available in lengths up to 30 feet and longer lengths by negotiation.

Shop Roofs.— All Lysaght Brownbuilt Decking profiles are suitable for the roofing of shopping blocks. The final choice of profile will be influenced largely by the particular design. Generally, Lysaght Klip-Lok or Brownbuilt Decking is used for modern low-pitched construction, while Spandek, Trimdek or Custom Orb is recommended for roofs of steeper pitch.

Shop Facades.— There are a number of Lysaght Brownbuilt building shapes which can be used to achieve a pleasing variety of design in shop facades. The California Panel Range can be used for a clean, sheer appearance. Alternatively, both V-Crimp and Trimdek provide an attractive ribbed appearance. The various types of Brownbuilt Decking may also be used, erected with either the face or the reverse side exposed, with adequate weather protection, each side presenting a contrasting appearance.

Shop Awning Soffits.— Lysaght Brownbuilt V-Crimp or Decking may be used for awning soffits. Available in a galvanized finish or a Zincanneal finish ready for on-site painting, V-Crimp may be run transversely or longtitudinally, the long lengths virtually ending the necessity for end lapping. The various types of decking and cladding include the range of Lysaght Brownbuilt California Panels. The range takes in panels in differing tray modules, available in suitable galvanized form for on-site painting or in Colorbond.

Factories, Warehouses.— Strength and economy make corrugated steel sheet the most commonly used material for the roofing and walling of factories and similar buildings. Custom Orb is available in long lengths and enables cladding to be carried out in a single run without end laps. The result is a saving in cladding time and a more pleasing finish.

As an alternative, Spandek is a form of corrugated sheet with a modern squared profile and can be used over longer spans, thus providing economies in framing costs.

V-Crimp is a walling that is eminently suitable for factory cladding and has a distinctive uncluttered appearance. Wall-Clad is another Lysaght Brownbuilt material which has a distinct appeal for factory wall cladding, both on the score of economy and that of durability.

For prestige building, or for feature areas, use Klip-Lok or other Brownbuilt Decking, the fixings for which are hidden from view. Where appearance is a factor to be considered, Lysaght Brownbuilt prepainted and pre-laminated profiles are an excellent choice. The range of colours and coating systems which have been tested and approved as suitable for exposure to even severe industrial atmospheric conditions is wide enough and distinctive enough to ensure that no part of a factory area need look dreary merely because it is functional.

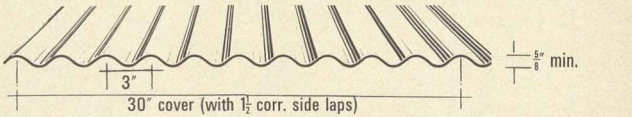
Buildings such as schools, hospitals, clubs and churches are usually architect-designed and the correct choice of roofing will usually be made from the individual design considerations.

APPLICATIONS OF LYSAGHT BROWNBUILT CLADDING PROFILES

	Roofing	Walling	Fencing and Privacy Screens	Fascias Soffits Awnings	Ceiling
Custom Orb	*	*	*	—	—
Custom Blue Orb	*	*	*	—	—
Trimdek	*	*	*	*	—
Spandek	*	*	*	*	—
Klip-Lok	*	*	*	*	—
Wall-Clad	—	*	*	—	—
V-Crimp	—	*	*	*	—
Tri-Lok	—	*	*	*	*
Brownbuilt 12″ & 16″ Decking	*	*	*	*	—
California Panels	—	*	*	*	*

*Suitable for Indicated Application.

CUSTOM ORB



Custom Orb is a zinc-coated, corrugated steel sheet intended for roof and wall cladding requiring high resistance to deformation, and maximum support centres. These sheets carry a nominal 1.75 oz/sq ft coating of zinc for maximum outdoor exposure protection, and conform to the requirements of Australian Standards:

CA42 — 1968
G24 — 1967
and G25 — 1969 Grade E.

Due to its resistance to deformation (high strength) Custom Orb is not suitable for curving.

The profile design and long sheet length offer design and fixing advantages including:

Custom cut lengths to avoid waste.

Support centres up to 48 inches for roofing and up to 72 inches for walling under normal design loads.

Up to 30 feet* coverage from roof peak to gutter in one length and an effective cover width of 30 inches.

Minimum pitch of 5° (1 in 12) on roofs without end laps.

Consecutive side lapping and fixing without the need to turn over alternate sheets.

Weatherproof 1½ corrugation side laps.

Maximum eaves overhang of 9 inches, or 18 inches when stiffened with a 2 inch x 2 inch 16BG angle or equivalent.

Colorbond (prepainted) or Exterior Marviplate (vinyl laminate) additional finishes are available on zinc-coated Custom Orb.

SIZE RANGE:

Available in stock lengths or custom cut to required lengths.

Approx. Coated Thickness:

.020".

Width:

10½ x 3" corrugations, 33½" overall. (30" effective cover)

Length Range:

6' 0" to 30' 0". *These are the practical limits but decks longer than 30 feet can be supplied provided satisfactory transport and on-site handling can be arranged.

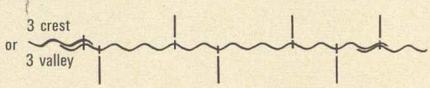
INSTALLATION DATA

Location of crest or valley fastenings for intermediate and end fixing under normal weather conditions:

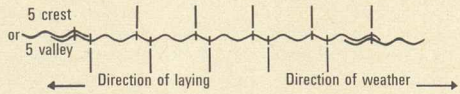
Side lapping:



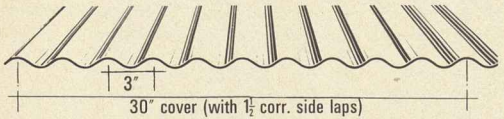
Intermediate



End



CUSTOM BLUE ORB



Custom Blue Orb corrugated to the Custom Orb profile, is used in applications where ductility is required, such as in curving or bending where Custom Orb is not suitable. The nominal 2.00 oz/sq ft zinc coating for tankmaking and maximum outdoor exposure protection, conforms to Australian Standard G24 — 1967.

The longer lengths available in Custom Blue Orb offer advantages particularly to the tankmaking trade, in that each tank strake can be curved from a single sheet. Other design features of this versatile corrugated deck include:

- Custom cut lengths to avoid waste.
- Support centres up to 48 inches for roofing and up to 72 inches for walling under normal design loads (.027″ standard gauge product).
- Up to 30 feet* coverage from roof peak to gutter in one length and an effective cover width of 30 inches.
- Minimum pitch of 5° (1 in 12) on roofs without end laps.
- Consecutive side lapping and fixing without the need to turn over alternate sheets.
- Weatherproof 1½ corrugation side laps.
- Maximum eaves overhang of 9 inches, or 18 inches when stiffened with a 2 inch x 2 inch 16BG angle or equivalent (.027″ standard gauge product).

Colorbond (prepainted) or Exterior Marviplate (vinyl laminate) additional finishes may be available on Custom Blue Orb.

SIZE RANGE:

Available in stock lengths or custom cut to required lengths.

Approx. Coated Thickness:

Standard gauge product .027".

Width:

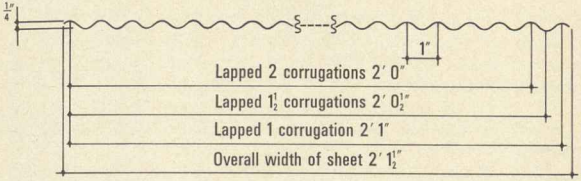
10½ x 3" corrugations, 33½" overall. (30" effective cover)

Length Range:

6' 0" to 30' 0". *These are the practical limits but decks longer than 30 feet can be supplied provided satisfactory transport and on-site handling can be arranged.

INSTALLATION DATA.— Refer to Custom Orb, page 73.

BLUE ORB



This 25 x 1 inch corrugation Blue Orb walling sheet is typically used for linings, awnings, ceilings, showers, sheds and country halls. This sheet may be curved.

SIZE RANGE:

Gauge:

26 Commercial.

Zinc Coating Weight:

1.25 oz/sq ft.

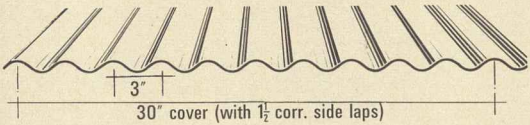
Width:

25 x 1″ pitch corrugations,
25″ cover width with 1 corrugation side lap,
25½″ overall.

Lengths:

60″ to 120″ in 12″ increments.

WALL-CLAD



Wall-Clad sheets are roll-formed to the Custom Orb profile from high-strength, continuously galvanized steel feed. They are specially produced for applications calling for strong, low-cost wall cladding where the lighter base thickness (0.014″) and zinc coating (1.25 oz/sq ft) can be used to distinct advantage.

Not recommended for roofing or curving, Wall-Clad sheets are specifically designed as a lower priced companion sheet for Custom Orb, being similar in appearance. The feed conforms to Australian Standard G24 — 1967 and the nominal 1.25 oz/sq ft zinc coating weight is suitable for the less demanding task of wall cladding sheets.

SIZE RANGE:

Available in stock lengths only.

Approx. Coated Thickness:

.016″.

Width:

10½ x 3″ corrugations, 33½″ overall. (30″ effective cover)

Length Range:

5′ 0″ to 10′ 0″.

STRENGTH

Wall-Clad sheets have a minimum yield strength in excess of 80,000 psi and thus conform to the requirements of ASTM Specification A446-67, Grade E and Australian Standard G25 — 1969, Grade E.

SPANDEK



Spandek is a light-weight continuously galvanized steel roofing and wall cladding sheet, which carries a nominal zinc coating weight of 1.75 oz/sq ft to provide maximum outdoor exposure protection and conforms to Australian Standard G24 — 1967.

Special design features include:

Custom cut to avoid waste.

Wide support centres.

Minimum pitch of 3° (1 in 18) on roofs without end laps.

Up to 40 feet* coverage from roof peak to gutter in one length and an effective cover width of 30 inches.

Modern mansard profile.

Patented fluted side lap for complete protection against moisture entry by capillary action.

Colorbond (prepainted) or Exterior Marviplate (vinyl laminate) additional finishes are available on zinc-coated Spandek.

SIZE RANGE:

Supplied in custom cut lengths.

Approx. Coated Thickness:

Standard gauge product .023".
Special gauge product .027".

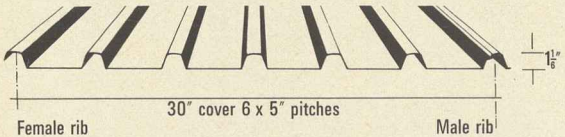
Width:

9 x 3⅓" pitches. (30" effective cover)

Length Range:

4' 0" to 40' 0". *These are the practical limits but lengths over 40 feet can be supplied provided satisfactory transport and on-site handling can be arranged.

TRIMDEK



Trimdek is a light-weight continuously galvanized steel roofing and wall cladding sheet, which carries a nominal zinc coating weight of 1.75 oz/sq ft for maximum outdoor exposure protection and conforms to Australian Standard G24 — 1967. The profile is similar to Spandek but features a wider pan.

Special design features include:

Custom cut to avoid waste.

Minimum pitch of 3° (1 in 18) on roofs without end laps.

Up to 30 feet* coverage from roof peak to gutter in one length and an effective cover width of 30 inches.

Modern profile with wide pan.

Patented fluted side lap for complete protection against moisture entry by capillary action.

Colorbond (prepainted) additional finish is available on zinc-coated Trimdek.

SIZE RANGE:

Available in custom cut lengths.

Approx. Coated Thickness:

Standard gauge product .020".
Special gauge product .027".

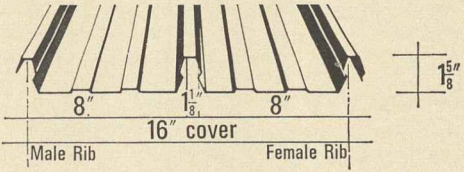
Width:

6 x 5" pitches. (30" effective cover)

Length Range:

4' 0" to 30' 0". *These are the practical limits but lengths over 30 feet can be supplied provided satisfactory transport and on-site handling can be arranged.

KLIP-LOK



Klip-Lok is a zinc-coated light-weight, self-supporting roof decking or wall cladding. It is manufactured in accordance with Australian Standard CA42 — 1968 and roll-formed from continuously galvanized, high strength steel in three gauges, referred to as .031″ and .027″ deck for general applications, and .022″ deck for domestic and similar applications.

The zinc coating weight of nominal 1.75 oz/sq ft for all thickness decks provides maximum outdoor exposure protection, ensures long service life and conforms to Australian Standard G24 — 1967.

Klip-Lok decks are designed particularly for low pitch roof applications. The interlocking ribs, together with concealed fixing (no puncturing) ensure watertightness on roof pitches as low as 1° (1 in 57) where no end laps are used. When used as a wall cladding, Klip-Lok may be erected with either the face or reverse side exposed, with equal protection, each side presenting a contrasting appearance. Other design and fixing features include:

Custom cut lengths to avoid waste.

Increased support spacing.

Long deck lengths.

Special rib design which makes the deck a structural member in itself, thus permitting use of more economical framework.

Positive side rib interlocking with concealed fixing straps providing adequate fastening.

Four inch building module.

Effective spreading of loads from one deck to adjacent decks.

Modern architectural profile.

Colorbond (prepainted) or Exterior Marviplate (vinyl laminate) additional finishes are available on zinc-coated Klip-Lok.

SIZE RANGE:

Approx. Coated Thickness	Length Range	Decks per Bundle	Av Weight per Pack lb/lin ft	Volume Av cubic feet per lin ft of Pack
.031″	4′ 0″ to 50′ 0″	20	50	1.8
.027″	4′ 0″ to 50′ 0″	20	45	1.8
.022″	4′ 0″ to 40′ 0″	20 May vary for some orders	35	1.8

The lengths shown above are the practical limits but longer decks can be supplied provided satisfactory transport and on-site handling can be arranged. The minimum length normally produced is 4 feet.

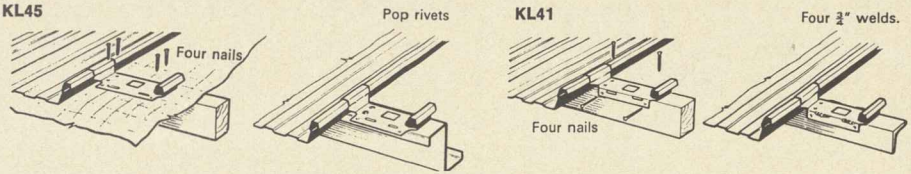
DESIGN DATA

Approx. Coated Thickness	Minimum Recommended Pitch	Maximum Recommended Spacing of Supports				Maximum Eaves Overhang
		Intermediate Spans		Single or End Spans		
		Roofs	Walls	Roofs	Walls	
.031″	1° (1 in 57)	8′ 0″	10′ 0″	7′ 0″	7′ 6″	1′ 0″ (4′ 0″ stiffened*)
.027″	1° (1 in 57)	6′ 3″	9′ 0″	4′ 9″	6′ 9″	1′ 0″ (3′ 0″ stiffened*)
.022″	2° (1 in 29)	4′ 0″	5′ 0″	3′ 3″	3′ 9″	3″ (1′ 0″ stiffened*)

* The longer maximum eaves overhangs shown above can be achieved provided that a 2 inch x 2 inch 16BG angle or equivalent stiffening is used to distribute any loading.

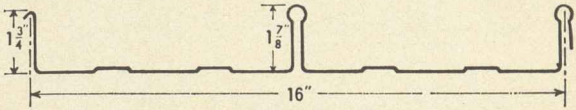
INSTALLATION DATA

The top (KL45) and Side (KL41) Fixing Straps are a special feature of the Klip-Lok system. These are concealed during erection and the roofing is secured without being punctured.



Installation accessories, tools, instructions and design data are available and detailed in the various published Klip-Lok leaflets. For details see Lysaght Fixing Manual CC31.

BROWNBUILT MARK V 16 INCH DECKING



Brownbuilt Mark V 16″ Decking is a self-supporting roof decking and wall cladding featuring the æsthetically pleasing narrow (¼″) rib profile. However, the rib profile differs from the Mark IV decks in that it reduces from $\frac{7}{16}$″ radius bulb top to the ¼″ spacing between rib walls. This bulb rib top gives added rib strength and allows the positive button punching connection of decks, which technique has been proven to be particularly predictable in strength and to contribute greatly to both concentrated and live load support.

Mark V decking is produced from continuously galvanized high strength steel coated with nominal 1.75 oz/sq ft of zinc for maximum outdoor exposure protection and long service life. Standard production also includes the same zinc-coated steel substrate prepainted as Colorbond.

This decking system provides a weathertight roof suitable for flat, low, gable or skillion application. The narrow rib enables clean undersoffit appearance for exposed eaves, canopies, carports, etc. When used as a wall cladding, the decks may be erected with either the face or reverse side exposed, with adequate weather protection, each side presenting a contrasting appearance. Other design and fixing features include:

Custom cut lengths to avoid waste.

Long deck lengths.

Less structural formwork required.

Increased support spacing.

Effective five-stage moisture barrier.

Positive and predictable button punch rib connection.

Positive male rib concealed clip securement.

Quick erection saves time and cost.

Aesthetically pleasing narrow (¼") rib.

Effective spreading of loads from one deck to another.

The Brownbuilt Decking profile system embodies patented features which permit the fitting of insulating materials from the underside of the decking after completion of the roof. A compatible range of highly efficient insulating and ceiling materials and systems has been developed for this purpose.

SIZE RANGE:

Approx. Coated Thickness:

.031" and .025".

Length Range:

Custom cut in ¼" increments. Extra long lengths can be supplied provided satisfactory transport and on-site handling can be arranged.

DESIGN DATA

Minimum recommended pitch: 1 in 60.

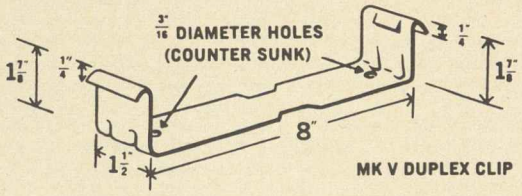
Approx. Coated Thickness	Maximum Recommended Spacing of Supports				Maximum Eaves Overhang stiffened*
	Intermediate Spans		Single Spans		
	Roofs	Walls	Roofs	Walls	
.031"	9′ 6"	9′ 6"	8′ 0"	8′ 0"	4′ 0"
.025"	6′ 0"	6′ 0"	4′ 6"	4′ 6"	3′ 0"

* These maximum eaves overhangs can be achieved provided the outer edges are given continuity by the attachment of Brownbuilt Gutter or 2" x 16BG angle or equivalent stiffening to distribute any loading.

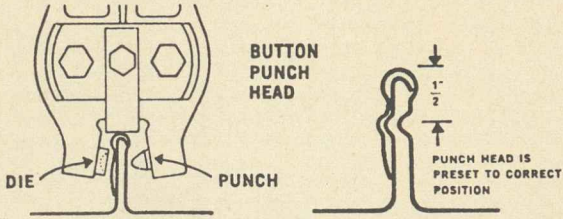
INSTALLATION DATA

Mark V Decking System is complete with roof fixing clips, gutter, capping, fascias, flashings, skylights, fixing tools, etc. to suit.

When button punching, it is most important that the button punch tool be correctly oriented, i.e. punch indenting under the return lip of the male rib.

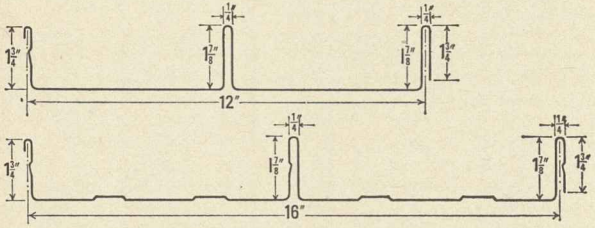


MK V DUPLEX CLIP



PUNCHING MUST BE 1/4" FROM THE CROWN OF THE RIB FOR EFFECTIVE LOCKING

BROWNBUILT MARK III 12 INCH DECKING
MARK IV 16 INCH DECKING



Brownbuilt Mark III 12" and Mark IV 16" Deckings are self-supporting roof deckings and wall claddings featuring the æsthetically pleasing narrow ($\frac{1}{4}$") rib profile. The narrow rib allows positive button punching connection of decks, which technique has been proven to be particularly predictable in strength and to contribute greatly to both concentrated and live load supports.

Mark III and Mark IV Decking is produced from continuously galvanized high strength steel coated with nominal 1.75 oz/sq ft of zinc for maximum outdoor exposure and long service life. Standard production also includes the same zinc-coated substrate as Colorbond or Exterior Marviplate.

These decking systems provide a weatherproof roof suitable for flat, low, gable or skillion applications. The narrow rib enables clean undersoffit appearance for exposed eaves, carports, canopies, etc. When used as a wall cladding, decks may be erected with either the face or reverse side exposed, with adequate weather protection, each side presenting a contrasting appearance. Other design and fixing features include:

Custom cut lengths to avoid waste.

Long deck lengths.

Less structural formwork required.

Increased support spacing.

Effective five-stage moisture barrier.

Positive and predictable button punch rib connection.

Positive male rib concealed clip securement.

Quick erection saves time and cost.

Aesthetically pleasing narrow (¼") rib.

Effective spreading of loads from one deck to another.

The Brownbuilt Decking profile system embodies patented features which permit the fitting of insulating materials from the underside of the decking after completion of the roof. A compatible range of highly efficient insulating and ceiling materials and systems has been developed for this purpose.

Approx. Coated Thickness:

.031" and .025".

Length Range:

Custom cut in ¼" increments. Extra long lengths can be supplied provided satisfactory transport and on-site handling can be arranged.

DESIGN DATA

Minimum recommended pitch: 1 in 60.

Approx. Coated Thickness	Maximum Recommended Spacing of Supports				Maximum Eaves Overhang stiffened (1)
	Intermediate Spans		Single Spans		
	Roofs	Walls	Roofs	Walls	
Mark III — 12"					
.031"	10' 0"(2)	12' 0"	10' 0"(2)	10' 0"	4' 0"
.025"	5' 0"	7' 0"	4' 0"	5' 0"	3' 0"
Mark IV — 16"					
.031"	7' 6"	8' 0"	6' 0"	6' 0"	4' 0"
.025"	4' 6"	6' 0"	3' 6"	4' 0"	3' 0"

Note (1)

These maximum eaves overhangs can be achieved provided the outer edges are given continuity by the attachment of Brownbuilt Gutter or 2″ x 16BG angle or equivalent stiffening to distribute any loading.

Note (2)

Brownbuilt 12 inch 22 ga. galvanized steel decking was tested in 1960, over single spans of 12′ 0″ by the Civil Engineering Department, University of Melbourne. Concentrated loads were placed on a 4 inch dia. pad at mid-span.

Residual deflection of 0.024″ was recorded after 200 lb load; 560 lb was sustained.

After exhaustive field-testing, the maximum recommended span was limited to 9′ 0″ for general applications because traffic effects, sub-structure subsidence, etc. caused "ponding" at the very low pitches commonly used.

For other types of structures, e.g. carports, garages, sheds, rural outbuildings, etc., where performance requirements are often not so rigid, spans to 10 feet are permissible providing code requirements are satisfied and the following procedure is adhered to:—

(1) The minimum fall is 3 inches in 10 feet (greater if possible).

(2) Temporary tomming is used at mid-span until roof-fixing is completed.

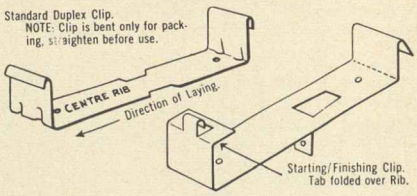
(3) Planking is used across the sheets whenever subjected to maintenance traffic.

INSTALLATION DATA

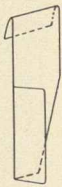
Mark III and Mark IV Decking systems are complete with roof fixing clips, gutter, capping, fixing tools, etc. to suit.

When button punching, it is most important that the button punch tool be correctly oriented, i.e. punch indenting under the return lip of the male rib.

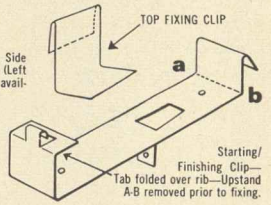
CLIPS FOR 16 INCH DECK

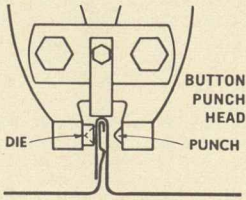


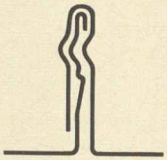
CLIPS FOR 12 INCH DECK



Right Hand Side Fixing Clip (Left Hand also available).

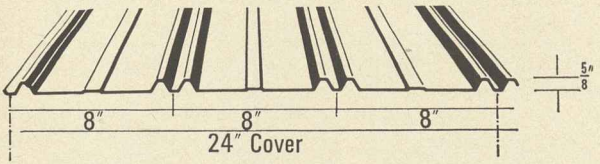






Punching must be ¼" from the crown of the rib for effective locking. Punch head is preset to correct position.

V-CRIMP



V-Crimp is a continuously galvanized steel sheet specifically designed for wall cladding and is therefore not suitable for roofing. It is roll-formed from either:—

Zincform — which carries a 1.25 oz/sq ft nominal zinc coating weight and conforms to Australian Standard G24 — 1967,

or

Zincanneal — which has a non-spangled zinc-iron alloy (galvannealed) coating of 1.00 oz/sq ft suitable for painting without any prior surface treatment other than normal degreasing operation.

Colorbond (prepainted) or Exterior Marviplate (vinyl laminate) additional finishes are available.

SIZE RANGE:

Available in stock lengths or custom cut to required lengths.

Approx. Coated Thickness:

.021" (ex both Zincform and Zincanneal).

Width:

3 x 8" rib centres.

Length Range:

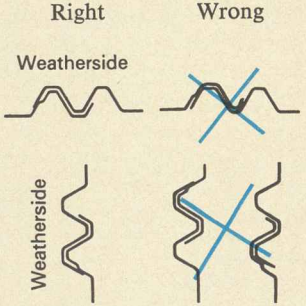
4' 0" to 25' 0". These are the practical limits, but lengths over 25 feet may be supplied provided

satisfactory transport and on-site handling can be arranged. The minimum length normally produced is 4 feet.

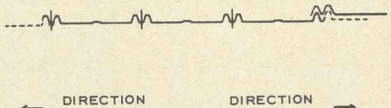
INSTALLATION DATA

The correct side lapping of V-Crimp walling can only be accomplished with the "flat face" or "bottom" of the sheet against support member, i.e. the sheet is not reversible. See detailed installation information in the Lysaght Fixing Manual CC31.

Side lapping:



Location of valley fastenings for all girts and battens under normal weather conditions. Crest fastening should not be used for V-Crimp walling.

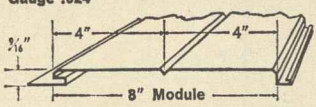


CALIFORNIA PANEL RANGE

Claddings in the California Panel Range are used for sidings, feature panels, soffit linings, non-acoustic ceilings, in internal and external applications. Vertical or horizontal fixing for walls and fascias. A full range of accessories is available. (Refer to trade literature for comprehensive data.)

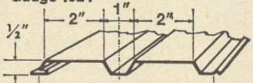
SHALLOW PROFILE RANGE: 1.00 oz/sq ft zinc-coated plain or Colorbond finish.

CA1
Gauge .024"



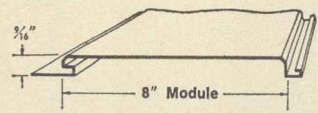
Flat trays. 8" sheet module, 4" tray module. Concealed clip or fixed by concealed nail, screw, rivet to grounds up to 4' 0" centres. Can be used for suspended applications. When perforated, becomes CC8 acoustic ceiling panel.

CA6
Gauge .024"



Flat trays. 6" sheet module, 3" tray module. Suits current architectural trend for flat pans with sharp shadow line. Concealed clip or fixed by concealed nail, screw, rivet to grounds up to 4' 0" centres. Can be used for suspended applications. When perforated, becomes CC4 acoustic ceiling panel.

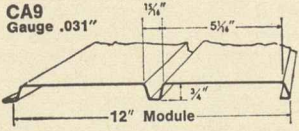
CA12
Gauge .024"



Flat tray. 8" sheet and tray module. Ideal for soffit areas where the "flat look" is desirable. Concealed clip or fixed by concealed nail, screw, rivet to grounds up to 4' 0" centres. Can be used for suspended applications.

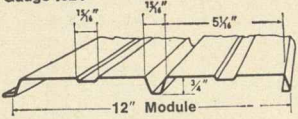
BOLD PROFILE RANGE: 1.25 oz/sq ft zinc-coated plain or Colorbond finish.

CA9
Gauge .031"



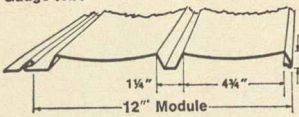
Flat trays. 12" sheet module, 6" tray module. The clean, flat pans suit current architectural demands. Concealed clip fixing to grounds up to 7' 0" centres.

CA11
Gauge .024"



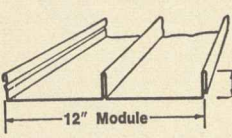
Fluted trays. 12" sheet module, 6" tray module. The fluted trays enable use of light gauge steel feed for economy. Concealed clip fixing to grounds up to 5' 0" centres.

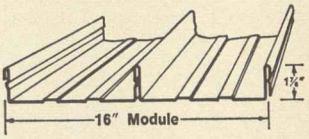
CA13
Gauge .024"



Doric trays. 12" sheet module, 6" tray module. Curve eliminates ripple for very crisp profile. Concealed pierce fixing by nail, screw, rivet to grounds up to 5' 0" centres.

Brownbuilt 12" and 16" Deckings can also be used as bold profile wall-cladding. Available in plain galvanized 1.75 oz/sq ft or Colorbond finish.





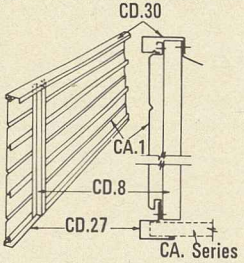
ACCESSORIES

Feature Fascia System

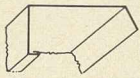
California Panel "Feature Fascia" systems meet flexible design needs with unique standardization of componentry, and offer almost unlimited scope for Commercial, Industrial and Domestic fascia and facade applications.

The basis of this system is the use, in combination, of components from the wide range of standard Panel profiles and accessories, thus providing great design freedom.

Example of typical feature fascia

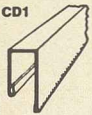


CB7/6" Fascia Capping

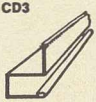


Accessory Sections

California Panels' wide range of work-saving accessories comprises trims, membranes, purlins, secondary grounds and fixings to reduce prime cost of panel and ceiling systems.



CD1 Trim channel



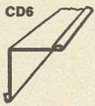
CD3 Fascia to soffit section



CD4 Feature section fascia to soffit



CD5 External corner trim



CD6 Internal corner trim



CD8 Purlin hat section



CD15 Tee section



CD27 Fascia to soffit section



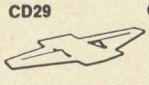
CD30 Fascia capping or trim



CD39 Trim channel

Accessory Clips

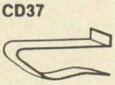
California Panels' accessory clips in many cases remove the need for power tools and hole drilling. These clips reduce fixing cost considerably.



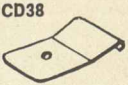
CD29 Lighting fix clip



CD34 Adjustable suspension clip (use 5G rod)



CD37 Termination clip



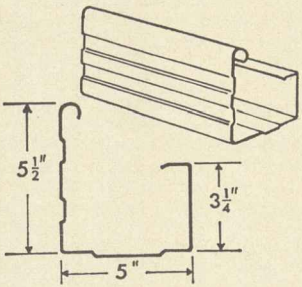
CD38 Fixing clip

ROOFING ACCESSORIES

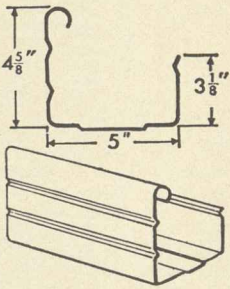
GUTTER SYSTEMS

Two Lysaght Brownbuilt gutter profiles suitable for all types of roofs are Sheerline and Trimline.

SHEERLINE



TRIMLINE



These are available in plain or prepainted galvanized steel. Other materials may be available on application.

Length range is Stock Lengths 6 ft to 32 ft in 1 ft increments.

ROOF DRAINAGE

Data for the Determination in Various Localities, of Gutter Sizes and Corresponding Roof Areas Drained.

The following data is based on information given in the CSIRO Division of Building Research Report No. 02.2-30 and is supplied for guidance only. The roof area drained is the product of the distance between downpipes and the length of the roof slope (gutter to ridge). Therefore, if the area of roof drained, as given in the tables is divided by the length of the roof slope, the correct spacing of downpipes will be obtained.

The area of downpipes must not be less than half the area of the gutter.

ROOF AREAS DRAINED BY VARIOUS TYPES AND SIZES OF GUTTERS FOR A RISK OF OVERFLOW OF ONCE IN TWENTY YEARS

Locality	Eaves Quadrant Gutters			Eaves Half Round Gutters		
	Approx. Gutter Dimensions		Approx. Area of Roof Drained sq ft	Approx. Gutter Dimensions		Approx. Area of Roof Drained sq ft
	Nominal Size in	Area of Cross Section sq in		Nominal Size in	Area of Cross Section sq in	
Hobart	4	10	650	4½	8	550
Broken Hill	4	10	650	4½	8	550
Melbourne	4	10	500	4½	8	400
Adelaide	4½	11½	550	5	10	500
Perth	4½	11½	500	5	10	450
Canberra	4½	11½	550	5	10	500
Alice Springs	4½	11½	550	5	10	500
Sydney	4½	11½	450	5	10	400
Brisbane	5	13½	500	6	14	500
Port Moresby	5	13½	450	6	14	450
Darwin	6	19	350	7	19	350
Cairns	6	19	400	7	19	400

ROOF AREAS DRAINED BY VARIOUS TYPES AND SIZES OF GUTTERS FOR A RISK OF OVERFLOW OF ONCE IN TWENTY YEARS

Locality	Eaves Box Gutters			Internal Box Gutters(1)		
	Approx. Gutter Dimensions		Approx. Area of Roof Drained sq ft	Gutter(2) Dimens. in	Area of(3) Cross Section sq in	Approx. Area of Roof Drained sq ft
	Nominal Size in	Area of Cross Section sq in				
Hobart	3 x 3	9	600	12 x 4	36	2400
Broken Hill ..	3 x 3	9	600	12 x 4	36	2400
Melbourne ..	3 x 3	9	450	12 x 4	36	2000
Adelaide	4 x 3	12	550	12 x 5	48	2400
Perth	4 x 3	12	500	12 x 5	48	2500
Canberra ..	4 x 3	12	550	12 x 5	48	2600
Alice Springs	4 x 3	12	550	12 x 5	48	2600
Sydney	4 x 3	12	450	12 x 5	48	2000
Brisbane	5 x 3	15	550	12 x 6	60	2400
Port Moresby	5 x 3	15	500	12 x 6	60	2300
Darwin	5 x 4	20	400	12 x 7	72	1500
Cairns	5 x 4	20	400	12 x 7	72	1600

NOTES:

(1) Based on a risk of overflow of once in 100 years.

(2) A minimum gutter width of 12 inches.

(3) Does not include freeboard of 1 inch in gutter depth.

SIZE OF DOWNPIPES

For every 100 square feet of actual roof area drained, 1 square inch of downpipe is required, whether round or square. This calculation is based on the assumption that the maximum rainfall does not exceed 5 inches per hour.

It is considered the best practice to drain to different points, using smaller downpipes rather than to one large outlet. Where possible, downpipes should be spaced at not more than 40 feet centres.

ROUND

Diameter	Area sq in	Roof Area Drained sq ft	Area of Building Roofed sq ft
2″	3.14	314	304
2½″	4.9	490	475
3″	7.07	707	686
4″	12.56	1,256	1,218
5″	19.63	1,963	1,905
6″	28.27	2,827	2,742

RECTANGULAR

Size of Piping	Area sq in	Roof Area Drained sq ft	Area of Building Roofed sq ft
3″ x 2″	6	600	582
4″ x 2″	8	800	775
4″ x 3″	12	1,200	1,165
4″ x 4″	16	1,600	1,555
5″ x 4″	20	2,000	1,940
6″ x 4″	24	2,400	2,315

INSTRUCTIONS FOR USE OF LYSAGHT SEALER

Lysaght Sealer is recommended for sealing lap joints in roof sheeting and rain water accessories manufactured from Galvabond, Colorbond and Exterior Marviplate. It is essentially a sealer, not an adhesive, and the joint requires some form of mechanical fastening, such as blind rivets ('Pop' rivets), rivets, self-tapping screws, gutter bolts, etc. To use the sealer, remove the plastic screw cap from the tube and cut the sealed end from the applicator nozzle. The sealer is now ready for use. For sealing joints in sheet steel roofing and accessories cut the nozzle as close to the small end as possible. This will leave a hole in the nozzle about $\frac{1}{16}$″ dia. which will provide a $\frac{1}{8}$″ bead of sealer. Leaving the nozzle as long as possible will also make application of the sealer easier.

The nozzle is tapered so a larger hole and a greater flow of sealer can be obtained by cutting the nozzle closer to the tube.

Always tightly replace the plastic screw cap after each application of sealer.

To lap join and seal two lengths of gutter, ridge capping, flashing, etc., the two lengths should be placed together at the required lap and adjusted where necessary to provide a snug fit. After alignment, holes for fastening (rivets, etc.) should be drilled at 1½" to 2" centres before separating the two sections to apply sealer.

Using the nozzle applicator, squeeze the tube to apply a ⅛" bead of sealer along the edge of the two faces to be lapped together. Also apply some sealer around the fastening holes on one section only.

Lap the two sections together again and fasten with the desired fixings. If monel blind rivets ('Pop' rivets) are used, the hole through the hollow shank of the rivet should be sealed by applying sealer with the nozzle applicator.

Remove any excess sealer, particularly from Colorbond or Exterior Marviplate, with '3M' Adhesive Cleaner.

When sealing laps in roof sheeting, fasteners such as blind rivets, etc., are not necessary where the lap is help together by the roof fixings.

FIXING INSTRUCTIONS AND SITE NOTES

CARE AND STORAGE PRIOR TO USE

Lysaght Brownbuilt roofing and walling products are normally delivered to the building site in strapped bundles.

If not required for immediate use, sheets or bundles should be neatly stacked clear of the ground, and, if left in the open, should be protected by loose tarpaulins or similar covers allowing for adequate air circulation. On no account should bundles be left exposed to the weather. Rain or condensation are easily drawn in between tightly nested sheets by capillary action, and because this moisture cannot then evaporate in the normal way, will cause unsightly stains which can detract seriously from the finished appearance of the installation.

Wet storage stain can occur from condensation alone — even in dry weather.

HANDLING

On large building projects handling time can be reduced by lifting bundles by crane directly on to the roof. Arrangements can be made with your local Lysaght Brownbuilt office for the loan of special spreader bars and slings, and for advice on lifting long-length bundles.

For small and medium jobs without mechanical handling facilities, sheets can be easily passed up one at a time by hand. Gloves should always be worn.

SPECIAL NOTES ON HANDLING COLORBOND AND MARVIPLATE

Do not drop sheets or drag one sheet over another. Wear smooth-soled rubber shoes, not ribbed soles that may pick up stones. If fixing with prepainted roofing nails, use a hard nylon mallet.

Do not drag tools, etc., over the painted surface. Carefully sweep away any metal shavings caused by drilling

or sawing. Use the touch-up paint supplied for the correction of minor erection damage. In other words, use sensible care as befits a high-quality finish so that it may perform properly for you.

Note: To make watertight joints in Colorbond gutters, flashings, etc., do not solder. Use 'Pop' rivets (or similar) together with Lysaght Sealer.

MOVEMENT ON ROOFS DURING FIXING

Sheets freshly taken from packs may have an oily surface, and care should be exercised when walking over newly laid sheets until the oil has had a chance to evaporate.

Always walk in the pans of decking such as Klip-Lok, and over two or more ribs on Custom Orb and Spandek. Always wear rubber-soled shoes.

When purlin spacings are fairly close (e.g. 3′ to 4′ as on Custom Orb and Trimdek) always walk on or close to the purlins.

With wider purlin spacings (e.g. on Spandek and Klip-Lok), avoid walking on mid-span.

Generally, keep the weight evenly distributed over the soles of both feet. When rising from a squatting position, try not to place the whole weight on the toe or heel on one spot.

GALVANIC OR ELECTRO-CHEMICAL ACTION

These terms refer to the corrosion set up when dissimilar metals are in contact with one another in the presence of moisture. In the case of zinc and steel, galvanic action leads to the protection of the steel by the sacrificial corrosion of the zinc. However, conditions can arise where zinc can be severely corroded by reason of its contact with dissimilar metals. In particular, contact with copper or brass, in the presence of moisture, will lead to the rapid removal of zinc from galvanized steel and likewise the corrosion of the underlying steel. Contact with lead flashing will not at any time cause

zinc to corrode, lead is highly inert and does not set up a galvanic cell when in contact with zinc.

CLEANING UP

On most roofing jobs it is necessary to trim sheets or flashings with a hacksaw or abrasive wheel, or to drill holes for fasteners. This gives rise to fine steel particles which collect in the vicinity of each operation and, in time, will rust. Likewise, 'Pop' rivet shanks, broken twist drills and carpenters' nails will also rust if left on the roof. This rusting not only causes unsightly stains but can also lead to the serious weakening of the adjacent zinc coating due to its normal sacrificial protective action.

Before leaving the job:—

(i) Remove all rubbish and left-overs — rivet shanks, sheet off-cuts, nails, etc.

(ii) Carefully sweep down the entire roof with a soft broom, paying particular attention to areas where drilling or sawing has taken place. Similarly, sweep out all gutters.

CEILINGS & CEILING SUPPORT SYSTEMS

CEILING PANELS

Although many of the roll-formed claddings produced by Lysaght Brownbuilt Industries may be used for ceiling panels, the California and Tri-Lok ranges are especially suited for this purpose.

Both systems employ concealed fixing and a full range of accessories are available.

California range is available in lengths up to 32 feet and in 6″, 8″ and 12″ modules. The 6″ and 8″ series are also available as acoustic panels. Spans of 4 to 7 feet are possible. Prepainted California Panel is also supplied.

Tri-Lok is custom cut in lengths between 6 and 25 feet and is available in 9″, 12″ and 15″ modules. Tri-Lok may be plain zinc-coated, prepainted or covered with a polyvinyl chloride film (Marviplate). Some panels are also supplied perforated for noise control.

C.R. BEAMS

C.R. (Ceiling and Roof) Beams and accessories provide a complete support system for insulated ceiling and roof systems. A wide range of beams are available permitting spans from 8 to 30 feet.

U-FOAM CEILING PANELS

U-Foam Ceiling Panels have a core of rigid polyurethane foam to which may be bonded a wide range of facings. The panels are light in weight, with excellent heat insulation characteristics and good fire resistance.

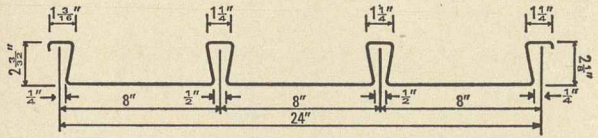
They are intended to be used in conjunction with the C.R. Beam System described above.

The panels are easily cut and shaped using conventional wood-working tools.

Standard U-Foam Panels are available in lengths up to 16 feet, in widths of 1, 2 and 4 feet by $1\frac{1}{8}$ inches thick. Other thicknesses are available.

STRUCTURAL DECKING

BONDEK



Bondek is a high strength zinc-coated steel composite decking which acts as both permanent formwork and positive tensile reinforcement in one-way reinforced concrete slab construction. It is suited for all types of construction, high-rise steel or concrete framed buildings, or traditional load-bearing brickwork such as home units, hospitals, cottages, bathroom, patio and porch slabs.

The panels are roll-formed from continuously galvanized Zinc-Hi-Ten and are supplied custom cut to the length required. The high-tensile steel provides increased resistance to handling and erection damage, and a greater margin of safety on design stresses. Other features include:

Simple construction.

Requires only limited propping.

Long lengths for continuous spans.

Reduces need for other reinforcement to a minimum.

Very fast fixing time with unskilled labour.

Safe working platform.

Weatherproof cover to workmen on floors below.

Reduced risk of falling objects.

Effective rib location permits thinner slabs.

Bondek either unsprayed or sprayed with ½" thickness of vermiculite/plaster has received a two hour fire rating classification at the Commonwealth Experimental Building Station, Ryde, N.S.W. The flat underside of

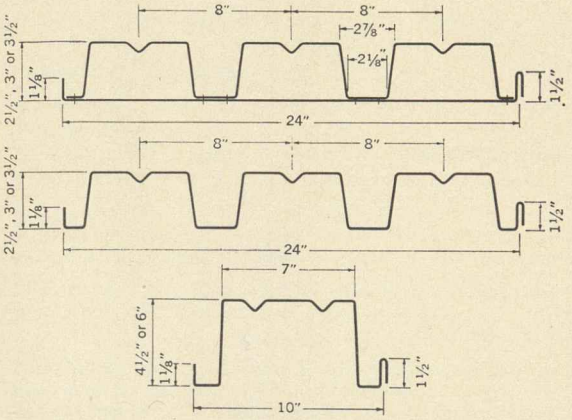
Bondek panels requires considerably less fire proofing material or ceiling finish than corrugated profiles, offering economies in this area.

SIZE RANGE

Available in Stockable lengths or Custom Cut to requirements. 40 ft* is the practical limit but lengths up to 60 ft can be supplied provided satisfactory transport and on-site handling can be arranged.

Thickness	Nom Rib Depth	Zinc Coating Weight oz/sq ft	Cover Width	Length*
20G	2-3/32"	1.25	24"	6' 0"-40' 0"
22G	2-3/32"	1.25	24"	6' 0"-40' 0"

CELDEK AND RIBDEK



Celdek and Ribdek are high strength, load carrying floor decks formed from Galvabond with a coating weight of 1.25 oz/sq ft. The steel base has a minimum

proof stress of 40,000 psi and conforms to the U.S. specification ASTM A446-67.

Celdek and Ribdek are widely used in multi-storey buildings, schools and factories wherever a high degree of "in-floor" electrical availability is required. This system provides a complete network of ducts throughout the floor area allowing complete flexibility of service.

On site handling is greatly reduced; the 24 in wide bundles can be hoisted direct from transport to the relevant floor, suitably marked to the builder's or fixer's requirements. Other features include;

- Light weight design.
- No temporary props required.
- Complete access to floors below.
- Safe working platform.
- Weatherproof cover to workmen on floors below.
- Reduced risk of falling objects.
- Cost savings in overall frame design and footing sizes.
- Cover of up to 8,000 sq ft per week can be safely achieved.
- Eliminates need for concrete formwork.
- Concrete topping increases deck strength by up to 90% and stiffening by up to 400%.

The cellular type Celdek may be used on its own or combined with Ribdek (24 in) as a floor decking system.

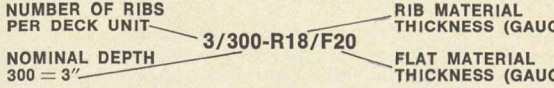
Two profiles of Ribdek are manufactured; the three-rib with 24 in cover (Celdek compatible) and the deeper one-rib with 10 in cover.

The Celdek system can be acceptably fire rated either by using a suspended fire rated ceiling or by direct application of fire-proofing materials such as vermiculite/plaster or asbestos.

Fuller data on all aspects are available in the "Celdek and Ribdek" brochure.

SIZE RANGE

CATALOGUE NUMBERING SYSTEM — EXAMPLE



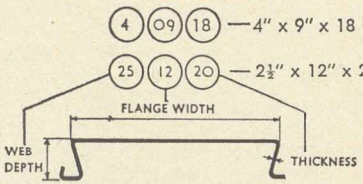
CELDEK

Catalogue No.	Cover Width	Length
3/250-R20/F20	24″	Custom
3/250-R18/F20	24″	Cut
3/300-R20/F20	24″	6′ 0″ to
3/300-R18/F20	24″	24′ 0″
3/350-R20/F20	24″	in ¼″
3/350-R18/F20	24″	increments

RIBDEK

Catalogue No.	Cover Width	Length
3/250-R20	24″	Custom
3/250-R18	24″	Cut
3/250-R16	24″	6′ 0″ to
3/300-R20	24″	24′ 0″
3/300-R18	24″	in ¼″
3/300-R16	24″	increments
3/350-R20	24″	
3/350-R18	24″	
3/350-R16	24″	
1/450-R20	10″	
1/450-R18	10″	
1/600-R18	10″	

TRI-LOK



Cataloguing: The system of cataloguing Tri-Lok panels is illustrated by the above diagram.

The interlocking design of Tri-Lok panels provides strength, economy and durability and is suitable for walls, floors, awnings, facades and similar applications.

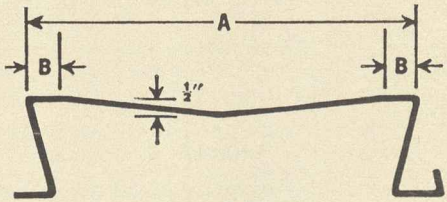
Tri-Lok Panels are formed from Galvabond with 1.25 oz/sq ft zinc coating weight, in a variety of sizes. The profile variations are to the rib depths and flange widths. Tri-Lok can be fixed "ribs out" or "ribs in" with equal effect.

SIZE RANGE

Standard Panels

Catalogue No.	Web Depth	Flange (Cover) Width	Length
21520	2″	15″	Custom
21220	2″	12″	Cut
251220	2½″	12″	
31220	3″	12″	6′-25′
31218	3″	12″	
40920	4″	9″	
40918	4″	9″	

"W" Type Panel



TRI-LOK CATALOGUE NUMBER	DIMENSION "A" (ins)	DIMENSION "B" (ins)
21520	15	1½
21220	12	1
251220	12	1
31220	12	1

This panel is available in a range of four sizes with maximum lengths of 25 ft.

PURLIN & GIRT SYSTEMS

LYSAGHT ZED SECTIONS

Lysaght Zed Sections are light gauge structural members with an asymmetrical Z profile, cold formed from high strength galvanized steel strip and are specifically designed for use as purlins and girts for the support of roof and wall cladding in framed structures.

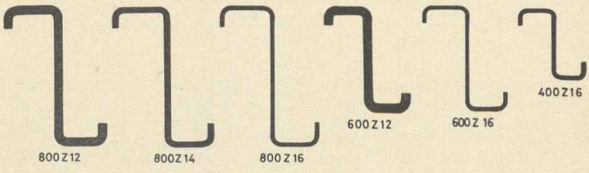
Zed Sections are custom made to order in the following range of sizes and gauges:

400 Z 16	800 Z 16
600 Z 16	800 Z 14
600 Z 12	800 Z 12

They are available pierced and notched to suit most requirements, together with bracing, fastening and a comprehensive range of accessories. All components are supplied with a primer coat of red oxide zinc chromate or in the galvanized condition.

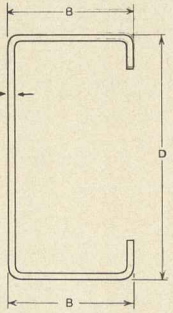
The lengths available are limited only by convenience in transporting but are standard to 35 feet and may be supplied up to 45 feet on enquiry. Spans up to 30 feet with spacings from 3 to 8 feet are possible.

Zed Sections are designed in accordance with the "Specification for the Design of Cold Formed Steel Structural Members" 1968 edition which is published by the American Iron and Steel Institute and accepted by building authorities throughout Australia.



BROWNBUILT BP SECTIONS

Brownbuilt BP Sections for purlins and girts are roll-formed from either uncoated or galvanized steel strip in a C type profile (lipped channel) in the following sizes and gauges and in lengths up to 40 feet.



	D x B(in)	t(in)
BP 414	4 x 2	0.075
BP 616	6 x 2½	0.062
BP 614	6 x 2½	0.075
BP 612	6 x 2½	0.105
BP 814	8 x 3	0.078
BP 812	8 x 3	0.105
BP 514	5 x 2	0.078
BP 713	6½ x 2¾	0.090
* BP 1012	10 x 3½	0.102
* BP 1010	10 x 3½	0.125

Brownbuilt BP Sections are manufactured from uncoated steel strip with a minimum yield strength of 50,000 psi or from galvanized steel strip with a yield strength of 40,000 psi.

Galvanized Sections have a coating weight of 1.25 oz/sq ft and Sections formed from uncoated strip are supplied with a primer coat of red oxide zinc chromate paint.

The following items in the painted condition are available on standard lead times:

BP 414	BP 614	BP 814
BP 616	BP 612	BP 812
BP 514	BP 713	

* The following items in the painted condition, together with the complete size range in galvanized condition, are available on negotiated lead times only:

BP 1012 BP 1010

BROWNBUILT SHEET PILING

Brownbuilt Sheet Pilings are high strength structural materials roll-formed from 0.188 in steel strip. They are designed for the efficient construction of virtually earth and watertight permanent or temporary walls, either straight or contoured (free form).

Four profiles are manufactured; Slimlock, Deeplock, Slimlap and Deeplap. Two driving helmets are also available — Deepcap (for Deeplock and Deeplap), Slimcap (for Slimlock and Slimlap). **Refer to illustration on page 131.**

Brownbuilt Sheet Piling is light and easily handled (approximately 10 lb per ft).

Can be driven with light hammers.

Requires only simple rigs and tooling.

Extractable for re-use.

Long lasting, either as permanent installations or when re-used for temporary requirements.

Extremely resistant to scouring forces.

Typical applications include:

Trenching:	Pipe laying and similar operations.
Water Conservation:	Dams, dam cores, well housings, coffer dams.
Waterways:	Canal, lakeside or dock walls, bulkheading, development of recreational areas.
Erosion Control:	Check dams, beach groins, cliff protection, dyke walls.
Structural:	Excavation walls, underpinning, formwork, machine well linings, bridge decks, bridge piers, footings, retaining walls, jetties, docks, causeways.

Sheet Piling is available from stock in 8, 12, 14, 16 and 18 ft lengths. Custom cut lengths available on a forward ordering basis.

STANDARD COLD FORMED SECTIONS

Lysaght Standard Cold Formed Sections are accurately roll-formed from hot rolled steel strip in four profiles — Angles, Plain Channels, Lipped Channels and Top Hat Sections.

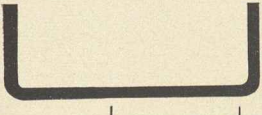
Forty-six different shapes and sizes are available with an equally wide range of uses in the fields of construction and general fabrication.

The sections are available in steel finished with a red oxide zinc chromate primer, or a galvanized finish.



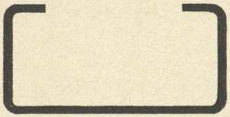
ANGLES

Cat. No.	Superseded Cat. No.	Leg Lengths (ins)	Leg Lengths (ins)	Gauge	Lin Ft Per Ton (min.)
LA1212	LA125	1-1/4	15/16	12	3030
LA1810	LA175	1-13/16	1-1/2	10	1590
LA2010	LA200	2	1-5/16	10	1590



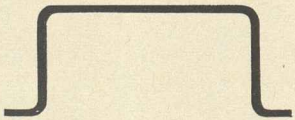
PLAIN CHANNELS

Cat. No.	Superseded Cat. No.	Web (ins)	Flange (ins)	Gauge	Lin Ft Per Ton (min.)
LC0716	LC 75	¾	½	16	6180
LC1016	LC100	1	½	16	5270
LC1516	LC150	1½	⅝	16	3710
LC2010	—	2	1	10	1460
LC2016	LC200	2	⅝	16	3100
LC2212	LC225	2¼	1⅛	12	1460
LC2512	LC250	2½	1	12	1460
LC3010	—	3	1½	10	950
LC3210	—	3¼	1⅜	10	950
LC3510	—	3½	1¼	10	950
LC3710	LC375	3¾	1½	10	780
LC4110	LC400	4	1⅜	10	780
LC4010	—	4	2¼	10	645
LC5010	—	5	2	10	600
LC6010	—	6	2	10	540



LIPPED CHANNELS

Cat. No.	Web (ins)	Flange (ins)	Lip (ins)	Gauge	Lin Ft Per Ton (min.)
LL2016	2	1⅜	.4	16	2070
LL2514	2½	1½	.4	14	1460
LL3014	3	1¾	.4	14	1240
LL3514	3½	2	.6	14	1060
LL3510	3½	2	.6	10	645
LL4012	4	2	.7	12	730
LL4010	4	2	.7	10	600
LL5012	5	2	.7	12	650
LL5010	5	2	.7	10	540
LL6010	6	2½	.7	10	470
LL7010	7	2¾	.7	10	400
LL8012	8	2¾	.7	12	485
LL8010	8	3	.8	10	350
LL10010	10	3½	1	10	290



TOP HAT SECTIONS

Cat. No.	Web (ins)	Flange (ins)	Lip (ins)	Gauge	Lin Ft Per Ton (min.)
LT2016	2	1⅜	.4	16	2070
LT2514	2½	1½	.4	14	1460
LT3014	3	1¾	.4	14	1240
LT3514	3½	2	.6	14	1060
LT3510	3½	2	.6	10	645
LT4012	4	2	.7	12	730
LT4010	4	2	.7	10	600
LT5012	5	2	.7	12	650
LT5010	5	2	.7	10	540
LT6010	6	2½	.7	10	470
LT7010	7	2¾	.7	10	400
LT8012	8	2¾	.7	12	485
LT8010	8	3	.8	10	350
LT10010	10	3½	1	10	290

LYSAGHT BROWNBUILT INDUSTRIES CUSTOM COLD ROLL-FORMED SECTIONS

Custom Cold Roll-Forming is a service offered to manufacturers and designers to meet their requirements when standard sections are unsuitable. A great variety of shapes and sizes can be produced with accuracy and consistency.

The roll-forming machines are capable of handling a wide range of basic materials including:

(1) Uncoated hot rolled and cold reduced steel strip.

(2) Galvanized steel strip.

(3) Prepainted galvanized or cold reduced steel or aluminium strip.

(4) Stainless steel strip.

(5) Aluminium strip.

(6) Copper strip.

(7) Zinc, bronze and magnesium are also available.

Regardless of the nature of the feed, thicknesses between 0.015 in and 0.375 in and widths up to 30 in may be formed.

Typical sections currently being produced are shown in the following illustration.

A — Truck bumper bar
B — Automotive glass channel
C — Mono-rail (composite section)
D — Bed frame bow
E — Conveyor track
F — Construction key
G — Lift door threshold
H — Partition upright
I — Stock crate siding
J — Conveyor track
K — Sheet piling
L — Shutter door bottom rail
M — Caravan cladding
N — Farm machinery component
O — Electrode plate stiffener

P — Shipping container top rail

Q — Truck chassis and mating reinforcement

R — Farm machinery component

S — Louvre for heating register

T — Acoustic ceiling suspension clip

U — Industrial sliding door track

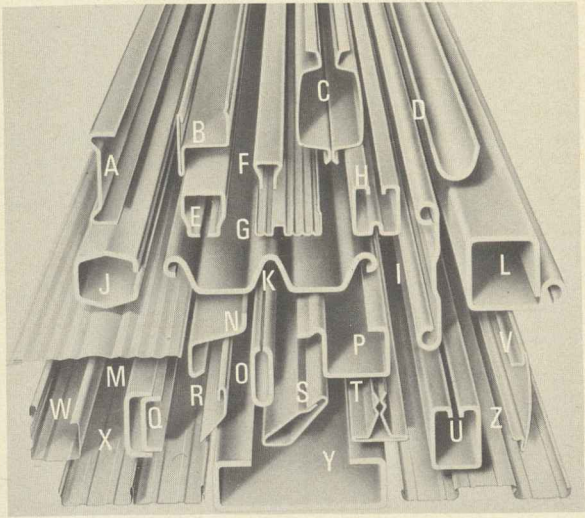
V — Venetian blind component

W — Gutter

X — Roof decking

Y — Electrical trunking and structural section

Z — Precipitator electrode



Not to scale

EXPANDED METAL

Expanded Metal is used in almost every branch of engineering and building. It is made from sheet metal which, by slitting and expanding, without any waste of material, is converted into a network of diamond or other special shaped openings.

Unlike netting, Expanded Metal is not an interlacing of loose or separate pieces. The strands are all part of the parent metal, rigidly unified at their junctions.

Expanded Metal is produced in six types:—

(a) Metalath — as a base for wet plaster work in the building trade.

(b) Ornamesh — for industrial, decorative and general use where a high degree of accuracy and finish is required.

(c) Balustrade Mesh — for balcony and stair railings, screen doors, room dividers and security partitions.

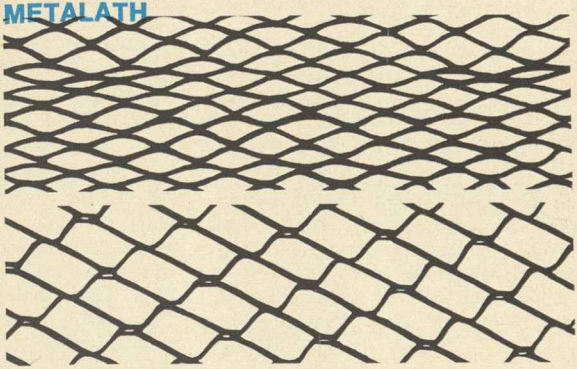
(d) Louvre Mesh — for sun screens, wind breaks and privacy screens, infill panels, facades and soffits.

(e) Gridmesh — produced from heavy steel plate for use on catwalks, work platforms, stair treads, etc.

(f) Micro-Mesh.

Many ductile materials can be expanded, such as steel, aluminium, copper, brass and other alloys, but the chief material for Expanded Metal is high-grade low carbon steel sheet.

METALATH



Metalath is a galvanized steel lathing mesh used extensively in the building industry, particularly as a base for plaster ceilings, ceramic wall tiles on timber frames, soffits and other architectural effects. Metalath is widely used also to support fire proofing sprays on steel columns and beams in fire rated construction and for cement rendering. The product is complemented with a range of corner beads and plaster partition accessories.

Catalogue No.	Sheet sizes		No. Sheets per Bundle	Weight per Bundle
	Width	Length		
PL25, FL25 — For general plastering and wall tiling (2.5 lb/sq yd)	27″	8′	10 (20 sq yd)	50 lb
	27″	9′	10 (22½ sq yd)	56¼ lb
PL34, FL34 — For lightweight fireproof construction (3.4 lb/sq yd)	27″	8′	5 (10 sq yd)	34 lb
	27″	9′	5 (11¼ sq yd)	38¼ lb

Material.— Formed from galvanized steel strip. PL25 is also available in 200 ft coils and can be supplied in larger coils subject to enquiry.

Accessories.— A complete range of accessories for walls, ceilings and partitions is available for use with Metalath.

ORNAMESH

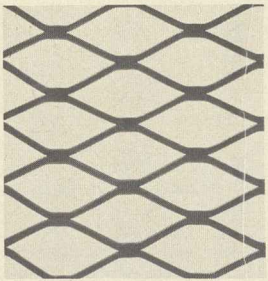
Whether it is for machinery guards in heavy industry, speaker grilles in transistor radios, room dividers or anti-dazzle screens on an express-way, there is a style and mesh size in the Ornamesh range to suit the purpose.

Ornamesh admits light and air and permits easy vision, yet it forms an effective barrier against entry, prevents accidents and has numerous other uses.

Ornamesh is not limited to any one field. It is used extensively in industry for machinery guards, shelving pallets and racking. It is used in manufactured products and equipment of all kinds, and in the building industry for concrete formwork, partitions, room dividers and the like.

Ornamesh is available in both low carbon steel and aluminium. Ornamesh can also be produced in copper, brass, stainless steel and other ductile metals to order.

In some applications of Ornamesh — such as machinery guards, ironing boards, functional furniture and storage bins — a particularly smooth and flat surface is desirable. In these cases, Flattened Steel Ornamesh is the best choice.



Flattened Ornamesh



Ornamesh

PATTERNED ORNAMESH

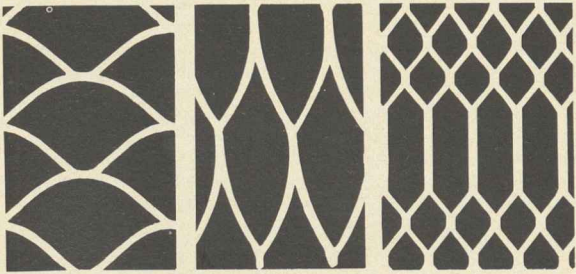


Used in decorative screens and panelling, Patterned Steel Ornamesh provides an attractive high-quality finish, yet it does not restrict the natural flow of air.

Three patterns are available in a wide range of sheet and mesh sizes. It can be supplied in aluminium if desired. A large range of special patterns can also be produced.

In addition to its many uses in industry, Patterned Ornamesh provides new, stimulating ideas for modern interior decoration.

BALUSTRADE MESH



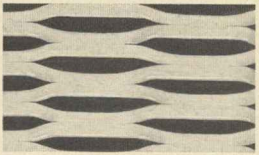
Balustrade Mesh is an ornamental expanded metal with a high percentage of open area giving the appearance of delicate wrought iron.

Intended for internal and external balustrades, grilles and dividers, window and door protectors, security partitions and stair railings. Three standard patterns are available in steel, galvanized steel and aluminium.

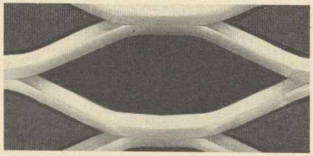
LOUVRE MESH

Louvre Mesh is primarily a sun screen mesh. Because of the unique mesh formation, which occupies only 20% of the total area, it forms an effective shield from the sun's rays, yet it permits free passage of air. Durability is assured by the heavily galvanized base steel.

In addition to being used for sun screens, Louvre Mesh is also suitable for infill panels, facades, and soffits. When installed with the mesh openings running vertically, it may be used effectively for wind breaks and outdoor screens.



Louvre Mesh



Gridmesh

GRIDMESH EXPANDED METAL GRATING

Gridmesh is a metal mesh — designed for use in walkways and platforms. It is strong and light, much lighter than steel plate of similar load bearing capacity and an important advantage for industrial use is its self-cleaning properties.

Available in two series — "GR" is comparatively open for general use and "GM" recommended for heavy-duty applications and where a smaller mesh opening is desirable.

Gridmesh is available in steel, hot-dipped galvanized finish and aluminium.

EXPANDED STAIR AND LADDER TREADS

To complement the range of Gridmesh flat sheets, Lysaght Brownbuilt Industries also manufacture a range of nine Stair and Ladder Treads. The angular ridged surface of Gridmesh provides excellent anti-slip qualities and the Treads are so designed as to allow speedy attachment to any type of steel or timber stringers.

SILOS

Lysaght Brownbuilt Industries manufacture a wide range of prefabricated silos and will be pleased to supply full details of their products and dealers' names.

All communications should be addressed to state offices of Lysaght Brownbuilt Industries.

GRAIN SILOS

Lysaght General Purpose (GP) Grain Silos are produced in capacities from 200 bushels to 5,100 bushels.

Segmented steel floors are standard equipment with the 200 bushel and 500 bushel Silos.

Silos from 1,200 bushels upward are fitted with a full size door, external ladder and bagging outlet complete with bag holder.

Optional extras include steel floors, steel earth rings, and elevated perforated steel floors for Silos from 1,200 bushels to 5,100 bushels.

A range of eight types of elevated gravity-emptying Silos are also available. The two Elevated Mash and Grain (EMG) models are designed with steep (60°) cones to suit most hammer-milled and mash feeds. Two Elevated Pellet and Grain (EPG) models designed for the storage of pellets feature "in shed" unloading and are available with pellet-delivery and air-exhaust pipes for fast filling from bulk feed trucks equipped with pneumatic blowers.

The four Elevated Seed Grain (ESG) models are specifically intended for seed grain storage with a controlled flow chute for the automatic transfer of grain from the Silo to grading equipment.

The most recent additions to the range of elevated Silos are the General Purpose Elevated models with capacities from 1,200 to 3,700 bushels of wheat or oats. These Silos are designed to be emptied by an auger which operates through a boot at the bottom of the cone. The auger boot is independent of the Silo and may be turned to face in any position.

STEEL OFFICE & STORAGE EQUIPMENT

LBI BROWNBUILT STEEL EQUIPMENT

(1) "Fliteline 700" Series office furniture

Desks — executive, clerical, secretarial

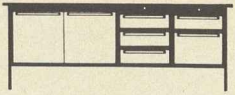
Credenzas

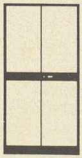
Tables

Filing Cabinets — 2, 3 and 4 drawer and personal executive

Cupboards — full length and counter high.



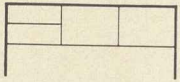






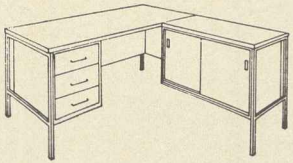
(2) "Trimline" desks — clerical and student.

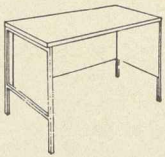
Tables.



(3) "Series 75" desks — clerical, secretarial and typist.

Tables.





(4) Office Equipment

Filing Cabinets — 2, 3 and 4 drawer and personal executive

Cupboards — full length and counter high

Flat File Cabinets — for "open book" filing

Plan File Cabinets — horizontal and vertical

Telephone Cabinets

"Compactus" Office File Units — mobile storage

Card Index Cabinets

Visible Record Cabinets — visual reference

Posting Mobiles — ledger card filing

Stationery Cases

Smokers Trays

Letter Racks

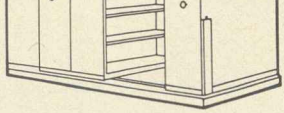
Waste Paper Bins

Office Mobiles — for typewriters, accounting machines, etc.

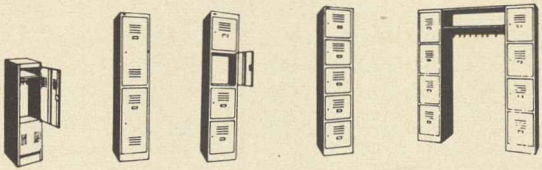
"Intimus" Paper Shredder — German product distributed by Brownbuilt

"Itoki" Fire-Master fire-resistent filing cabinets — Japanese product distributed by Brownbuilt

Chairs — executive, clerical and typist.



(5) Lockers — full length, 2, 4 and 5 tier for sports and golf clubs and factory amenities.



(6) Shelving and Racking

Rolled Upright — up to 250 lb per shelf distributed

General Purpose — up to 500 lb per shelf distributed

Channel Upright — up to 1 ton per shelf distributed
All shelves fully adjustable on patented clips.

Angle Type — up to 1,500 lb per shelf distributed

Panel Type Library Shelving — for school libraries, etc.

Cantilever Library Shelving (4 types) — for larger, institutional libraries

Storage Racking — adjustable for general or palletised loads (light, medium or heavy-duty)
Full range of sizes and accessories.

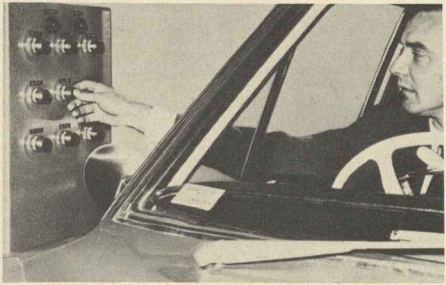
(7) Mobile Storage

"Compactus" hand operated, mechanically assisted, semi-automatic or fully-automatic for medium to heavy storage

"Maxtor" pneumatic for heavy or very heavy storage.

(8) "Maxtor" Automatic Car Parker

For maximum storage of cars in given area — up to 80% increase over normal parking.





(9) Automatic Electric Clothes Driers

Domestic and institutional.

(10) Other

Industrial desks for foremen, supervisors, etc.
Paint Storage Cabinets — ventilated and double-walled.

STEEL BUILDING STUDS

Galvanized steel building studs, suitable for load-bearing applications in cottage construction, are available from a number of manufacturers, including Lysaght Brownbuilt Industries.

WALL FRAMING

Wall framing using galvanized steel studs follows normal timber construction in that frames are assembled, either in the factory or on site, using studs, plates, nogging, diagonal bracing and window headers.

Many of the common rules of timber framing apply, e.g.:

(1) Roof framing members must fall directly over a stud, except where a header or specially stiffened top plate is used.

(2) The stud must in turn bear directly over a firm support in the floor structure or foundation.

(3) Doubled or stiffened studs must be used at each side of wide openings.

(4) Individual wall frames must be braced, and bracing in each wall must be sufficient to resist wind loads on the wall against which it abuts.

STUD DIMENSIONS AND LOAD CAPACITIES

Load-bearing studs are either plain or lipped channel sections, 3″ to 3¾″ deep and of 20BG galvanized steel or heavier. Load capacities of individual studs depend on the form and dimensions of the stud, the gauge of steel and the unbraced length of the stud.

As an example, the plain channel section manufactured by Lysaght Brownbuilt Industries, i.e., 3$\frac{11}{16}$″ x 1¼″ x 18BG of total length 8′ 3″ and with only one row of nogging, will safely support a design compression load of 2,570 lb.

The use of such a stud with a single row of nogging has been approved by the Uniform Standards Committee of N.S.W.

Studs may be spaced at up to 24″ centres, although, roof or floor framing centres may require closer stud spacing in all or part of the construction.

In conventional framing it is necessary to use extra studs to provide backing for the lining at wall junctions. With steel framing, this support can be provided by the use of a stud formed into a top hat section (see sketch). Such a stud is used as the last stud in one wall and the out-turned flanges, lying in the plane of the adjacent wall, eliminate the need for extra studs. As many as twenty studs can be saved in an average cottage.

WALL PLATES, NOGGING, ETC.

Wall plates are commonly a plain channel section, slightly wider than the end of the stud, to allow engagement of the stud into the plate.

Nogging and bracing may be plain channel sections which nest into the studs.

Window headers may take a variety of forms, including heavy-gauge angles or lipped channel sections. Alternatively, stud and plate sections may be used to build up trusses.

CONNECTING OF COMPONENTS

An increasing variety of connection methods is available, and there remains scope for considerable ingenuity in this area.

Plain channel sections may be joined by:

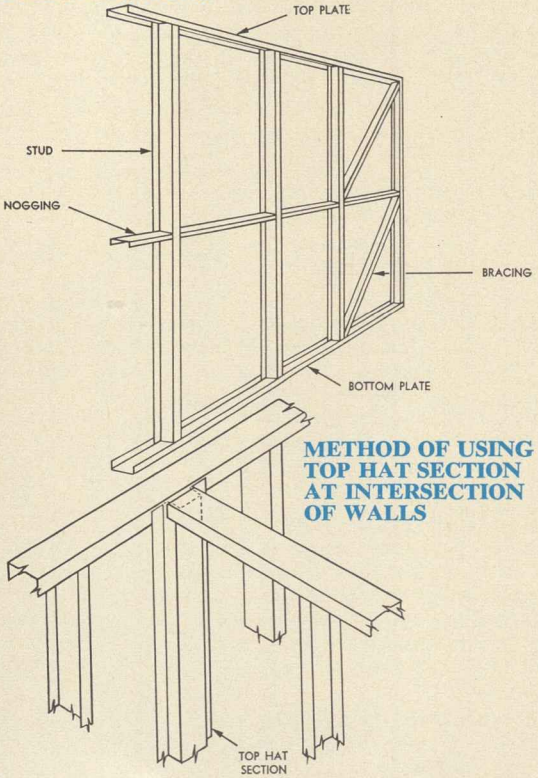
(1) Welding using arc or M.I.G. welding equipment. A minimum of 2″ run of weld should be used at each stud connection.

(2) Drilling and riveting. Zinc-plated steel blind rivets are recommended, and four $\frac{3}{16}$″ diameter rivets should be used at each joint between stud and plate.

(3) Self-tapping or self-drill tapping screws. A minimum of four screws $\frac{1}{2}$″ long x 8 g should be used at each joint.

Pre-punched components are available to simplify riveted connections, and a variety of patented connection methods is now available from several manufacturers.

WALL FRAMING USING ZINC-COATED STEEL BUILDING STUDS



LYSAGHT BROWNBUILT INDUSTRIES — ENGINEERING DIVISION

The Engineering Division of Lysaght Brownbuilt Industries manufactures a wide range of structural, mechanical and electrical equipment and also offers a comprehensive design and general fabricating service.

HEAT TRANSFER EQUIPMENT

Lysaght Brownbuilt Industries Engineering Division in conjunction with Yuba offers a complete range of Shell and Tube Exchangers for the Petroleum Refinery, Gas Processing and Chemical Processing Industries. The Company is thoroughly experienced in the production of units for high pressure, high temperature or cryogenic service.

Petro-chem Isoflow Furnaces are completely shop assembled with refractory lining, heating tubes, burners and manifolding. Heaters are delivered to the job site in the largest transportable sections for easy installation. Skilled on-site labour supervision and expensive testing are eliminated.

The Engineering Division manufactures under licence the full range of Brown Fintube Heat Exchanger Equipment including:

Double Pipe and Multi-tube Hairpin Sections

Tank Suction Heaters

Line Heaters

Vertical and Horizontal Tank Heating Coils.

Brown Fintube Equipment is completely flexible and tailor designed to meet exacting process specifications. When duties change either up or down, heat exchanger modules are merely added or removed as required.

It also manufactures under licence Yuba Transaire Extended Surface Type Aircooled Heat Exchangers in both induced and forced draft design to customers'

special requirements. The Yuba Fintube features a formed angle base helically wound at controlled tension providing 100% contact with the tube surface for high heat transfer.

PRESSURE VESSELS

A full range of pressure vessels for storage and process application is fabricated.

ANNEALING EQUIPMENT

Under licence agreement, a complete range of Lee Wilson Open and Closed Coil Annealing Equipment is manufactured. For all annealing operations including treatment of coiled rod, wire and sheet steel, the complete line can be supplied fully automated for push button operation.

COIL AND SHEET HANDLING EQUIPMENT

A wide range of lifting and handling equipment such as uncoilers, coil cars, flatteners, C-Hooks, caliper grabs and lifting beams is also produced.

CONTINUOUS PROCESS LINES

Continuous process lines such as galvanizing lines, cut-up lines for sheet production and continuous roll-forming lines can be manufactured for operation with coil feed-loop and back tension slitters.

ELECTRICAL EQUIPMENT

A wide range of custom built control equipment for industry is manufactured and the Engineering Division has a co-operative manufacturing licence with Allgemeine Elektricitats-Gesellschaft, Germany which enables them to offer the following equipment:

High tension switchgear

Systems engineering for process lines, rolling mills, paper mill and printing machinery

Automated and computer controlled processes

Gas and steam turbines

Generation equipment

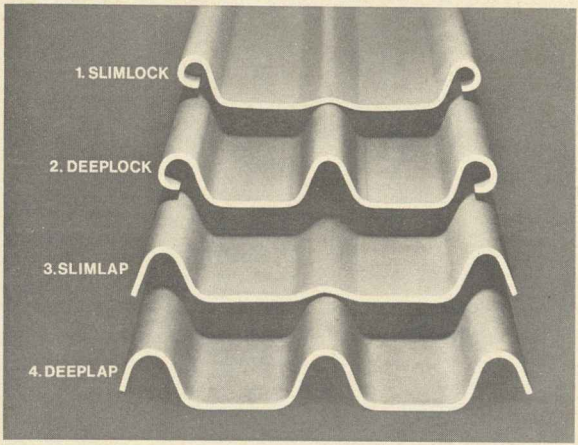
Large AC and DC machines

Vibratory feed equipment

Ship machinery.

LARGE PLANT INSTALLATIONS

The Engineering Division has a co-operative agreement with Siemag and Freid Krupp of Germany which enables them to offer complete design, manufacture, installation and commissioning of plants such as mine winders, coal handling equipment, rolling mills, process lines, desalination plants, steam generation equipment and boiler feed water heaters.



Lysaght Brownbuilt Industries Sheet Piling — refer to text on page 111.



GKN BUILDING AND ENGINEERING

A DIVISION OF GUEST, KEEN & NETTLEFOLDS (AUSTRALIA) PTY. LTD.

EXISTING REPRESENTATION:

MILLS SCAFFOLDING Tubular Scaffolding, Easyfix, Milframe, Self-Lock, Bantam Self-Lock, Trestles, Travelling and fixed cradles, Saf-T-Climb anti-fall device, Heavy Duty Suspended Stage Scaffolding, Milfast.
MILLS FORMWORK: Shore X and Milframe shoring, Milprops, Beam Props, Column Clamps, Beam Clamps, Helical Anchor Bolts.
CONSTRUCTION PRODUCTS Williams Form Clamps, Concrete Form Ties and Anchors, Wedge-Lock Ties, Beam Hangers, Rock Bolts.
MECHANICAL HANDLING EQUIPMENT Formech Mechanised Formworking. System, Alimak Men & Material Hoist.
FRAMING SYSTEMS Unistrut for Racking, Partitioning, Displays, Electrical Trunking, Concrete inserts, Pipe Supports, Cavity Wall Bracket, Met-L-Strut Computer Floor, Adjustable Bench Framing, Saf-T-Trolley, Cable Ladders, Cable Trays, Cable Clamps, Q Straps, Speedrack Boltless Racking—Selective, Drive-in, Drive-thru, Cantilever and Rack Buildings.
GENERAL BUILDING PRODUCTS Thru-Way Rigid PVC Skirting Ducts Mk. I and II, Dure-frame Steel Home Framing, Zibell system for precision wall panel fixing.

BRANCH OFFICES:

SYDNEY 51 7361 410-416 Mitchell Road, Alexandria
MELBOURNE 387 1222 11 Syme Street, Brunswick
BRISBANE 36 2622 10-14 Graham Street, Milton
ADELAIDE 46 3141 Cnr. Adam and Manton Streets, Hindmarsh
PERTH 28 6622 35 Forbes Road, Perth
CANBERRA 95 0004 169-171 Newcastle Street, Fyshwick
NEWCASTLE 68 2513 Lsyaght's Works, Newcastle
PORT KEMBLA 4 2525 C.R.M. Works, Port Kembla
GEELONG 71 204 Station Street, Norlane
TOWNSVILLE 74 5122 Ingham Road, Garbutt
HOBART 34 2477 156 Campbell Street, Hobart
Also at
DARWIN 43 634 **GLADSTONE** 21 201
PORT HEDLAND 31 354

And at Gove and agents in major country centres

GKN BUILDING AND ENGINEERING
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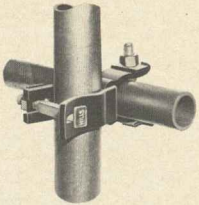
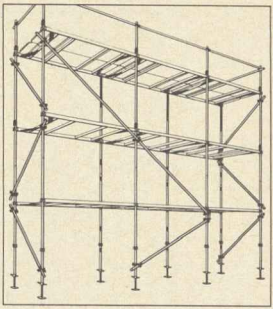


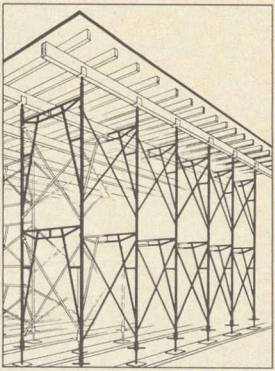
TUBULAR SCAFFOLDING

Steel, or aluminium with over 20 fittings Used for independent bricklayers' scaffolds and special applications including temporary seating stands, cantilever scaffolds and the like. Tubular Scaffolds can be bought or hired. Design, erection and dismantling services available.



MILFAST Horizontal Frame Scaffolding

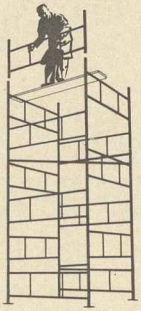
A frame scaffold system comprising frames and few fittings. Used for independent scaffolding providing access for workmen during building operations.



MILFRAME FRAME SCAFFOLDING

Can be used as an independent scaffold to provide safe access to workmen in multi-story building operations or as a medium duty shoring system.

GKN BUILDING AND ENGINEERING
Continued



SELF-LOCK

A frame system comprising four frames and accessories. Used for independent scaffolds and where access is required in building maintenance for a variety of trades including electricians, painters, etc.

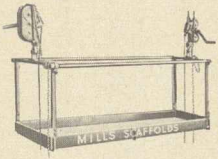
BANTAM SELF-LOCK

A lightweight working platform that comes in three kits. Popular Kit 2′ x 2′ x 6′ high. Household, 4′-3″ x 2′ x 8′ high and Tradesman's Kit, 4′-3″ x 4′-3″ x 12′-0″ high. These kits provide working platforms for home decorators, painters, plasterers, builders and renovators and consist of frames, diagonal braces, foot ties, rubber feet and scaffold boards.



MILLS TRAVELLING CRADES

Light duty fixed and travelling are supported on a framework of scaffolds tube and fittings and provide access to fascades of multi-story buildings for tradesmen including painters, cleaners and other contractors.



ADJUSTABLE TRESTLES

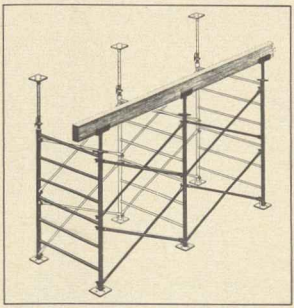
LARGE TRESTLE:
Height (fully extended), 8′-0″.
Height (fully collapsed), 5′-0″.
Extension every 6″.
Weight 88½ lbs.

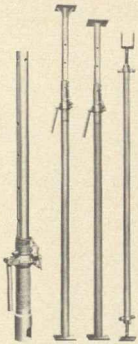
SMALL TRESTLE:
Height (fully extended), 5′-9″.
Height (fully collapsed), 2′-9″.
Extension every 6″.
Weight 77 lbs.



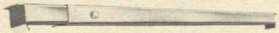
MILLS FORMWORK SHORE X:

A two frame adjustable shoring system used for the support of heavy concrete slabs in bridge soffits, floor slabs in multi-storey buildings, heavy industrial installations and for trench and tunnel work. System comprises one base and one extension frame and accessories.





MILPROPS AND ADJUSTABLE PUNCHEON

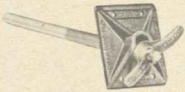


MILCENTRE

WILLIAMS FORM HARDWARE



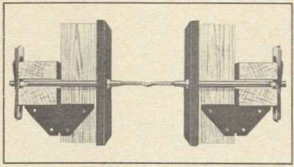
HEX-NUT CLAMP & SHE BOLT



VIBRA-LOCK CLAMP & SHE BOLT



HEX-LOCK CLAMP & SHE BOLT



WEDGE-LOCK OUTER UNIT ASSEMBLY



CRIMPED INNER ROD

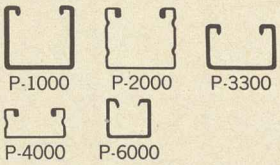
STRESS GRADIENT PIGTAIL ANCHOR

Wedge-Lock Beam Hangers
Reinforcement Bar Chairs
G.K.N. Rock Bolts

GKN BUILDING AND ENGINEERING
Continued

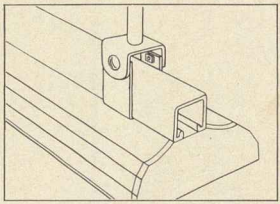
UNISTRUT
All-purpose metal framing





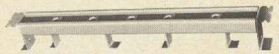
UNISTRUT ELECTRICAL TRUNKING

Consists of continuous channels. Accepts all types of incandescent and fluorescent lighting. Spacing can be intermittent or continuous. System can be adjusted to suit changes in layout and preassembled and wired on the ground.



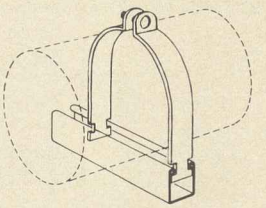
CONCRETE INSERTS

Unistrut Concrete Inserts provide a fixing of known strength. The continuous opening in the channel enables exact location of mechanical and electrical fixings. Full range of Unistrut accessories covers installation of all mechanical services in any position.



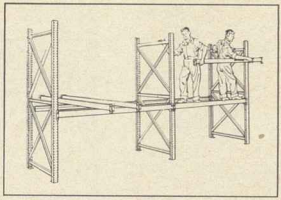
UNISTRUT PIPE AND CABLE SUPPORTS

A range for all service installation requirements, horizontal, vertical cable ducts or risers. These include; Unirod end threaded rod, one and two piece pipe or tubing clamps, etc.



SPEEDRACK

Heavy duty racking including selective Speedrack for selective heavy duty storage of a wide variety of goods, Drive-in and Drive-thru Speedrack providing high density storage without stock damage and Cantilever Speedrack giving continuous and adjustable planes of storage as long as commodities to be stored require it.



PAINTING OF GALVANIZED SHEET

The painting of zinc-coated steel sheet for either decoration or added protection may be easily and effectively carried out, providing certain basic requirements are observed. Ordinary techniques combined with readily available zinc-compatible paints should be used, but care must be taken in the choice of paint to ensure its suitability for application

in the factory; (see Section 1)

or in the field. (see Section 2)

Painting in the factory, normally on a line designed specifically for the purpose, usually requires **oven drying** paints, while painting in the field — with less elaborate cleaning and pretreatment — requires **air drying** paints. Table 2 summarizes the general approach to the field painting of galvanized steel.

Selection of paint for factory use . . . is again dictated by the final use and exposure and should be chosen in consultation with a reputable manufacturer. Interior exposure tends to be less severe than exterior but many highly corrosive interior conditions are encountered, for example in washing machine cabinets.

Selection of paint for field use . . . should take into account the severity of the environment to which the paint will be exposed e.g., in rural, marine, industrial or other special conditions. A number of proprietary paints which have been found suitable for use in a wide range of conditions have been set out in Table 3 on page 142. Omission from this Table does not necessarily indicate unsuitability, only that in many instances the paint system has not yet been evaluated by John Lysaght (Australia) Limited.

SECTION 1 — FACTORY PAINTING

Pretreatment with a phosphate coating system or with a two pack etch primer is commonly used in the factory before painting. This confers a valuable combination of paint adhesion and increased corrosion resistance under the type of paints — generally stoving varieties —

normally used. Pretreatment is particularly important if the products are for outdoor use, and for many indoor applications where the product is exposed to humid conditions or to the risk of mechanical damage.

Cleaning, phosphating and post-treatment systems are available from companies dealing in metal pretreatment and known to the trade. Two suppliers whose systems have been found satisfactory are Parker Bonderite Australia Pty. Ltd., and Amchem Australia Pty. Ltd. Where phosphating facilities are not available, two pack etch primers may be used.

If Galvabond is to be phosphated, it should be ordered unchromated and oiled since the chromate film, usually applied to the surface during production, may interfere with the phosphating reaction resulting in unsatisfactory coatings. The light mineral oil used on unchromated strip for protection during transit does not provide the same resistance to corrosion as the chromate treatment. Particular care should be taken to keep packages waterproof prior to use. Water staining, usually a white corrosion product, should be removed by light abrasion before or during the normal cleaning and phosphating process.

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 to the selection of finish coats. The technique should be considered only in close consultation with a paint manufacturer experienced in this field.

A variety of basic paint types is available for factory finishing, but the importance of selecting the correct paint for any particular application is again stressed. A summary of paint finishes and typical applications, together with cleaning and pretreatment notes has been compiled in Table 1.

Acrylics are very popular in the appliance and building industries because of their mar resistance and excellent resistance to heat and chemicals. Alkyds are less ex-

pensive coatings, widely used where their properties are applicable to the end product.

SECTION 2 — FIELD PAINTING

For satisfactory priming, the surface to be painted must be clean and dry. Dirt should be removed by washing with water, greasy deposits should be wiped with paint thinners and any loose corrosion product removed by wire brushing.

Weathering was formerly considered to improve long term paint adhesion, but 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 to be withstood; reference to the information listed in detail in Table 3 is strongly advised.

Use of the recommended brands will produce an entirely satisfactory result but care should always be taken to follow the manufacturers' mixing and application instructions closely. 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 except for zinc dust — zinc oxide paints where a total of two is sufficient. Spray painting can be used to cover larger areas at lower cost providing the paint is suitable for this method of application.

Lysaght Colorbond

In many instances, it is possible — and desirable — to avoid either field or factory painting. John Lysaght (Australia) Limited now produces Colorbond, a pre-painted zinc-coated quality, on Australia's largest fully integrated coil coating line. Colorbond is available in a wide range of roofing and cladding profiles or as coil for fabrication.

TABLE 1 FACTORY PAINTING OF GALVANIZED SHEET

QUALITY	COATING TYPE		CLEANING	PRE-TREATMENT	PAINT FINISH
	Type	Comment			
GALVABOND and similar	Zinc	For phosphating ensure that "unchromated & oiled" is specified on the order.	Alkaline, usually part of pretreatment.	Phosphates, Chromates, or two pack etch primers.	Stoving appliance or outdoor finishes, e.g. acrylics, alkyds, vinyls, epoxies.
ZINCMATTE	Zinc	For phosphating ensure that "unchromated & oiled" is specified on the order.	Alkaline, usually part of pretreatment.	Phosphates, Chromates, or two pack etch primers.	Stoving appliance finishes, e.g. acrylics, alkyds, epoxies.
ZINCSEAL	Zinc	Provided with sophisticated phosphate coating.	Solvent wiping. Trichlorethylene vapour degrease.	None required. Two pack Etch Primers for damaged phosphate coating.	Stoving appliance finishes, e.g. acrylics, alkyds.
ZINCANNEAL	Zinc-iron alloy	Provided with simple phosphate coating.	Solvent wiping. Trichlorethylene vapour degrease.	None normally. Performance can be upgraded by two pack etch priming.	Stoving appliance or outdoor finishes, e.g. acrylics, alkyds, epoxies.

TABLE 2

GENERAL APPROACH TO THE FIELD PAINTING OF GALVANIZED SHEET

CLEANING

(1) Remove dirt by washing with water.

(2) Wipe off greasy deposits with paint thinners.

(3) Remove any corrosion product by wire brushing.

PRIMING & FINISHING

(1) Select paint system from Table 3 with due regard to environmental requirements.

(2) Follow the paint manufacturers instructions explicitly.

(3) Do not mix different proprietary brands of primer and finisher.

(4) Apply 2 finishing coats in addition to the primer. Principal exception is zinc dust — zinc oxide where 2 coats in total is usually sufficient.

(5) Finishing coats may be applied directly to Zincanneal without priming, but when a 2 pack type etch primer is used, the overall protection given by the paint system is very much improved.

TABLE 3 FIELD PAINTING OF GALVANIZED SHEET

Recommendations for rural, urban, moderate industrial and moderate marine conditions; approximately ½ mile and further from surf, depending on terrain and prevailing winds.

Primer Type	Application	Brand	Finish Type	Application	Brand
Two pack etch primer	Brush or spray Spray preferred	Balm Wash Primer Berger Etch Primer Taubmans Met-L-Etch	Alkyd	Brush or spray	Balm Dulux Berger Roofmaster Taubmans Butex
			Oleoresinous/ micaceous iron oxide	Brush or spray	Balm Ferrodor Berger Hemacote Taubmans Mironite
Zinc dust/ zinc oxide	Brush or spray	Berger Galvanized Iron Primer Grey Taubmans Galva Kote	Zinc dust/ zinc oxide	Brush or spray	Berger Galvanized Iron Primer Grey Taubmans Galva Kote
			Alkyd	Brush or spray	Berger Roofmaster Taubmans Butex
			Oleoresinous/ micaceous iron oxide	Brush or spray	Berger Hemacote Taubmans Mironite
Low gloss water borne acrylic*	Brush	Taubmans Primabond T2029 Red Taubmans Primabond T2646 White	Low gloss water borne acrylic	Brush	Taubmans Primabond T2029 Red Taubmans Primabond T2646 White
			High gloss water borne acrylic	Brush	Taubmans Big A
High gloss water borne acrylic*	Brush	Balm Galvaclad	High gloss water borne acrylic	Brush	Balm Galvaclad

Note: Before use, 6 lb zinc dust must be added per gallon of zinc dust/zinc oxide paint.

Note: For acrylics, overpainting with oil based paints can reduce adhesion of total system; white is suitable for mild conditions only, colours contain anti-corrosive pigments.

Primer Type	Application	Brand	Finish Type	Application	Brand
Oil based calcium plumbate primer	Brush Spray not permitted	Balm Dulux Primer for Galvanized Iron Taubmans Galvanized Iron Primer	Alkyd	Brush or spray	Balm Dulux Taubmans Butex

Note: Calcium plumbate primer contains lead and must not be used on water catchments.

Recommendations for heavy industrial and severe marine conditions; approximately within ½ mile of open surf, depending on terrain and prevailing winds.

Primer Type	Application	Brand	Finish Type	Application	Brand
Two pack etch primer	Brush or spray Spray preferred	Balm Wash Primer Taubmans Met-L-Etch	High build vinyl	Spray preferred	Balm Dulux VR3 Vinyl Taubmans Valchem Vinyl Enamel
			Two pack polyurethane	Brush or spray	Balm Durethane PGH Alumidise
			Chlorinated rubber	Brush or spray	Balm Dulux Thik-Clor Taubmans Valchem Chlorinated Rubber

Note: Suppliers' recommendations should be followed explicitly in regard to film builds.

Recommendations for buried or immersion conditions, e.g., tanks storing ground waters.

Primer Type	Application	Brand	Finish Type	Application	Brand
Two pack etch primer	Brush or spray Spray preferred	Balm Wash Primer Taubmans Met-L-Etch	Two pack coal tar epoxy	Brush or spray	Balm Duretar Taubmans Bitoxy

The proprietary products referred to for guidance in the above tablets are among those which have been evaluated by John Lysaght (Australia) Limited and found satisfactory. The performance of a system is influenced by the quality of preparation and application. The paint manufacturers' instructions should be followed explicitly.

Contact the nearest John Lysaght (Australia) Limited Sales Office listed on pages 3 to 6 for further information.

* As some acrylic paints may contain chromium compounds, their use on water catchments is not advisable.

SOLDERING GALVANIZED SHEETS

All qualities of Lysaght zinc-coated sheets may be soldered quickly and effectively if the simple procedures given below are followed.

Common Soldering Problems

The most common causes of problems in soldering are:

	Refer to Comments Under
1. Dirty soldering iron	Cleanliness
2. Overheated soldering iron and abrasion	Applying the Solder
3. Dirty and poor quality flux	Cleanliness; Fluxing
4. Poor quality solder	Solder
5. Use of percussion tools	Forming
6. Resistance to wetting by flux	Fluxing
7. Covering spangle cracks	Fluxing
8. Soldering Zincanneal	Fluxing

Storage of Sheets

Sheets or products for soldering should be stored appropriately to avoid water damage or oxidation of the surface as it is necessary to remove any surface deposit with abrasive paper before soldering.

Forming

The manner in which the material is formed before soldering has an important bearing on its soldering properties. It is important to ensure correct tailoring of seams and to avoid mechanical bruising in either:

(a) Hand Seaming.
Use a wooden dresser or mallet in preference to a steel hammer. A groover of the correct size should be used.

(b) Machine Seaming.
The size of the seam should be carefully tailored to suit the grooving machine. Care should be taken to ensure that machines are correctly set.

Cleanliness in Forming and Soldering

Forming tools and working surfaces should be thoroughly clean, as grit ground into the surface during forming can not be readily removed. Before seaming, sheets which are obviously dirty should be cleaned and, where applicable, surface deposits should be removed from the area to be soldered by the use of abrasive paper. Before fluxing, the job should be thoroughly cleaned to remove dirt, grease or oil picked up from the forming tools.

Flux pots and flux brushes must be clean, and flux which has become contaminated through excessive use should be discarded. It is most important that the soldering iron be clean and well tinned and that the solder be free from contamination.

Keep the Zinc on the Sheet

The technique of soldering — as described in both Fluxing and Applying the Solder — is built around the maxim "keep the zinc on the sheet". This is particularly important with the thin coating of electro-galvanized sheet.

Fluxing

Two types of flux are recommended; the conventional spirits flux and a proprietary flux, Kemtex Pinnacle Soldering Fluid, with the latter being preferred. A spirits flux is not recommended for Zincanneal but this sheet may be readily soldered if Kemtex Pinnacle Soldering Fluid is used.

1. Spirits Flux.
   A spirits flux is normally a mixture of killed spirits and raw spirits in equal proportions, but good results can be obtained with killed spirits alone or with raw spirits alone. Excessive use of raw spirits can effectively remove significant amounts of the zinc coating and this may lead to soldering problems or corrosion of adjacent areas.

   Raw spirits, spirits of salts and muriatic acid are popular names for hydrochloric acid. Killed spirits (or zinc chloride) is hydrochloric acid to which

zinc has been added until gas bubbles stop rising from the solution. These materials are normally obtainable from plumbing supply houses.

2. Kemtex Pinnacle Soldering Fluid.
This flux is the preferred choice for soldering and is highly recommended. It is available from the manufacturer, O. T. Lempriere & Co. Ltd., in all capital cities as well as from many plumbing supply houses in both city and country areas. This flux instantly wets and superficially etches the zinc surface. It is easier to control than a spirits flux, fluxing time is reduced and, normally, greater speed and ease of soldering results with better joint penetration. The slightly higher cost tends to be offset by the smaller quantity required for effective fluxing. For best results the time between fluxing and soldering should be minimised by fluxing small areas.

As a flux is corrosive, only the portions of the work to be covered with solder should be fluxed. This should be observed with particular care when using a high proportion of raw spirits, which is very reactive with zinc.

The flux should be applied until it has uniformly covered the whole of the joint and has penetrated into the joint. With a spirits flux it is essential to ensure that the area to be soldered has been thoroughly wetted with flux; a second application may be necessary.

The wetting action and joint penetration of a spirits flux is improved by the use of a wetting agent in the proportion of one drop per cup of flux. This approach may be used with Pinnacle flux for ensuring joint penetration, although generally penetration of both lapped and grooved seams is complete if sufficient flux is used.

The wetting agent may be an industrial surface active agent such as Nonidet P40, which is available from Shell Chemical (Australia) Pty. Ltd. Alternatively, many of the readily available household detergents are satisfactory and a simple trial will establish suitability. Some cloudiness may occur following the addition of the detergent but this will not affect the fluxing operation.

When forming or seaming operations involve severe stretching of the coating relative to the base, minute surface fissures, or spangle cracks, may result. Spangle cracking does not normally interfere with the penetration of solder into a seam; but when appearance is important and smooth coverage of these areas is necessary, careful attention must be given to cleanliness and fluxing technique, and the speed of soldering must be reduced, particularly when a spirits flux is used. This problem can normally be overcome by the use of Pinnacle flux.

At regular intervals the flux pot should be cleaned and filled with fresh flux. Constant use of the same flux, or adding to used flux, will result in contamination and ineffective fluxing action.

Solder

A good quality 50/50 solder with a maximum antimony content of 0.5 per cent should be used. Australian Standard Specification No. H.1 — 1931 gives full details of a suitable composition. Solder sticks should be clean and the use of badly oxidized sticks should be avoided.

Applying the Solder

To obtain best results the required heat should be applied in the shortest possible time at a minimum working temperature. Overheating may result in local buckling and it causes an excessive solution of the zinc coating, giving a rough sandy finish. The seam must, however, be adequately heated if good penetration is to be obtained. To achieve these objectives the following points should be observed:

1. Avoid heat conduction away from the joint. This will occur when the work is in contact with a heat conductor, such as a steel block, and inadequate heating may result.
2. Avoid soldering in draughty conditions. Inadequate heating may result.
3. Use a soldering iron with a high rate of heat transfer. It is desirable to dress the bit face to provide a large surface area in contact with the work.

4. The soldering iron should be clean and well tinned.
5. Do not overheat the soldering iron. An overheated iron, indicated by a predominance of green coloration in the heating flame, will cause overheating of the work.
6. Avoid applying a direct flame to the work. Overheating may result.
7. Solder the joint in one run wherever possible. A second run is more difficult to apply and serves little purpose if the first run has been properly applied.
8. Avoid undue abrasion of the zinc surface with the soldering iron.
9. The soldering iron should always be drawn along the seam towards the operator, because the iron preheats the seam, and should be drawn in a straight line with no movement from side to side.

After Soldering

It is most important that the job be wiped with clean cloths dampened in clean water to remove excess flux and so prevent corrosion.

Lysaght Sealer

As a substitute for soldering, zinc-coated sheets may be joined by the use of "Pop" rivets and caulking compounds. In this case the "Pop" rivets provide the primary joining strength and the caulking compound acts as a sealant. One such compound is Lysaght Sealer, and several other brands are available commercially. Full instructions for the use of Lysaght Sealer are included in every pack.

Lysaght Colorbond

Prepainted Colorbond galvanized sheet can be soldered if the paint film is scraped off the area to be soldered. Colorbond sheets can be mechanically joined, in place of soldering, without removal of the paint film by using the approach described in the section above on Lysaght Sealer.

HANDLING & STORAGE OF GALVANIZED STEEL SHEET

Provided certain precautions are observed, zinc-coated steel sheet may be satisfactorily stored without deterioration in quality.

It must be stressed, that, should water become trapped between adjacent surfaces of zinc-coated sheet or coil, the resulting corrosive reactions are far more aggressive than those encountered in normal service. In extreme cases and with the lighter coating weight qualities such as Zincseal or Zincanneal 0.5 oz/sq ft, this may lead rapidly to failure of the coating.

Both sheet and coil should be transported and stored so that water is unable to penetrate between adjacent sheet or wrap surfaces. These qualities must not only be kept dry in transit and stored in weatherproof buildings, but under conditions of high humidity, condensation must be prevented by adequate ventilation and air circulation.

If, inadvertently, any of these zinc-coated qualities should become wet, the suggested remedial action is to wipe off excess water with a clean rag and to stack the sheet so that air circulation completes the drying process. Obviously, this procedure is not applicable to coil, emphasising the need for initial precautions.

In prolonged storage, especially under humid conditions, some staining of the surface may occur.

To preserve the surface, handling should only be carried out using clean dry gloves. Precautions against mechanical damage should be observed.

CORRUGATED GALVANIZED STEEL TANKS

Recommendations

INTRODUCTION

Where piped water supplies are not available, common practice is to install storage tanks of corrugated galvanized steel, varying in size from 800-1,000 gallons for small cottages to the large 20,000-30,000 gallon tanks for sheep and cattle stations. Galvanized steel tanks are relatively inexpensive to buy and transport, and erection on the site is not difficult.

Australia is a naturally dry country and every endeavour should be made to conserve all available water, particularly rain water. A galvanized steel roof forms an admirable, clean catchment and circular tanks of corrugated galvanized steel are a most efficient and economical method of storing water. Any desired size tank can be built by the choice of the appropriate lengths and gauges of Lysaght Brownbuilt Custom Blue Orb.

TANK INSTALLATION

The life of a tank is dependent upon many factors and a little care in the choice of the location of the tank can often mean a difference of many years in its life. Whenever possible, tanks should be installed in a shady position, preferably on the southern side of the building but away from trees from which falling leaves might clog up the strainer or contaminate the water. Direct sunlight falling on a tank for long periods on hot days creates temperature differentials in the water which tend to promote corrosion.

Tanks should be fitted with a top, since this will not only help to prevent contamination of the water but will also prevent the growth of harmful algae. Most algae are not at all harmful but a few evolve acids during their normal process of growth and as a consequence are

detrimental to galvanized steel. Green algae are usually quite harmless and may grow to an appreciable length.

Inlet filling pipes should extend well into the tank in order to ensure that water does not run down the tank wall, because this creates conditions which can promote corrosion.

No metals such as copper, brass or bare steel should be in contact with the zinc coating on the sheets nor be in the water which is in contact with the zinc. Solder, although electro-positive to zinc, does not show any tendency to corrode in water and therefore no zinc is required for the sacrificial protection of this metal. When brass fittings are used in tanks, they should be thoroughly tinned before fixing otherwise severe corrosion will result in their immediate vicinity.

USES OF GALVANIZED STEEL TANKS

Galvanized steel tanks are used for the storage of rain, bore, dam and river waters, and in all cases the conditions of first filling are of the utmost importance in determining the ultimate life of the tank.

Zinc is not inherently a corrosion resistant metal, but if the initial corrosion of its surface takes place under suitable conditions, a light tightly adherent film can form, which reduces any further corrosion to a very low level. In a tank containing water of high purity or waters of high chloride and low magnesium and calcium content, conditions are not suitable for film formation, with the result that corrosion of the zinc is not inhibited. To overcome this problem, pretreatment of the water tank is highly desirable and the following recommendations should be followed.

RECOMMENDATIONS FOR TANK PROTECTION

Rain Water Storage.— Zinc will not form a protective film when exposed to very pure water, and the corrosion that takes place under these conditions produces a non-adherent, flocculent deposit which affords no protection, and through which corrosion will proceed unchecked.

During the course of an extended period of rainfall, the nature of the water falling gradually changes. At the start, the composition of the rain water may be such that it will readily form a protective film. At the beginning of the shower, the rain-drops will collect dust and other impurities from the air and from the catchment, and these impurities will generally contribute to rapid film formation. With continued rainfall the purity of the water increases and what enters the tank is no longer capable of forming a protective film. If a tank is gradually filled by a succession of showers over an extended period, each run-off will contribute its share of impurities and a protective film may be formed which is then able to perform well even when high purity water enters at a later stage. If, however, the first filling of the tank occurs during continuous rain, the water in the tank will be relatively pure and, as a consequence, the initial protective film may not be formed.

To overcome this uncertainty, **Lysaght Tect-A-Tank** was developed for use in new tanks to ensure satisfactory film formation. **Tect-A-Tank** must be placed in the tank prior to the entry of any water at all, and protection is automatically afforded as the tank fills.

Tect-A-Tank contains two compounds, one a readily soluble zinc metaphosphate, and the other a less soluble zinc-calcium metaphosphate, which are mixed and packed in sections in a long, perforated plastic tube. On partial or total filling, the contents of the submerged sections of tube dissolve. Traces of zinc and calcium phosphates pass into solution but these are not sufficient to affect the taste of the water, nor to have any detrimental effect on the health of those using the water.

Tect-A-Tank is not effective in a header tank where the large volume of water circulating will prevent the formation of a passivating film on the tank walls, nor is it effective if it is placed in a tank which already has, or has had, water in it.

Rain water tanks may run dry during a drought and be refilled with ground water. If this should become necessary, it must be realised that any protective film

that has formed on the tank walls can be destroyed and the life of the tank may be seriously shortened. To avoid this, the recommendation made in the following paragraphs regarding painting, should be observed.

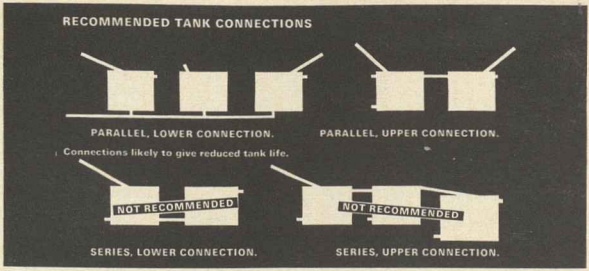
Ground Water Storage.— Bore, well, dam and river waters can vary widely in composition; many are aggressive to galvanized steel, some are protective. The behaviour of water from any one source may fluctuate from one extreme to the other as a result of floods or droughts. Waters from different locations vary considerably, dependent upon the nature of the terrain over, or through which the water has passed.

If in the initial stages of filling, a protective film or crust is formed, either by reaction of the water with the zinc or by the deposition of solids from the water, a long tank life is assured. However, the variability of ground waters is such that it must be considered unwise to be unduly optimistic in this regard, and the safest practice is to paint the inside of ground water tanks before their first filling. (Refer to Painting of Zinc-Coated Sheet page 137). Bituminous paints should never be used for painting galvanized steel tanks. The performance of these paints has been found to be variable and whilst some are quite satisfactory, others actually cause corrosion.

SERIES CONNECTIONS

Where two or more tanks are in use in the one location, each should have a separate inlet and outlet, since it has been found in many cases that the second or subsequent tanks in an inter-connected series have very short lives. The reason for the early failures in series connected tanks appears to be associated with differences in water purity and siltation between the first and subsequent tanks.

See illustration overleaf.



CATCHMENT AREAS

The nature of the catchment areas from which rain water tanks are filled is of importance in determining the conditions in the tank, because the composition of the water may be influenced by both the size of the catchment and the material used.

Large catchment areas, over 800 sq ft per 1,000 gallons of water storage capacity, have been found to be associated with shorter tank lives. This is only of importance where very heavy rains are usual, and is considered to be due to the fact that rapid filling occurs, overflowing the tank and washing away any silt and leaving behind high purity water.

The material used for the roof catchment can have a considerable bearing on the nature of the water collected in the tank and, therefore, on the life of the tank. This particular aspect of tank lives has been under investigation for a number of years and whilst it is not possible to quote quantitative data in support, it is possible to indicate the order of preference for various roofing materials.

The investigations indicate that the best materials for roof catchments feeding rain-water tanks are unpainted Lysaght Orb sheets or asbestos cement sheeting; less satisfactory are glazed terra-cotta tiles, roofs painted with aluminium paint or roofs sheeted with copper or aluminium.

Capacity of Tanks — Calculations

Square or Rectangular Section.— All dimensions in feet: length x breadth x depth x 6¼ = capacity in gallons.

Circular.— Capacity in gallons given by the following rules:

A. Capacity = $\frac{\pi}{4}$ x (diameter)^2 x height x 6¼.

B. Capacity = Multiply circumference by itself and by half the height — $C^2 \times h/2$.

C. Capacity = Multiply diameter by itself and by five times the height — $D^2 \times 5h$.

Example.— Diameter 6 ft, height 6 ft.
6 x 6 x 30 ft = 1,080 gal approximately.

AERIAL AGRICULTURE

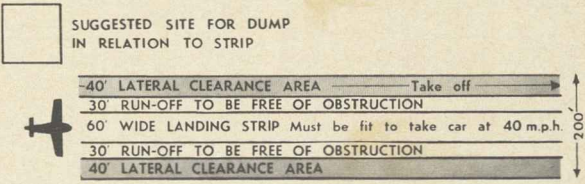
During recent years an increasing use has been made of aircraft for top dressing and seeding, for spraying and dusting of crops and pastures and for pest and vermin extermination. In 1968 the total area treated was 10,495,000 acres.

AIRSTRIP REQUIREMENTS

The development and maintenance of good airstrips on your own property can be highly advantageous to you in the following ways:—

1. Greater safety for the pilot and aircraft while operating on your property.
2. Fast and efficient operation of aircraft.
3. Airstrip facilities add to the capital value of your property.
4. Good operating conditions mean fuller utilization of contractor's equipment, which affects the cost to you.

The minimum requirements for an airstrip are set out below and it will be appreciated that in addition to these it is also necessary to provide a good access road and dump site for the storage of fertilizers, etc.



The diagram above sets out the landing strip requirements and suggests a siting of the dump area in relation to it.

A 60-foot wide graded landing area is required and it is essential that it should be free of stone. The surface of the run-off area (30 ft wide each side) must be completely free of obstruction of any sort and smooth enough so that there will be no damage to the plane

should it swing on landing or take-off. The 40-foot wide clearance area on each flank should have no obstructions more than 1 foot above the ground.

The basic length for an airstrip is 500 yd at sea level, with an extra 50 yd for each 1000 feet above sea level. At an altitude of 2000 feet, for example, a 600-yard strip would be necessary.

The strip surface should be well graded and then grassed so that it can stand up to maximum work and resist erosion. This will reduce maintenance costs to a minimum. When it becomes overgrown it should be mowed to the full length and the loose grass should be removed from both the first 200 yards of the strip and all around the loading area. Long grass will retard aircraft acceleration and, if wet, can reduce brake control to a serious extent.

The reason for removing the cut grass as suggested is that it could otherwise be drawn into the intake of the aircraft with serious results, and there is always the possibility of dry loose grass being set alight by the aircraft exhaust.

It is a good idea to mark your airstrips with four small car tyres, painted white, along each side. A fair test of serviceability of an airstrip surface is to drive a car over it at 40 mph. At this speed there should be no undue roughness in the ride and there should be NO pitching or rolling.



De Havilland Beaver Aircraft spreading Super-phosphate
(Photograph by courtesy of Aerial Agriculture Pty. Ltd.)

BRICKS AND BRICKWORK

1,000 common bricks weigh about 4 tons.

Standard brick size = 9″ x 4-5/16″ x 3″.

Standard measure = 1 rod = 16′ 6″ x 16′ 6″ x 13-1/2″.

1 Rod = 272 super feet x 1-1/2 brick thickness.
= 408 ,, ,, x 1 ,, ,,
= 816 ,, ,, x 1/2 ,, ,,
= 306 cubic feet or 11-1/3 cubic yards.

QUANTITIES OF MATERIALS REQUIRED FOR ONE UNIT OF BRICKWORK

Unit Quantity	Bricks		Mortar: Lime or Cement Cu Ft	2:1 Cement Mortar	
				Cement	Sand
	No.	Cu Ft		Bags	Cu Ft
¼″ Joints					
1 Rod	3,703	260	48	23	46
1 Cu Yd	327	22.97	4.03	2	4
⅜″ Joints				3:1 Cement Mortar	
1 Rod	3,429	241	65	23.2	70
1 Cu Yd	302	21.27	5.73	2.04	6.12

Weight of Brickwork.—In lime mortar, about 112 lb per cu ft. In cement mortar, about 120 lb per cu ft.

Paving requires per sq yd—32 bricks on flat; 48 bricks on edge.

MORTAR FOR BRICKWORK:

(a) Cement mortar should be used where a high degree of impermeability is required, as in walls and piers below dampcourse, or where high strength is required, as in piers or walls carrying heavy loads. Usual proportions are 1 part cement to 3 parts sand, or 1 part cement to 4 parts sand by volume.

(b) Lime mortar is frequently used where strength is of less importance; it is more workable than cement mortar, resulting in a higher rate of bricklaying. Usual proportions are 3 to 4 parts of sand to 1 part of hydrated lime or lime putty by volume.

(c) Composition mortars consist of cement, hydrated lime, and sand, and are intermediate between cement and lime mortars in regard to strength and workability. Proportions used vary from a cement mortar with added lime equal to 10% of cement volume (to improve workability) to a lime mortar gauged with 10% cement immediately before use to improve robustness of the job; satisfactory proportions for normal brickwork are 1 part cement to 1 part hydrated lime or lime putty to 6 parts sand by volume.

MODULAR BRICKS

Although at present they represent only a small proportion of the total numbers produced, there has been a steady increase in the production and use of bricks made to modular sizes. They are at present being incorporated in a revision of Australian Standard A 21.

Sizes of modular bricks are expressed as nominal, that is, including the mortar joint. Thus, in calculating numbers required it is only necessary to work on the nominal sizes, ignoring the mortar joint.

Nominal sizes are: 12″ x 4″ x 4″.

8″ x 4″ x 4″.

SPECIAL BRICKS

New applications in brickwork call for many special, or non-standard sizes. Space does not permit a complete listing but the following are more common examples.

"Nu-lite" Block: 9″ x 4-5/16″ x 4-11/16″.

Norman: 11-5/8″ x 3-1/2″ x 2-5/8″.

Modulated: 12″ x 4″ x 4-1/2″ (nominal).

BRICKWORK DIMENSIONS

NOTES.—⅜″ should be added for bed under sills bearers, etc. Openings are ¾″ longer than piers. Four courses equals 1′-1½″.

Courses or Bricks	Piers	Openings	Heights	Courses or Bricks	Piers	Openings	Heights
1/2	4-5/16″	5-1/16″		13	1′ 1-1/2″	1′ 2-1/4″	3′ 7-7/8″
1	9″	9-3/4″	3-3/8″	13-1/2	1′ 6-3/16″	1′ 6-15/16″	
1-1/2	1′ 1-11/16″	1′ 2-7/16″		14	1′ 10-7/8″	1′ 11-5/8″	3′ 11-1/4″
2	1′ 6-3/8″	1′ 7-1/8″	6-3/4″	14-1/2	1′ 3-9/16″	1′ 4-5/16″	
2-1/2	1′ 11-1/16″	1′ 11-13/16″		15	1′ 8-1/4″	1′ 9″	4′ 2-5/8″
3	2′ 3-3/4″	2′ 4-1/2″	10-1/8″	15-1/2	1′ 0-15/16″	1′ 1-11/16″	
3-1/2	2′ 8-7/16″	2′ 9-3/16″		16	1′ 5-5/8″	1′ 6-3/8″	4′ 6″
4	3′ 1-1/8″	3′ 1-7/8″	1′ 1-1/2″	16-1/2	1′ 10-5/16″	1′ 11-1/16″	
4-1/2	3′ 5-13/16″	3′ 6-9/16″		17	1′ 3″	1′ 3-3/4″	4′ 9-3/8″
5	3′ 10-1/2″	3′ 11-1/4″	1′ 4-7/8″	17-1/2	1′ 7-11/16″	1′ 8-7/16″	
5-1/2	4′ 3-3/16″	4′ 3-15/16″		18	1′ 0-3/8″	1′ 1-1/8″	5′ 0-3/4″
6	4′ 7-7/8″	4′ 8-5/8″	1′ 8-1/4″	18-1/2	1′ 5-1/16″	1′ 5-13/16″	
6-1/2	5′ 0-9/16″	5′ 1-5/16″		19	1′ 9-3/4″	1′ 10-1/2″	5′ 4-1/8″
7	5′ 5-1/4″	5′ 6″	1′ 11-5/8″	19-1/2	1′ 2-7/16″	1′ 3-3/16″	
7-1/2	5′ 9-15/16	5′ 10-11/16″		20	1′ 7-1/8″	1′ 7-7/8″	5′ 7-1/2″
8	6′ 2-5/8″	6′ 3-3/8″	2′ 3″	20-1/2	1′ 11-13/16″	1′ 0-9/16″	
8-1/2	6′ 7-5/16″	6′ 8-1/16″		21	1′ 4-1/2″	1′ 5-1/4″	5′ 10-7/8″
9	7′ 0″	7′ 0-3/4″	2′ 6-3/8″	21-1/2	1′ 9-3/16″	1′ 9-15/16″	
9-1/2	7′ 4-11/16″	7′ 5-7/16″		22	1′ 1-7/8″	1′ 2-5/8″	6′ 2-1/4″
10	7′ 9-3/8″	7′ 10-1/8″	2′ 9-3/4″	22-1/2	1′ 6-9/16″	1′ 7-5/16″	
10-1/2	8′ 2-1/16″	8′ 2-13/16″		23	1′ 11-1/4″	1′ 0″	6′ 5-5/8″
11	8′ 6-3/4″	8′ 7-1/2″	3′ 1-1/8″	23-1/2	1′ 3-15/16″	1′ 4-11/16″	
11-1/2	8′ 11-7/16″	9′ 0-3/16″		24	1′ 8-5/8″	1′ 9-3/8″	6′ 9″
12	9′ 4-1/8″	9′ 4-7/8″	3′ 4-1/2″	24-1/2	1′ 1-5/16″	1′ 2-1/16″	
12-1/2	9′ 8-13/16″	9′ 9-9/16″		25	1′ 6″	1′ 6-3/4″	7′ 0-3/8″

CONCRETE MASONRY

ESTIMATING DATA

112 x 16″ x 8″ (face area) units equals one 10′ x 10′ Wall Square or 100 sq ft.

10.125 x 16″ x 8″ (face area) units equals one square yard.

4 cu ft mortar per 100 sq ft of wall in either 8″ or 4″ thick walls.

SPECIFICATION FOR BUILDING MASONRY WALLS

Modular Planning.— To achieve economy in construction, concrete masonry walls should be dimensioned to take full advantage of full, quarter, half and three-quarter length units.

Dimensions of Blocks.— It will be noted that all dimensions end in $\frac{5}{8}$″. When taken with the standard $\frac{3}{8}$″ mortar joint this means that all joints are spaced horizontally and vertically at intervals of 8″ or multiples thereof. The effective length and height of all standard blocks are thus 16″ and 8″ respectively. Note that all external measurements are multiples of 4″ minus $\frac{3}{8}$″ and openings are plus $\frac{3}{8}$″ to allow for one mortar joint.

Laying.— Dry units are essential. They should never be wetted to control suction prior to application of mortar. Keep blocks as dry as possible on the site. Moreover, at the stoppage of work the tops of the walls should be covered to prevent moisture entering the cores of the blocks.

In single leaf construction the first bed joints on the footings shall be full bedding and also at damp proof courses. Thereafter, vertical and horizontal joints shall be shell bedded only, care being taken not to allow mortar to spread over the webs or drop into cavities to create bridging. Full bedding should be used in columns and piers intended to carry heavy loads.

Mortar Mix.— The function of mortar is to provide an even bedding for the block, a reasonable strength in

compression, a high resistance to shear, a high degree of adhesion between mortar and block, and a high degree of durability and weather resistance.

Tests have shown that to get the most satisfactory balance between strength, shrinkage and adhesion for general purpose block laying, the following recommendations should be followed:

Above damp course level —

1 part Portland cement
1 part hydrated lime
6 parts clean pit sand

As lime does not set while moist, lime mortars and cement lime mortars are unsuitable in retaining walls and in work below damp-proof course level where they are subject to continuous dampness. Cement mortars with only sufficient lime to facilitate working are therefore recommended.

1 part Portland cement
¼ part hydrated lime
3 parts clean pit sand

To lay 112 blocks, either 4″ or 8″ wide (face shell bedding) giving 100 sq ft of wall area will require 3 cubic feet sand, ½ bag cement, and ½ bag lime (1.1.6).

Joint Reinforcement.— To assist in controlling shrinkage, cracking and distribution of stresses through the walls, joint reinforcement should be used. It may consist of welded wire strips 2¼″ wide for 4″ walls, 6¼″ wide for 8″ walls, and 10¼″ wide for 12″ walls. In walls less than 20′ long and in walls where control joints are used in conjunction with bond beams, no joint reinforcement is necessary — otherwise it is placed in every third bed joint throughout the wall. It is also used in the first bed joint above a lintel, and in the first two bed joints under a sill, unless bond beams are used in these locations. Joint reinforcement must not extend across any expansion or control joint. Lap 8″ at all joints and intersection.

Tooling Joints.— The mortar squeezed from the joints should be struck off flush with the wall as each block is laid. When the mortar has stiffened somewhat, it is firmly compacted with a jointing tool. This compactness is important since mortar, when hardening, has a tendency to shrink slightly.

Control Joints.— Use should be made of control joints to prevent masonry walls from cracking due to unusual stresses. Such joints are built into walls in such a manner as to permit slight wall movement without cracking. The spacing and location of these joints will depend on several factors — such as the length of wall and architectural details, but they should be used at wall openings and at the junction of walls and columns. In long walls with joint reinforcement, control joints should be provided every 25′. If no joint reinforcement is used, the control joints should be at 16′ intervals. After mortar has stiffened rake out joints to a depth of ¾″ and fill joints with an approved elastic caulking compound. It is advisable to prime the control joint before caulking to prevent absorption of oils from compound. Control joints should provide a continuous vertical separation through the entire thickness of the masonry wall, and joint reinforcement is to be broken at control joints.

Bond Beam.— This is a continuous lintel around the exterior of the building for the purpose of providing lateral stability to the walls, and to minimise shrinkage cracking at openings. It is constructed of beam blocks and filled with concrete and reinforcing steel.

Reinforcement should be not less than two ½″ dia. bars cross tied at 12″ intervals with No. 8 gauge wire stirrup for walls up to 40′ long.

Bond beams must be used in the following locations:—

At or near the top of all exterior load-bearing walls.

On all internal walls which provide lateral support to load-bearing walls.

Immediately below intermediate floor levels in multi-storey construction.

Bond beams may be omitted in single storied construction provided the roof rafters are adequately tied across the building at wall top level if control joints are provided.

Lintels.— Reinforced lintels are necessary over all door and window openings. Lintel blocks are manufactured for this purpose. The 8″ lintel block, reinforced with two ½″ dia. rods and No. 8 gauge ties at 12″ centres, will support a superimposed uniformly distributed load of 160 lb per foot on spans up to 7 feet. However, a minimum 8-inch bearing should be required for all lintels. Where convenient, the lintel may actually be a section of the bond beam. Where reinforced concrete masonry lintels are used, the first course of masonry above the lintel should be laid in full mortar bed so that the cross ribs as well as the face shells of the units will bear on the lintel and thus reduce the shear stress between the core fill concrete and the face shell of the unit.

Spans up to 20 feet can be obtained with 16″ deep lintel blocks.

Sills.— Where standard sill blocks are shown to window openings no flashing is necessary. Where paving slab or other sill construction is shown, flashing is necessary.

Top Plate Fixing.— Fix plates by grouting holding down bolts into block cavity and bedding plate on top of standard blocks or by tying down with hoop iron straps carried down two courses looped under cross web and spiked to top of plate.

External Finish.— To 8″ and 12″ blockwork: seal all exterior faces of concrete blockwork with two coats of approved latex based paint or cement based paint or approved clear sealer. Alternatively, one coat of cement based paint plus one coat of latex paint may be used. Rendered or Tyrolean finish is also suitable for weatherproofing exterior walls.

Damp Proofing.— Waterproof all mortar up to one course above floor levels with approved mortar waterproofing admixture, or use approved metal core damp-course in first course below floor level.

CONCRETE MASONRY WALLS

MODULAR LENGTHS (Note: Full Module = 4″ x 4″ = 16″)					MODULAR HEIGHTS	
No. of Blocks	Full Module	Plus ¼	½	¾	No. of Blocks	Half Module
1	1′ 4″	1′ 8″	2′ 0″	2′ 4″	1	8″
2	2′ 8″	3′ 0″	3′ 4″	3′ 8″	2	1′ 4″
3	4′ 0″	4′ 4″	4′ 8″	5′ 0″	3	2′ 0″
4	5′ 4″	5′ 8″	6′ 0″	6′ 4″	4	2′ 8″
5	6′ 8″	7′ 0″	7′ 4″	7′ 8″	5	3′ 4″
6	8′ 0″	8′ 4″	8′ 8″	9′ 0″	6	4′ 0″
7	9′ 4″	9′ 8″	10′ 0″	10′ 4″	7	4′ 8″
8	10′ 8″	11′ 0″	11′ 4″	11′ 8″	8	5′ 4″
9	12′ 0″	12′ 4″	12′ 8″	13′ 0″	9	6′ 0″
10	13′ 4″	13′ 8″	14′ 0″	14′ 4″	10	6′ 8″
11	14′ 8″	15′ 0″	15′ 4″	15′ 8″	11	7′ 4″
12	16′ 0″	16′ 4″	16′ 8″	17′ 0″	12	8′ 0″
13	17′ 4″	17′ 8″	18′ 0″	18′ 4″	13	8′ 8″
14	18′ 8″	19′ 0″	19′ 4″	19′ 8″	14	9′ 4″
15	20′ 0″	20′ 4″	20′ 8″	21′ 0″	15	10′ 0″
16	21′ 4″	21′ 8″	22′ 0″	22′ 4″	16	10′ 8″
17	22′ 8″	23′ 0″	23′ 4″	23′ 8″	17	11′ 4″
18	24′ 0″	24′ 4″	24′ 8″	25′ 0″	18	12′ 0″
19	25′ 4″	25′ 8″	26′ 0″	26′ 4″	19	12′ 8″
20	26′ 8″	27′ 0″	27′ 4″	27′ 8″	20	13′ 4″
21	28′ 0″	28′ 4″	28′ 8″	29′ 0″		
22	29′ 4″	29′ 8″	30′ 0″	30′ 4″		
23	30′ 8″	31′ 0″	31′ 4″	31′ 8″		
24	32′ 0″	32′ 4″	32′ 8″	33′ 0″		
25	33′ 4″	33′ 8″	34′ 0″	34′ 4″		
26	34′ 8″	35′ 0″	35′ 4″	35′ 8″		
27	36′ 0″	36′ 4″	36′ 8″	37′ 0″		
28	37′ 4″	37′ 8″	38′ 0″	38′ 4″		
29	38′ 8″	39′ 0″	39′ 4″	39′ 8″		
30	40′ 0″	40′ 4″	40′ 8″	41′ 0″		
31	41′ 4″	41′ 8″	42′ 0″	42′ 4″		
32	42′ 8″	43′ 0″	43′ 4″	43′ 8″		
33	44′ 0″	44′ 4″	44′ 8″	45′ 0″		
34	45′ 4″	45′ 8″	46′ 0″	46′ 4″		
35	46′ 8″	47′ 0″	47′ 4″	47′ 8″		
36	48′ 0″	48′ 4″	48′ 8″	49′ 0″		
37	49′ 4″	49′ 8″	50′ 0″	50′ 4″		
38	50′ 8″	51′ 0″	51′ 4″	51′ 8″		
39	52′ 0″	52′ 4″	52′ 8″	53′ 0″		
40	53′ 4″	53′ 8″	54′ 0″	54′ 4″		

HOW TO MAKE GOOD CONCRETE

Proportions.— Correct proportions of cement, aggregate, and water depend on nature of work for which concrete is intended, and character and condition of aggregate. Table of quantities for various classes of work is given below.

Class of Work	Proportions of nominal mix (volumes)	Materials required to make 10 cu yd of concrete			Yield of mixture per paper bag of cement (cu ft)	Water in gal per bag of cement
		Cement (Bags)	Sand (Dry) (cu yd)	Metal or Gravel (cu yd)		
High structural strength concrete for thin reinforced walls, slender reinforced columns, concrete products, heavy-duty floors	1:1.1/2:3	76	4.2	8.5	3.55	4.7
Commonly adopted mixture for reinforced concrete beams and floor slabs, roads, footpaths, etc. silos, etc.	1:2:4	60	4.4	8,9	4.50	5.4
For strong foundations, road bases	1:2.1/2:5	49	4.5	9.1	5.50	6.1
Foundations for domestic machinery, buildings, etc., and for concrete in mass walls	1:3:6	41	4.6	9.1	6.60	6.5
Watertight plaster coats for cellars, tanks, dairy walls, etc.	1:2	128	9.5	—	2.10	4.2
Surface rendering for two-course concrete paths	1:2.1/2	110	10.1	—	2.45	4.5
Mortar for wall plaster, rough-casting, and stucco	1:3*	96	10.6	—	2.80	4.9

Job proportioning may be by volume or weight; volumetric method is usual for small jobs. Water should be carefully measured, allowance being made for moisture content of sand.

*If lime is added, proportions of sand to cementitious materials remain at 3 to 1, e.g., mix 1 cement, 1 lime, 6 sand.

MATERIALS

Portland Cement.— Normal type suited to all normal work; High-Early Strength and Low-Heat for special applications only.

Packing.— Paper bags hold 1 cu ft = 94 lb net.

Storage.— Must be dry; stack off the ground and away from exterior walls, and in a manner so that only limited air circulation through stack is possible.

At time of use, cement should be free-flowing and free from lumps.

Sand or Fine Aggregate.— Must be clean and free from earth, clay, humus, etc.; a coarse sand is best for concrete making, but particles should preferably be graded from coarse to fine. A sand containing silt and/or clay should be washed before use.

Coarse Aggregate.— May be gravel or crushed stone, graded from the largest particles down to the size of the largest sand grains to be used. Particles should be clean, hard, impervious and free from organic matter.

Other Aggregate.— (1) Crushed blast furnace slag may be an economic and satisfactory material. (2) Cinders and coke-breeze should be used only for unimportant work unless previous experience has shown material from the same source to be satisfactory. (3) Lightweight aggregate of the bloated clay or shale type is suitable for structural concretes with strengths up to 4,000-5,000 psi. The concrete density varies from 90 to 105 pcf. (4) Exceptionally lightweight aggregate — vermiculite or perlite — can be used for concretes

where no structural strength is required. It has excellent sound-absorbing and heat-resisting properties. It is suitable for use as a fire-proofing medium.

Water.— Should be drinkable.

Uses of Concrete.— Information relating to concrete problems will be given upon request to the Cement and Concrete Association of Australia, 147 Walker Street, North Sydney, New South Wales.

MIXING

Concrete should preferably be mixed in a concrete mixer, hand or power operated or may be hand mixed.

Mixers, when used, should revolve at speeds recommended by makers, and a minimum mixing time of 1½ to two minutes after addition of all ingredients is recommended.

HAND MIXING is carried out as follows:—

Equipment.— Shovel, mixing board, watering can, measuring box.

Method.— (1) Sand measured and spread on mixing board.

(2) Cement spread over sand.

(3) Sand and cement turned over with shovels until thoroughly mixed and uniform colour throughout.

(4) Coarse aggregate measured, spread on top, and mixing process repeated until colour again uniform.

(5) Water added slowly in depression in centre and mixed as added until whole has a quaky, jelly-like consistency.

PLACING

(1) When concrete is thoroughly mixed, place without delay; concrete made with ordinary Portland cement should be placed within half an hour of

mixing in summer and three-quarters of an hour in winter.

(2) Place with care, avoiding chuting and dumping, which causes segregation of coarse from fine material.

(3) Place as near as possible to final position; working concrete along in forms causes segregation.

(4) Work thoroughly in mass of concrete against forms to ensure good packing.

(5) When placing against hardened concrete —

(a) Thoroughly wire-brush surface and wash to remove all loose particles.

(b) Apply layer of mortar of same composition as new concrete (but without coarse aggregate), and of plastic consistency, to surface — preferably brushing in.

(c) Immediately place fresh concrete.

Curing.— As soon as placed, protect concrete against drying out by shading. When hard enough to resist finger impressions, cover, and keep moist for at least one week.

Watertight Concrete.— Essential requirements for watertight concrete are as follows:—

(1) Suitable design (to prevent cracking).

(2) Sound, well-graded aggregates of low porosity.

(3) Limited amount of mixing water.

(4) Plastic, workable mixes.

(5) Thorough mixing.

(6) Proper placing and compacting.

(7) Favourable curing conditions.

Waterproofing admixtures may provide additional insurance where low hydraulic heads only are to be resisted, but are not a substitute for good concrete.

Coloured Concrete.— Colour pigments for use with cement must be —

(1) Proof against lime, alkali, and action of direct sunlight.

(2) Very finely ground, insoluble in water, and uniform in shade and quality.

The most suitable pigments are metallic oxides of a high degree of purity; low-grade pigments must be used in larger quantities, thereby reducing strength and quality of the concrete or mortar. A pure white is obtained only by use of white Portland cement with white sand, crushed marble, etc.

For economy, pigment and cement should be ground together; or, failing this, sieved together to a uniform colour throughout. A steel floating trowel gives a darker colour than a wooden float. Concrete cured in sunlight will be given a lighter colour than if cured in shade.

Coloured concrete is darker when wet than when dry. Trowelling on partly hardened surfaces causes colour blotches.

Amount of pigment depends on a number of factors, and may vary from about five to 10 lb per bag of cement.

Use of the following pigments is recommended:—

Colour	Pigment
Red	Iron oxide.
Yellow	Iron oxide or hydroxide.
Brown	Iron oxide.
Black	Iron oxide or manganese dioxide. (Lamp black should NOT be used.)
Green	Chromium oxide.
Blue	Cobalt oxide.

Pigments may be mixed to give other effects as desired. Coloured cements with white cement as a base are available.

Formwork.— The following points must be observed if a good concrete job is to be obtained at lowest cost.

(1) Shuttering must be strong and rigid.

(2) It must be designed for removal without excessive damage to concrete or timber.

(3) It must be carefully made and erected to avoid gaps between boards, panels, etc., which may require filling with clay, putty, or other suitable material.

(4) It must be treated to prevent concrete from adhering to it.

(5) It must not be removed until concrete has sufficient strength; this period will be longer in cold than in warm weather.

Reinforced Concrete.— Concrete is strong in compression, weak in tension; hence, when tensile stresses are to be carried, steel bars are used to reinforce the concrete. Determination of the amount and placing of the steel require expert knowledge, and are not matters for the layman; once determined, the steel must be accurately placed on the job.

Paving and Rendering.— Materials required for 1,000 sq ft of surface:—

Paving thickness	Concrete Mix					
	1:2:4			1:2.1/2:5		
	Cement (bags)	Sand (cu ft)	Metal (cu ft)	Cement (bags)	Sand (cu ft)	Metal (cu ft)
2″ (Light foot traffic)	38	75	150	31	77	154
3″ (Normal footpath)	56	112	224	46	115	230
4″ (Car drives, etc.)	76	150	298	62	154	308
6″ (Heavy trucks, etc.)	112	224	448	92	230	460

Render thickness	1:2		1:2.1/2		1:3	
	Cement (bags)	Sand (cu ft)	Cement (bags)	Sand (cu ft)	Cement (bags)	Sand (cu ft)
½″	20	40	17	43	15	44
¾″	30	60	25	63	22	68
1″	40	80	34	85	30	88

A.R.C. REINFORCING FABRIC

RECTANGULAR MESHES

Standard Sheets 20′ x 8′ = 160 Sq Feet

Standard Rolls 200′ x 8′ = 1600 Sq Feet

A.S.A. Ref. No.	Specifications Main Wire*	Transverse Wire*	Weight Per Sheet (lb)	Weight Per Roll
300	5/0g @ 3″	1g @ 8″	376	—
301	4/0g @ 3″	1g @ 8″	331	—
302	3/0g @ 3″	1g @ 8″	294	—
303	2/0g @ 3″	1g @ 8″	265	—
304	1/0g @ 3″	1g @ 8″	237	—
305	1g @ 3″	1g @ 10″	200	—
306	2g @ 3″	1g @ 10″	176	—
307	3g @ 3″	1g @ 10″	155	—
308	1/0g @ 6″	1g @ 12″	128	—
309	1g @ 6″	1g @ 12″	115	—
310	2g @ 6″	1g @ 12″	104	—
312	8g @ 3″	8g @ 12″	—	546
314	10g @ 3″	10g @ 12″	—	350

SQUARE MESHES

Standard Sheets 20′ x 8′ = 160 Sq Feet

Standard Rolls 200′ x 8′ = 1600 Sq Feet

A.S.A. Ref. No.	Specifications Main Wire*	Transverse Wire*	Weight Per Sheet (lb)	Weight Per Roll
640	4/0g @ 6″	4/0g @ 6″	273	—
630	3/0g @ 6″	3/0g @ 6″	236	—
620	2/0g @ 6″	2/0g @ 6″	207	—
600	1/0g @ 6″	1/0g @ 6″	179	—
601	1g @ 6″	1g @ 6″	154	—
602	2g @ 6″	2g @ 6″	130	—
603	3g @ 6″	3g @ 6″	109	1086
604	4g @ 6″	4g @ 6″	92	920
605	5g @ 6″	5g @ 6″	77	768
606	6g @ 6″	6g @ 6″	63	630
608	8g @ 6″	8g @ 6″	44	438
610	10g @ 6″	10g @ 6″	—	279
3310	10g @ 3″	10g @ 3″	56	—

***NOTE:** Expressed in British Standard Wire Gauge — Refer to page 59.

USEFUL HYDRAULIC DATA

One Imperial Gallon	=	Volume occupied by 10 lb of distilled water at 62° F under a pressure of 1 atmosphere
	=	.16054 cubic feet
	=	277.420 cubic inches
	=	1.201 U.S. gallons
	=	4.5496 litres
U.S. gallons x .833	=	Imperial gallons
Imperial gallons x 1.2	=	U.S. gallons
Head of water (in ft)	=	$\frac{\text{Pounds per sq in x 2.31}}{\text{Specific gravity}}$
Pound per sq in pressure	=	$\frac{\text{Foot head x specific gravity}}{2.31}$
Specific Gravity of Water	=	1.00
One cubic foot of Water	=	62.288 pounds
	=	6.229 gallons
	=	7.48 U.S. gallons
One cubic inch of Water	=	.03605 pounds
One pound of Water	=	27.74 cubic inches
One cubic yard of Water	=	168 gallons

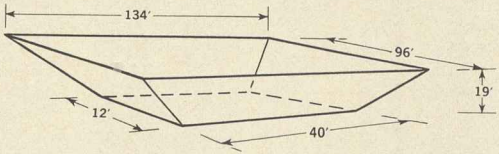
One acre-inch of water is the quantity required to cover one acre of area to a depth of one inch.

One acre-inch	=	3,630 cubic feet
	=	22,610 gallons
	=	101 tons (approximately)

One acre-foot	=	12 acre-inches
	=	43,560 cubic feet
	=	271,316 gallons
One cubic foot of Water per second (cusec)	=	374 Imperial gallons per min
	=	1 acre-inch in about 1 hour
	=	2 acre-feet in about 24 hours

Atmospheric pressure (mean) = 14.7 lb per square inch at sea level. With a perfect vacuum, one atmosphere will sustain a column of mercury 29.9 inches high (760 mm) or a column of water 33.95 ft high.

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:—

(a) Length at Bottom multiplied by width at Bottom = 40 x 12 = 480

(b) Length at Top multiplied by width at Top = 134 x 96 = 12,864

(c) Sum of the Lengths multiplied by sum of the Widths = 174 x 108 = 18,792

(a) plus (b) plus (c) = 32,136

(d) (a) plus (b) plus (c) multiplied by the depth and divided by 6 = $\frac{32{,}136 \times 19}{6}$ = 101,764 cu ft

Step (d) gives the cubic contents of the tank in cubic feet and if this figure is divided by 27, the result will be cubic yards:—

$$= \frac{101{,}764}{27} = 3{,}769 \text{ cu yd}$$

If the cubic contents of the tank, in cubic feet, is multiplied by 6¼ it will give its capacity in gallons.

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 ton 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 for 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:—

1. Multiply length of base in feet by breadth at base in feet.
2. Multiply together length and breadth at eaves in feet.
3. Add length at base and length at eaves in feet together and multiply this figure by the sum of the breadth at the base and the breadth at the eaves in feet. Add (1), (2) and (3) together and multiply by the height in feet of the eaves above ground level. Divide this product by 6, and the result is the volume of the body of the stack in cubic feet.

For the top portion:—

4. Multiply together the length and breadth in feet at the eaves.

5. Multiply the breadth in feet at the eaves by the sum of the length at the eaves and length along the ridge in feet.

   Add (4) and (5) together, multiply by the height of the ridge above the eaves in feet and divide by 6. 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.

Examples.— Consider a rectangular stack the dimensions of which are: 40 ft by 20 ft at base; 45 ft by 23 ft at eaves; 30 ft long at the ridge; eaves 10 ft above the ground; ridge 10 ft vertically above the eaves. Applying the formula:—

Volume of base or body =

1. $40 \times 20 = 800$
2. $45 \times 23 = 1{,}035$
3. $(40+45) \times (20+23) = 85 \times 43 = 3{,}655$

$(1) + (2) + (3) = 5{,}490$

$$\frac{5{,}490 \times 10}{6} = 9{,}150 \text{ cubic feet}$$

Volume of portion above eaves =

4. $45 \times 23 = 1{,}035$
5. $23 \times (45 + 30) = 23 \times 75 = 1{,}725$

$(4) + (5) = 2{,}760$

$$\frac{2{,}760 \times 10}{6} = 4{,}600 \text{ cubic feet}$$

Total volume of stack = 13,750 cubic feet

Cubic contents of circular stack:—

1. Measure the circumference at both the base and eaves in feet.

2. Add these together and multiply this figure by itself (i.e., "square" it).

3. Multiply the circumference at the base by the circumference at the eaves and deduct this from the result of (2).

4. Multiply the result of (3) by the height in feet of the eaves above the base and divide the result by 38. The figure obtained is the volume of the body of the stack in cubic feet.

For the top conical position of the stack, square the circumference in feet at the eaves and multiply by the height in feet of the top or peak above the eaves. Divide by 38 and the result obtained is the volume in cubic feet of the top portion. By adding the volume of the base and top together, the total content of the stack is obtained.

Example.— Circumference at ground level 60 feet, at the eaves 70 feet and 9 feet high at the eaves and 8 feet at the top from the eaves.

Volume of body of the stack =

$$= (60 + 70) \times (60 + 70) - (60 \times 70) \times \frac{9}{38}$$

$$= (16{,}900 - 4{,}200) \times \frac{9}{38}$$

$$= 12{,}700 \times \frac{9}{38}$$

$$= 3{,}078 \text{ cubic feet}$$

Volume of conical top =

$$= \frac{70 \times 70 \times 8}{38}$$

$$= \frac{4{,}900 \times 8}{38}$$

$$= 1{,}031 \text{ cubic feet}$$

Total volume of haystack = 4,190 cubic feet

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.

WEIGHT OF HAY IN STACKS

Average Width Feet	Average Length Feet	Height to Eaves Feet	Height of Ridge Feet	Weight of Hay Tons
10	20	8	4	5
10	20	10	5	7
13	28	10	10	14
16	30	12	10	20
20	50	14	10	50

APPROXIMATE NUMBER OF CUBIC FEET PER TON OF HAY

Period	Oats		Wheat		Lucerne cu ft
	Sheaf cu ft	Loose cu ft	Sheaf cu ft	Loose cu ft	
Freshly stacked	350	400	400	500	400-450
One month after stacking	300	350	350	400	350-400
One year after stacking	300	325	325	350	300-350

These figures are subject to considerable variation and frequently fresh cereal hay is lighter than the figures given.

HINTS ON FENCING

The class of fence to be erected depends mainly upon the site and material available, and whether the fence is to be rabbit- or dog-proof or merely stock-proof.

Boundary fences in rabbit infested country should be about four feet high, with the top wire barbed, making the fence proof for general stock. The line of fence should be marked out before commencing to drive the posts. Insert a peg where a straining post is required

as a guide for driving "Star" steel posts, and see that the posts are driven truly in line and perfectly upright. In ordinary ground "Star" posts should be driven about one third of their length. Wooden straining posts, preferably of natural round timber, provide the most secure anchorage for a fence and should be sunk at least three feet into the ground five chains apart.

All corner posts and those at gateways and at bends in the fence should be stayed with sound struts at least 10 feet long. The struts should be mortised into the straining post above the centre. The back end of the struts should be placed hard up against the next post or against a peg driven firmly into the ground so that it cannot shift. At corners, two well-fitted struts should be used, one on each line of fence.

At either side of corners or gateways where stock is liable to congregate, fences should be strengthened. This can be ensured by using shorter panels or more droppers. Gate posts must be independent and not in any way connected with the fence.

For fencing wire, the number of steel posts commonly used is four to the chain, but in soft ground it is advisable to increase the number. Droppers, where used, are generally placed about eight feet apart.

When straining a fence, begin at the bottom wire, otherwise the straining post may be pulled out of line.

Short lengths of wire looped across from wire to wire on the opposite sides of a wooden straining post prevent any collapse of the fence and ensure it remaining stock-proof in the event of the wooden straining post being burnt out, provided steel posts have been used in the construction of the fence.

Wire netting is best supported by steel posts placed about 11 feet apart without droppers between the posts. If posts are placed 22 feet apart with droppers between, livestock will be much more likely to lift the netting from the ground owing to the extra spring of the fence on the widely spaced posts.

Rabbit netting should be placed in the ground at a depth of six inches, and this can most easily be accom-

plished by cutting a furrow with a small plough. Rabbit netting should be supported by three plain wires. A wire should run six inches above the ground to secure the netting, the portion below this being held by being buried in the ground. Another wire should be run along the top edge of the netting, the third being midway between the other two. Fasten the netting to the top wire with strong tie wire or clips at intervals of four feet, but there should be a tie one foot on each side of every post. Also fasten the netting to the centre wire.

WARNING

Attention is drawn to the absolute necessity of removing every trace of old netting and the earth in which it was buried when renewing rabbit netting. The trench should be thoroughly cleared out of all old soil, clean virgin soil being used to bury the new netting. It has been found that fragments of old wire or rust spots in the soil will rapidly destroy any new netting.

STEEL FENCE POSTS—"STAR" SECTION

Table showing number and approximate weight of "Star" fence posts of different lengths and spacing per mile of fencing.

Spacing of Fence Posts in Feet	Number of Posts per Mile	Length of "Star" Section Steel Posts		
		5′ 0″	5′ 6″	6′ 0″
		Weight c q lb	Weight c q lb	Weight c q lb
8	660	41 1 0	45 1 14	49 2 0
9	586	36 2 14	40 1 0	43 3 14
10	528	33 0 0	36 1 0	39 2 0
11	480	30 0 0	33 0 0	36 0 0
12	440	27 2 0	30 1 0	33 0 0
15	352	22 0 0	24 1 0	26 1 14
16½	320	20 0 0	22 0 0	24 0 0
18	293	18 1 14	20 0 14	22 0 0
22	240	15 0 0	16 2 0	18 0 0
24	220	13 3 0	15 0 14	16 2 0
36	147	9 1 0	10 0 14	11 0 0
66	80	5 0 0	5 2 0	6 0 0

NOTE.— No allowance has been made in the above table for straining posts, the number of which will need to be deducted from the quantities shown.

RYLANDS FENCE DROPPERS

These fence droppers are made from high tensile galvanized steel so that they are fire and rust proof. They are attached after the fence posts have been erected and line wires run and strained. They may be used on all fencing wire between 8 and 12-1/2 gauge thickness, and barbed wire.

A suggested fence construction would be posts spaced at up to 1 chain apart with droppers clipped at intervals of 6′ to 14′, depending on the number of line wires and site conditions.

The dropper dimensions are as follows:—

Thickness — 19BG (Approximately).

Length — 38″ and 44″.

Depth — 11/16″ (Approximately).

Width — 1½″ (Approximately).

Hole diameter — ⅛″.

Hole spacing — the extreme holes are approximately ½″ from the ends of the dropper, other holes are at 1″ centres.

Approximate weights are:—

One only 38″ dropper — 14.4 oz.

One only 44″ dropper — 1 lb.

Complete bundle of 50 — 38″ droppers with clips and fixing tools — 47 lb.

Complete bundle of 50 — 44″ droppers with clips and fixing tools — 52 lb.

GALVANIZED FENCE WIRE

Gauge	Type	Length per cwt in yards	Approx. Breaking Strain in lb
8	Standard	546	1576
9	Standard	675	1276
10	Standard	854	1008
11	H.T. Hvy. Galv.	1040	1800
12½	High Tensile	1500	850
12½	"Tyeasy" High Ten.	1500	1250

The above represents Standard Gauges regularly produced for fencing purposes; for special needs other gauges can be produced and details are:—

4	Standard	260	3313
6	Standard	380	2269
12	Soft	1293	570

12 Gauge Soft frequently used for short telephone line.

Quantity of Wire per Mile of Fencing

PLAIN GALVANIZED

No. of Wires in Fence	Gauge								
	8 Standard			10 Standard			12½ High-tensile		
	cwt	qr	lb	cwt	qr	lb	cwt	qr	lb
1	3	1	0	2	0	14	1	0	14
2	6	1	14	4	0	14	2	1	14
3	9	3	14	6	1	0	3	2	0
4	12	3	14	8	1	0	4	2	14
5	16	0	14	10	1	14	5	3	14
6	19	1	0	12	1	14	7	0	0

BARBED GALVANIZED

No. of Wires in Fence	Reels	Standard 12½G 10WA Pattern			High-tensile — 16G Reverse Twist		
		cwt	qr	lb	cwt	qr	lb
1	4	3	2	8	1	2	20
2	8	7	1	2	3	1	12
3	12	10	3	10	5	0	4
4	16	14	2	4	6	2	24
5	20	18	0	12	8	1	16
6	24	21	2	20	10	0	8

Weights for Barbed include weight of spool.

WIRE NETTING

Standardisation on types and ranges of sizes in widths and gauges avoids waste of production time and is an aid to economic production with greater efficiency and lowest costs.

The main sizes regularly produced are:—

Type	Mesh	Gauge	Widths (Inches)
Rabbit-proof	1¼ and 1½″	17	12, 36, 42
Sheep	3″	16, 17	24, 30, 36
Sheep	4″	15, 16, 17	24, 30, 36
Dingo 3 ply 3 twist	3″	15, 16	60, 72
Poultry	4″	15, 16	60, 72
Poultry	1″	20	36
Poultry	2″	19	36, 72
Fish Trap	2″	16, 17	36, 48, 60, 72
Oyster	1″	17	36
Dried Fruit Racks	2″	17	42, 48

NAILS

APPROXIMATE NUMBER PER LB

Size	No. per lb	Size	No. per lb	Size	No. per lb
1″ x 16G	1080	2″ x 11G	158	3″ x 9G	67
1″ x 15G	840	2″ x 10G	120	3″ x 8G	60
1″ x 14G	723	2″ x 9G	100	3″ x 7G	48
1½″ x 14G	460	2½″ x 13G	200	3″ x 6G	39
1½″ x 13G	340	2½″ x 12G	150	3½″ x 8G	44
1½″ x 12G	240	2½″ x 11G	130	3½″ x 7G	40
1½″ x 11G	206	2½″ x 10G	100	4″ x 7G	35
2″ x 14G	280	2½″ x 9G	80	4″ x 6G	30
2″ x 13G	230	2½″ x 8G	65	5″ x 5G	21
2″ x 12G	190	3″ x 10G	81	6″ x 4G	13

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 Apl.	5 Mar.
8 ,,	14 ,,	18 ,,	7 June	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 Apl.
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 ,,

STOCK BREEDING TABLE — Cont'd.

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)*	
26 Feb.	1	Feb.	6	Dec.	26	July	23	July	22	June	30	Apl.
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 Apl.	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	Apl.	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.
11 ,,	17	,,	21	,,	8	,,	5	Nov.	5	Oct.	13	,,
18 ,,	24	,,	28	,,	15	,,	12	,,	12	,,	20	,,
25 ,,	31	,,	4	Apl.	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	Apl.	1	Apl.	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	Apl.	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, which, however, may be subject to slight variation in individual cases.

TABLE OF THERMAL CONDUCTIVITIES OF BUILDING MATERIALS

Material	Description	Density lb per cu ft	Conductivity K.	Res't'ce R for Thickness listed or 1″
Air Space:	Horizontal ¾″-4″	—	—	0.82
	Vertical ¾″-4″	—	—	0.92
Air Surfaces:	Still—Horizontal	—	—	0.61
	Vertical	—	—	0.68
	15 mph H. or V.	—	—	0.17
Building Boards:	Gypsum Board ⅜″	58	1.39	0.27
	Plywood ¼″	34	—	0.31
Flooring Materials:	Carpet and U/felt	—	—	2.08
	Ceramic Tile 1″	—	—	0.08
	Lino ⅛″	—	—	0.05
	Plastic Tile ⅛″	110	6.25	0.02
	Terrazzo 1″	—	—	0.08
	Hardwood ¾″	—	—	0.68
Insulating Materials:	Mineral Wool (Glass, Slag or Rock)	2.0-5.0	0.30	3.33
	Glass Fibre	9.5	0.25	4.00
	Cane Fibre Tile ¾″	10.5	—	3.16
	Esterfoam	1.62	0.29	3.45
	Asbestos Fibre (Spray)	6.0	0.32	3.13
Roof Insulation: (For use above deck):	Cane Fibre ½″	16.0	0.35	1.39
	Cane Fibre 1″	16.0	0.35	2.78
	Cane Fibre 2″	16.0	0.35	5.26
Concretes:	Gypsum Mortar	116	5.00	0.20
	L.W. Aggregates Including:	120	5.20	0.19
	Shale	100	3.60	0.28
	Slate, Slag	80	2.50	0.40
	Pearlite	60	1.70	0.59
	Vermiculite and Cellular Concretes	40	1.15	0.86
	Sand, Gravel + Stone	140	12.0	0.08
Brick:	Common	120	5.00	0.20
	Face	130	9.00	0.11
Plaster:	Cement + Sand ½″	116	5.00	0.10
	Gypsum + Sand ½″	105	—	0.09
Woods:	Hardwoods	45	1.10	0.91
	Softwoods	32	0.80	1.25

HEAT TRANSMISSION THROUGH BUILDINGS

Heat transfer through buildings depends on the thermal conductivity of the components which form the enclosing units of that building.

Thermal Conductivity, K, is the time rate of heat flow through a given homogeneous material, and is expressed in Btu/hr/sq ft/°F/1" thickness.

The overall coefficient of heat transmission, U, is the time rate of heat flow from air to air through the various materials used to construct walls, roofs or floors. U is expressed in Btu/hr/sq ft/°F.

The Thermal Resistance, R, is the reciprocal of the overall coefficient, U, for a particular construction. Thus resistances are additive, i.e., R. Total = $R_1 + R_2 + \ldots + Rn$, where R_1, R_2 .... Rn are the individual resistances of the components.

EFFECT OF ROOFING ON INTERNAL TEMPERATURES

The rate of heat-flow through the roofing membrane depends on its thermal conductivity and its thickness. Heat flows through a 24-gauge galvanized steel roofing sheet 1,500 times to 2,000 times more rapidly than through a terracotta tile ½" thick, and only one-quarter as fast as through an aluminium sheet of the same thickness. This fact, as shown later, has very little bearing on the thermal resistance of a roof.

From the underside of the roofing membrane, heat is transferred to the cooler interior of the building by three processes:—

(i) Conduction.— Heat is transferred to the roof frame and thence to the remainder of the structure through the purlins or battens. Only a very small quantity of heat is transferred in this manner.

(ii) Convection.— Heat is transferred to cool air in contact with the underside of the roof. This heated air circulates throughout the inside of the

structure and, in turn, heats surfaces at cooler temperatures.

(iii) Radiation.— Heat radiates from the hot roof to cooler surfaces below.

The rate of heat-flow by convection and radiation from the underside of the roof is reduced to a very small proportion of its rate of flow through the roofing material by the surface air film between the sheet and the surrounding air. This rate of flow through this surface film is constant, being independent of the roofing material.

MACHINE SCREWS

Stocked in steel and brass in Whitworth Threads (BS 450/1958) and BA Threads (BS 57/1951) in Countersunk, Round and Cheese Heads.

Heads and threads, or materials other than the above, can be supplied on demand.

DECIMAL EQUIVALENTS AND THREADS PER INCH

BSW AND BSF THREADS

Dia.	Decimal Equiv.	Threads per in	
		BSW	BSF
1/8″	.1250″	40	—
5/32″	.1563″	32	—
3/16″	.1875″	24	32
1/4″	.2500″	20	26
5/16″	.3125″	18	22
3/8″	.3750″	16	20
7/16″	.4375″	14	18
1/2″	.5000″	12	16
5/8″	.6250″	11	14
3/4″	.7500″	10	12

UNIFIED THREADS

Dia.	Decimal Equiv.	Threads per in	
		UNC	UNF
No. 2	.086″	56	64
,, 4	.112″	40	48
,, 6	.138″	32	40
,, 8	.164″	32	36
,, 10	.190″	24	32
,, 12	.216″	24	28
1/4″	.250″	20	28
5/16″	.3125″	18	24
3/8″	.375″	16	24
7/16″	.4375″	14	20
1/2″	.500″	13	20
5/8″	.625″	11	18
3/4″	.750″	10	16

BA THREADS

Dia.	Decimal Equiv.	TPI	Dia.	Decimal Equiv.	TPI
6 BA	.110	47.9	2 BA	.185	31.4
5 BA	.126	43.1	1 BA	.209	28.2
4 BA	.142	38.5			
3 BA	.161	34.8	0 BA	.236	25.4

UNC = Unified Thread Coarse
UNF = Unified Thread Fine
BA = British Association Standard Thread
BSW = British Standard Whitworth Thread
BSF = British Standard Fine Thread.

GUEST KEEN & NETTLEFOLDS (AUST.) LTD.

NETTLEFOLDS DIVISION

NETTLEFOLDS
CASE-HARDENED SELF-TAPPING SCREWS

Case-hardened Self-tapping Screws are used for joining and making fastenings to metal sheets and other metal parts. These screws eliminate the need for tapping holes. They tap their own threads as they are driven in.

THREAD TYPES		HEAD TYPES
 B	For joining and making fastenings to metal sheets from 28 gauge (.016) up to 6 gauge (.198).	C'sunk Head 
		Raised Head 
 AB	For assembling light metal sheets up to 18 gauge (.050).	Round Head 
		Mush. Head 
 U	Hardened metallic drive screw for making permanent fastenings to iron, brass and aluminium castings, steel, plastics, etc.	Hex. Head 
		Binding Head 
		Pozidriv Recessed Head 

NOTE.— For drill hole sizes, see page 190.

HOLE SIZES

FOR NETTLEFOLDS SELF-TAPPING SCREWS

TYPE "B" & "AB" SCREWS

Dia. of Screw	Steel Sheet Gauge	Dia. of Hole	Drill Size
No. 2 .088″	28-26	.063	No. 52
	24	.067	51
	22	.070	50
	20-18	.073	49
	16	.076	48
No. 4 .114″	28-26	.086	44
	24	.089	43
	22-20	.093	42
	18	.096	41
	16	.099	39
	14	.101	38
No. 6 .139″	28-26	.104	37
	24-22	.106	36
	20	.110	35
	18	.111	34
	16	.116	32
	14	.120	31
	12	.128	30
No. 7 .154″	26-20	.116	32
	18	.120	31
	16	.128	30
	14	.136	29
	12	.140	28
No. 8 .166″	24-22-20	.116	32
	18	.128	30
	16	.136	29
	14	.140	28
	12	.149	25
	10-1/8	.152	24
No. 10 .189″	26-18	.144	No. 27
	16	.152	24
	14	.157	22
	12	.161	20
	10-1/8	.169	18
	8	.173	17
No. 12 .215″	24-22-20	.166	19
	18	.169	18
	16	.177	16
	14	.182	14
	12	.185	13
	10-1/8	.196	9
	8	.201	7
No. 14 .246″	14	.204	6
	12	.209	4
	10-1/8	.228	1
	8-6-3/16	.234	15/64

TYPE "U" SCREWS

Dia. of Screw		Dia. of Hole	Drill Size
No. 00	.060″	.052	No. 55
0	.075″	.067	51
2	.100″	.086	44
4	.116″	.104	37
6	.140″	.120	31
7	.154″	.136	29
8	.167″	.144	27
10	.182″	.161	20
12	.212″	.191	11
14	.242″	.221	2

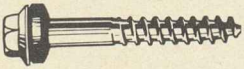
NOTE.—The recommended hole sizes for all types may be varied slightly if necessary. For hard material, use larger drill. For soft material, use smaller drill.

"SELEFAST" ROOFING SCREWS

WITH NEOPRENE WASHER ATTACHED

ART No. 9103

FOR CREST FIXING INTO HARD OR SOFT WOODS
Not necessary to pre-drill timber



Hexagon Head Washer Collar Roofing Screw complete with Neoprene Washer attached. Bright Zinc Plated.

Size	Pack
1¾″ x 12	250
2″ x 12	250
2¼″ x 12	250
2½″ x 12	250

ART No. 9033

FOR CREST FIXING INTO HARD OR SOFT WOODS
Necessary to pre-drill timber



Slotted Pan Head Washer Collar Roofing Screw complete with Neoprene Washer attached. Bright Zinc Plated.

Size	Pack
1¾″ x 12	250
2″ x 12	250
2¼″ x 12	250
2½″ x 12	250

ART No. 9104-12g
ART No. 9028-¼″

FOR CREST OR VALLEY FIXING INTO STEEL



Hexagon Head Washer Collar Self-tapping Screw type "Z", complete with Neoprene Washer attached. Bright Zinc Plated.

Size	Pack
⅝″ x 12	500
1″ x 12	500
1¼″ x 12	500
1½″ x 12	250
2″ x 12	250
¾″ x ¼″	500
1″ x ¼″	500
1¼″ x ¼″	500
1½″ x ¼″	250
2″ x ¼″	250

ART No. 9105-10g
ART No. 9032-12g

FOR SIDE LAPS AND FLASHING FIXING



Slotted Pan Head Washer Collar Self-tapping Screw type "A", complete with Neoprene Washer attached. Bright Zinc Plated.

Size	Pack
⅝″ x 10	500
¾″ x 12	500

BRIGHT ZINC IS THE STANDARD FINISH.

COLOURED ROOFING SCREWS — FOR USE WITH LYSAGHT "COLORBOND" SHEETS

A range of Crest, Valley and Lap Fasteners — as listed on page 191 — are available in the following colours.

OFF WHITE
CHARCOAL
BEIGE
LIGHT BROWN
TAWNY BROWN
GULL GREY
GOLD
BRONZE OLIVE
MIST GREEN
SLATE GREY

"SELEFAST" ROOFING SCREWS

WITH NEOPRENE WASHER ATTACHED

STAINLESS STEEL ROOFING SCREWS TYPE 305 (18-8)

ART No. 9133

FOR CREST FIXING INTO HARD OR SOFT WOODS
Necessary to pre-drill timber



Type 305 (18-8) Stainless Steel Slotted Pan Washer Collar Roofing Screw complete with Neoprene Washer attached.

Size	Pack
1¾″ x 12	250
2″ x 12	250
2¼″ x 12	250
2½″ x 12	250

ART No. 9111

FOR CREST OR VALLEY FIXING INTO STEEL



Type 305 (18-8) Stainless Steel Hexagon Head Washer Collar Self-tapping Screw type 2 complete with Neoprene Washer attached.

Size	Pack
¾″ x ¼″	500
1″ x ¼″	500
1¼″ x ¼″	500
1½″ x ¼″	250
2″ x ¼″	250

ART No. 9112

FOR SIDE LAPS AND FLASHING FIXING

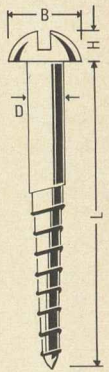


Type 305 (18-8) Stainless Steel Slotted Pan Head Self-tapping Screw type "A" complete with Neoprene Washer attached.

Size	Pack
¾″ x 12	500

GALV. CONE-HEAD ROOFING SCREWS

ASSURE PERMANENT ROOF FIXINGS



Dia. of Head "B" = twice diameter of Shank "D".
Depth of Head "H" = .7 of the dia. of Shank "D".

APPROXIMATE NUMBER PER CWT

Length	Screw Gauge 10 (.192)		12 (.220)		14 (.248)	
"L"	Gross	Doz.	Gross	Doz.	Gross	Doz.
1½	62	11	48	11	—	—
1¾	—	—	43	1	31	2
2	—	—	39	5	29	2
2¼	—	—	34	—	27	—
2½	—	—	30	9	24	4
3	—	—	—	—	20	3
3½	—	—	—	—	17	—
4	—	—	—	—	15	6

GALVANIZED MUSHROOM-HEAD BOLTS AND NUTS



HEAD DIMENSIONS:

Dia. of Head "B" = 2.25 dia. of Shank "D".
Depth of Head "H" = ¾ of dia. of Shank "D".

NUT DIMENSIONS:

Whit. Thread ..	3/16"	7/32"	1/4"	9/32"	5/16"
Across Flats ..	3/8"	7/16"	1/2"	1/2"	9/16"
Thickness	.112"	.131"	.150"	.150"	.169"



GALV. TANK RIVETS AND WASHERS

RIVETS:

Packed in ½ cwt bags.

Number of gross per cwt:

Sizes 5/16" x 3/16" = 157 gross 9 doz. per cwt.
Sizes 3/8" x 3/16" = 141 gross 9 doz. per cwt.



WASHER DIMENSIONS:

(Weights shown are approx. weights per gross)

"D"	"H"	Gauge	Weight
11/16"	3/16"	16	.95 lb
13/16"	1/4"	16	1.35 ,,
3/4"	9/32"	16	1.08 ,,
13/16"	5/16"	16	1.22 ,,

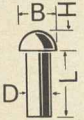


REAPER RIVETS

ROUND AND COUNTERSUNK HEAD

HEAD DIMENSIONS:

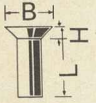
Round Head.— Diameter of Head "B" = 1.5 of diameter of Shank "D". Depth of Head "H" = .55 of diameter of Shank "D". "L" = Length.



APPROX. No. PER LB — ROUND HEAD

Length	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
No. 5 (.212")	181	149	127	110	98	88	73
No. 6 (.192")	232	190	161	139	123	110	91

Countersunk Head.— Diameter of Head "B" = 1.6 diameter of Shank "D". Depth of Head = .3 of diameter of Shank "D". Countersunk 90°. "L" = Length.



APPROX. No. PER LB — COUNTERSUNK HEAD

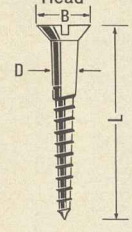
Length	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
No. 5 (.212")	215	171	142	121	106	94	77
No. 6 (.192")	272	215	178	152	133	118	96

WOOD SCREWS

Nettlefold's Wood Screws are machine-turned to ensure perfect heads, concentricity of head with shank, freedom from burrs, and good appearance. Available in mild steel, brass, and other metals, and with Countersunk, Round, Raised or Special Heads.

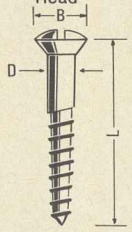
HEAD TYPES AND DIMENSIONS

Countersunk Head



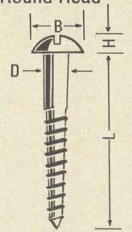
"B"=twice dia. of Shank "D". Included angle C'sink "A", 90°

Raised Head



"B"=twice dia. of Shank "D". Included angle C'sink "A", 90°

Round Head



"B"=twice dia. of Shank "D". "H" = 3/4 of dia. "D".

Pozidriv Recessed Head



Raised Round or Countersunk.

NOTE.— For decimal equivalents of screw gauges, see page 195.

DECIMAL EQUIVALENTS

WOOD SCREW GAUGE, IMPERIAL STANDARD WIRE GAUGE, AND FRACTIONS OF AN INCH

Screw Gauge (SG)	Imp. St. Wire Gauge	Fraction of an Inch	Equiv. in Decimal of Inch
	30		.0124
	29		.0136
	28		.0148
		1/64	.015625
	27		.0164
	26		.018
	25		.020
	24		.022
	23		.024
	22		.028
		1/32	.03125
	21		.032
	20		.036
	19		.040
		3/64	.046875
	18		.048
4/0			.054
	17		.056
3/0			.057
2/0			.060
		1/16	.0625
0			.063
	16		.064
1			.066
	15		.072
		5/64	.078125
2	14		.080
	13		.092
		3/32	.09375
3			.094
	12		.104
4			.108
		7/64	.109375
	11		.116
5			.122
		1/8	.125
	10		.128
6			.136
		9/64	.140625
	9		.144
7			.150
		5/32	.15625
	8		.160
8			.164
		11/64	.171875
	7		.176
9			.178
		3/16	.1875
10	6		.192
		13/64	.203125
11			.206
	5		.212
		7/32	.21875
12			.220
	4		.232
13			.234
		15/64	.234375
14			.248
		1/4	.250
	3		.252
15			.262
16	2		.276
		9/32	.28125
17			.290
	1		.300
18			.304
		5/16	.3125
	0		.324
20			.332
		11/32	.34375
	2/0		.348
22			.360
	3/0		.372
		3/8	.375
24			.388
	4/0		.400
		13/32	.40625
26			.416
	5/0		.432
		7/16	.4375
28			.444
	6/0		.464
		15/32	.46875
30			.472
32	7/0	1/2	.500
36			.556
		9/16	.5625
40			.612
		5/8	.625
		11/16	.6875
		3/4	.750
		13/16	.8125
		7/8	.875
		15/16	.9375

BOLTS AND NUTS

Nettlefolds can supply a comprehensive range of Bolts and Nuts, as follows:—

Black Cup Head Bolts and Nuts (to AS B108) — (Cup Head, Square Neck, Square Nut) —

RANGE: From 3/16" BSW x 3/4" long to 3/4" BSW x 24" long.

Black Hexagon Head Bolts and Nuts (to AS B100) — (Hex. Head, Round Shank, Hex. Nut) —

RANGE: From 1/4" BSW x 3/4" long to 1" BSW x 24" long.

Black Hexagon Head Set Screws (to AS B100) —

RANGE: From 1/4" BSW x 1/2" long to 1" BSW x 6" long.

Black Hexagon Head Coach Screws —

RANGE: From 1/4" x 1-1/2" long to 3/4" x 9" long.

Precision Bright Forged Hexagon Head Bolts and Nuts — Set Screws (to AS B117) —

RANGE: From 1/4" x 3-1/2" long to 3/4" x 6" long.

50/55 Ton High Tensile Hexagon Head Bolts and Nuts — Set Screws (to BS 1768) UNC, UNF Threads —

RANGE: From 1/4" x 3/4" long to 3/4" x 6" long.

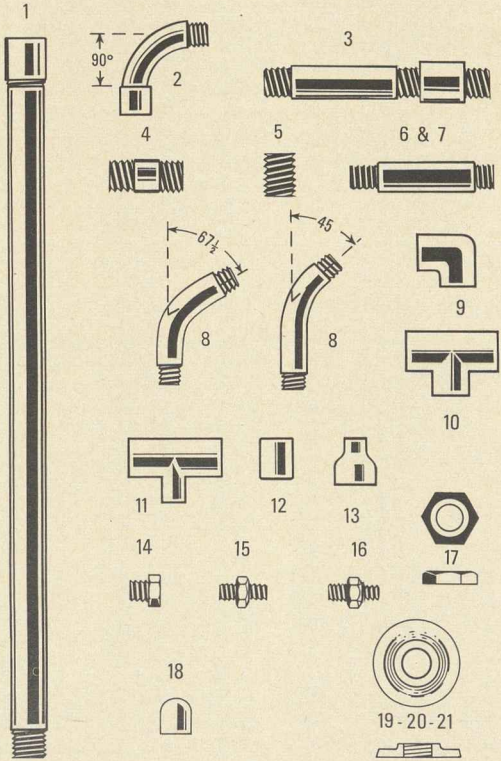
High Strength Structural Bolts and Nuts (to AS B157) UNC Threads —

RANGE: From 1/2" x 1-1/2" long to 1-1/4" x 12" long.

The above can be supplied in any required finish, including Hot Dipped Galvanizing and non-standard products are available subject to economic manufacturing quantities.

TUBEMAKERS OF AUSTRALIA LIMITED, STEWARTS & LLOYDS DIVISION

S. & L. SCREWED AND SOCKETED STEEL TUBES AND FITTINGS



STEEL TUBES AND FITTINGS
Range of Galvanized and Ungalvanized Types manufactured

	1/8"	1/4"	3/8"	1/2"	3/4"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	5"	6"	8"
TUBES																
1. Tubes (2' long and over	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TUBULARS																
2. Bends (90°)	—	X	X	X	X	X	X	X	X	X	X	—	X	X	X	—
3. Longscrews	—	—	—	X	X	X	X	X	X	X	X	—	—	—	—	—
4. Barrel Nipples	—	—	—	X	X	X	X	X	X	X	X	—	—	—	—	—
5. Plain Nipples	—	—	—	X	X	X	X	X	X	X	X	—	—	—	—	—
6. Pieces not socketed (4"-11")	—	—	—	X	X	X	X	X	X	—	—	—	—	—	—	—
7. Pieces not socketed (12"-23½")	—	—	—	X	X	X	X	X	X	—	—	—	—	—	—	—
8. Springs not socketed	—	—	—	X	X	X	X	X	X	X	X	—	X	—	—	—
OTHER FITTINGS																
9. Elbows	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10. Tees	—	—	—	X	X	X	X	X	X	X	X	—	—	—	X	X
11. Tees, Reducing	—	X	—	X	X	X	X	X	X	X	X	—	—	—	X	X
12. Sockets	—	—	—	X	X	X	X	X	X	X	X	X	X	X	X	X
13. Sockets, Reducing	—	—	—	X	X	X	X	X	X	—	—	—	—	—	—	—
14. Bushes	—	—	—	X	X	X	X	X	X	—	—	—	—	—	—	—
15. Hexagon Nipples	—	—	X	X	X	X	X	X	X	—	—	—	—	—	—	—
16. Hex. Nipples, Red.	—	—	X	X	X	X	X	X	X	—	—	—	—	—	—	—
17. Backnuts	—	—	—	X	X	X	X	X	X	X	X	—	—	—	—	—
18. Caps	—	—	—	X	X	X	X	X	X	X	X	—	—	—	—	—
19. Flanges, Table "D"	—	—	—	X	X	X	X	X	X	X	X	—	X	X	X	—
20. Flanges, Table "E"	—	—	—	X	X	X	X	X	X	X	X	—	—	X	X	X
21. Flanges, Table "H"	—	—	—	X	X	X	X	X	X	X	X	—	X	X	X	X

PIPE CHARACTERISTICS

Plain End and Screwed and Socketed Steel Tubes

Nom. Bore in	Outside Dia. in	Quality	Thickness		Ft per ton		Nom. Bore in	Outside Dia. in	Quality	Thickness		Ft per ton	
			SWG	in	P/E	S & S				SWG	in	P/E	S & S
⅛″	13/32″	Medium	14	0.080	8205	8146	1½″	1-29/32″	Medium	10	0.128	923	911
		Heavy	12	0.104	6829	6787			Med. Gal.	10	0.128	895	885
¼″	17/32″	Medium	13	0.092	5150	5114			Heavy	8	0.160	752	744
		Med. Gal.	13	0.092	4859	4828	2″	2-3/8″	Ammonia	5	0.212	585	—
		Heavy	11	0.116	4316	4291			Medium	9	0.144	653	644
		Ammonia	11	0.116	4316	—			Med. Gal.	9	0.144	636	627
⅜″	11/16″	Medium	13	0.092	3923	3895			Heavy	7	0.176	542	536
		Med. Gal.	13	0.092	3709	3685			Ammonia	5	0.212	458	—
		Heavy	11	0.116	3246	3228	2½″	3″	Medium	9	0.144	511	503
		Ammonia	10	0.128	3006	—			Med. Gal.	9	0.144	498	490
½″	27/32″	Medium	12	0.104	2725	2705			Heavy	7	0.176	423	418
		Med. Gal.	12	0.104	2613	2595	3″	3-1/2″	Ammonia	4	0.232	328	—
		Heavy	10	0.128	2288	2274			Medium	8	0.160	393	385
		Ammonia	9	0.144	2082	—			Med. Gal.	8	0.160	384	376
¾″	1-1/16″	Medium	12	0.104	2109	2094			Heavy	6	0.192	331	325
		Med. Gal.	12	0.104	2024	2009	3½″	4″	Ammonia	4	0.232	277	—
		Heavy	10	0.128	1758	1747			Medium	8	0.160	341	335
		Ammonia	8	0.160	1456	—			Med. Gal.	8	0.160	330	324
1″	1-11/32″	Medium	10	0.128	1363	1354	4″	4-1/2″	Heavy	6	0.192	287	282
		Med. Gal.	10	0.128	1317	1309			Medium	7	0.176	276	270
		Heavy	8	0.160	1120	1114	5″	5-1/2″	Med. Gal.	7	0.176	267	261
		Ammonia	7	0.176	1032	—			Heavy	5	0.212	231	226
1¼″	1-11/16″	Medium	10	0.128	1062	1054			Medium	6	0.192	205	200
		Med. Gal.	10	0.128	1030	1023	6″	6-1/2″	Med. Gal.	6	0.192	200	195
		Heavy	8	0.160	867	862			Heavy	5	0.212	187	183
		Ammonia	6	0.192	738	—			Medium	6	0.192	173	168
									Med. Gal.	6	0.192	168	164
									Heavy	5	0.212	157	153

Weights per foot of screwed and socketed tubing are based on the overall length of tube plus socket, screwed to basic engagement.

MALLEABLE PIPE FITTINGS

	1/8"	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"
1. Backnuts	—	X	X	X	X	X	X	X	X	X	X	—	X	—	—
2. Bends, M. & F.	—	X	X	X	X	X	X	X	X	X	X	—	X	—	X
3. Bends, F. & F.	—	—	—	X	X	X	X	X	X	X	X	—	—	—	—
4. Bends, M. & F. 45°	—	—	—	X	X	X	X	X	X	X	X	—	—	—	—
5. Bushes	—	X	X	X	X	X	X	X	X	—	X	X	X	—	X
6. Caps	—	—	—	X	X	X	X	X	X	X	X	—	X	—	—
7. Crosses	—	—	X	X	X	X	X	X	X	X	X	—	—	—	—
8. Elbows, F. & F.	—	X	X	X	X	X	X	X	X	X	X	—	X	—	X
9. Elbows, M. & F.	—	X	X	X	X	X	X	X	X	X	X	—	X	—	—
10. Elbows, Three-way	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—
11. Elbows, M. & F. 45°	—	—	—	—	—	X	—	X	—	—	—	—	—	—	—
12. Elbows, F. & F. 45°	—	—	—	—	—	X	X	X	X	X	X	—	X	—	X
13. Flanges	—	X	X	X	—	X	X	X	X	X	X	—	X	X	X
14. Flanges, Oval	—	—	—	X	X	X	X	X	X	X	X	—	—	—	—
15. Hexagon Nipples	—	X	X	X	X	X	X	X	X	X	X	—	X	—	X
16. Hex. Nipples, Red.	—	X	X	X	X	X	X	X	X	X	X	—	X	—	—
17. Plugs	X	X	X	X	X	X	X	X	X	X	X	—	X	—	—
18. Sockets	—	X	X	X	X	X	X	X	X	X	X	—	—	—	—
19. Sockets, Reducing	—	X	X	X	X	X	X	X	X	X	X	—	—	—	—
20. Tees	X	X	X	X	X	X	X	X	X	X	X	—	X	—	X
20a. Tees, Reducing	—	—	X	X	X	X	X	X	X	X	X	—	X	—	—
21. Tees, Four-way	—	—	—	X	X	X	—	X	X	X	X	—	—	—	—
22. Unions, F.S.	—	X	X	X	X	X	X	X	X	X	X	—	X	—	—
23. Unions, B.S.	—	X	X	X	X	X	X	X	X	X	X	—	—	—	—
24. Unions, M. & F., B.S.	—	—	—	—	—	X	—	X	—	—	—	—	—	—	—
25. Unions, Deflection 5°	—	—	—	—	—	X	X	X	—	—	—	—	—	—	—

TUBEMAKERS OF AUSTRALIA LIMITED, CAST IRON PIPE DIVISION

SPUN CAST IRON PIPES
TYTON FLEXIBLE JOINT

DIMENSIONS AND WEIGHTS — UNLINED

Nominal Internal Diameter	Class	Wall Thickness Inch	Weight Pipe Barrel per ft lb	Total Weight Per 18′ Length lb	Pipes Per Ton
4″	B	0.30	13.03	250	8.96
	C	0.31	13.43	257	8.72
	D	0.35	15.03	286	7.83
6″	B	0.33	21.18	404	5.54
	C	0.37	23.60	448	5.00
	D	0.43	27.18	512	4.38
8″	B	0.36	30.50	590	3.80
	C	0.43	36.15	691	3.24
	D	0.49	40.91	777	2.88
9″	B	0.37	35.10	678	3.30
	C	0.45	42.34	809	2.77
	D	0.52	48.58	921	2.43
10″	B	0.39	40.91	788	2.84
	C	0.47	48.94	932	2.40
	D	0.55	56.85	1075	2.08
12″	B	0.43	54.65	1044	2.15
	C	0.52	65.64	1242	1.80
	D	0.60	75.28	1416	1.58
15″	B	0.47	73.98	1441	1.55
	C	0.58	90.68	1741	1.29
	D	0.67	104.17	1984	1.13
18″	B	0.52	97.57	1892	1.18
	C	0.64	119.33	2284	0.98
	D	0.74	137.26	2606	0.86
20″	B	0.55	114.19	2218	1.01
	C	0.67	138.31	2652	0.84
	D	0.77	158.21	3010	0.74
24″	B	0.60	148.60	2883	0.78
	C	0.74	182.26	3489	0.64
	D	0.85	208.45	3960	0.57

Pipe barrels meet the requirements of Australian Standard A145, British Standard BS 1211.

RECTANGULAR HOLLOW SECTION TUBES

R.H.S. TUBES are a comprehensive range of rectangular and square steel sections. They enable every fabricator to enjoy the advantages associated with hollow section construction without the necessity of installing new plant and equipment.

They are now widely used in the structural, architectural, mechanical handling, agricultural and general engineering fields with their established advantages — minimum maintenance, high load/weight ratios, immense torsional stiffness and aesthetic qualities.

In many cases R.H.S. Tube is now being used in conjunction with traditional sections and for this reason it is manufactured to dimensions which match with conventional rolled steel sections.

SIZE RANGE:

The sizes for square profiles range from ½" x ½" to 16" x 16" and for rectangular profiles from 2" x 1" to 18" x 14".

LENGTH RANGE:

The standard stock length range is detailed in the last column of the Standard Sizes and Properties Tables. Exact lengths (tolerance plus ¼" minus 0") can be produced ex mill rollings.

SURFACE FINISH:

R.H.S. Tubes are normally paint indentified (red for Grade 16-27 sections, blue for Grade 23-31) which is applied in the ex mill condition.

MATERIAL:

The steel for these sections is weldable quality made by the open hearth or basic oxygen process and the sections are supplied in two grades to the Australian Standard A177.

NOTE: R.H.S. Tube is normally only stocked in Grade 16-27 quality. Grade 23-31 can be supplied to order ex mill rollings.

MECHANICAL PROPERTIES:

Grade 16-27 (Mild Steel)	Grade 23-31 (High Yield Steel)

TENSILE STRENGTH:

27 tonf/in² minimum	31 tonf/in² minimum

MINIMUM YIELD STRESS:

16 tonf/in²	23 tonf/in²

WEIGHT:

The minimum weight will not be more than 4% under tabulated weight.

DIMENSIONS:

Outside dimensions of sides: plus/minus 1% of length of side for 2" and over: plus/minus 0.02" for length of side under 2".

Squareness of corners: 90° plus/minus 1°.

Corners Inside: between the limits of 1/10t and 2t radius.

Outside: between the limits of 1/2t and 3t radius (where t = thickness).

RECTANGULAR HOLLOW SECTION TUBES

BUNDLING SCHEDULE

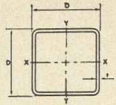
Size Inches	Thick-ness Inches	21 Foot Lengths			22 Foot Lengths			24 Foot Lengths		
		Lengths Per Bundle	Approx Total Feet	Approx Tons	Lengths Per Bundle	Approx Total Feet	Approx Tons	Lengths Per Bundle	Approx Total Feet	Approx Tons
SQUARES										
½ x ½	0.072	64	1,344	0.22	—	—	—	—	—	—
⅝ x ⅝	0.072	64	1,344	0.30	—	—	—	—	—	—
¾ x ¾	0.072	64	1,344	0.37	—	—	—	—	—	—
¾ x ¾	0.080	64	1,344	0.40	—	—	—	—	—	—
1 x 1	0.080	64	1,344	0.57	—	—	—	—	—	—
1 x 1	0.104	64	1,344	0.70	—	—	—	—	—	—
1 x 1	0.128	64	1,344	0.82	—	—	—	—	—	—
1¼ x 1¼	0.104	64	1,344	0.92	—	—	—	—	—	—
1½ x 1½	0.104	72	1,512	1.27	—	—	—	—	—	—
1½ x 1½	0.128	64	1,344	1.34	—	—	—	—	—	—
1½ x 1½	0.160	49	1,029	1.24	—	—	—	—	—	—
2 x 2	0.128	48	1,008	1.40	—	—	—	—	—	—
2 x 2	0.160	36	756	1.28	—	—	—	—	—	—
2 x 2	0.192	30	630	1.24	—	—	—	—	—	—
2½ x 2½	0.128	36	756	1.35	—	—	—	—	—	—
2½ x 2½	0.160	30	630	1.37	—	—	—	—	—	—
2½ x 2½	0.192	25	525	1.34	—	—	—	—	—	—
2½ x 2½	0.250	16	336	1.07	—	—	—	—	—	—
3 x 3	0.128	—	—	—	—	—	—	30	720	1.56
3 x 3	0.160	—	—	—	—	—	—	25	600	1.60
3 x 3	0.192	—	—	—	—	—	—	20	480	1.50
3 x 3	0.250	—	—	—	—	—	—	16	384	1.51
3½ x 3½	0.144	—	—	—	—	—	—	20	480	1.37
3½ x 3½	0.192	—	—	—	—	—	—	16	384	1.43
3½ x 3½	0.250	—	—	—	—	—	—	12	288	1.35
4 x 4	0.160	—	—	—	—	—	—	16	384	1.39
4 x 4	0.192	—	—	—	—	—	—	16	384	1.65
4 x 4	0.250	—	—	—	—	—	—	12	288	1.57
4 x 4	0.375	—	—	—	9	198	1.62	8	192	1.57
4½ x 4½	0.192	—	—	—	12	264	1.32	12	288	1.44
4½ x 4½	0.250	—	—	—	9	198	1.26	9	216	1.38

4½ x 4½	0.375	8	168	1.56	—	—	—	—	6	144	1.34
5 x 5	0.192	—	—	—	12	264	1.47	—	12	288	1.61
5 x 5	0.250	—	—	—	9	198	1.41	—	9	216	1.54
5 x 5	0.375	8	148	1.55*	—	—	—	—	6	144	1.50
RECTANGLES											
2 x 1	0.104	36	756	0.63	—	—	—	—	—	—	—
2 x 1	0.128	32	672	0.67	—	—	—	—	—	—	—
2½ x 1½	0.128	42	882	1.22	—	—	—	—	—	—	—
2½ x 1½	0.160	35	735	1.24	—	—	—	—	—	—	—
3 x 1½	0.128	40	840	1.33	—	—	—	—	—	—	—
3 x 1½	0.160	32	672	1.30	—	—	—	—	—	—	—
3 x 2	0.128	35	735	1.31	—	—	—	—	—	—	—
3 x 2	0.160	28	588	1.28	—	—	—	—	—	—	—
3 x 2	0.192	24	504	1.28	—	—	—	—	—	—	—
3 x 2	0.250	20	420	1.33	—	—	—	—	—	—	—
3½ x 1½	0.128	—	—	—	—	—	—	—	32	768	1.41
3½ x 1½	0.160	—	—	—	—	—	—	—	27	648	1.46
4 x 2	0.128	—	—	—	—	—	—	—	28	672	1.46
4 x 2	0.160	—	—	—	—	—	—	—	24	576	1.53
4 x 2	0.192	—	—	—	—	—	—	—	21	504	1.58
4 x 2	0.250	—	—	—	—	—	—	—	15	360	1.41
4 x 3	0.144	—	—	—	—	—	—	—	20	480	1.37
4 x 3	0.192	—	—	—	—	—	—	—	16	384	1.43
4 x 3	0.250	—	—	—	—	—	—	—	12	288	1.35
5 x 2	0.144	—	—	—	—	—	—	—	21	504	1.44
5 x 2	0.192	—	—	—	—	—	—	—	18	432	1.60
5 x 2	0.250	—	—	—	—	—	—	—	14	336	1.58
5 x 2½	0.160	—	—	—	—	—	—	—	18	432	1.46
5 x 2½	0.192	—	—	—	—	—	—	—	16	384	1.54
5 x 2½	0.250	—	—	—	—	—	—	—	12	288	1.52
5 x 3	0.250	—	—	—	—	—	—	—	15	360	1.59
5 x 3	0.375	—	—	—	9	198	1.62	—	8	192	1.57
6 x 3	0.192	—	—	—	12	264	1.32	—	12	288	1.44
6 x 3	0.250	—	—	—	9	198	1.26	—	9	216	1.38
6 x 3	0.375	8	168	1.56	—	—	—	—	6	144	1.34
6 x 4	0.192	—	—	—	12	264	1.47	—	12	288	1.61
6 x 4	0.250	—	—	—	9	198	1.41	—	9	216	1.54
6 x 4	0.375	8	148	1.55	—	—	—	—	6	144	1.50

*Approx Mill Length 18' - 6" Long

RECTANGULAR HOLLOW SECTION TUBES

SQUARES STANDARD SIZES AND PROPERTIES



Size in Inches D	Thick-ness (t) Inch	Weight lb/Ft	Feet Per Ton	Area of Section (in^2)	Super-ficial Area Per Foot (ft^2)	Moment of Inertia (in^4)	Elastic Modulus (in^3)	Radius of Gyration (in)	Approx Mill Length Feet
½ x ½	.072	.374	5994	.110	.146	.003	.013	.169	21
⅝ x ⅝	.072	.496	4515	.146	.188	.007	.023	.220	,,
¾ x ¾	.072	.619	3622	.182	.229	.013	.036	.271	,,
	.080	.673	3329	.198	.227	.014	.038	.267	,,
1 x 1	.080	.945	2371	.278	.310	.038	.076	.370	,,
	.104	1.17	1910	.345	.304	.044	.088	.358	,,
	.128	1.37	1630	.404	.297	.048	.097	.346	,,
1¼ x 1¼	.104	1.53	1468	.449	.387	.095	.152	.460	,,
1½ x 1½	.104	1.88	1192	.553	.470	.175	.233	.562	,,
	.128	2.24	998	.660	.463	.200	.267	.551	,,
	.160	2.69	832	.792	.454	.226	.302	.535	,,
2 x 2	.128	3.11	719	.916	.630	.552	.522	.755	,,
	.160	3.78	593	1.11	.621	.608	.608	.739	,,
	.192	4.40	509	1.29	.612	.677	.677	.724	,,
2½ x 2½	.128	3.99	562	1.17	.797	1.08	.863	.959	,,
	.160	4.87	460	1.43	.788	1.28	1.02	.944	,,
	.192	5.70	393	1.68	.778	1.45	1.16	.928	,,
	.250	7.10	315	2.09	.762	1.69	1.35	.899	,,
3 x 3	.128	4.86	461	1.43	.963	1.93	1.29	1.16	,,
	.160	5.96	376	1.75	.954	2.31	1.54	1.15	,,
	.192	7.01	320	2.06	.945	2.64	1.76	1.13	,,
	.250	8.80	255	2.59	.929	3.16	2.10	1.10	,,
3½ x 3½	.144	6.39	351	1.88	1.13	3.48	1.99	1.36	,,
	.192	8.32	269	2.45	1.11	4.37	2.50	1.34	,,
	.250	10.5	213	3.09	1.10	5.29	3.02	1.31	,,

LYSAGHT REFEREE

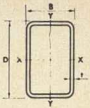
4 x 4	.160	8.13	276	2.39	1.29	5.80	2.90	1.56	,,
	.192	9.62	233	2.83	1.28	6.72	3.36	1.54	,,
	.250	12.2	184	3.59	1.26	8.22	4.11	1.51	,,
	.375	18.3	123	5.37	1.27	11.6	5.82	1.47	22 or 24†
4½ x 4½	.192	11.2	200	3.29	1.47	10.1	4.51	1.76	,,
	.250	14.3	156	4.22	1.46	12.6	5.62	1.73	,,
	.375	20.8	108	6.12	1.43	17.2	7.65	1.68	21 or 24†
5 x 5	.192	12.5	179	3.67	1.63	14.1	5.65	1.96	22 or 24†
	.250	16.0	140	4.72	1.62	17.7	7.07	1.94	,,
	.375	23.4	96	6.87	1.60	24.3	9.73	1.88	18.5 or 24†
6 x 6	.192	15.1	148	4.44	1.97	24.9	8.31	2.37	24
	.250	19.4	115	5.72	1.96	31.4	10.5	2.34	,,
	.375	28.5	79	8.37	1.93	43.9	14.6	2.29	,,
7 x 7	.232	21.3	105	6.25	2.29	47.6	13.6	2.76	30 to 36
	.250	22.8	98	6.72	2.29	50.9	14.5	2.75	,,
	.281	25.5	88	7.51	2.28	56.4	16.1	2.74	,,
	.375	33.6	67	9.87	2.27	71.9	20.5	2.70	,,
8 x 8	.232	24.4	92	7.18	2.63	72.1	18.0	3.17	,,
	.250	26.2	85	7.72	2.62	77.1	19.3	3.16	,,
	.281	29.4	76	8.64	2.62	85.5	21.4	3.15	,,
	.375	38.7	58	11.4	2.60	110	27.4	3.11	,,
10 x 10	.250	33.0	68	9.72	3.29	154	30.7	3.98	,,
	.375	48.9	46	14.4	3.27	221	44.2	3.92	,,
	.500	64.2	35	18.9	3.24	283	56.6	3.87	,,
12 x 12	.375	59.1	38	17.4	3.93	390	65.1	4.74	,,
	.500	77.8	29	22.9	3.91	503	83.8	4.69	,,
	.625	96.0	23	28.2	3.89	607	101	4.63	,,
14 x 14	.375	69.3	32	20.4	4.60	629	89.9	5.56	,,
	.500	91.4	24	26.9	4.58	814	116	5.50	,,
	.625	113	20	33.2	4.55	988	141	5.45	,,
16 x 16	.375*	79.5	28	23.4	5.27	949	119	6.37	,,
	.500*	105	21	30.9	5.24	1234	154	6.32	,,

* Sizes not in regular production.

† S & L reserve the right to supply these sizes in either length depending upon mill loading at the time of order.

RECTANGULAR HOLLOW SECTION TUBES

RECTANGLES STANDARD SIZES AND PROPERTIES



Size in Inches D B	Thick-ness (t) Inch	Weight lb/Ft	Feet Per Ton	Area of Section (in^2)	Super-ficial Area Per Foot (ft^2)	Moment of Inertia (in^4)		Elastic Modulus (in^3)		Radius of Gyration (in)		Approx Mill Length Feet
						XX	YY	XX	YY	XX	YY	
2 x 1	.104	1.88	1192	.553	.470	.260	.086	.260	.172	.686	.395	21
	.128	2.24	998	.660	.463	.298	.097	.298	.195	.671	.384	,,
2½ x 1½	.128	3.11	719	.916	.630	.718	.321	.575	.428	.886	.592	,,
	.160	3.78	593	1.11	.621	.836	.371	.669	.494	.867	.577	,,
3 x 1½	.128	3.55	631	1.04	.713	1.14	.381	.761	.509	1.05	.604	,,
	.160	4.32	518	1.27	.704	1.34	.443	.893	.590	1.03	.590	,,
3 x 2	.128	3.99	562	1.17	.797	1.41	.747	.937	.747	1.10	.798	,,
	.160	4.87	460	1.43	.788	1.66	.879	1.11	.879	1.08	.784	,,
	.192	5.70	393	1.68	.778	1.89	.992	1.26	.992	1.06	.769	,,
	.250	7.10	315	2.09	.762	2.21	1.15	1.47	1.15	1.03	.742	,,
3½ x 1½	.128	3.99	562	1.17	.797	1.69	.442	.969	.589	1.20	.614	24
	.160	4.87	460	1.43	.788	2.00	.515	1.14	.687	1.18	.600	,,
4 x 2	.128	4.86	461	1.43	.963	2.87	.972	1.44	.972	1.42	.825	24
	.160	5.96	376	1.75	.954	3.43	1.15	1.72	1.15	1.40	.811	,,
	.192	7.01	320	2.06	.945	3.93	1.31	1.97	1.31	1.38	.796	,,
	.250	8.80	255	2.59	.929	4.69	1.54	2.35	1.54	1.35	.771	,,
4 x 3	.144	6.39	351	1.88	1.13	4.23	2.71	2.12	1.81	1.50	1.20	,,
	.192	8.32	269	2.45	1.11	5.33	3.40	2.66	2.27	1.48	1.18	,,
	.250	10.5	213	3.09	1.10	6.45	4.10	3.23	2.74	1.45	1.15	,,
5 x 2	.144	6.39	351	1.88	1.13	5.58	1.31	2.23	1.31	1.72	.836	,,
	.192	8.32	269	2.45	1.11	7.01	1.62	2.81	1.62	1.69	.814	,,
	.250	10.5	213	3.09	1.10	8.48	1.92	3.39	1.92	1.66	.789	,,
5 x 2½	.160	7.59	295	2.23	1.20	7.02	2.37	2.81	1.90	1.77	1.03	,,
	.192	8.97	250	2.64	1.20	8.12	2.73	3.25	2.18	1.75	1.02	,,
	.250	11.8	190	3.47	1.21	10.6	3.44	4.25	2.75	1.75	.996	,,

5 x 3	.192	9.88	227	2.91	1.30	9.68	4.31	3.87	2.87	1.82	1.22	"
	.250	12.6	177	3.72	1.29	12.0	5.30	4.81	3.53	1.80	1.19	"
	.375	18.3	123	5.37	1.27	16.3	6.98	6.51	4.65	1.74	1.14	22 or 24†
6 x 3	.192	11.2	200	3.29	1.47	15.2	5.07	5.07	3.38	2.15	1.24	"
	.250	14.3	156	4.22	1.46	19.0	6.24	6.34	4.16	2.12	1.22	"
	.375	20.8	108	6.12	1.43	26.1	8.28	8.69	5.52	2.06	1.16	21 or 24†
6 x 4	.192	12.5	179	3.67	1.63	18.4	9.78	6.15	4.89	2.24	1.63	22 or 24†
	.250	16.0	140	4.72	1.62	23.1	12.2	7.71	6.10	2.21	1.61	"
	.375	23.4	96	6.87	1.60	32.0	16.6	10.7	8.29	2.16	1.55	18.5 or 24†
8 x 4	.192	15.1	148	4.44	1.97	37.2	12.6	9.31	6.29	2.89	1.68	24
	.250	19.4	115	5.72	1.96	47.1	15.7	11.8	7.86	2.87	1.66	"
	.375	28.5	79	8.37	1.93	66.1	21.5	16.5	10.8	2.81	1.60	"
8 x 6	.232	21.3	105	6.25	2.29	58.1	37.2	14.5	12.4	3.05	2.44	30 to 36
	.250	22.8	98	6.72	2.29	62.1	39.7	15.5	13.2	3.04	2.43	"
	.281	25.5	88	7.51	2.28	68.8	43.9	17.2	14.6	3.03	2.42	"
	.375	33.6	67	9.87	2.27	87.9	55.8	22.0	18.6	2.98	2.38	"
10 x 6	.232	24.4	92	7.18	2.63	99.2	44.9	19.8	15.0	3.72	2.50	"
	.250	26.2	85	7.72	2.62	106	48.0	21.2	16.0	3.71	2.49	"
	.281	29.4	76	8.64	2.62	118	53.1	23.6	17.7	3.69	2.48	"
	.375	38.7	58	11.4	2.60	152	67.7	30.3	22.6	3.65	2.44	"
12 x 8	.250	33.0	68	9.72	3.29	200	107	33.4	26.8	4.54	3.32	"
	.375	48.9	46	14.4	3.27	289	153	48.2	38.3	4.48	3.27	"
	.500	64.2	35	18.9	3.24	370	195	61.7	48.8	4.43	3.21	"
16 x 8	.375	59.1	38	17.4	3.93	583	197	72.9	49.3	5.79	3.37	"
	.500	77.8	29	22.9	3.91	753	251	94.1	62.8	5.74	3.31	"
	.625	96.0	23	28.2	3.89	911	300	114	75.1	5.68	3.26	"
18 x 10	.375	69.3	32	20.4	4.60	897	360	99.7	72.1	6.64	4.21	"
	.500	91.4	24	26.9	4.58	1164	463	129	92.7	6.58	4.15	"
	.625	113	20	33.2	4.55	1415	559	157	112	6.52	4.10	"
18 x 14	.375*	79.5	28	23.4	5.27	1130	768	126	110	6.95	5.73	"
	.500*	105	21	30.9	5.24	1470	997	163	142	6.90	5.68	"

* Sizes not in regular production.

† S & L reserve the right to supply these sizes in either length depending upon mill loading at the time of order.

Weights and Areas of SQUARE AND ROUND STEEL BARS

Thickness or diam. in inches	Weight in lb of Square bar one foot long	Weight in lb of Round bar one foot long	Area of Square bar in inches	Area of Round bar in inches	Circumference of Round bar in inches
3/16	.120	.094	.0352	.0276	.5891
1/4	.212	.167	.0625	.0491	.7854
5/16	.332	.261	.0977	.0767	.9818
3/8	.478	.376	.1406	.1104	1.1781
7/16	.651	.511	.1914	.1503	1.3745
1/2	.850	.668	.2500	.1963	1.5708
9/16	1.076	.845	.3164	.2485	1.7672
5/8	1.328	1.043	.3906	.3068	1.9635
11/16	1.607	1.262	.4727	.3712	2.1599
3/4	1.913	1.502	.5625	.4418	2.3562
13/16	2.245	1.763	.6602	.5185	2.5526
7/8	2.603	2.044	.7656	.6013	2.7489
15/16	2.988	2.347	.8789	.6903	2.9453
1	3.400	2.670	1.0000	.7854	3.1416
1-1/8	4.303	3.380	1.2656	.9940	3.5343
1-1/4	5.313	4.172	1.5625	1.2272	3.9270
1-3/8	6.428	5.049	1.8906	1.4849	4.3197
1-1/2	7.650	6.008	2.2500	1.7671	4.7124
1-5/8	8.978	7.051	2.6406	2.0739	5.1051
1-3/4	10.41	8.178	3.0625	2.4053	5.4978
1-7/8	11.95	9.388	3.5156	2.7612	5.8905
2	13.60	10.68	4.0000	3.1416	6.2832
2-1/8	15.35	12.06	4.5156	3.5466	6.6759
2-1/4	17.21	13.52	5.0625	3.9761	7.0686
2-3/8	19.18	15.06	5.6406	4.4301	7.4613
2-1/2	21.25	16.69	6.2500	4.9087	7.8540
2-5/8	23.43	18.40	6.8906	5.4119	8.2467
2-3/4	25.71	20.19	7.5625	5.9396	8.6394
2-7/8	28.10	22.07	8.2656	6.4918	9.0321
3	30.60	24.03	9.0000	7.0686	9.4248
3-1/4	35.92	28.21	10.563	8.2958	10.210
3-1/2	41.65	32.71	12.250	9.6211	10.996
3-3/4	47.82	37.55	14.063	11.045	11.781
4	54.40	42.73	16.000	12.566	12.566
4-1/4	61.41	48.24	18.063	14.186	13.352
4-1/2	68.85	54.07	20.250	15.904	14.137
4-3/4	76.71	60.25	22.563	17.721	14.923
5	85.00	66.76	25.000	19.635	15.708
5-1/2	102.9	80.78	30.250	23.758	17.279
6	122.4	96.13	36.000	28.274	18.850

One cubic foot of steel weighs 489.6 lb.

WEIGHTS OF STEEL PLATES

POUNDS PER LINEAL FOOT

Width Inches	Thickness in inches							
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2
12	2.55	5.10	7.65	10.20	12.75	15.30	17.85	20.40
13	2.76	5.53	8.29	11.05	13.81	16.58	19.34	22.10
14	2.98	5.95	8.93	11.90	14.88	17.85	20.83	23.80
15	3.19	6.38	9.56	12.75	15.94	19.13	22.31	25.50
16	3.40	6.80	10.20	13.60	17.00	20.40	23.80	27.20
17	3.61	7.23	10.84	14.45	18.06	21.68	25.29	28.90
18	3.83	7.65	11.48	15.30	19.13	22.95	26.78	30.60
19	4.04	8.08	12.11	16.15	20.19	24.23	28.26	32.30
20	4.25	8.50	12.75	17.00	21.25	25.50	29.75	34.00
21	4.46	8.93	13.39	17.85	22.31	26.78	31.24	35.70
22	4.68	9.35	14.03	18.70	23.38	28.05	32.73	37.40
23	4.89	9.78	14.66	19.55	24.44	29.33	34.21	39.10
24	5.10	10.20	15.30	20.40	25.50	30.60	35.70	40.80
26	5.53	11.05	16.58	22.10	27.63	33.15	38.68	44.20
28	5.95	11.90	17.85	23.80	29.75	35.70	41.65	47.60
30	6.38	12.75	19.13	25.50	31.88	38.25	44.63	51.00
32	6.80	13.60	20.40	27.20	34.00	40.80	47.60	54.40
34	7.23	14.45	21.68	28.90	36.13	43.35	50.58	57.80
36	7.65	15.30	22.95	30.60	38.25	45.90	53.55	61.20
38	8.08	16.15	24.23	32.30	40.38	48.45	56.53	64.60
40	8.50	17.00	25.50	34.00	42.50	51.00	59.50	68.00
42	8.93	17.85	26.78	35.70	44.63	53.55	62.48	71.40
44	9.35	18.70	28.05	37.40	46.75	56.10	65.45	74.80
46	9.78	19.55	29.33	39.10	48.88	58.65	68.43	78.20
48	10.20	20.40	30.60	40.80	51.00	61.20	71.40	81.60
50	10.6	21.3	31.9	42.5	53.1	63.8	74.40	85.0
52	11.1	22.1	33.2	44.2	55.3	66.3	77.4	88.4
54	11.5	23.0	34.4	45.9	57.4	68.9	80.3	91.8
56	11.9	23.8	35.7	47.6	59.5	71.4	83.3	95.2
58	12.3	24.7	37.0	49.3	61.6	74.0	86.3	98.6
60	12.8	25.5	38.3	51.0	63.8	76.5	89.3	102.0
62	13.2	26.4	39.5	52.7	65.9	79.1	92.2	105.4
64	13.6	27.2	40.8	54.4	68.0	81.6	95.2	108.8
66	14.0	28.1	42.1	56.1	70.1	84.2	98.2	112.2
68	14.5	28.9	43.4	57.8	72.3	86.7	101.2	115.6
70	14.9	29.8	44.6	59.5	74.4	89.3	104.1	119.0
72	15.3	30.6	45.9	61.2	76.5	91.8	107.1	122.4
74	15.7	31.5	47.2	62.9	78.6	94.4	110.1	125.8
76	16.2	32.3	48.5	64.6	80.8	96.9	113.1	129.2
78	16.6	33.2	49.7	66.3	82.9	99.5	116.0	132.6
80	17.0	34.0	51.0	68.0	85.0	102.0	119.0	136.0
82	17.4	34.9	52.3	69.7	87.1	104.6	122.0	139.4
84	17.9	35.7	53.6	71.4	89.3	107.1	125.0	142.8

WEIGHTS OF FLAT ROLLED STEEL

POUNDS PER LINEAL FOOT

Width inches	Thickness in inches																
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
¼	.053	.106	.159	.213	.27	.32	.37	.43	.48	.53	.58	.64	.69	.74	.80	.85
½	.106	.213	.319	.425	.53	.64	.74	.85	.96	1.06	1.17	1.28	1.38	1.49	1.59	1.70
¾	.159	.319	.478	.638	.80	.96	1.12	1.28	1.43	1.59	1.75	1.91	2.07	2.23	2.39	2.55
1	.213	.425	.638	.850	1.06	1.28	1.49	1.70	1.91	2.13	2.34	2.55	2.76	2.98	3.19	3.40
1¼	.266	.531	.797	1.063	1.33	1.59	1.86	2.13	2.39	2.66	2.92	3.19	3.45	3.72	3.98	4.25
1½	.319	.638	.956	1.275	1.59	1.91	2.23	2.55	2.87	3.19	3.51	3.83	4.14	4.46	4.78	5.10
1¾	.372	.744	1.116	1.488	1.86	2.23	2.60	2.98	3.35	3.72	4.09	4.46	4.83	5.21	5.58	5.95
2	.425	.850	1.275	1.700	2.13	2.55	2.98	3.40	3.83	4.25	4.68	5.10	5.53	5.95	6.38	6.80
2¼	.478	.956	1.434	1.913	2.39	2.87	3.35	3.83	4.30	4.78	5.26	5.74	6.22	6.69	7.17	7.65
2½	.531	1.063	1.594	2.125	2.66	3.19	3.72	4.25	4.78	5.31	5.84	6.38	6.91	7.44	7.97	8.50
2¾	.584	1.169	1.753	2.338	2.92	3.51	4.09	4.68	5.26	5.84	6.43	7.01	7.60	8.18	8.77	9.35
3	.638	1.275	1.913	2.550	3.19	3.83	4.46	5.10	5.74	6.38	7.01	7.65	8.29	8.93	9.56	10.20
3¼	.691	1.381	2.072	2.763	3.45	4.14	4.83	5.53	6.22	6.91	7.60	8.29	8.98	9.67	10.36	11.05
3½	.744	1.488	2.231	2.975	3.72	4.46	5.21	5.95	6.69	7.44	8.18	8.93	9.67	10.41	11.16	11.90
3¾	.797	1.594	2.391	3.188	3.98	4.78	5.58	6.38	7.17	7.97	8.77	9.56	10.36	11.16	11.95	12.75
4	.850	1.700	2.550	3.400	4.25	5.10	5.95	6.80	7.65	8.50	9.35	10.20	11.05	11.90	12.75	13.60
4¼	.903	1.806	2.709	3.613	4.52	5.42	6.32	7.23	8.13	9.03	9.93	10.84	11.74	12.64	13.55	14.45
4½	.956	1.913	2.869	3.825	4.78	5.74	6.69	7.65	8.61	9.56	10.52	11.48	12.43	13.39	14.34	15.30
4¾	1.009	2.019	3.028	4.038	5.05	6.06	7.07	8.08	9.08	10.09	11.10	12.11	13.12	14.13	15.14	16.15
5	1.063	2.125	3.188	4.250	5.31	6.38	7.44	8.50	9.56	10.63	11.69	12.75	13.81	14.88	15.94	17.00
5¼	1.116	2.231	3.347	4.463	5.58	6.69	7.81	8.93	10.04	11.16	12.27	13.39	14.50	15.62	16.73	17.85
5½	1.169	2.338	3.506	4.675	5.84	7.01	8.18	9.35	10.52	11.69	12.86	14.03	15.19	16.36	17.53	18.70
5¾	1.222	2.444	3.666	4.888	6.11	7.33	8.55	9.78	11.00	12.22	13.44	14.66	15.88	17.11	18.33	19.55
6	1.275	2.550	3.825	5.100	6.38	7.65	8.93	10.20	11.48	12.75	14.03	15.30	16.58	17.85	19.13	20.40

WEIGHTS OF STEEL WIRE

Diam. inches (app.)	Size SWG	Decimal of an inch	Milli-metres	Sectional area in sq in	Appr. wt in lb	
					100 yd	Mile
1/2	7/0	.500	12.7	.19635	200.11	3,522
15/32	6/0	.464	11.8	.16910	172.33	3,033
7/16	5/0	.432	11.0	.14657	149.37	2,629
13/32	4/0	.400	10.2	.12568	128.07	2,254
3/8	3/0	.372	9.4	.10869	110.80	1,950
11/32	2/0	.348	8.8	.09510	96.93	1,706
	1/0	.324	8.2	.08244	84.03	1,479
	1	.300	7.6	.07069	72.04	1,268
	2	.276	7.0	.05982	60.97	1,073
1/4	3	.252	6.4	.04987	50.85	895
	4	.232	5.9	.04227	43.07	758
	5	.212	5.4	.03530	35.97	633
3/16	6	.192	4.9	.02896	29.43	518
	7	.176	4.5	.02432	24.77	436
	8	.160	4.1	.02011	20.45	360
	9	.144	3.7	.01628	16.59	292
1/8	10	.128	3.3	.01287	13.12	231
	11	.116	3.0	.01057	10.80	190
	12	.104	2.6	.00850	8.63	152
3/32	13	.092	2.3	.00665	6.76	119
	14	.080	2.0	.00503	5.11	90
	15	.072	1.8	.00407	4.15	73
1/16	16	.064	1.6	.00322	3.29	58
	17	.056	1.4	.00246	2.50	44
3/64	18	.048	1.2	.00181	1.83	32.5
	19	.040	1.0	.00126	1.27	22.54
	20	.036	0.9	.00102	1.03	18.25
1/32	21	.032	0.8	.00080	0.819	14.42
	22	.028	0.7	.00062	0.628	11.04
	23	.024	0.6	.00045	0.461	8.11
3/128	24	.022	0.55	.00038	0.387	6.82
	25	.020	0.5	.00031	0.320	5.63
	26	.018	0.45	.00025	0.259	4.56
	27	.0164	0.4	.00021	0.215	3.79

STEEL WIRE ROPES

A wire rope is made up of a number of strands, each comprised of a combination of wires or wires and fibres laid over a core. This may be made of fibre or an independent wire rope core (IWRC).

FACTORS OF SAFETY

Cranes (Hook Hoist, Grab Hoist), Derrick Fall and Boom Lines 6

Service Winch or Block Ropes 6

Shovels and Excavating Equipment	5 to 6 min
Derrick Crane Guys	5
Logging Skylines, Main Cableways	4
Logging Spar Tree Guys and Stack Guys	3½ to 4
Incline Haulages	6 to 8

THE CHIEF COMPONENT PARTS OF A STEEL WIRE ROPE ARE:

(1) The wires which are used to form the strands.
(2) The strands which are laid together to form the rope.
(3) The core which provides the foundation on which the rope strands are laid.

To describe a wire rope fully the following characteristics should be specified:

Description of Item	Example
(a) Dimensions:	
Length	5280 ft
Diam. or Circumference	3⅛" Circ.
(b) Construction:	
No. of strands	6
No. of wires per strand	× 19
Arrangement of wires in strands	9/9/1
Lay: Direction and type	RHOL
Core	IWRC
Kind of Fabrication	Preformed
(c) Grade:	
Quality of steel	Basic
Tensile strength of wire	100/110 tpsi
(d) Lubrication:	
P.J., Graphite, Crater, Corbula, etc.	Graphite

POINTS OF WIRE ROPE USAGE

EQUIPMENT:

It is important for maximum economical, efficient and safe rope life that the equipment on which it operates be maintained in good working condition.

Before making or altering recommendations for new ropes, close inspection of the equipment and the work-

ing conditions should be made. All steps should be taken to correct such items as:

(1) Worn drum and sheave grooves which pinch and distort the rope — especially Langs Lay rope.

(2) Worn sheave bearings and faulty alignment between sheaves and drum which can lead to heavy abrasion of the rope between it and the sides of the sheave grooves.

(3) Undue vibration or whipping of the rope which can lead to fatigue failures of the rope wires.

(4) Obstructions in the path of the rope against which it may rub and cause excessive wear on the rope.

(5) Lack of suitable lubrication of the rope and its core to prevent corrosion and reduce internal friction and wear between the wires and strands.

Contrary to the belief of many users, the lubricant applied during the manufacture of the rope is seldom sufficient to last out the life of the rope, and the rope lubricant should be replenished regularly right from the time of the rope's installation.

THE STORAGE, HANDLING AND FITTING:

The storage, handling and fitting of the rope prior to its installation should be checked to see that:

(1) The rope is stored under dry conditions off the ground and free from corrosive fumes or moisture.

(2) The rope is coiled on to or off the reel coil so that all tendency to form loops or kinks in the rope is avoided.

(3) Where rope is stored for long periods under hot conditions the reel or coil is turned at intervals to prevent the lubricant from draining to the bottom of the reel or coil.

(4) The rope is suitably seized with a marline, annealed wire or strand seizing before cutting the rope to prevent distortion of the lay and strands.

(5) All end fittings and attachments are suitable for the work, properly fitted and maintained in good safe working order during the life of the rope.

TINPLATE GAUGE TABLE

Weight lb per base box	Equivalent Weight lb per sq ft	Approximate thickness, in	Old Symbol
60	0.2755	0.0066	—
65	0.2985	0.0072	—
70	0.3214	0.0077	—
75	0.3444	0.0083	—
80	0.3673	0.0088	—
85	0.3903	0.0094	—
90	0.4133	0.0099	—
95	0.4362	0.0105	—
100	0.4592	0.0110	ICL
107	0.4913	0.0118	IC
112	0.5143	0.0123	—
118	0.5418	0.0130	—
128	0.5878	0.0141	IXL
135	0.6199	0.0149	IX
139	0.6383	0.0153	DC
148	0.6796	0.0163	2XL
155	0.7117	0.0171	2X
168	0.7714	0.0185	3XL
175	0.8036	0.0193	3X
180	0.8265	0.0198	DX
188	0.8633	0.0207	4XL
195	0.8954	0.0215	4X
208	0.9551	0.0229	5XL
210	0.9643	0.0231	D2X
215	0.9872	0.0237	5X
228	1.0496	0.0251	6XL

Standard size 28″ x 20″ — 112 sheets per double box.

NOTE.— Tinplate is always supplied on a weight basis and not thickness (thickness figures are used as a guide only). Determine substance from single sheet weight as follows:—

$$\text{Substance (lb)} = \frac{\text{Single Sheet Weight} \times 112}{\text{Ratio}}$$

$$\text{Ratio} = \frac{\text{Nominal Sheet Area (sq in)}}{280 \text{ (sq in)}}$$

280 sq in = 14″ x 20″ (basis sheet size).

COPPER—SHEET AND STRIP

GENERAL.— 1. Types available: High Conductivity, Commercial, De-oxidised, Arsenical.

2. Finishes available: Hard (Cold) Rolled; Semi, Medium or Half Hard (Cold) Rolled; Soft (Cold) Rolled; Hot (Soft) Rolled.

TRADE SIZES.— Sheets: 26G and heavier (48″ x 14″ sheathing), 4′ x 2′, 6′ x 2′, 6′ x 2′ 6″, 6′ x 3′, 8′ x 3′, 6′ x 4′, 8′ x 4′, according to gauge.

Strip: .002″ and heavier, 5/16″ to 24″ wide.

WEIGHT PER SQUARE FOOT.— It is customary to order copper sheets by the Standard Wire Gauge or by weight in pounds and ounces per square foot. A table showing the weight per square foot equivalents to the various gauge numbers, calculated on the assumption that one square foot of rolled copper, 1 inch in thickness, weighs 46½ lb, is detailed below.

SWG No.	Decimal of inch	Wt per sq ft in lb	Equiv. per sq ft in lb	SWG No.	Decimal of inch	Wt per sq ft in lb	Equiv. per sq ft in oz
7/0	.500	23.25	—	23	.024	1.116	18
6/0	.464	21.57	—	24	.022	1.023	16
5/0	.432	20.08	—	25	.020	.930	14
4/0	.400	18.60	—	26	.018	.837	13
3/0	.372	17.29	—	27	.0164	.762	12
2/0	.348	16.18	—	28	.0148	.688	11
0	.324	15.06	—	29	.0136	.632	—
1	.300	13.950	—	30	.0124	.576	9
2	.276	12.834	—	31	.0116	.539	—
3	.252	11.718	—	32	.0108	.502	8
4	.232	10.788	—	33	.0100	.465	—
5	.212	9.858	10	34	.0092	.427	—
6	.192	8.928	9	35	.0084	.390	—
7	.176	8.184	8	36	.0076	.353	—
8	.160	7.440	7½	37	.0068	.316	—
9	.144	6.696	—	38	.0060	.279	—
10	.128	5.952	6	39	.0052	.241	—
11	.116	5.394	—	40	.0048	.223	—
12	.104	4.836	5	41	.0044	.204	—
13	.092	4.278	4½	42	.0040	.186	—
14	.080	3.720	3¾	43	.0036	.167	—
15	.072	3.348	—	44	.0032	.149	—
16	.064	2.976	3	45	.0028	.130	—
17	.056	2.604	2½	46	.0024	.112	—
18	.048	2.232	2¼	47	.0020	.093	—
19	.040	1.860	2	48	.0016	.074	—
20	.036	1.674	1¾	49	.0012	.056	—
21	.032	1.488	1½	50	.0010	.047	—
22	.028	1.302	1¼				

WEIGHT OF DRAWN COPPER BARS

Standard Rectangular Sizes

POUNDS PER LINEAL FOOT

Size in	Pounds
1/2	.1206
5/8	.1507
3/4	.1809
7/8	.2110
1	.2412
1 1/4	.3014
1 1/2	.3617
1/2	.2412
5/8	.3014
3/4	.3617
7/8	.4220
1	.4823
1 1/4	.6029
1 1/2	.7235
1 3/4	.8440
2	.9646
2 1/4	1.085
2 1/2	1.206
2 3/4	1.326
3	1.447
1/2	.3617
5/8	.4522
3/4	.5426
7/8	.6330
1	.7235
1 1/4	.9043
1 1/2	1.085
1 3/4	1.266
2	1.447
2 1/4	1.628
2 1/2	1.809
2 3/4	1.989
3	2.170
1/2	.4823
5/8	.6029
3/4	.7235
7/8	.8440
1	.9646
1 1/4	1.206
1 1/2	1.447
1 3/4	1.688
2	1.929
2 1/4	2.170
2 1/2	2.412
2 3/4	2.653
3	2.894

Size in	Pounds
1	1.447
1 1/4	1.809
1 1/2	2.170
1 3/4	2.532
2	2.894
2 1/4	3.256
2 1/2	3.617
2 3/4	3.979
3	4.341
3 1/4	4.702
3 1/2	5.064
3 3/4	5.426
4	5.788
4 1/4	6.149
4 1/2	6.511
4 3/4	6.873
5	7.235
1	1.929
1 1/4	2.412
1 1/2	2.894
1 3/4	3.376
2	3.858
2 1/4	4.341
2 1/2	4.823
2 3/4	5.305
3	5.788
3 1/4	6.270
3 1/2	6.752
3 3/4	7.235
4	7.717
4 1/4	8.199
4 1/2	8.681
4 3/4	9.164
5	9.646
5 1/4	10.13
5 1/2	10.61
5 3/4	11.09
6	11.58

Size in	Pounds
1	2.894
1 1/4	3.617
1 1/2	4.341
1 3/4	5.064
2	5.788
2 1/4	6.511
2 1/2	7.235
2 3/4	7.958
3	8.681
3 1/4	9.405
3 1/2	10.13
3 3/4	10.85
4	11.58
4 1/4	12.30
4 1/2	13.02
4 3/4	13.75
5	14.47
5 1/4	15.19
5 1/2	15.92
5 3/4	16.64
6	17.36
1	3.858
1 1/4	4.823
1 1/2	5.788
1 3/4	6.752
2	7.717
2 1/4	8.681
2 1/2	9.646
2 3/4	10.61
3	11.58
3 1/4	12.54
3 1/2	13.50
3 3/4	14.47
4	15.43
4 1/4	16.40
4 1/2	17.36
4 3/4	18.33
5	19.29
5 1/4	20.26
5 1/2	21.22
5 3/4	22.19
6	23.15

BRASS AND COPPER—RODS AND BARS

WEIGHT PER LINEAL FOOT — LB

SQUARE			ROUND		
Side inches	Brass	Copper	Dia. in inches	Brass	Copper
1/8	.057	.061	1/8	.045	.048
3/16	.128	.136	3/16	.101	.108
1/4	.228	.243	1/4	.179	.190
5/16	.357	.380	5/16	.280	.300
3/8	.513	.545	3/8	.403	.430
7/16	.699	.742	7/16	.549	.585
1/2	.913	.970	1/2	.717	.760
9/16	1.15	1.23	9/16	.91	.960
5/8	1.43	1.52	5/8	1.12	1.19
11/16	1.73	1.83	11/16	1.35	1.44
3/4	2.05	2.18	3/4	1.61	1.72
13/16	2.41	2.56	13/16	1.89	2.01
7/8	2.80	2.97	7/8	2.19	2.34
15/16	3.21	3.40	15/16	2.52	2.68
1	3.65	3.88	1	2.87	3.05
1-1/8	4.62	4.91	1-1/8	3.63	3.85
1-1/4	5.70	6.06	1-1/4	4.48	4.76
1-3/8	6.90	7.33	1-3/8	5.42	5.76
1-1/2	8.21	8.72	1-1/2	6.45	6.87
1-5/8	9.64	10.23	1-5/8	7.57	8.04
1-3/4	11.18	11.87	1-3/4	8.78	9.35
1-7/8	12.83	13.62	1-7/8	10.08	10.70
2	14.60	15.50	2	11.47	12.20
2-1/8	—	—	2-1/8	12.94	—
2-1/4	—	19.62	2-1/4	14.51	15.40
2-3/8	—	—	2-3/8	16.17	—
2-1/2	—	24.22	2-1/2	17.92	19.02

BA AND BSW STANDARD HEXAGON SIZES—BRASS

Association	Across flats min. to max.		Lb per lin ft	Standard		Across flats min. to max.		Lb per lin ft
				Whit.	Fine			
	in	in		in	in	in	in	
No. 3	.279	.282	.251	1/2	9/16	.915	.920	2.68
No. 2	.321	.324	.332	9/16	5/8	1.002	1.010	3.22
No. 1	.362	.365	.421	5/8	11/16	1.092	1.100	3.82
No. 0	.410	.413	.539	11/16	3/4	1.192	1.200	4.55
				3/4	7/8	1.292	1.300	5.34
				7/8	1	1.468	1.480	6.92
				1	1-1/8	1.658	1.670	8.81
				1-1/8	1-1/4	1.845	1.860	10.94
				1-1/4	1-3/8	2.035	2.050	13.29
				1-3/8	1-1/2	2.200	2.200	15.58
				1-1/2	1-5/8	2.390	2.410	18.36
				1-5/8	1-3/4	2.555	2.580	21.03
				1-3/4	2	2.735	2.760	24.07
				2	—	3.125	3.150	31.35

Standard				
Whit.	Fine			
in	in			
—	7/32	.410	.413	.539
—	1/4	.440	.445	.626
1/4	5/16	.520	.525	.871
5/16	3/8	.595	.600	1.14
3/8	7/16	.705	.710	1.59
7/16	1/2	.815	.820	2.13

SOLID DRAWN COPPER TUBES

COMMERCIAL QUALITY

Standard sizes — weight in lb per lineal foot. Calculated on a basis of copper at .323 lb per cubic inch. To find the weight of tubes composed of the following metals, multiply the weights of the equivalent copper tubes by the constants shown:— 6/40 brass, 0.942; 70/30 brass, 0.958; aluminium, 0.304.

Standard Wire Gauge	4	6	8	10	12	14	16	17	18	19	20	22
Dec. equiv. in inches	.232	.192	.160	.128	.104	.080	.064	.056	.048	.040	.036	.028
External diameter inch												
1/2	—	—	—	.58	.50	.41	.34	.30	.26	.22	.20	.16
9/16	—	—	—	—	—	.47	.39	—	.30	—	.23	.18
5/8	—	—	—	—	.66	.53	.44	.38	.34	.28	.26	.20
11/16	—	—	—	—	.74	.59	.48	—	.37	—	.28	.22
3/4	—	—	—	.97	.82	.65	.53	.47	.41	.34	.31	.25
13/16	—	—	—	1.06	.89	.71	.58	—	.45	—	.34	.27
7/8	—	—	—	1.16	.97	.77	.63	.55	.48	.40	.37	.29
15/16	—	—	—	1.25	1.05	.83	.68	—	.52	—	.39	.31
1	—	—	1.76	1.35	1.13	.89	.73	.63	.55	.46	.42	.33
1-1/32	—	—	—	—	—	.92	—	—	—	—	—	—
1-1/8	—	2.17	1.87	1.54	1.29	1.01	.82	.72	.63	.52	.48	.37
1-1/4	—	2.45	2.11	1.74	1.45	1.13	.92	.80	.70	.58	.53	.42
1-9/32	—	—	—	—	1.48	—	—	—	—	—	—	—
1-3/8	—	2.75	2.36	1.94	1.60	1.26	1.02	.89	.77	.64	.58	—
1-1/2	—	3.04	2.60	2.13	1.76	1.38	1.11	.97	.85	.70	.64	—

1-5/8	—	3.33	2.84	2.32	1.92	1.50	1.21	1.06	.92	.77	.69	—
1-3/4	—	3.62	3.08	2.52	2.08	1.61	1.31	1.14	.99	.83	.75	—
1-7/8	—	3.92	3.33	2.71	2.23	1.74	1.41	1.23	1.06	.89	.80	—
2	—	4.21	3.57	2.90	2.39	1.86	1.50	1.31	1.14	.95	.86	—
2-1/8	5.32	4.50	3.81	3.09	2.55	1.98	1.60	—	1.21	—	.92	—
2-1/4	5.67	4.79	4.05	3.29	2.71	2.10	1.70	1.48	1.28	1.07	.97	—
2-5/16	—	—	—	—	—	2.17	—	—	—	—	—	—
2-3/8	6.03	5.06	4.30	3.49	2.86	2.23	1.79	—	1.35	—	1.02	—
2-1/2	6.38	5.37	4.54	3.68	3.02	2.35	1.89	1.65	1.43	1.19	1.08	—
2-5/8	6.73	5.66	4.78	3.87	3.18	2.47	1.99	—	1.50	—	1.13	—
2-3/4	7.08	5.95	5.02	4.07	3.34	2.59	2.08	1.82	1.57	1.31	1.18	—
2-7/8	7.43	6.25	5.27	4.26	3.49	2.71	2.18	—	1.65	—	1.24	—
2-15/16	—	—	—	—	—	2.77	—	—	—	—	—	—
3	7.78	6.54	5.51	4.45	3.65	2.83	2.28	1.99	1.72	1.43	1.29	—
3-1/4	8.48	7.12	5.99	4.84	3.97	3.07	2.47	2.16	1.86	1.55	—	—
3-7/16	—	—	—	5.13	—	—	—	—	—	—	—	—
3-1/2	9.19	7.70	6.48	5.23	4.28	3.32	2.67	2.33	2.01	1.67	—	—
3-3/4	9.89	8.28	6.96	5.62	4.60	3.56	2.86	2.50	2.15	1.79	—	—
4	10.59	8.87	7.45	6.00	4.91	3.80	3.05	2.67	2.30	1.91	—	—
4-1/4	11.29	9.45	7.93	6.39	5.23	4.04	3.25	2.84	—	2.04	—	—
4-1/2	12.00	10.03	8.42	6.78	5.54	4.29	3.44	3.01	—	2.16	—	—
4-3/4	12.70	10.61	8.90	7.17	5.86	4.53	—	3.18	—	2.28	—	—
5	13.40	11.20	9.39	7.55	6.17	4.77	3.83	3.34	—	2.40	—	—
5-1/4	—	—	—	—	—	—	—	3.51	—	—	—	—
5-1/2	14.81	12.36	10.36	8.33	6.80	—	—	3.68	—	—	—	—
6	16.21	13.53	11.33	9.10	7.43	—	—	—	—	—	—	—

BRASS—SHEET AND STRIP

GENERAL.— 1. Commercial Brass is made in three grades: 70/30 (Deep Drawing); 65/35; 63/37 (Basis Brass).

2. Finishes available: Soft (Cold) Rolled; Semi, Medium or Half Hard (Cold) Rolled; Hard (Cold) Rolled; Extra Hard (Strip only).

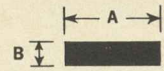
TRADE SIZES.— Sheets: 26 gauge and heavier — 4′ x 2′, 6′ x 2′, 6′ x 2′ 6″, 6′ x 3′. Strip: .002″ and heavier — 5/16″ to 24″ wide (special manufacture).

WEIGHT PER SQUARE FOOT.— The weight per square foot of rolled brass varies slightly with the composition of the alloy. For the basis of all calculations, the figure used is that one square foot of rolled brass weighs 44⅓ lb per square foot one inch in thickness.

SWG No.	Decimal of an inch	Weight per sq ft in lb	SWG No.	Decimal of an inch	Weight per sq ft in lb
7/0	.500	22.250	23	.024	1.068
6/0	.464	20.648	24	.022	.979
5/0	.432	19.224	25	.020	.890
4/0	.400	17.800	26	.018	.801
3/0	.372	16.540	27	.0164	.729
2/0	.348	15.486	28	.0148	.658
0	.324	14.418	29	.0136	.605
1	.300	13.350	30	.0124	.551
2	.276	12.282	31	.0116	.516
3	.252	11.214	32	.0108	.480
4	.232	10.324	33	.0100	.445
5	.212	9.434	34	.0092	.409
6	.192	8.544	35	.0084	.373
7	.176	7.832	36	.0076	.338
8	.160	7.120	37	.0068	.302
9	.144	6.408	38	.0060	.267
10	.128	5.696	39	.0052	.231
11	.116	5.162	40	.0048	.213
12	.104	4.628	41	.0044	.195
13	.092	4.094	42	.0040	.178
14	.080	3.560	43	.0036	.160
15	.072	3.204	44	.0032	.142
16	.064	2.848	45	.0028	.124
17	.056	2.492	46	.0024	.106
18	.048	2.136	47	.0020	.089
19	.040	1.780	48	.0016	.071
20	.036	1.602	49	.0012	.053
21	.032	1.424	50	.0010	.044
22	.028	1.246	—	—	—

OTHER COPPER ALLOYS ARE.— Gilding Metal (four grades), 90/10, 88/12, 85/15, 80/20 (Sheet and Strip); Nickel Silver, 10% (Sheet and Strip), 15%, 18%, 20% (Strip only); Engraving Brass (free cutting), Sheet and Strip; Naval Brass (improved Muntz Metal), Sheets and Sheathing; Phosphor Bronze (Strip only).

EXTRUDED FLAT BRASS SECTIONS



Dimensions (in)		Est. Weight per ft (lb)	Dimensions (in)		Est. Weight per ft (lb)	Dimensions (in)		Est. Weight per ft (lb)
A	B		A	B		A	B	
3	1	10.9	1-1/2	1	5.47	7/8	3/16	.599
3	7/8	9.58	1-1/2	7/8	4.79	7/8	1/8	.399
3	3/4	8.21	1-1/2	3/4	4.10	7/8	1/16	.200
3	5/8	6.84	1-1/2	5/8	3.42			
3	1/2	5.47	1-1/2	1/2	2.74	3/4	3/4	2.05
3	3/8	4.10	1-1/2	3/8	2.05	3/4	5/8	1.71
3	1/4	2.74	1-1/2	1/4	1.37	3/4	1/2	1.37
3	3/16	2.04	1-1/2	3/16	1.03	3/4	3/8	1.03
3	1/8	1.37	1-1/2	1/8	.684	3/4	1/4	.684
			1-1/2	1/16	.342	3/4	3/16	.513
2-1/2	1	9.12				3/4	1/8	.342
2-1/2	7/8	7.98	1-1/4	1	4.56	3/4	1/16	.171
2-1/2	3/4	6.84	1-1/4	7/8	3.99			
2-1/2	5/8	5.70	1-1/4	3/4	3.42	5/8	5/8	1.43
2-1/2	1/2	4.56	1-1/4	5/8	2.85	5/8	1/2	1.14
2-1/2	3/8	3.42	1-1/4	1/2	2.28	5/8	3/8	.855
2-1/2	1/4	2.28	1-1/4	3/8	1.71	5/8	1/4	.570
2-1/2	3/16	1.71	1-1/4	1/4	1.14	5/8	3/16	.428
2-1/2	1/8	1.14	1-1/4	3/16	.855	5/8	1/8	.285
			1-1/4	1/8	.570	5/8	1/16	.143
2	1	7.30	1-1/4	1/16	.285			
2	7/8	6.38				1/2	1/2	.912
2	3/4	5.47	1	1	3.65	1/2	3/8	.684
2	5/8	4.56	1	7/8	3.19	1/2	1/4	.456
2	1/2	3.65	1	3/4	2.74	1/2	3/16	.342
2	3/8	2.74	1	5/8	2.28	1/2	1/8	.228
2	1/4	1.82	1	1/2	1.82	1/2	1/16	.114
2	3/16	1.37	1	3/8	1.37			
2	1/8	.912	1	1/4	.912	3/8	3/8	.513
			1	3/16	.684	3/8	1/4	.342
1-3/4	1	6.38	1	1/8	.456	3/8	3/16	.257
1-3/4	7/8	5.59	1	1/16	.228	3/8	1/8	.171
1-3/4	3/4	4.79				3/8	1/16	.086
1-3/4	5/8	3.99	7/8	7/8	2.79			
1-3/4	1/2	3.19	7/8	3/4	2.39	1/4	1/4	.228
1-3/4	3/8	2.39	7/8	5/8	2.00	1/4	3/16	.171
1-3/4	1/4	1.60	7/8	1/2	1.60	1/4	1/8	.114
1-3/4	3/16	1.20	7/8	3/8	1.20	1/4	1/16	.057
1-3/4	1/8	.798	7/8	1/4	.798			

ZINC AND ZINC SHEET

Zinc is produced in Australia and is sold by the ton in the form of slabs weighing approximately 56 lb each. Zinc is also rolled into plates, sheet and strip and is available in sheets up to a maximum width of 36″ and a length of 96″. Strip in coil is supplied up to a maximum width of 23″ in standard thicknesses of 21, 22, 23 and 26 SWG.

Weight of Zinc Sheet

SWG No.	Zinc Gauge No.*	Thickness		Wt per sq ft-lb	Approx. Sheet Wt-lb	
		inch	mm		36″ x 72″	36″ x 96″
26	—	0.018	0.457	0.6741	12.13	16.18
—	10	0.019	0.483	0.7115	12.81	17.08
25	—	0.020	0.508	0.7490	13.48	17.98
—	—	0.021	0.533	0.7864	14.16	18.87
24	11	0.022	0.559	0.8239	14.83	19.77
—	—	0.023	0.584	0.8613	15.50	20.67
23	—	0.024	0.610	0.8988	16.18	21.57
—	12	0.025	0.635	0.9362	16.85	22.47
—	—	0.026	0.660	0.9737	17.52	23.37
—	—	0.027	0.686	1.0111	18.20	24.27
22	13	0.028	0.711	1.0486	18.87	25.17
—	—	0.029	0.737	1.0860	19.55	26.07
—	—	0.030	0.762	1.1235	20.22	26.96
—	14	0.031	0.787	1.1610	20.90	27.86
21	—	0.032	0.813	1.1984	21.57	28.76
—	—	0.033	0.838	1.2358	22.25	29.66
20	15	0.036	0.915	1.3482	24.27	32.36
19	16	0.041	1.041	1.5354	27.64	36.85

*There are a number of Zinc Gauges, this is the English Zinc Gauge as given in British Standard No. 3737-1964.

Process Engravers' Zinc

Process engravers' zinc is usually supplied in 40″ x 20″ plates, polished on one side, and in 8, 10, 12, 14 and 16 SWG. The following table gives weights of these standard sizes of plates.

40″ x 20″ x	8G	10G	12G	14G	16G
Weight of plate	33 lb	26½ lb	22 lb	16½ lb	13 lb

LEAD AND LEAD SHEET

Soft lead (up to 99.99% lead) and alloy lead is generally sold by the ton in ingots weighing approximately 56 lb. Lead and lead alloy plate, sheet and strip are also available. When ordering lead sheet it is usual to specify the weight of sheet per square foot rather than the thickness.

STANDARD SIZES FOR SHEET LEAD

Available as rolled or cast sheet

ROLLED SHEET: Soft lead and lead alloy (Commercial and Chemical Grades).
Widths: Up to 108 inches. Lengths: Up to 35 feet.
Weights: From foils 1 lb per square foot, up to 1″ plate 60 lb per square foot.

CAST SHEET: Soft lead both plain and wire reinforced for greater creep resistance.
Widths: Up to 36 inches. Lengths: Up to 2,000 feet.
Weights: Plain, 1, 1½, 2, 3 and 4 lb per square foot. Wire reinforced 2, 3 and 4 lb per square foot.

DAMP COURSE:

Bitumen Coated:
Weights: 14, 17 oz per sq ft, 2 and 3 lb per sq ft.

Plain (Uncoated):
Widths: (for both) 4½″, 6″, 9″, 12″, 14″, 18″, etc.
Lengths: (for both) 20 feet.
Weights: 2, 3, 4, 5 and 6 lb per sq ft.

Weights and Equivalent Thicknesses

Weight lb/sq ft	Thickness			Nearest SWG No.
	inch	mm	Fraction to nearest 1/64″	
1	0.0156	0.396	1/64	27
1-1/2	0.0234	0.594	1/32	23
2	0.0312	0.792	1/32	21
2-1/2	0.0391	0.993	3/64	19
3	0.0468	1.189	3/64	18
3-1/2	0.0547	1.389	1/16	17
4	0.0625	1.588	1/16	16
5	0.0781	1.985	5/64	15
6	0.0937	2.380	3/32	13
7	0.1092	2.789	7/64	11
8	0.1250	3.175	1/8	10
10	0.1563	3.970	5/32	8
12	0.1875	4.760	3/16	6
14	0.2188	5.560	7/32	5
16	0.2500	6.350	1/4	3
20	0.3126	7.940	5/16	0
30	0.4689	11.900	15/32	—
40	0.6252	15.890	5/8	—
60	0.9378	23.820	15/16	—

ALUMINIUM

Weight per Square Foot—Sheet

Thickness		Weight lb sq ft	Thickness		Weight lb sq ft
SWG	Inches		SWG	Inches	
—	.500	7.042	12	.104	1.465
—	.4375	6.161	14	.080	1.127
—	.375	5.281	16	.064	0.9013
—	.3125	4.401	18	.048	0.6760
—	.250	3.521	19	.040	0.5633
—	.187	2.641	20	.036	0.5070
8	.160	2.253	22	.028	0.3943
10	.128	1.803	24	.022	0.3098
—	.125	1.760	26	.018	0.2535

MONEL METAL AND NICKEL

Weights of Rounds, Squares and Hexagons

Size in inches	lb per foot			Size in inches	lb per foot		
	Rounds	Squares	Hexs.		Rounds	Squares	Hexs.
7/32	.146	—	—	2	12.178	15.504	13.426
1/4	.190	—	.209	2⅛	13.747	17.503	15.156
5/16	.297	.379	.327	2¼	15.411	19.622	16.991
3/8	.428	.545	.472	2⅜	17.171	21.863	18.921
7/16	.583	.742	.643	2½	19.027	24.225	20.977
1/2	.761	.969	.839	2⅝	20.977	26.708	23.127
9/16	.963	1.226	1.062	2¾	23.022	29.312	25.382
5/8	1.189	1.514	1.311	2⅞	25.162	32.038	27.741
11/16	1.439	1.832	1.586	3	27.399	34.884	30.207
3/4	1.712	2.180	1.887	3¼	32.155	40.940	35.451
13/16	2.010	2.559	2.216	3½	37.291	47.481	41.113
7/8	2.331	2.968	2.570	3¾	42.810	54.506	47.198
15/16	2.766	3.407	2.940	4	48.706	62.016	53.698
1	3.044	3.876	3.356	4¼	54.985	70.010	60.621
1-1/16	3.436	4.376	3.778	4½	61.644	78.489	67.963
1-1/8	3.853	4.906	4.248	4¾	68.714	87.452	75.757
1-3/16	4.293	5.466	4.733	5	76.105	96.900	83.906
1-1/4	4.756	6.056	5.243	5¼	83.908	106.832	92.509
1-5/16	5.244	6.677	5.782	5½	92.086	117.249	101.525
1-3/8	5.756	7.328	6.346	5¾	100.648	128.150	110.964
1-7/16	6.291	8.009	6.934	6	109.590	139.536	120.823
1-1/2	6.849	8.721	7.551	6¼	118.916	151.406	131.105
1-9/16	7.432	9.463	8.194	6½	128.617	163.761	141.800
1-5/8	8.039	10.235	8.863	6¾	138.703	176.600	152.910
1-11/16	8.669	11.038	9.558	7	149.168	189.924	164.458
1-3/4	9.321	11.870	10.276	7¼	160.009	203.733	176.410
1-13/16	10.001	12.733	11.026	7½	171.238	218.025	188.790
1-7/8	10.702	13.627	11.799	7¾	182.843	232.802	201.584
1-15/16	11.428	14.550	12.599	8	194.827	248.064	214.797

NON-FERROUS WIRE

WEIGHT PER 100 FEET IN POUNDS

Thickness		Copper or Bronze	Brass or Muntz	Alumin-ium	Nickel Silver	Monel Metal or Nickel
Inches	SWG					
0.5	7/0	76.0	71.9	22.93	74.1	76.1
0.372	3/0	42.0	39.8	12.17	41.0	42.76
0.324	0	32.0	30.2	7.63	31.1	31.9
0.276	2	23.3	21.9	7.00	22.6	23.16
0.252	3	19.3	18.3	5.83	18.8	19.20
0.232	4	16.4	15.5	4.96	15.9	16.37
0.192	6	11.15	10.6	3.4	10.9	11.18
0.160	8	7.80	7.36	2.35	7.58	7.77
0.128	10	5.07	4.71	1.53	4.85	4.98
0.104	12	3.30	3.11	0.99	3.20	3.28
0.080	14	1.94	1.84	0.66	1.90	1.93
0.064	16	1.24	1.18	0.377	1.21	1.25
0.048	18	0.70	0.663	0.212	0.682	0.695
0.036	20	0.395	0.373	0.119	0.384	0.387
0.028	22	0.238	0.226	0.072	0.232	0.238
0.022	24	0.148	0.139	0.044	0.143	0.147
0.018	26	0.098	0.0932	0.0297	0.096	0.098
0.0148	28	0.0663	0.0630	0.0201	0.0649	0.066
0.0124	30	0.0465	0.0442	0.0141	0.0455	0.046
0.0108	32	0.0353	0.0336	0.0108	0.0345	0.035
0.0092	34	0.0256	0.0243	0.0077	0.0250	0.025
0.0076	36	0.0175	0.0166	0.0053	0.0171	0.017

C.M.A. CABLES — SINGLE V.I.R. BRAIDED AND COMPOUNDED

Nominal area in sq in	No. and dia. of wires in inches	Nominal o/all dia. in inches		Weight per 100 yd in lb		Rating Current SAA Wiring Rules in Amp	Stand. Resist. (ohms) per 1000 yd @ 60° F
		660V	250V	660V	250V		
.0015	1/.044	.196	.142	7	5	8	15.79
.002	3/.029	.216	.164	8	6	10	12.36
.003	1/.064	.220	.166	10	7	15	7.463
.003	3/.036	.234	.184	11	8	15	8.019
.0045	7/.029	.255	.195	13	10	20	5.281
.007	7/.036	.278	.220	17	14	27	3.427
.010	7/.044	.304	.258	23	20	35	2.294
.0145	7/.052	.330	.288	29	27	45	1.643
.0225	7/.064	.368	.330	41	38	55	1.084
.030	19/.044	.396	.376	50	48	65	0.8468

ELECTRICITY

FUNDAMENTAL UNITS:

The Ampere is the unit in which electric current flow is measured.

The Ohm is the unit in which resistance to the flow of an electric current is measured.

The 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.— This 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 for in units of 1,000 watt hours, and is called the Board of Trade unit or kilowatt hour.

$$\text{kWh} = \frac{\text{Volts} \times \text{Amperes} \times \text{Hours}}{1{,}000} \text{ or } \frac{\text{Watts} \times \text{Hours}}{1{,}000}$$

Example: To find the cost of burning five 60-watt lamps for ten hours, assuming the cost per unit to be 3 cents —

$$\text{Cost} = \frac{60 \times 5 \times 10 \times 3\text{c}}{1{,}000} = \$0.09$$

$$\text{Horsepower} = \frac{\text{Watts}}{746} \qquad \text{Kilowatts} = \frac{\text{Watts}}{1{,}000}$$

The normal voltage for household appliances is 240; for 3-phase motors, etc., 415.

HINTS:

Do NOT take risks with electricity.

Do NOT use frayed or damaged cords or flexibles on portable appliances — THEY ARE DANGEROUS.

WATER is injurious to most electrical equipment.

DO NOT handle wet or damp metal-clad switchgear unless it is effectively EARTHED. If in doubt, have it inspected by a competent electrician, or cover the hand with a rubber glove, several thicknesses of dry cloth, or similar material before attempting to touch.

Portable appliances, unless double insulated, should be earthed by means of the appropriate type of flex and plug to an earth plug socket.

A cable carrying electric current (amperes) greater than its capacity will develop excessive heat. This is injurious to insulation (except in special applications) and uneconomical.

The fuse is there for protection. ALWAYS use the correct wire sizes and material (usually copper) when replacing fuses. Oversize fuse wire is dangerous. Frequent blowing of a fuse justifies a check being made.

In all cases of electric shock, remove person from danger zone and apply artificial respiration until medical aid arrives.

AVERAGE DISTRICT RAINFALL THROUGHOUT AUSTRALIA

(100 points = 1 inch)

	DISTRICT	Annual fall, Points	DISTRICT	Annual fall, Points
N.S.W.	Western Far North West	829	Manning	5350
	Western Lower Darling	967	Hunter	3463
	Western Upper Darling	1282	Central Tablelands North	2310
	Western S.W. Plains	1287	Central Tablelands South	3342
	Central Western Plains South	1746	Central Western Slopes North	2285
	Central Western Plains North	1713	Central Western Slopes South	2193
	North-west Plains East	2181	Metropolitan East	4190
	North-west Plains West	1838	Metropolitan West	3004
	North-west Slopes North	2606	Illawarra	4340
	North-west Slopes South	2428	South Coast	3628
	Northern Tablelands Western	3045	Southern Tablelands, Goulburn, Monaro	2495
	Northern Tablelands Eastern	3755	Southern Tablelands, Snowy Mountains	3338
	North Coast Upper	5544	South-west Slopes South	3343
	North Coast Lower	5563	South-west Slopes North	2353
			Riverina East	1846
			Riverina West	1371
VIC.	Mallee North	1123	East Gippsland	3021
	Mallee South	1335	West Gippsland	3570
	North Wimmera	1578	East Central	3472
	South Wimmera	1892	West Central	2355
	Lower North	1655	North Central	2816
	Upper North	1951	Western Plains	2432
	Lower North-east	3038	West Coast	2929
	Upper North-east	4365		

AVERAGE DISTRICT RAINFALL THROUGHOUT AUSTRALIA

(100 points = 1 inch)

	DISTRICT	Annual fall, Points	DISTRICT	Annual fall, Points
TAS.	Northern	3776	Central Plateau	5055
	East Coast	3118	West Coast	9625
	Midland	2270	King Island	3330
	South-east	2772	Flinders Island	3010
	Derwent Valley	2824		
S.A.	North-west Interior	741	Central West	1688
	Far North Interior	613	Central East	2338
	Western	1304	Murray Valley	1219
	Upper North	1247	Murray Mallee	1183
	North-east	771	Upper South-east	1658
	Lower North	1665	Lower South-east	2550
W.A.	North Kimberley	3116	North Coastal	1590
	East Kimberley	1493	Central Coastal	3549
	West Kimberley	2008	South Coastal	3675
	De Grey	1181	Central North	1386
	Fortescue	995	Central South	1710
	West Gascoyne	845	Eucla	740
	East Gascoyne	953	South-east	1037
	Murchison	869	North-east	923
N.T.	Northern Rivers	4264	Northern Plateau	1232
QLD.	Peninsula North	5575	Upper West	1430
	Peninsula South	3605	Lower West	911
	Carpentaria Lower	2420	South Coast, Port Curtis	3640
	Carpentaria Upper	2404	South Coast, Moreton	4156
	North Coast, Barron	6255	Darling Downs East	2599
	North Coast, Herbert	8412	Darling Downs West	2130
	Central Coast East	3694	Maranoa	2066
	Central Coast West	2254	Warrego	1621
	Central Highlands	2318	Far South West	1121
	Central Lowlands	1754		

AREA DISTRIBUTION OF AVERAGE ANNUAL RAINFALL: STATES AND TERRITORIES (Per cent)

Average annual rainfall	W.A.	N.T.	S.A.	Qld.	N.S.W. (a)	Vic.	Tas.	Total
Under 10 inches	58.0	24.7	82.8	13.0	19.7	Nil	Nil	39.0
10 and under 15 inches	22.4	32.4	9.4	14.4	23.5	22.4	Nil	20.6
15 " " 20 "	6.8	9.7	4.5	19.7	17.5	15.2	0.7	11.2
20 " " 25 "	3.7	6.6	2.2	18.8	14.2	17.9	11.0	9.0
25 " " 30 "	3.7	9.3	0.8	11.6	9.1	18.0	11.4	7.2
30 " " 40 "	3.3	4.7	0.3	11.1	9.9	16.1	20.4	6.1
40 inches and over	2.1	12.6	Nil	11.4	6.1	10.4	56.5	6.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(a) Includes Australian Capital Territory.

AREAS OF STATES AND TERRITORIES

State or Territory	Area sq miles	State or Territory	Area sq miles
New South Wales	309,433	Northern Territory	520,280
Victoria	87,884	Australian Capital Territory	939
Queensland	667,000	Mainland	2,941,526
South Australia	380,070	Tasmania	26,383
Western Australia	975,920	**Australia**	**2,967,909**

The coastline of Australia is approximately 12,000 miles long — New South Wales, 700 miles; Victoria, 700 miles; Queensland 3,200 miles; South Australia, 1,500 miles; Western Australia, 4,000 miles; Northern Territory, 1,000 miles; Australian Capital Territory, Jervis Bay area included in New South Wales; Tasmania, 900 miles. These measurements are broadly on a 'direct' basis, but even so they must be regarded as approximate only.

POPULATION(a)
AUSTRALIAN CENSUSES, STATES AND TERRITORIES 1881 to 1966

Census	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	A.C.T. (b)	Aust.
				PERSONS					
3 April 1881	749,825	861,566	213,525	276,414	29,708	115,705	3,451	....	2,250,194
5 April 1891	1,127,137	1,140,088	393,718	315,533	49,782	146,667	4,898	....	3,177,823
31 March 1901 ..	1,354,846	1,201,070	498,129	358,346	184,124	172,475	4,811	....	3,773,801
3 April 1911	1,646,734	1,315,551	605,813	408,558	282,114	191,211	3,310	1,714	4,455,005
4 April 1921	2,100,371	1,531,280	755,972	495,160	332,732	213,780	3,867	2,572	5,435,734
30 June 1933	2,600,847	1,820,261	947,534	580,949	438,852	227,599	4,850	8,947	6,629,839
30 June 1947	2,984,838	2,054,701	1,106,415	646,073	502,480	257,078	10,868	16,905	7,579,358
30 June 1954	3,423,529	2,452,341	1,318,259	797,094	639,771	308,752	16,469	30,315	8,986,530
30 June 1961	3,917,013	2,930,113	1,518,828	969,340	736,629	350,340	27,095	58,828	10,508,186
30 June 1966	4,233,822	3,219,526	1,663,685	1,091,875	836,673	371,435	37,433	96,013	11,550,462

(a) Excludes full-blood Aborigines. (b) Part of New South Wales before 1911.

POPULATION OF PRINCIPAL CITIES AND TOWNS: STATES AND TERRITORIES 30 JUNE 1966 (CENSUS) AND 1968

City or town	Population at 30 June — 1966(a)	1968
NEW SOUTH WALES —		
Sydney —		
Sydney City	159,531	155,480
Metropolitan Area	2,447,219	n.a.
Statistical Division(b)	2,542,207	2,646,800
Newcastle —		
Newcastle City	143,070	144,450
Urban Centre	234,005	n.a.
Statistical District(c)	327,578	338,920
Wollongong —		
Greater Wollongong	149,523	155,160
Urban Centre	162,171	n.a.
Statistical District(d)	177,456	187,910
Greater Cessnock	34,521	34,500
Blue Mountains	30,733	32,110
Broken Hill	30,043	30,320
Wagga Wagga	25,820	27,180
Albury	25,112	26,210
Tamworth	21,683	22,480
Orange	20,996	21,970
Goulburn	20,871	21,090
Lismore	19,757	20,040
Bathurst	17,230	17,330
Woy Woy-Umina (urban centre)	16,289	n.a.
Grafton	15,987	16,150
Dubbo	15,589	15,970
Armidale	15,010	15,890
Lithgow	12,811	12,710
Gosford (urban centre)	11,310	n.a.
Taree	10,563	10,910
QUEENSLAND —		
Brisbane —		
Brisbane City	656,612	680,000
Metropolitan Area	719,278	n.a.
Statistical Division	778,193	813,300
Townsville	59,135	63,300
Toowoomba	55,813	58,000
Gold Coast	49,495	56,500
Rockhampton	46,246	47,000
Cairns	26,891	27,400
Bundaberg	25,472	26,500
Mackay —		
Mackay City	18,651	19,100
Urban Centre	24,603	n.a.
Maryborough	19,662	19,850
Mount Isa (urban centre)	16,952	n.a.
Gladstone	12,435	12,400
Gympie	11,286	11,350
Warwick	10,075	10,150
SOUTH AUSTRALIA —		
Adelaide —		
Adelaide City	18,619	17,100
Metropolitan Area	728,279	742,300
Statistical Division	771,561	794,300
Whyalla	22,131	26,900
Mount Gambier	17,261	17,350
Port Pirie	13,965	13,900
Port Augusta	10,132	10,650
WESTERN AUSTRALIA —		
Perth —		
Perth City	96,322	96,800

City or town	Population at 30 June — 1966(a)	1968
VICTORIA —		
Melbourne —		
Melbourne City	76,006	76,200
Metropolitan Area	2,110,336	n.a.
Statistical Division	2,230,793	2,319,700
Geelong —		
Geelong City	18,129	18,190
Urban Centre	105,060	n.a.
Statistical District	111,365	115,500
Ballarat —		
Ballarat City	41,661	41,910
Urban Centre	56,312	n.a.
Bendigo —		
Bendigo City	30,806	31,350
Urban Centre	42,209	n.a.
Moe —		
Moe City	16,555	16,690
Moe-Yallourn (urban centre)	23,222	n.a.
Shepparton	17,488	18,250
Warrnambool	17,500	17,980
Morwell (urban centre)	16,647	n.a.
Wangaratta	15,181	15,640
Traralgon	14,080	14,420
Mildura	12,934	13,120
Horsham	10,562	10,900
Hamilton	10,062	10,160
WESTERN AUSTRALIA — continued		
Metropolitan Area	500,246	n.a.
Statistical Division	559,298	606,000
Kalgoorlie —		
Kalgoorlie Town	9,203	9,400
Kalgoorlie-Boulder (urban centre)	19,980	n.a.
Bunbury	15,467	16,450
Geraldton	12,196	13,500
Albany	11,440	12,050
TASMANIA —		
Hobart —		
Hobart City	53,257	52,810
Metropolitan Area	119,469	123,500
Statistical Division	141,311	144,850
Launceston —		
Launceston City	37,217	36,880
Urban Centre	60,456	61,870
Burnie-Somerset (urban centre)	18,042	19,050
Devonport (urban centre)	14,874	15,910
NORTHERN TERRITORY —		
Darwin —		
Darwin City	18,695	21,617
Urban Centre	21,205	n.a.
Alice Springs	6,390	7,810
AUSTRALIAN CAPITAL TERRITORY —		
Canberra —		
Canberra City District	93,314	110,020
Metropolitan Area	92,311	n.a.
Statistical District(e)	107,138	124,490

(a) Population at Census date. The difference between the statistics published here and those shown in census publications, which exclude full-blood Aborigines, cannot be taken as reliable statistics of Aboriginal population. (b) Includes part (15,290 at 1968) of Blue Mountains. (c) Includes Maitland (29,350 at 1968) and most (33,820 at 1968) of Greater Cessnock. (d) Includes Shellharbour (26,600 at 1968). (e) Includes Queanbeyan (13,330 at 1968) in New South Wales.

LYSAGHT REFEREE
LYSAGHT REFEREE

POPULATION, DENSITY, AND RATE OF INCREASE FOR THE WORLD AND CONTINENTS — SELECTED YEARS

(Source: United Nations Demographic Yearbook, 1967)

Continent and region	Population: Estimates of mid-year population (millions) 1930	1940	1950	1960	1963	1967	Annual rate of increase 1960-67 (per cent)	Average annual increase 1960-67 (mill's)	Density (persons per square mile) 1967
World Total	2,070	2,295	2,517	3,005	3,175	3,420	1.9	59.3	65
Africa	164	191	222	278	297	328	2.4	7.1	28
Western Africa	48	58	67	88	94	104	2.4	2.3	44
Eastern Africa	46	54	63	77	82	90	2.4	1.9	36
Northern Africa	39	44	53	66	71	79	2.6	1.9	23
Middle Africa	21	23	25	29	31	34	1.9	0.7	13
Southern Africa	10	12	14	18	19	21	2.4	0.4	21
America	242	274	329	412	439	479	2.2	9.6	28
Northern America	134	144	166	199	208	220	1.4	3.0	26
Latin America	108	130	163	213	231	259	2.9	6.6	34
Tropical South America	55	67	84	112	122	137	3.0	3.6	26
Middle America	22	27	35	48	53	61	3.4	1.9	62
Temperate South America	19	22	27	33	34	37	1.8	0.6	23
Caribbean	12	14	17	20	22	24	2.4	0.6	264
Asia	1,120	1,244	1,381	1,660	1,760	1,907	2.0	35.3	179
East Asia	591	634	684	794	827	877	1.4	11.9	194
Mainland region	501	533	563	654	680	720	1.4	9.4	168
Japan	64	71	83	93	96	100	1.0	1.0	699
Other East Asia	26	30	38	47	51	57	2.8	1.4	567
South Asia	529	610	697	866	933	1,030	2.5	23.4	168
Middle South Asia	371	422	479	588	634	698	2.5	15.7	267
South East Asia	127	150	173	219	236	262	2.6	6.1	150
South West Asia	31	38	45	59	63	70	2.6	1.6	41
Europe	355	380	392	425	437	452	0.9	3.9	238
Western Europe	108	113	123	135	140	146	1.1	1.6	383
Southern Europe	93	103	108	117	120	125	0.9	1.1	246
Eastern Europe	89	96	88	97	99	101	0.6	0.6	264
Northern Europe	65	68	73	76	78	80	0.7	0.6	127
Oceania	10.0	11.1	12.7	15.8	16.8	18.1	2.0	0.33	5
Australia and New Zealand	8.0	8.7	10.1	12.7	13.5	14.5	1.9	0.26	5
Melanesia	1.6	1.8	1.9	2.2	2.4	2.5	2.3	0.04	13
Polynesia and Micronesia	0.4	0.6	0.7	0.9	0.9	1.1	2.9	0.03	91
Union of Soviet Socialist Republics	179	195	180	214	225	236	1.4	3.1	28

Reference should be made to the detailed comments contained in the United Nations Demographic Yearbook, 1967, regarding geographical units used, boundaries of areas, reliability of estimates, etc.

LYSAGHT REFEREE
LYSAGHT REFEREE

OVERSEAS TRADE: AUSTRALIA, 1901 TO 1967-68
(f.o.b.)

Period	Exports	Imports	Excess of exports (+) or imports (—)	Value per head of population	
				Exports	Imports
	$m	$m	$m	$	$
Annual average —					
1901 to 1905	102	71	+ 31	26.2	18.2
1906 to 1910	139	94	+ 45	32.6	22.0
1911 to 1915-16	149	133	+ 16	30.8	27.6
1916-17 to 1920-21	230	183	+ 47	43.8	34.8
1921-22 to 1925-26	269	249	+ 20	45.8	42.2
1926-27 to 1930-31	263	239	+ 24	41.0	37.2
1931-32 to 1935-36	242	148	+ 94	36.2	22.2
1936-37 to 1940-41	315	247	+ 68	45.4	35.6
1941-42 to 1945-46	328	423	— 95	44.8	58.2
1946-47 to 1950-51	1,143	899	+244	145.4	114.3
1951-52 to 1955-56	1,572	1,566	+ 6	176.4	175.6
1956-57 to 1960-61	1,811	1,729	+ 82	182.0	173.7
Year —					
1958-59	1,623	1,593	+ 30	163.1	160.1
1959-60	1,875	1,854	+ 21	184.5	182.4
1960-61	1,938	2,175	—237	186.5	209.3
1961-62	2,155	1,769	+385	202.4	166.2
1962-63	2,152	2,163	— 11	198.5	199.4
1963-64	2,782	2,373	+410	251.6	214.5
1964-65	2,651	2,905	—253	235.1	257.5
1965-66	2,721	2,939	—218	236.6	255.6
1966-67	3,024	3,045	— 21	258.3	260.1
1967-68	3,045	3,264	—220	255.3	273.7

GOVERNMENT RAILWAYS: ROUTE-MILEAGE OPEN, STATES AND TERRITORIES, 1855 TO 1968

(Miles)

30 June —	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
1855(a)	14	2	....	7	....	....	....	....	23
1861(a)	73	114	....	56	....	....	....	....	243
1871(a)	358	276	218	133	....	45	....	....	1,030
1881(a)	996	1,247	800	832	92	45	....	....	4,012
1891	2,182	2,763	2,195	1,666	198	351	145	....	9,500
1901	2,846	3,237	2,801	1,736	1,355	457	145	....	12,577
1911	3,762	3,523	3,868	1,935	2,376	470	145	....	16,079
1921	5,043	4,267	5,752	3,408	3,992	630	199	5	23,296
1931	6,247	4,514	6,529	3,725	4,634	665	317	5	26,636
1941	6,368	4,518	6,567	3,809	4,835	642	490	5	27,234
1951	6,354	4,445	6,560	3,805	4,682	613	490	5	26,954
1961	6,303	4,050	6,324	3,836	4,577	517	490	5	26,102
1965	6,259	4,007	5,785	3,800	4,187	500	490	5	25,033
1966	6,259	3,984	5,785	3,781	4,201	500	490	5	25,005
1967	6,259	4,027	5,730	3,779	4,269	500	490	5	25,059
1968	6,265	4,012	5,825	3,780	4,269	500	490	5	25,146

(a) At 31 December.

PROCLAIMED OR DECLARED ROADS: LENGTHS, STATES, 30 JUNE 1968

(Miles)

Class of road	N.S.W.	Vic.	Qld.	S.A.	W.A.(a)	Tas.	Total
State highways	6,563	4,460	6,242			1,206	
Trunk roads	4,228	9,097	5,150	8,156	3,435	667	60,797
Ordinary main roads	11,593						
TOTAL MAIN ROADS ..	22,384	13,557	11,392	8,156	3,435	1,873	60,767
Secondary roads	(b)159	....	(c)8,893	....	7,958	197	17,207
Developmental roads	2,747	....	4,377	....	(d)43,930	....	51,054
Tourist roads	218	483	....	....	....	47	748
Other roads	....	(e)501	....	....	(f)74	(g)179	754
TOTAL OTHER ROADS	3,124	984	13,270	....	51,962	423	69,763
Grand total	**25,508**	**14,541**	**24,662**	**8,156**	**55,397**	**2,296**	**130,560**

(a) 30 June 1967. (b) Metropolitan only. (c) Includes mining access roads, farmers' roads and tourist tracks. (d) Maintenance of these roads is the responsibility of the several local authorities. (e) Forest roads and by-pass roads. (f) Gazetted as controlled access roadway but not constructed. (g) Subsidised roads.

DISTANCES BETWEEN AIRPORTS

Air miles actually flown by aircraft following the prescribed airline routes

By courtesy of the Department of Civil Aviation

PERTH																
325	KALGOORLIE															
692	333	FORREST														
1056	677	344	CEDUNA													
1355	990	658	261	ADELAIDE												
1564	1199	866	470	208	MILDURA											
1883	1405	1072	676	415	287	MELBOURNE										
2161	1683	1351	955	693	565	279	LAUNCESTON									
2253	1776	1443	1047	785	658	371	93	HOBART								
2194	1716	1383	987	725	598	311	590	692	CANBERRA							
2076	1711	1378	982	721	851	486	843	935	151	SYDNEY						
2302	1246	913	517	256	159	446	724	816	734	583	BROKEN HILL					
2541	2176	1844	1447	1186	1316	951	1308	1400	616	465	1048	BRISBANE				
2866	2501	2168	1772	1511	1642	1276	1633	1725	941	790	1373	325	ROCKHAMPTON			
3245	2880	2547	2151	1890	2021	1655	2012	2104	1320	1169	1751	704	379	TOWNSVILLE		
3429	3061	2728	2332	2070	2202	1835	2192	2285	1500	1350	1932	884	560	181	CAIRNS	
3745	3376	3043	2647	2386	2517	2151	2508	2600	1816	1665	2248	1200	875	496	316	NORMANTON

AREA FERTILISED AND QUANTITY OF ARTIFICIAL FERTILISERS USED, STATES AND TERRITORIES, 1967-68

State or Territory	Crops			Pastures			Total		
	Area fertilised ('000 acres)	Super-phosphate used (tons)	Other artificial fertilisers used (tons)	Area fertilised ('000 acres)	Super-phosphate used (tons)	Other artificial fertilisers used (tons)	Area fertilised ('000 acres)	Super-phosphate used (tons)	Other artificial fertilisers used (tons)
N.S.W.	7,555	275,976	77,066	9,697	514,444	25,983	17,252	790,420	103,049
Vic.	4,961	225,085	63,661	11,359	680,231	99,629	16,319	905,315	163,290
Qld.	1,242	34,635	198,766	260	24,324	5,734	1,502	58,960	204,500
S.A.	5,033	272,964	19,436	5,130	302,513	4,964	10,163	575,477	24,400
W.A.	8,868	472,304	53,650	12,597	676,535	17,479	21,465	1,148,839	71,129
Tas.	244	24,945	12,263	1,561	126,813	8,175	1,805	151,757	20,438
N.T.	14	1,097	568	47	2,883	81	60	3,980	649
A.C.T.	6	326	94	44	2,256	19	50	2,582	113
Australia ..	**27,922**	**1,307,332**	**425,504**	**40,693**	**2,329,999**	**162,064**	**68,615**	**3,637,330**	**587,568**

AERIAL AGRICULTURE, 1963-64 TO 1967-68

Year ended 31 March 1968 —	Area topdressed and seeded ('000 acres)	Area sprayed ('000 acres)	Total area treated (a) ('000 acres)	Materials used		Total flying time (hours)
				Super-phosphate (tons)	Seed ('000 lb)	
New South Wales(b)	6,418	990	7,716	308,786	(c)	53,241
Victoria	(c)	266	1,803	(c)	310	15,124
Queensland(d)	(c)	(c)	1,030	15,741	626	(c)
South Australia ..	(c)	237	(c)	(c)	217	5,609
Western Australia	(c)	(c)	(c)	46,826	201	15,072
Tasmania	(c)	(c)	(c)	(c)	(c)	(c)
Australia	**10,495**	**(c)**	**14,348**	**524,374**	**3,249**	**102,112**
1967	11,646	3,192	15,237	596,628	2,407	108,688
1966	11,314	3,469	15,010	588,045	1,581	108,850
1965	14,147	2,416	16,640	656,094	3,467	108,753
1964	10,666	2,041	12,788	505,811	1,997	84,827

(a) Includes other types of treatment (rabbit baiting, etc.). (b) Includes details for the Australian Capital Territory. (c) Not available for publication. (d) Includes details for the Northern Territory.

MAJOR DAMS AND RESERVOIRS IN AUSTRALIA

EXISTING DAMS AND RESERVOIRS

Name	Location	Capacity (acre feet)	Height of wall (feet)	Remarks
Eucumbene	Eucumbene River, New South Wales	3,890,000	381	Part of Snowy Mountains Hydro-electric Scheme
Eildon	Upper Goulburn River, Victoria	2,750,000	260	Storage for irrigation and for the generation of electricity
Hume	Murray River, near Albury, New South Wales	2,480,000	142	Part of Murray River Scheme—storage for domestic stock and irrigation purposes. Hydro-electric power also developed
Menindee Lakes Storage	Darling River, near Menindee, New South Wales	2,000,000	....	Part of Darling River Water Conservation Scheme
Miena	Great Lake, Tasmania	1,710,000	60	Storage for Poatina hydro-electric power station
Warragamba	Warragamba River, New South Wales	1,670,000	379	For Sydney water supply. Also provides for generation of hydro-electricity and flood mitigation
Burrendong	Macquarie River, near Wellington, New South Wales	1,361,000	250	Storage for rural water supplies

LYSAGHT REFEREE

Blowering	Tumut River, New South Wales	1,320,000	368	For regulation of discharges from stations of Snowy Mountains Hydro-electric Scheme, primarily for irrigation but also for hydro-electric power generation
Burrinjuck	Murrumbidgee River, New South Wales	837,000	264	Storage for irrigation and production of hydro-electric power
Somerset	Stanley River, Queensland	735,000	173	Brisbane-Ipswich water supply, flood mitigation and small hydro-electric power station
Wyangala	Lachlan River, New South Wales	(a)560,000	(b)220	Storage for domestic, stock and irrigation purposes and for generation of hydro-electric power. (see also under Dams and Reservoirs under Construction)
Jindabyne	Snowy River, New South Wales	558,000	235	Part of Snowy Mountains Hydro-electric Scheme
Lake Victoria	Murray River, near South Australian border, in New South Wales	551,700	....	Natural off-river storage for irrigation in South Australia. Storage improved by construction of embankments and control regulators
Lake Echo	Lake Echo, Tasmania ..	442,000	60	Storage for Lake Echo, Tungatinah, Liapootah, Wayatinah and Catagunya hydro-electric power stations

MAJOR DAMS AND RESERVOIRS IN AUSTRALIA

EXISTING DAMS AND RESERVOIRS

Name	Location	Capacity (acre feet)	Height of wall (feet)	Remarks
Clark	Derwent River, Tasmania	434,000	220	Storage for Tarraleah, Liapootah, Wayatinah, and Catagunya hydro-electric power stations
Arthur Lakes	Source of Lake River, near Great Lake, Tasmania	410,000	50	Part of Great Lake hydro-electric power development
Keepit	Namoi River, near Gunnedah, New South Wales	345,000	177	For rural water supplies and hydro-electricity generation
Waranga	Goulburn River, Victoria	333,400	45	For irrigation storage
Tinaroo Falls	Barron River, North Queensland	330,000	136	For irrigation purposes in the Mareeba-Dimbulah area
Glenbawn	Hunter River, near Scone, New South Wales	293,000	251	Part of Hunter Valley conservation work, for irrigation and flood mitigation
Rocklands	Glenelg River, Victoria	272,000	93	Part of Wimmera-Mallee domestic and stock water supply system
Eppalock	Campaspe River, near Heathcote, Victoria	252,860	150	To supplement supply to Bendigo and for irrigation

LYSAGHT REFEREE

Tantangara	Murrumbidgee River, New South Wales	206,000	148	Part of Snowy Mountains Hydro-electric Scheme
Avon	Avon River, New South Wales	(a)163,390	232	Part of Sydney water supply
Upper Yarra	Yarra River, Victoria	162,000	270	For Melbourne water supply
Glenmaggie	Gippsland, Victoria	154,300	121	Storage for irrigation
Lake St Clair	Central Highlands, Tasmania	154,200	....	Improved natural storage for Tarraleah hydro-electric power station
Wellington	Collie River, Western Australia	150,100	112	For supply of water to irrigation districts and to agricultural areas and country towns
Grahamstown	Grahamstown River, near Newcastle, New South Wales	147,000	35	To supplement supply to Newcastle and district
Koombooloomba	Tully River, North Queensland	146,000	123	For hydro-electric and irrigation purposes
Serpentine	Serpentine River, Western Australia	144,000	171	For Perth water supply
Lake Brewster	Lachlan River, near Hillston, New South Wales	123,900	....	Storage of rural water supplies for the lower Lachlan
Cairn Curran	Loddon River, Victoria	120,600	144	For irrigation storage
Rowallan	Mersey River, North Tasmania	110,000	140	Storage for Mersey Forth power development

MAJOR DAMS AND RESERVOIRS IN AUSTRALIA

DAMS AND RESERVOIRS UNDER CONSTRUCTION

Name	Location	Capacity (acre feet)	Height of wall (feet)	Remarks
Gordon	Gordon River, South-west Tasmania	9,600,000	450	Storage for Gordon River power development
Ord River (main)	Near Wyndham, Western Australia	4,600,000	220	For irrigation, generation of hydro-electric power and flood mitigation (additional 6,000,000 acre feet flood control proposed)
Fairbairn Dam	Nogoa River, Central Queensland	(c)1,170,000	148	Storage for the Emerald Irrigation Area
Copeton	Gwydir River, New South Wales	1,100,000	373	For irrigation storage
Wyangala	Lachlan River, New South Wales	1,000,000	280	Strengthening and enlarging of existing dam for increased water supply and hydro-electric power generation. (See also under Existing Dams and Reservoirs)
Talbingo	Tumut River, New South Wales	747,000	530	Part of Snowy Mountains Hydro-electric Scheme
Serpentine	Serpentine River, South-west Tasmania	307,200	135	Storage for Gordon River power development
Scotts Peak	Huon River, South-west Tasmania		160	
Mokoan	Winton Swamp, near Benalla, Victoria	300,000	35	For irrigation storage

Wuruma	Nogoa River, Central Queensland	157,000	120	For irrigation storage
Eungella	Broken River, North Queensland	106,000	130	Provision of cooling water for Collinsville power station, supply to Collinsville town and for irrigation purposes

DAMS AND RESERVOIRS PROJECTED

Chowilla	Murray River, in South Australia, near Victorian border	5,000,000	41	Regulation of the lower Murray River
Dartmouth	Mitta-Mitta River in North-Eastern Victoria	3,000,000	590	Additional regulation of Upper Murray flow to secure River Murray irrigation development
Buffalo (second stage)	Buffalo River, near Myrtleford, Victoria	800,000	260	For irrigation storage
Warkworth	Wollombi Brook, Hunter Valley, New South Wales	406,000	130	Flood mitigation and irrigation dam for Hunter Valley
Cardinia Creek	Near Emerald, Victoria	220,000	260	For off river storage for Melbourne water supply
Pike Creek	Near Stanthorpe, Queensland	200,000	150	For irrigation, part of Dumaresq-Barwon Border Rivers Scheme
North Pine	North Pine River, near Petrie, Queensland	164,000	125	To supplement supply to northern Brisbane area

(a) Present (temporary) storage capacity. (b) Maximum height of water at wall. (c) Subject to final survey.

BRITISH WEIGHTS AND MEASURES

LENGTH

12 inches (in)	= 1 Foot (ft)		4 Rods		
3 Feet	= 1 Yard (yd)		22 Yards	= 1 Chain	
36 Inches			100 Links		
5½ Yards	= 1 Rod, pole, or perch		8 Furlongs		
16½ Feet			80 Chains	= 1 Mile	
40 Rods	= 1 Furlong		320 Rods		
			1760 Yards		

SQUARE

Sq In	Sq Ft	Sq Yd	Sq Rods	Sq Ch	Acres	
144	1	—	—	—	—	1 sq ft
1,296	9	1	—	—	—	1 sq yd
39,204	272¼	30¼	1	—	—	1 sq rod
627,264	4,356	484	16	1	—	1 sq chain
6,272,640	43,560	4,840	160	10	1	1 acre
4,014,489,600	27,878,400	3,097,600	102,400	6,400	640	1 sq mile

CUBIC

1 cubic ft	= 1728 cubic in	1 Perch of stone	= 24¾ cubic ft
1 cubic yd	= 27 cubic ft	1 Bushel	= 1.284 cubic ft
1 cord ft	= 16 cubic ft	1 Gall. of water	= 0.161 cubic ft
1 cord of wood	= 128 cubic ft	1 Shipping ton	= 40 cubic ft

AVOIRDUPOIS

16 Drams	= 1 Ounce (oz)	=	437.5 Grains
16 Ounces	= 1 Pound (lb)	=	7,000 Grains
14 Pounds	= 1 Stone		
2 Stone	= 1 Quarter	=	28 Pounds
4 Quarters	= 1 Hundredweight (cwt)	=	112 Pounds
20 Cwt	= 1 Ton	=	2,240 Pounds
100 Pounds	= 1 Hundredweight (cwt U.S.A.)		
2,000 Pounds	= 1 Short Ton (U.S.A.)		

CAPACITY

4 Gills	= 1 Pint	4 Pecks	= 1 Bushel
2 Pints	= 1 Quart	8 Bushels	= 1 Quarter
4 Quarts	= 1 Gallon	1 Bag	= 3 Bushels
2 Gallons	= 1 Peck		

APPROXIMATE EQUIVALENTS

1 Millimetre	= 1/25th of inch	1 Kilogramme	= 2¼ lb
2½ Centimetres	= 1 inch	1,000 Kilogrammes	= 1 Ton
1 Metre	= 39⅜ inches	6½ Sq Centimetres	= 1 Sq Inch
1 Kilometre	= 5 Furlongs(⅝m)	1 Sq Metre	= 10¾ Sq Ft

(See Conversion Table, pages 251 to 261)

CONVERSION FACTORS

The data depicted here is directly extracted from British Standard 350: Part 1: 1959, Section Two: Conversion Factors (incorporating amendments issued to January 1965 inclusive. We acknowledge and thank the British Standards Institution in the reproduction of these pages.

LENGTH

As altered April, 1963

	metre m	inch in	foot ft	yard yd	chain	furlong	mile
1 metre m =	**1**	39.3701	3.28084	1.09361	0.0497097	4.97097×10^{-3}	6.21371×10^{-4}
1 inch in =	**0.0254**	**1**	0.0833333	0.0277778	1.26263×10^{-3}	1.26263×10^{-4}	1.57828×10^{-5}
1 foot ft =	**0.3048**	**12**	**1**	0.333333	0.0151515	1.51515×10^{-3}	1.89394×10^{-4}
1 yard yd =	**0.9144**	**36**	**3**	**1**	0.0454545	4.54545×10^{-3}	5.68182×10^{-4}
1 chain =	**20.1168**	**792**	**66**	**22**	**1**	**0.1**	**0.0125**
1 furlong =	**201.168**	**7920**	**660**	**220**	**10**	**1**	**0.125**
1 mile =	**1609.344**	**63360**	**5280**	**1760**	**80**	**8**	**1**

Exact values are printed in **bold** type to distinguish them from rounded values.

AREA

	square metre m^2	square inch in^2	square foot ft^2	square yard yd^2
1 square metre m^2 =	**1**	1550.00	10.7639	1.19599
1 square inch in^2 =	**6.4516×10^{-4}**	**1**	6.94444×10^{-3}	7.71605×10^{-4}
1 square foot ft^2 =	0.0929030	**144**	**1**	0.111111
1 square yard yd^2 =	0.836127	**1296**	**9**	**1**

Exact values are printed in **bold** type to distinguish them from rounded values.

AREA

As altered April, 1963

	hectare* ha	square yard yd^2	rood	acre	square mile
1 hectare ha =	**1**	11959.9	9.88422	2.47105	3.86102×10^{-3}
1 square yard yd^2 =	8.36127×10^{-5}	**1**	8.26446×10^{-4}	2.06612×10^{-4}	3.22831×10^{-7}
1 rood =	0.101171	**1210**	**1**	**0.25**	**3.90625×10^{-4}**
1 acre =	0.404686	**4840**	**4**	**1**	**1.5625×10^{-3}**
1 square mile =	258.999	**3.0976×10^{6}**	**2560**	**640**	**1**

* 1 hectare (ha) = 10,000 square metres (m^2).

Exact values are printed in **bold** type to distinguish them from rounded values.

VOLUME

As altered Oct., 1963

	cubic decimetre dm^3	litre l	cubic inch in^3	cubic foot ft^3	UK pint UK pt	UK gallon UK gal	US liquid pint US liq pt	US gallon US gal
1 cubic decimetre dm^3 =	**1**	0.999972	61.0237	0.0353147	1.75976	0.219969	2.11338	0.264172
1 litre l =	1.000028	**1**	61.0255	0.0353157	1.75980	0.219976	2.11344	0.264179
1 cubic inch in^3 =	0.0163871	0.0163866	**1**	5.78704×10^{-4}	0.0288372	3.60465×10^{-3}	0.0346320	4.32900×10^{-3}
1 cubic foot ft^3 =	28.3168	28.3161	**1728**	**1**	49.8307	6.22884	59.8442	7.48052
1 UK pint* UK pt =	0.568261	0.568245	34.6774	0.0200679	**1**	**0.125**	1.20095	0.150119
1 UK gallon† UK gal =	4.54609	4.54596	277.419‡	0.160544	**8**	**1**	9.60759	1.20095
1 US liquid pint US liq pt =	0.473176	0.473163	**28.875**	0.0167101	0.832675	0.104084	**1**	**0.125**
1 US gallon US gal =	3.78541	3.78531	**231**	0.133681	6.66140	0.832675	**8**	**1**

* Also called 'imperial pint'.
† Also called 'imperial gallon'.
‡ This value when taken to six significant figures becomes 277.419 if the key factor 1 UK gal = 4.54596 litres is used, or alternatively 277.420 if full advantage of the relationship resulting from the redefinition of the gallon in the Weights and Measures Act, 1963, is taken.
Exact values are printed in **bold** type to distinguish them from rounded values.

VOLUME

As altered Oct., 1963

	cubic metre m^3	litre l	cubic inch in^3	cubic foot ft^3	cubic yard yd^3	UK bushel	US dry pint	US bushel
1 cubic metre m^3 =	**1**	999.972	61023.7	35.3147	1.30795	27.4962	1816.17	28.3776
1 litre l =	1.000028×10^{-3}	**1**	61.0255	0.0353157	1.30799×10^{-3}	0.0274969	1.81622	0.0283784
1 cubic inch in^3 =	1.63871×10^{-5}	0.0163866	**1**	5.78704×10^{-4}	2.14335×10^{-5}	4.50582×10^{-4}	0.0297616	4.65025×10^{-4}
1 cubic foot ft^3 =	0.0283168	28.3161	**1728**	**1**	0.0370370	0.778605	51.4281	0.803564
1 cubic yard yd^3 =	0.764555	764.533	**46656**	**27**	**1**	21.0223	1388.56	21.6962
1 UK bushel =	0.0363687	36.3677	2219.35	1.28435	0.0475685	**1**	66.0516	1.03206
1 US dry pint =	5.50610×10^{-4}	0.550595	33.6003	0.0194446	7.20171×10^{-4}	0.0151397	**1**	**0.015625**
1 US bushel =	0.0352391	35.2381	**2150.42**	1.24446	0.0460910	0.968940	**64**	**1**

NOTE. 1 acre foot = 1233.48 m^3

1 m^3 = 0.00081071 acre ft

Exact values are printed in **bold** type to distinguish them from rounded values.

VOLUME

As altered Oct., 1963

	cubic centimetre cm^3	millilitre ml	cubic inch in^3	UK minim UK min	UK fluid drachm UK fl dr	UK fluid ounce UK fl oz	US fluid ounce US fl oz
1 cubic centimetre cm^3 =	**1**	0.999972	0.0610237	16.8936	0.281561	0.0351951	0.0338140
1 millilitre ml =	1.000028	**1**	0.0610255	16.8941	0.281569	0.0351961	0.0338150
1 cubic inch in^3 =	16.3871	16.3866	**1**	276.837	4.61395	0.576744	0.554113
1 UK minim UK min =	0.0591938	0.0591922	3.61223×10^{-3}	**1**	0.0166667	2.08333×10^{-3}	2.00158×10^{-3}
1 UK fluid drachm UK fl dr =	3.55163	3.55153	0.216734	**60**	**1**	**0.125**	0.120095
1 UK fluid ounce UK fl oz =	28.4130	28.4122	1.73387	**480**	**8**	**1**	0.960759
1 US fluid ounce US fl oz =	29.5735	29.5727	1.80469	499.605	8.32675	1.04084	**1**

Exact values are printed in **bold** type to distinguish them from rounded values.

VELOCITY, LINEAR

As altered Oct., 1963

		metre per second m/s	kilometre per hour km/h	foot per second ft/s	mile per hour mile/h	UK knot	international knot kn
1 metre per second m/s	=	**1**	**3.6**	3.28084	2.23694	1.94260	1.94384
1 kilometre per hour km/h	=	0.277778	**1**	0.911344	0.621371	0.539612	0.539957
1 foot per second ft/s	=	**0.3048**	**1.09728**	**1**	0.681818	0.592105	0.592484
1 mile per hour mile/h	=	**0.44704**	**1.609344**	1.46667	**1**	0.868421	0.868976
1 UK knot	=	0.514773	1.85318	1.68889	1.15152	**1**	1.00064
1 international knot kn	=	0.514444	**1.852**	1.68781	1.15078	0.999361	**1**

Exact values are printed in **bold** type to distinguish them from rounded values.

MASS

		kilogramme kg	pound lb	slug	metric 'technical' unit of mass
1 kilogramme kg	=	**1**	2.20462	0.0685218	0.101972
1 pound lb	=	**0.45359237**	**1**	0.0310810	0.0462535
1 slug	=	14.5939	32.1740	**1**	1.48816
1 metric 'technical' unit of mass	=	**9.80665**	21.6200	0.671969	**1**

Exact values are printed in **bold** type to distinguish them from rounded values.

MASS

		gramme g	metric carat	grain gr	dram (avoir)	drachm (apoth)	ounce (avoir) oz	ounce (troy or apoth) oz tr or oz apoth
1 gramme g	=	**1**	**5**	15.4324	0.564383	0.257206	0.0352740	0.0321507
1 metric carat	=	**0.2**	**1**	3.08647	0.112877	0.0514412	7.05479×10^{-3}	6.43015×10^{-3}
1 grain gr	=	0.0647989	0.323995	**1**	0.0365714	0.0166667	2.28571×10^{-3}	2.08333×10^{-3}
1 dram (avoir)	=	1.77185	8.85923	**27.34375**	**1**	0.455729	**0.0625**	0.0569661
1 drachm (apoth)	=	3.88793	19.4397	**60**	2.19429	**1**	0.137143	**0.125**
1 ounce (avoir) oz	=	28.3495	141.748	**437.5**	**16**	7.29167	**1**	0.911458
1 ounce (troy or apoth) oz tr or oz apoth	=	31.1035	155.517	**480**	17.5443	**8**	1.09714	**1**

The grain has the same value in the avoirdupois, troy and apothecaries' systems.
Exact values are printed in **bold** type to distinguish them from rounded values.

MASS

	tonne (1000 kg) t	pound lb	UK hundredweight cwt	short hundredweight sh cwt	UK ton	short ton sh ton
1 tonne (1000 kg) t =	**1**	2204.62	19.6841	22.0462	0.984207	1.10231
1 pound lb =	4.53592×10^{-4}	**1**	8.92857×10^{-3}	**0.01**	4.46429×10^{-4}	**0.0005**
1 hundredweight cwt =	0.0508023	**112**	**1**	**1.12**	**0.05**	**0.056**
1 short hundredweight* sh cwt =	0.0453592	**100**	0.892857	**1**	0.0446429	**0.05**
1 UK ton =	1.01605	**2240**	**20**	**22.4**	**1**	**1.12**
1 short ton* sh ton =	0.907185	**2000**	17.8571	**20**	0.892857	**1**

* U.S. unit.

Exact values are printed in **bold** type to distinguish them from rounded values.

DENSITY (mass/volume)

As altered Oct., 1963

		gramme per cubic centimetre g/cm^3	gramme per millilitre g/ml	pound per cubic inch lb/in^3	pound per cubic foot lb/ft^3	UK ton per cubic yard UK ton/yd^3	pound per UK gallon lb/UK gal	pound per US gallon lb/US gal
1 gramme per cubic centimetre g/cm^3	=	**1**	1.000028	0.0361273	62.4280	0.752480	10.0224	8.34540
1 gramme per millilitre g/ml	=	0.999972	**1**	0.0361263	62.4262	0.752459	10.0221	8.34517
1 pound per cubic inch lb/in^3	=	27.6799	27.6807	**1**	**1728**	20.8286	277.419	**231**
1 pound per cubic foot lb/ft^3	=	0.0160185	0.0160189	5.78704×10^{-4}	**1**	0.0120536	0.160544	0.133681
1 UK ton per cubic yard UK ton/yd^3	=	1.32894	1.32898	0.0480110	82.9630	**1**	13.3192	11.0905
1 pound per UK gallon lb/UK gal	=	0.0997764	0.0997792	3.60465×10^{-3}	6.22884	0.0750798	**1**	0.832675
1 pound per US gallon lb/US gal	=	0.119826	0.119830	4.32900×10^{-3}	7.48052	0.0901670	1.20095	**1**

NOTE. 1 kilogramme per cubic metre (kg/m^3) = (1/1000) gramme per cubic centimetre (g/cm^3). Exact values are printed in **bold** type to distinguish them from rounded values.

MASS PER UNIT AREA (applicable to sheet metal, plating, etc., and in agriculture)

As altered Oct., 1963

		pound per thousand square feet lb/1000 ft²	ounce per square yard oz/yd²	gramme per square metre g/m²	ounce per square foot oz/ft²	milligramme per square centimetre mg/cm²	pound per acre lb/acre	UK ton per square mile ton/sq mile	kilogramme per hectare kg/ha
1 pound per thousand square feet lb/1000 ft²	=	**1**	**0.144**	4.88243	**0.016**	0.488243	**43.56**	12.4457	48.8243
1 ounce per square yard oz/yd²	=	6.94444	**1**	33.9057	0.111111	3.39057	**302.5**	86.4286	339.057
1 gramme per square metre g/m²	=	0.204816	0.0294935	**1**	3.27706×10^{-3}	**0.1**	8.92179	2.54908	**10**
1 ounce per square foot oz/ft²	=	**62.5**	**9**	305.152	**1**	30.5152	**2722.5**	777.857	3051.52

1 milligramme per square centimetre mg/cm²	=	2.04816	0.294935	**10**	0.0327706	**1**	89.2179	25.4908	**100**
1 pound per acre lb/acre	=	0.0229568	3.30579×10^{-3}	0.112085	3.67309×10^{-4}	0.0112085	**1**	0.285714	1.12085
1 UK ton per square mile ton/sq mile	=	0.0803489	0.0115702	0.392298	1.28558×10^{-3}	0.0392298	**3.5**	**1**	3.92298
1 kilogramme per hectare kg/ha*	=	0.0204816	2.94935×10^{-3}	**0.1**	3.27706×10^{-4}	**0.01**	0.892179	0.254908	**1**

* 1 kilogramme per hectare (kg/ha) = 10^{-1} g/m².

SPECIFIC SURFACE

(Area/mass). The relationships between the units can be deduced from the entries in the above table. For example,

1 square metre per gramme (m²/g) = 0.112085 acre per pound (acre/lb).

Exact values are printed in **bold** type to distinguish them from rounded values.

GEOMETRY AND MENSURATION

CIRCLE.— Circumference = diameter x $\frac{22}{7}$ (or 3.1416).

Area = diameter^2 x 0.7854.

Area of sector of circle = length of arc x half radius.

Area of segment of circle = area of sector, less area of triangle.

Side of square of area equal to circle = 0.8852 diameter.

Diameter of circle equal in area to square = 1.1284 side.

SPHERE.— Surface area = 3.1416 x diameter^2.

Volume = 0.5236 diameter^3.

AREAS generally.

Square, rectangle, rhombus, or rhomboid = base x height.

Triangle = half base x perpendicular height.

Trapezoid = half sum of two parallel sides x height.

Area of any figure of four or more unequal sides is found by dividing it into triangles, finding areas of each, and adding together.

Regular polygon (inscribed circle) = half radius of circle x length of one side x number of sides.

Parabola = base x height x ⅔.

Ellipse = long axis x short axis x 0.7854.

SURFACES AND VOLUMES

CUBES.— a = length of one side, volume = a^3, surface area = $6a^2$.

RECTANGULAR PRISM.— Volume = area of base x ½ height = $\frac{bl \times h.}{2}$

Total surface area = 2(bl + lh x bh).

REGULAR PRISM.— Volume = ½n x r x a x h, where n = number of sides, r = radius of inscribed circle, a = length of side.

CYLINDER (Right Circular).— Volume = 0.7854 x diameter^2 x height. Lateral surface area, 3.1416 x diameter x height.

Total surface area = 3.1416 (diam. x height + 1.5708 diam.^{2}

ANY PRISM OR CYLINDER.— Volume = h x area of base. Lateral surface area = length of cylinder x perimeter of normal sector.

REGULAR PYRAMID OR CONE.— Volume = ⅓ (area of base x height). Lateral area of regular figure = half (perimeter of base x slant height).

ANY PYRAMID OR CONE.— Volume = ⅓ (area of base x distance from vertex to plane of base).

FRUSTUM OF ANY PYRAMID OR CONE.— Volume = 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 IN INCHES

Dia. in in	Areas				Dia. in in	Circumferences			
	0 in	¼ in	½ in	¾ in		0 in	¼ in	½ in	¾ in
0	.0	.0490	.1963	.4417	0	.0	.7854	1.570	2.356
1	.7854	1.227	1.767	2.405	1	3.142	3.927	4.712	5.497
2	3.142	3.976	4.908	5.939	2	6.283	7.069	7.854	8.639
3	7.068	8.295	9.621	11.04	3	9.424	10.21	10.99	11.78
4	12.56	14.18	15.90	17.72	4	12.56	13.35	14.13	14.92
5	19.63	21.64	23.76	25.96	5	15.70	16.49	17.27	18.06
6	28.27	30.68	33.18	35.78	6	18.84	19.63	20.42	21.20
7	38.48	41.28	44.18	47.17	7	21.99	22.77	23.56	24.34
8	50.26	53.45	56.74	60.13	8	25.13	25.91	26.70	27.48
9	63.61	67.20	70.88	74.66	9	28.27	29.05	29.84	30.63
10	78.54	82.51	86.59	90.76	10	31.42	32.20	32.98	33.77
11	95.03	99.40	103.8	108.4	11	34.55	35.34	36.12	36.91
12	113.1	117.8	122.7	127.6	12	37.69	38.48	39.27	40.05
13	132.7	137.8	143.1	148.4	13	40.84	41.62	42.41	43.19
14	153.0	159.4	165.1	170.8	14	43.98	44.76	45.55	46.33
15	176.7	182.6	188.6	194.8	15	47.12	47.90	48.69	49.48
16	201.0	207.3	213.8	220.3	16	50.26	51.05	51.83	52.62
17	226.9	233.7	240.5	247.4	17	53.40	54.19	54.97	55.76
18	254.4	261.5	268.8	276.1	18	56.54	57.33	58.11	58.90
19	283.5	291.0	298.6	306.3	19	59.69	60.47	61.26	62.04
20	314.2	322.0	330.0	338.1	20	62.83	63.61	64.40	65.18
21	346.3	354.6	363.0	371.5	21	65.97	66.75	67.54	68.32
22	380.1	388.8	397.6	406.4	22	69.11	69.90	70.68	71.47
23	415.4	424.5	433.7	443.0	23	72.25	73.04	73.82	74.61
24	452.3	461.8	471.4	481.1	24	75.39	76.18	76.96	77.75
25	490.8	500.7	510.7	520.7	25	78.54	79.32	80.11	80.89
26	530.9	541.1	551.5	562.0	26	81.68	82.46	83.25	84.03
27	572.5	583.2	593.9	604.8	27	84.82	85.60	86.39	87.17
28	615.7	626.8	637.9	649.1	28	87.96	88.75	89.53	90.32
29	660.5	671.9	683.3	695.1	29	91.10	91.89	92.67	93.46
30	706.8	718.6	730.6	742.6	30	94.24	95.03	95.81	96.60
31	754.8	767.0	779.3	791.7	31	97.39	98.18	98.96	99.75
32	804.2	816.9	829.6	842.4	32	100.5	101.3	102.1	102.9
33	855.3	868.3	881.4	894.6	33	103.7	104.5	105.2	106.0
34	908.0	921.3	934.8	948.4	34	106.8	107.6	108.4	109.2
35	962.1	975.9	989.8	1003.8	35	110.0	110.7	111.5	112.3
36	1017.9	1032.1	1046.4	1060.7	36	113.1	113.8	114.6	115.5
37	1075.2	1089.8	1104.5	1119.2	37	116.2	117.0	117.8	118.6
38	1134.1	1149.3	1164.2	1179.3	38	119.4	120.2	121.0	121.7
39	1194.6	1210.0	1225.4	1241.0	39	122.5	123.3	124.1	124.8
40	1256.6	1272.4	1288.3	1304.2	40	125.7	126.4	127.2	128.0

SQUARES, CUBES, SQUARE ROOTS AND CUBE ROOTS

No.	Square	Cube	Sq Root	Cube Root	No.	Square	Cube	Sq Root	Cube Root
1/8	.015	.0019	.353	.5	4 1/4	18.062	76.765	2.061	1.61
1/4	.062	.0156	.500	.620	4 1/2	20.250	91.125	2.121	1.65
3/8	.140	.0527	.612	.721	4 3/4	22.562	107.171	2.179	1.68
1/2	.250	.1250	.707	.793	5	25	125	2.236	1.71
5/8	.390	.244	.790	.855	5 1/4	27.562	144.703	2.291	1.73
3/4	.562	.421	.866	.908	5 1/2	30.250	166.375	2.345	1.76
7/8	.765	.670	.935	.956	5 3/4	33.062	190.109	2.397	1.79
1	1	1	1	1	6	36	216	2.449	1.81
1 1/8	1.265	1.423	1.060	1.04	6 1/4	39.062	244.140	2.500	1.84
1 1/4	1.562	1.953	1.118	1.07	6 1/2	42.250	274.625	2.549	1.86
1 3/8	1.890	2.599	1.172	1.11	6 3/4	45.562	307.546	2.598	1.88
1 1/2	2.250	3.375	1.224	1.14	7	49	343	2.645	1.91
1 5/8	2.641	4.291	1.274	1.17	7 1/4	52.562	381.078	2.692	1.93
1 3/4	3.062	5.359	1.322	1.20	7 1/2	56.250	421.875	2.738	1.95
1 7/8	3.515	6.591	1.369	1.23	7 3/4	60.062	465.484	2.783	1.97
2	4	8	1.414	1.26	8	64	512	2.828	2
2 1/8	4.515	9.595	1.457	1.28	8 1/4	68.062	561.515	2.872	2.02
2 1/4	5.062	11.390	1.500	1.30	8 1/2	72.250	614.125	2.915	2.04
2 3/8	5.640	13.396	1.541	1.33	8 3/4	76.562	669.921	2.958	2.06
2 1/2	6.250	15.625	1.581	1.35	9	81	729	3	2.08
2 5/8	6.890	18.088	1.620	1.37	9 1/4	85.562	791.453	3.041	2.09
2 3/4	7.562	20.796	1.658	1.40	9 1/2	90.25	857.375	3.082	2.11
2 7/8	8.265	23.763	1.695	1.42	9 3/4	95.062	926.859	3.122	2.13
3	9	27	1.732	1.44	10	100	1000	3.162	2.15
3 1/8	9.765	30.517	1.767	1.46	10 1/4	105.062	1076.89	3.201	2.17
3 1/4	10.562	34.328	1.802	1.48	10 1/2	110.250	1157.625	3.240	2.18
3 3/8	11.390	38.443	1.837	1.50	10 3/4	115.562	1242.296	3.278	2.20
3 1/2	12.250	42.875	1.870	1.51	11	121	1331	3.316	2.22
3 5/8	13.140	47.634	1.903	1.53	11 1/4	126.562	1423.828	3.354	2.24
3 3/4	14.062	52.734	1.936	1.55	11 1/2	132.250	1520.875	3.391	2.25
3 7/8	15.015	58.185	1.968	1.57	11 3/4	138.062	1622.234	3.427	2.27
4	16	64	2	1.58	12	144	1728	3.464	2.29

DECIMALS OF AN INCH FOR EACH 64th OF AN INCH WITH MILLIMETRE EQUIVALENTS

Fraction	1/64ths	Decimal	Millimetre	Fraction	1/64ths	Decimal	Millimetre
	1	.015625	0.397		33	.515625	13.097
1/32	2	.03125	0.794	17/32	34	.53125	13.494
	3	.046875	1.191		35	.546875	13.891
1/16	4	.0625	1.588	9/16	36	.5625	14.288
	5	.078125	1.984		37	.578125	14.684
3/32	6	.09375	2.381	19/32	38	.59375	15.081
	7	.109375	2.778		39	.609375	15.478
1/8	8	.125	3.175	5/8	40	.625	15.875
	9	.140625	3.572		41	.640625	16.272
5/32	10	.15625	3.969	21/32	42	.65625	16.669
	11	.171875	4.366		43	.671875	17.066
3/16	12	.1875	4.763	11/16	44	.6875	17.463
	13	.203125	5.159		45	.703125	17.859
7/32	14	.21875	5.556	23/32	46	.71875	18.256
	15	.234375	5.953		47	.734375	18.653
1/4	16	.250	6.350	3/4	48	.750	19.050
	17	.265625	6.747		49	.765625	19.447
9/32	18	.28125	7.144	25/32	50	.78125	19.844
	19	.296875	7.541		51	.796875	20.241
5/16	20	.3125	7.938	13/16	52	.8125	20.638
	21	.328125	8.334		53	.828125	21.034
11/32	22	.34375	8.731	27/32	54	.84375	21.431
	23	.359375	9.128		55	.859375	21.828
3/8	24	.375	9.525	7/8	56	.875	22.225
	25	.390625	9.922		57	.890625	22.622
13/32	26	.40625	10.319	29/32	58	.90625	23.019
	27	.421875	10.716		59	.921875	23.416
7/16	28	.4375	11.113	15/16	60	.9375	23.813
	29	.453125	11.509		61	.953125	24.209
15/32	30	.46875	11.906	31/32	62	.96875	24.606
	31	.484375	12.303		63	.984375	25.003
1/2	32	.500	12.700	1	64	1.000	25.400

DECIMALS OF A FOOT FOR EACH 32nd OF AN INCH

Inch	0″	1″	2″	3″	4″	5″
0	0	.0833	.1667	.2500	.3333	.4167
1/32	.0026	.0859	.1693	.2526	.3359	.4193
1/16	.0052	.0885	.1719	.2552	.3385	.4219
3/32	.0078	.0911	.1745	.2578	.3411	.4245
1/8	.0104	.0938	.1771	.2604	.3438	.4271
5/32	.0130	.0964	.1797	.2630	.3464	.4297
3/16	.0156	.0990	.1823	.2656	.3490	.4323
7/32	.0182	.1016	.1849	.2682	.3516	.4349
1/4	.0208	.1042	.1875	.2708	.3542	.4375
9/32	.0234	.1068	.1901	.2734	.3568	.4401
5/16	.0260	.1094	.1927	.2760	.3594	.4427
11/32	.0286	.1120	.1953	.2786	.3620	.4453
3/8	.0313	.1146	.1979	.2812	.3646	.4479
13/32	.0339	.1172	.2005	.2839	.3672	.4505
7/16	.0365	.1198	.2031	.2865	.3698	.4531
15/32	.0391	.1224	.2057	.2891	.3724	.4557
1/2	.0417	.1250	.2083	.2917	.3750	.4583
17/32	.0443	.1276	.2109	.2943	.3776	.4609
9/16	.0469	.1302	.2135	.2969	.3802	.4635
19/32	.0495	.1328	.2161	.2995	.3828	.4661
5/8	.0521	.1354	.2188	.3021	.3854	.4688
21/32	.0547	.1380	.2214	.3047	.3880	.4714
11/16	.0573	.1406	.2240	.3073	.3906	.4740
23/32	.0599	.1432	.2266	.3099	.3932	.4766
3/4	.0625	.1458	.2292	.3125	.3958	.4792
25/32	.0651	.1484	.2318	.3151	.3984	.4818
13/16	.0677	.1510	.2344	.3177	.4010	.4844
27/32	.0703	.1536	.2370	.3203	.4036	.4870
7/8	.0729	.1563	.2396	.3229	.4063	.4896
29/32	.0755	.1589	.2422	.3255	.4089	.4922
15/16	.0781	.1615	.2448	.3281	.4115	.4948
31/32	.0807	.1641	.2474	.3307	.4141	.4974

DECIMALS OF A FOOT FOR EACH 32nd OF AN INCH

6″	7″	8″	9″	10″	11″	Inch
.5000	.5833	.6667	.7500	.8333	.9167	0
.5026	.5859	.6693	.7526	.8359	.9193	1/32
.5052	.5885	.6719	.7552	.8385	.9219	1/16
.5078	.5911	.6745	.7578	.8411	.9245	3/32
.5104	.5938	.6771	.7604	.8438	.9271	1/8
.5130	.5964	.6797	.7630	.8464	.9297	5/32
.5156	.5990	.6823	.7656	.8490	.9323	3/16
.5182	.6016	.6849	.7682	.8516	.9349	7/32
.5208	.6042	.6875	.7708	.8542	.9375	1/4
.5234	.6068	.6901	.7734	.8568	.9401	9/32
.5260	.6094	.6927	.7760	.8594	.9427	5/16
.5286	.6120	.6953	.7786	.8620	.9453	11/32
.5313	.6146	.6979	.7813	.8646	.9479	3/8
.5339	.6172	.7005	.7839	.8672	.9505	13/32
.5365	.6198	.7031	.7865	.8698	.9531	7/16
.5391	.6224	.7057	.7891	.8724	.9557	15/32
.5417	.6250	.7083	.7917	.8750	.9583	1/2
.5443	.6276	.7109	.7943	.8776	.9609	17/32
.5469	.6302	.7135	.7969	.8802	.9635	9/16
.5495	.6328	.7161	.7995	.8828	.9661	19/32
.5521	.6354	.7188	.8021	.8854	.9688	5/8
.5547	.6380	.7214	.8047	.8880	.9714	21/32
.5573	.6406	.7240	.8073	.8906	.9740	11/16
.5599	.6432	.7266	.8099	.8932	.9766	23/32
.5625	.6458	.7292	.8125	.8958	.9792	3/4
.5651	.6484	.7318	.8151	.8984	.9818	25/32
.5677	.6510	.7344	.8177	.9010	.9844	13/16
.5703	.6536	.7370	.8203	.9036	.9870	27/32
.5729	.6563	.7396	.8229	.9063	.9896	7/8
.5755	.6589	.7422	.8255	.9089	.9922	29/32
.5781	.6615	.7448	.8281	.9115	.9948	15/16
.5807	.6641	.7474	.8307	.9141	.9974	31/32

LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	1	3	5	7	9
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	4	12	21	29	37
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4	11	19	26	34
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	3	10	17	24	31
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	3	10	16	23	29
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	3	9	15	21	27
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	3	8	14	20	25
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	3	8	13	18	24
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	2	7	12	17	22
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	2	7	12	16	21
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	2	7	11	16	20
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2	6	11	15	19
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	2	6	10	14	18
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2	6	10	14	17
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2	6	9	13	17
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2	5	9	12	16
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2	5	9	12	15
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2	5	8	11	15
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2	5	8	11	14
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	2	5	8	11	14
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	1	4	7	10	13
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	1	4	7	10	13
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1	4	7	10	12
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	1	4	7	9	12
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1	4	6	9	12
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	1	4	6	9	11
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1	4	6	9	11
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	1	4	6	8	11
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	1	3	6	8	11
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	1	3	6	8	10
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	1	3	5	8	10
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1	3	5	8	10
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	1	3	5	7	9
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1	3	5	7	9
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1	3	5	7	9
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	1	3	5	7	9
45	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	1	3	5	7	9
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	1	3	5	7	8
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	1	3	5	6	8
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	1	3	4	6	8
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	1	3	4	6	8
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	1	3	4	6	8
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	1	3	4	6	8
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	1	2	4	6	7
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	1	2	4	6	7
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	1	2	4	6	7

Difference 2 4 6 8 obtained by interpolation.

LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	1	3	5	7	9
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	1	2	4	5	7
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	1	2	4	5	7
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	1	2	4	5	7
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1	2	4	5	7
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1	2	4	5	7
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1	2	4	5	6
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1	2	4	5	6
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1	2	3	5	6
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1	2	3	5	6
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	1	2	3	5	6
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1	2	3	5	6
66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	1	2	3	5	6
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1	2	3	5	6
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1	2	3	4	6
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	1	2	3	4	6
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	1	2	3	4	6
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	1	2	3	4	5
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	1	2	3	4	5
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	1	2	3	4	5
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	1	2	3	4	5
75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	1	2	3	4	5
76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	1	2	3	4	5
77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	1	2	3	4	5
78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	1	2	3	4	5
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	1	2	3	4	5
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	1	2	3	4	5
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	1	2	3	4	5
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	1	2	3	4	5
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	1	2	3	4	5
84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	1	2	3	4	5
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	1	2	3	4	5
86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	1	2	3	4	5
87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	0	1	2	3	4
88	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	0	1	2	3	4
89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	0	1	2	3	4
90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586	0	1	2	3	4
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	0	1	2	3	4
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	0	1	2	3	4
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	0	1	2	3	4
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773	0	1	2	3	4
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	0	1	2	3	4
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	0	1	2	3	4
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	0	1	2	3	4
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	0	1	2	3	4
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	0	1	2	3	4

Common Logarithms = Hyperbolic Logarithms x 0.43429.

ANTILOGARITHMS

	0	1	2	3	4	5	6	7	8	9	1	3	5	7	9
.00	1000	1002	1005	1007	1009	1012	1014	1016	1019	1021	0	1	1	2	2
.01	1023	1026	1028	1030	1033	1035	1038	1040	1042	1045	0	1	1	2	2
.02	1047	1050	1052	1054	1057	1059	1062	1064	1067	1069	0	1	1	2	2
.03	1072	1074	1076	1079	1081	1084	1086	1089	1091	1094	0	1	1	2	2
.04	1096	1099	1102	1104	1107	1109	1112	1114	1117	1119	0	1	1	2	2
.05	1122	1125	1127	1130	1132	1135	1138	1140	1143	1146	0	1	1	2	2
.06	1148	1151	1153	1156	1159	1161	1164	1167	1169	1172	0	1	1	2	2
.07	1175	1178	1180	1183	1186	1189	1191	1194	1197	1199	0	1	1	2	2
.08	1202	1205	1208	1211	1213	1216	1219	1222	1225	1227	0	1	1	2	3
.09	1230	1233	1236	1239	1242	1245	1247	1250	1253	1256	0	1	1	2	3
.10	1259	1262	1265	1268	1271	1274	1276	1279	1282	1285	0	1	1	2	3
.11	1288	1291	1294	1297	1300	1303	1306	1309	1312	1315	0	1	2	2	3
.12	1318	1321	1324	1327	1330	1334	1337	1340	1343	1346	0	1	2	2	3
.13	1349	1352	1355	1358	1361	1365	1368	1371	1374	1377	0	1	2	2	3
.14	1380	1384	1387	1390	1393	1396	1400	1403	1406	1409	0	1	2	2	3
.15	1413	1416	1419	1422	1426	1429	1432	1435	1439	1442	0	1	2	2	3
.16	1445	1449	1452	1455	1459	1462	1466	1469	1472	1476	0	1	2	2	3
.17	1479	1483	1486	1489	1493	1496	1500	1503	1507	1510	0	1	2	2	3
.18	1514	1517	1521	1524	1528	1531	1535	1538	1542	1545	0	1	2	2	3
.19	1549	1552	1556	1560	1563	1567	1570	1574	1578	1581	0	1	2	3	3
.20	1585	1589	1592	1596	1600	1603	1607	1611	1614	1618	0	1	2	3	3
.21	1622	1626	1629	1633	1637	1641	1644	1648	1652	1656	0	1	2	3	3
.22	1660	1663	1667	1671	1675	1679	1683	1687	1690	1694	0	1	2	3	3
.23	1698	1702	1706	1710	1714	1718	1722	1726	1730	1734	0	1	2	3	4
.24	1738	1742	1746	1750	1754	1758	1762	1766	1770	1774	0	1	2	3	4
.25	1778	1782	1786	1791	1795	1799	1803	1807	1811	1816	0	1	2	3	4
.26	1820	1824	1828	1832	1837	1841	1845	1849	1854	1858	0	1	2	3	4
.27	1862	1866	1871	1875	1879	1884	1888	1892	1897	1901	0	1	2	3	4
.28	1905	1910	1914	1919	1923	1928	1932	1936	1941	1945	0	1	2	3	4
.29	1950	1954	1959	1963	1968	1972	1977	1982	1986	1991	0	1	2	3	4
.30	1995	2000	2004	2009	2014	2018	2023	2028	2032	2037	0	1	2	3	4
.31	2042	2046	2051	2056	2061	2065	2070	2075	2080	2084	0	1	2	3	4
.32	2089	2094	2099	2104	2109	2113	2118	2123	2128	2133	0	1	2	3	4
.33	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	0	1	2	3	4
.34	2188	2193	2198	2203	2208	2213	2218	2223	2228	2234	1	2	3	4	5
.35	2239	2244	2249	2254	2259	2265	2270	2275	2280	2286	1	2	3	4	5
.36	2291	2296	2301	2307	2312	2317	2323	2328	2333	2339	1	2	3	4	5
.37	2344	2350	2355	2360	2366	2371	2377	2382	2388	2393	1	2	3	4	5
.38	2399	2404	2410	2415	2421	2427	2432	2438	2443	2449	1	2	3	4	5
.39	2455	2460	2466	2472	2477	2483	2489	2495	2500	2506	1	2	3	4	5
.40	2512	2518	2523	2529	2535	2541	2547	2553	2559	2564	1	2	3	4	5
.41	2570	2576	2582	2588	2594	2600	2606	2612	2618	2624	1	2	3	4	5
.42	2630	2636	2642	2649	2655	2661	2667	2673	2679	2685	1	2	3	4	6
.43	2692	2698	2704	2710	2716	2723	2729	2735	2742	2748	1	2	3	4	6
.44	2754	2761	2767	2773	2780	2786	2793	2799	2805	2812	1	2	3	4	6
.45	2818	2825	2831	2838	2844	2851	2858	2864	2871	2877	1	2	3	5	6
.46	2884	2891	2897	2904	2911	2917	2924	2931	2938	2944	1	2	3	5	6
.47	2951	2958	2965	2972	2979	2985	2992	2999	3006	3013	1	2	3	5	6
.48	3020	3027	3034	3041	3048	3055	3062	3069	3076	3083	1	2	4	5	6
.49	3090	3097	3105	3112	3119	3126	3133	3141	3148	3155	1	2	4	5	6

Difference 2 4 6 8 obtained by interpolation.

ANTILOGARITHMS

	0	1	2	3	4	5	6	7	8	9	1	3	5	7	9
.50	3162	3170	3177	3184	3192	3199	3206	3214	3221	3228	1	2	4	5	7
.51	3236	3243	3251	3258	3266	3273	3281	3289	3296	3304	1	2	4	5	7
.52	3311	3319	3327	3334	3342	3350	3357	3365	3373	3381	1	2	4	5	7
.53	3388	3396	3404	3412	3420	3428	3436	3443	3451	3459	1	2	4	6	7
.54	3467	3475	3483	3491	3499	3508	3516	3524	3532	3540	1	2	4	6	7
.55	3548	3556	3565	3573	3581	3589	3597	3606	3614	3622	1	2	4	6	7
.56	3631	3639	3648	3656	3664	3673	3681	3690	3698	3707	1	3	4	6	8
.57	3715	3724	3733	3741	3750	3758	3767	3776	3784	3793	1	3	4	6	8
.58	3802	3811	3819	3828	3837	3846	3855	3864	3873	3882	1	3	4	6	8
.59	3890	3899	3908	3917	3926	3936	3945	3954	3963	3972	1	3	5	6	8
.60	3981	3990	3999	4009	4018	4027	4036	4046	4055	4064	1	3	5	6	8
.61	4074	4083	4093	4102	4111	4121	4130	4140	4150	4159	1	3	5	7	9
.62	4169	4178	4188	4198	4207	4217	4227	4236	4246	4256	1	3	5	7	9
.63	4266	4276	4285	4295	4305	4315	4325	4335	4345	4355	1	3	5	7	9
.64	4365	4375	4385	4395	4406	4416	4426	4436	4446	4457	1	3	5	7	9
.65	4467	4477	4487	4498	4508	4519	4529	4539	4550	4560	1	3	5	7	9
.66	4571	4581	4592	4603	4613	4624	4634	4645	4656	4667	1	3	5	7	10
.67	4677	4688	4699	4710	4721	4732	4742	4753	4764	4775	1	3	5	8	10
.68	4786	4797	4808	4819	4831	4842	4853	4864	4875	4887	1	3	6	8	10
.69	4898	4909	4920	4932	4943	4955	4966	4977	4989	5000	1	3	6	8	10
.70	5012	5023	5035	5047	5058	5070	5082	5093	5105	5117	1	4	6	8	11
.71	5129	5140	5152	5164	5176	5188	5200	5212	5224	5236	1	4	6	8	11
.72	5248	5260	5272	5284	5297	5309	5321	5333	5346	5358	1	4	6	9	11
.73	5370	5383	5395	5408	5420	5433	5445	5458	5470	5483	1	4	6	9	11
.74	5495	5508	5521	5534	5546	5559	5572	5585	5598	5610	1	4	6	9	12
.75	5623	5636	5649	5662	5675	5689	5702	5715	5728	5741	1	4	7	9	12
.76	5754	5768	5781	5794	5808	5821	5834	5848	5861	5875	1	4	7	9	12
.77	5888	5902	5916	5929	5943	5957	5970	5984	5998	6012	1	4	7	10	12
.78	6026	6039	6053	6067	6081	6095	6109	6124	6138	6152	1	4	7	10	13
.79	6166	6180	6194	6209	6223	6237	6252	6266	6281	6295	1	4	7	10	13
.80	6310	6324	6339	6353	6368	6383	6397	6412	6427	6442	1	4	7	10	13
.81	6457	6471	6486	6501	6516	6531	6546	6561	6577	6592	2	5	8	11	14
.82	6607	6622	6637	6653	6668	6683	6699	6714	6730	6745	2	5	8	11	14
.83	6761	6776	6792	6808	6823	6839	6855	6871	6887	6902	2	5	8	11	14
.84	6918	6934	6950	6966	6982	6998	7015	7031	7047	7063	2	5	8	11	15
.85	7079	7096	7112	7129	7145	7161	7178	7194	7211	7228	2	5	8	12	15
.86	7244	7261	7278	7295	7311	7328	7345	7362	7379	7396	2	5	8	12	15
.87	7413	7430	7447	7464	7482	7499	7516	7534	7551	7568	2	5	9	12	16
.88	7586	7603	7621	7638	7656	7674	7691	7709	7727	7745	2	5	9	12	16
.89	7762	7780	7798	7816	7834	7852	7870	7889	7907	7925	2	5	9	13	16
.90	7943	7962	7980	7998	8017	8035	8054	8072	8091	8110	2	6	9	13	17
.91	8128	8147	8166	8185	8204	8222	8241	8260	8279	8299	2	6	9	13	17
.92	8318	8337	8356	8375	8395	8414	8433	8453	8472	8492	2	6	10	14	17
.93	8511	8531	8551	8570	8590	8610	8630	8650	8670	8690	2	6	10	14	18
.94	8710	8730	8750	8770	8790	8810	8831	8851	8872	8892	2	6	10	14	18
.95	8913	8933	8954	8974	8995	9016	9036	9057	9078	9099	2	6	10	15	19
.96	9120	9141	9162	9183	9204	9226	9247	9268	9290	9311	2	6	11	15	19
.97	9333	9354	9376	9397	9419	9441	9462	9484	9506	9528	2	7	11	15	20
.98	9550	9572	9594	9616	9638	9661	9683	9705	9727	9750	2	7	11	16	20
.99	9772	9795	9817	9840	9863	9886	9908	9931	9954	9977	2	7	11	16	20

Difference 2 4 6 8 obtained by interpolation.

TRIGONOMETRICAL RATIOS

Angle		Chord	Sine	Tangent	Co-tangent	Cosine			
De-grees	Radians								
0°	0	0	0	0	∞	1	1.414	1.5708	90°
1	.0175	.017	.0175	.0175	57.2900	.9998	1.402	1.5533	89
2	.0349	.035	.0349	.0349	28.6363	.9994	1.389	1.5359	88
3	.0524	.052	.0523	.0524	19.0811	.9986	1.377	1.5184	87
4	.0698	.070	.0698	.0699	14.3007	.9976	1.364	1.5010	86
5	.0873	.087	.0872	.0875	11.4301	.9962	1.351	1.4835	85
6	.1047	.105	.1045	.1051	9.5144	.9945	1.338	1.4661	84
7	.1222	.122	.1219	.1228	8.1443	.9925	1.325	1.4486	83
8	.1396	.140	.1392	.1405	7.1154	.9903	1.312	1.4312	82
9	.1571	.157	.1564	.1584	6.3138	.9877	1.299	1.4137	81
10	.1745	.174	.1736	.1763	5.6713	.9848	1.286	1.3963	80
11	.1920	.192	.1908	.1944	5.1446	.9816	1.272	1.3788	79
12	.2094	.209	.2079	.2126	4.7046	.9781	1.259	1.3614	78
13	.2269	.226	.2250	.2309	4.3315	.9744	1.245	1.3439	77
14	.2443	.244	.2419	.2493	4.0108	.9703	1.231	1.3265	76
15	.2618	.261	.2588	.2679	3.7321	.9659	1.218	1.3090	75
16	.2793	.278	.2756	.2867	3.4874	.9613	1.204	1.2915	74
17	.2967	.296	.2924	.3057	3.2709	.9563	1.190	1.2741	73
18	.3142	.313	.3090	.3249	3.0777	.9511	1.176	1.2566	72
19	.3316	.330	.3256	.3443	2.9042	.9455	1.161	1.2392	71
20	.3491	.347	.3420	.3640	2.7475	.9397	1.147	1.2217	70
21	.3665	.364	.3584	.3839	2.6051	.9336	1.133	1.2043	69

22	.3840	.382	.3746	.4040	2.4751	.9272	1.118	1.1868	68
23	.4014	.399	.3907	.4245	2.3559	.9205	1.104	1.1694	67
24	.4189	.416	.4067	.4452	2.2460	.9135	1.089	1.1519	66
25	.4363	.433	.4226	.4663	2.1445	.9063	1.075	1.1345	65
26	.4538	.450	.4384	.4877	2.0503	.8988	1.060	1.1170	64
27	.4712	.467	.4540	.5095	1.9626	.8910	1.045	1.0996	63
28	.4887	.484	.4695	.5317	1.8807	.8829	1.030	1.0821	62
29	.5061	.501	.4848	.5543	1.8040	.8746	1.015	1.0647	61
30	.5236	.518	.5000	.5774	1.7321	.8660	1.000	1.0472	60
31	.5411	.534	.5150	.6009	1.6643	.8572	.985	1.0297	59
32	.5585	.551	.5299	.6249	1.6003	.8480	.970	1.0123	58
33	.5760	.568	.5446	.6494	1.5399	.8387	.954	.9948	57
34	.5934	.585	.5592	.6745	1.4826	.8290	.939	.9774	56
35	.6109	.601	.5736	.7002	1.4281	.8192	.923	.9599	55
36	.6283	.618	.5878	.7265	1.3764	.8090	.908	.9425	54
37	.6458	.635	.6018	.7536	1.3270	.7986	.892	.9250	53
38	.6632	.651	.6157	.7813	1.2799	.7880	.877	.9076	52
39	.6807	.668	.6293	.8098	1.2349	.7771	.861	.8901	51
40	.6981	.684	.6428	.8391	1.1918	.7660	.845	.8727	50
41	.7156	.700	.6561	.8693	1.1504	.7547	.829	.8552	49
42	.7330	.717	.6691	.9004	1.1106	.7431	.813	.8378	48
43	.7505	.733	.6820	.9325	1.0724	.7314	.797	.8203	47
44	.7679	.749	.6947	.9657	1.0355	.7193	.781	.8029	46
45°	.7854	.765	.7071	1.0000	1.0000	.7071	.765	.7854	45°
			Cosine	Co-tangent	Tangent	Sine	Chord	Radians	Degrees
								Angle	

TEMPERATURE CONVERSION TABLE

The numbers in BLUE TYPE refer to the temperature either in degrees Celsius (previously called Centigrade) or Fahrenheit which it is desired to convert into the other scale. If converting from Fahrenheit degrees to Celsius degrees the equivalent temperature will be found in the left column, while if converting from degrees Celsius to degrees Fahrenheit, the answer will be found in the column on the right.

°C		°F	°C		°F	°C		°F	°C		°F	°C		°F
—40	—40	—40.0	90.6	195	383	338	640	1184	599	1110	2030	860	1580	2876
—37.2	—35	—31.0	93.3	200	392	343	650	1202	604	1120	2048	866	1590	2894
—34.4	—30	—22.0	96.1	205	401	349	660	1220	610	1130	2066	871	1600	2912
—31.7	—25	—13.0	98.9	210	410	354	670	1238	616	1140	2084	877	1610	2930
—28.9	—20	— 4.0	100	212	413.6	360	680	1256	621	1150	2102	882	1620	2948
—26.1	—15	5.0	104	220	428	366	690	1274	627	1160	2120	888	1630	2966
—23.3	—10	14.0	110	230	446	371	700	1292	632	1170	2138	893	1640	2984
—20.6	— 5	23.0	116	240	464	377	710	1310	638	1180	2156	899	1650	3002
—17.8	0	32.0	121	250	482	382	720	1328	643	1190	2174	904	1660	3020
—15.0	5	41.0	127	260	500	388	730	1346	649	1200	2192	910	1670	3038
—12.2	10	50.0	132	270	518	393	740	1364	654	1210	2210	916	1680	3056
— 9.4	15	59.0	138	280	536	399	750	1382	660	1220	2228	921	1690	3074
— 6.7	20	68.0	143	290	554	404	760	1400	666	1230	2246	927	1700	3092
— 3.9	25	77.0	149	300	572	410	770	1418	671	1240	2264	932	1710	3110
— 1.1	30	86.0	154	310	590	416	780	1436	677	1250	2282	938	1720	3128
1.7	35	95.0	160	320	608	421	790	1454	682	1260	2300	943	1730	3146
4.4	40	104.0	166	330	626	427	800	1472	688	1270	2318	949	1740	3164
7.2	45	113.0	171	340	644	432	810	1490	693	1280	2336	954	1750	3182
10.0	50	122.0	177	350	662	438	820	1508	699	1290	2354	960	1760	3200
12.8	55	131.0	182	360	680	443	830	1526	704	1300	2372	966	1770	3218
15.6	60	140.0	188	370	698	449	840	1544	710	1310	2390	971	1780	3236

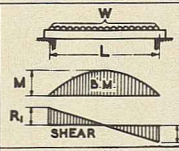
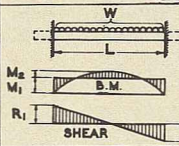
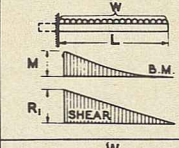
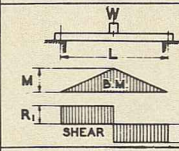
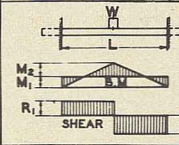
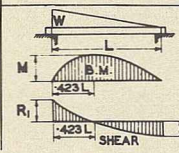
18.3	65	149.0	193	380	716	454	850	1562	716	1320	2408	977	1790	3254
21.1	70	158.0	199	390	734	460	860	1580	721	1330	2426	982	1800	3272
23.9	75	167.0	204	400	752	466	870	1598	727	1340	2444	998	1810	3290
26.7	80	176.0	210	410	770	471	880	1616	732	1350	2462	993	1820	3308
29.4	85	185.0	216	420	788	477	890	1634	738	1360	2480	999	1830	3326
32.2	90	194.0	221	430	806	482	900	1652	743	1370	2498	1004	1840	3344
35.0	95	203.0	227	440	824	488	910	1670	749	1380	2516	1010	1850	3362
37.8	100	212.0	232	450	842	493	920	1688	754	1390	2534	1016	1860	3380
40.6	105	221.0	238	460	860	499	930	1706	760	1400	2552	1021	1870	3398
43.3	110	230.0	243	470	878	504	940	1724	766	1410	2570	1027	1880	3416
46.1	115	239.0	249	480	896	510	950	1742	771	1420	2588	1032	1890	3434
48.9	120	248.0	254	490	914	516	960	1760	777	1430	2606	1038	1900	3452
51.7	125	257.0	260	500	932	521	970	1778	782	1440	2624	1043	1910	3470
54.4	130	266.0	266	510	950	527	980	1796	788	1450	2642	1049	1920	3488
57.2	135	275.0	271	520	968	532	990	1814	793	1460	2660	1054	1930	3506
60.0	140	284.0	277	530	986	538	1000	1832	799	1470	2678	1060	1940	3524
62.8	145	293.0	282	540	1004	543	1010	1850	804	1480	2696	1066	1950	3542
65.6	150	302.0	288	550	1022	549	1020	1868	810	1490	2714	1071	1960	3560
68.3	155	311.0	293	560	1040	554	1030	1886	816	1500	2732	1077	1970	3578
71.1	160	320.0	299	570	1058	560	1040	1904	821	1510	2750	1082	1980	3596
73.9	165	329.0	304	580	1076	566	1050	1922	827	1520	2768	1088	1990	3614
76.7	170	338.0	310	590	1094	571	1060	1940	832	1530	2786	1093	2000	3632
79.4	175	347.0	316	600	1112	577	1070	1958	838	1540	2804			
82.2	180	356	321	610	1130	582	1080	1976	843	1550	2822			
85.0	185	365	327	620	1148	588	1090	1994	849	1560	2840			
87.8	190	374	332	630	1166	593	1100	2012	854	1570	2858			

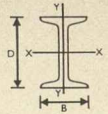
$$°C = \frac{5}{9}\left(°F - 32\right)$$

CONVERSION FORMULAE

$$°F = \frac{9}{5}°C + 32$$

BEAM LOADING

System of Loading	Max. B.M.	Diagram	Shear Reactions	Max. Deflection
Uniformly loaded. Ends supported.	$M = \frac{WL}{8}$		$R_1 = \frac{W}{2}$ $R_2 = \frac{W}{2}$	$\frac{WL^3}{76.8EI}$
Uniformly loaded. Ends fixed.	$M_1 = \frac{WL}{12}$ $M_2 = \frac{WL}{24}$		$R_1 = \frac{W}{2}$ $R_2 = \frac{W}{2}$	$\frac{WL^3}{384EI}$
Uniformly loaded. One end fixed, other free.	$M = \frac{WL}{2}$		$R_1 = W$ $R_2 = O$	$\frac{WL^3}{8EI}$
Load concentrated at centre. Ends supported.	$M = \frac{WL}{4}$		$R_1 = \frac{W}{2}$ $R_2 = \frac{W}{2}$	$\frac{WL^3}{48EI}$
Load concentrated at centre. Ends fixed.	$M_1 = \frac{WL}{8}$ $M_2 = \frac{WL}{8}$		$R_1 = \frac{W}{2}$ $R_2 = \frac{W}{2}$	$\frac{WL^3}{192EI}$
Load uniformly increasing to one end. Ends supported.	$M = \frac{2WL}{9\sqrt{3}}$		$R_1 = \frac{2W}{3}$ $R_2 = \frac{W}{3}$	$\frac{WL^3}{76.6EI}$



Properties of Australian "I" Beams

Reference Marks	Size in D x B	Wgt. per ft	Sect. Area in²	Moment of Inertia in⁴		Elastic Moduli of section	
				About XX	About YY	About XX	About YY
	*24 x 7½	100	29.44	2605.04	64.30	217.09	17.00
ASB126	24 x 7½	95	27.94	2533.04	62.54	211.09	16.68
ASB125	22 x 7	75	22.06	1676.80	41.07	152.44	11.73
ASB124	20 x 6½	65	19.12	1226.17	32.56	126.62	10.02
ASB123	18 x 6	55	16.18	841.76	23.63	93.53	7.88
ASB121	16 x 6	50	14.71	618.09	22.47	77.26	7.49
ASB120	15 x 6	45	13.24	491.91	19.87	65.59	6.62
ASB119	14 x 5½	40	11.77	377.06	14.79	53.87	5.38
ASB118	13 x 5	35	10.30	283.51	10.81	43.62	4.33
ASB117	12 x 8	65	19.12	487.77	65.18	81.29	16.30
ASB116	12 x 5	30	8.83	206.93	8.77	34.49	3.51
ASB115	10 x 8	70	20.58	345.04	71.61	69.01	17.90
ASB114	10 x 8	55	16.18	288.69	54.74	57.74	13.69
ASB113	10 x 6	40	11.77	204.80	21.76	40.94	7.39
ASB112	10 x 4½	25	7.35	122.34	6.49	24.47	2.88
ASB111	9 x 7	50	14.71	208.13	40.17	46.25	11.48
ASB110	9 x 4	21	6.18	81.13	4.15	18.03	2.07
ASB109	8 x 6	35	10.30	115.06	19.54	28.76	6.51
ASB108	8 x 4	18	5.30	55.63	3.51	13.91	1.75
ASB107	7 x 3½	15	4.42	35.90	2.41	10.26	1.38
ASB106	6 x 5	25	7.35	45.16	9.88	15.05	3.95
ASB105	6 x 3	12	3.53	20.99	1.46	7.00	0.97
ASB104	5 x 2½	9	2.65	10.91	0.79	4.36	0.63
ASB103	4 x 3	10	2.94	7.79	1.33	3.89	0.88
ASB102	4 x 1¾	5	1.47	3.66	0.19	1.83	0.21

* Nominal size — actual width is 7.9/16".

MAXIMUM ALLOWABLE EQUIVALENT STRESS, Pc in KIPS/SQ IN FOR BS 15 AND BS 2762

Application to combinations of bending and axial compression, axial tension, shear or bearing.

Form	Thickness	Pc
R.S.J.'s and Channels	All	32.5
Plates, bars and sections other than above	Up to and including ¾"	32.5
Plates etc. as above	Over ¾"	30.5
Allowable Bearing Stress pb in Kips/sq in		
Plates, bars and sections	All	27.0
Allowable Maximum Shear Stress pq in Kips/sq in		
Plates, sections and bars	All	15.5
Allowable Stresses pt in Axial Tension in Kips/sq in		
R.S.J. and Channels	All	21.5
Plates, bars etc. other than above	Up to and including ¾"	21.5
	Over ¾"	20.0

ROLLED STEEL "I" BEAMS AS GIRDERS

SAFE DISTRIBUTED LOAD IN TONS, ABOUT AXIS XX

Size Inches	Weight per ft. lb	SPAN IN FEET																	Size Inches
		4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	36	40	
24 x 7½	100		205.0	178.5	142.5	119.0	102.0	89.2	79.2	71.4	64.8	59.5	54.8	51.0	47.5	44.6	39.7	35.7	24 x 7½
24 x 7½	95		182.0	175.0	140.0	117.0	100.0	87.6	78.0	70.2	63.3	58.5	54.0	50.2	46.8	43.9	39.1	35.1	24 x 7½
24 x 7½	90			166.3	135.3	112.6	96.4	84.4	75.0	67.4	61.5	56.2	51.9	48.1	45.0	42.2	37.4	33.7	24 x 7½
22 x 7	75		147.0	127.0	101.6	84.6	72.5	63.4	56.4	50.8	46.2	42.3	39.1	36.3	33.8	31.7	28.2	25.4	22 x 7
20 x 6½	65		120.0	101.8	81.4	67.8	58.1	50.8	45.1	41.7	37.0	33.8	31.2	29.0	27.1	25.4	22.6	20.3	20 x 6½
18 x 6	55		101.0	77.6	62.0	51.8	44.3	38.8	34.3	31.0	28.2	25.9	23.9	22.1	20.6	19.4	17.2	15.4	18 x 6
16 x 8	75		102.4	101.1	81.0	67.4	57.8	50.5	44.9	40.4	36.8	33.5	31.1	28.9	27.0	25.2	22.5	20.3	16 x 8
16 x 6	50		85.4	64.0	51.2	42.6	36.6	32.0	28.4	25.6	23.3	21.4	19.6	18.3	17.1	16.1	14.2	12.8	16 x 6
15 x 6	45		72.5	54.4	43.5	36.2	31.1	27.1	24.1	21.6	19.9	18.1	16.7	15.6	14.4	13.5	12.1	10.8	15 x 6
14 x 5½	40	69.1	59.3	44.6	35.6	29.7	25.5	22.3	19.8	17.8	16.2	14.8	13.7	12.7	11.8	11.1	9.8	8.8	14 x 5½
13 x 5	35	60.6	48.1	36.2	29.0	24.0	20.6	18.0	16.1	14.4	13.1	12.0	11.1	10.3	9.7	9.0	8.0	7.2	13 x 5
12 x 8	65		68.6	67.4	54.0	44.9	38.4	33.7	30.0	27.0	24.5	22.5	20.8	19.3	18.1	16.8	14.9	13.6	12 x 8
12 x 5	30	52.7	38.1	28.5	22.9	19.1	16.3	14.3	12.7	11.5	10.3	9.6	8.8	8.1	7.6	7.1	6.3	5.7	12 x 5
10 x 8	70	79.9	76.5	57.5	45.9	38.3	32.8	28.7	25.5	23.0	20.9	19.2	17.7	16.4	15.3	14.3			10 x 8
10 x 8	55		53.2	47.9	38.3	31.8	27.2	23.9	21.3	19.2	17.4	15.9	14.7	13.6	12.7	11.9			10 x 8
10 x 6	40	48.0	45.4	34.1	27.2	22.8	19.4	17.1	15.2	13.6	12.4	11.3	10.4	9.7	9.1	8.6			10 x 6
10 x 4½	25	40.4	27.0	20.3	16.2	13.6	11.6	10.1	9.0	8.1	7.5	6.7	6.2	5.7	5.4	5.1			10 x 4½
9 x 7	50		48.0	38.4	30.7	25.6	21.9	19.2	17.1	15.5	13.9	12.8	11.8	10.9	10.2				9 x 7
9 x 4	21	29.9	19.9	14.9	12.0	10.0	8.5	7.5	6.6	6.0	5.4	5.0	4.6	4.2					9 x 4
8 x 6	35	37.3	31.7	23.9	19.0	15.9	13.6	12.0	10.6	9.6	8.6	8.0	7.3	6.8					8 x 6
8 x 4	18	23.0	15.4	11.6	9.2	7.7	6.6	5.7	5.1	4.6	4.2	3.9	3.5	3.2					8 x 4
7 x 3½	15	17.1	11.3	8.5	6.8	5.7	4.9	4.2	3.7	3.4	3.1	2.9	2.6						7 x 3½
6 x 5	25	24.9	16.7	12.4	10.0	8.4	7.1	6.1	5.6	5.0	4.5								6 x 5
6 x 3	12	11.6	7.7	5.9	4.6	3.9	3.4	2.9	2.6	2.4									6 x 3
5 x 2½	9	7.2	4.9	3.6	2.9	2.4	2.0	1.7											5 x 2½
4 x 3	10	6.5	4.4	3.2	2.6	2.1	1.9	1.6											4 x 3
4 x 1¾	5	3.0	2.0	1.5	1.2	1.0	.9	.7											4 x 1¾

FIRM LINE REPRESENTS MAX. SPAN WITHOUT LATERAL SUPPORT

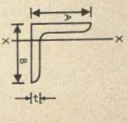
LYSAGHT REFEREE

Equal Angles Properties

The tabulated values of section moduli for single angles, when used for the determination of bending stresses in angles, apply only to sections consisting of two angles back to back or toe to toe, for which twice the tabulated values are the section moduli.

Reference Number	Size A x B x t inches	Weight per ft. lb.	Sect. Area sq. in.	M. of I. about XX	Min. mod. of Sect. about XX
ASEA 143	8 x 8 x 5/8	32.68	9.61	58.26	10.05
" 144	8 x 8 x 3/4	38.89	11.44	68.58	11.94
" 145	8 x 8 x 7/8	45.00	13.24	78.44	13.77
" 146	8 x 8 x 1	51.01	15.00	87.85	15.55
ASEA 139	6 x 6 x 3/8	14.82	4.36	14.95	3.40
BSEA 113	6 x 6 x 7/16	17.19	5.05	17.22	3.95
ASEA 140	6 x 6 x 1/2	19.55	5.75	19.48	4.49
BSEA 113	6 x 6 x 9/16	21.86	6.43	21.60	5.01
ASEA 141	6 x 6 x 5/8	24.17	7.11	23.73	5.54
" 142	6 x 6 x 3/4	28.69	8.44	27.74	6.54
BSEA 113	6 x 6 x 7/8	33.04	9.72	31.40	7.50
	6 x 6 x 1	37.40	11.00	35.06	8.45
	5 x 5 x 5/16	10.30	3.03	7.20	1.97
ASEA 135	5 x 5 x 3/8	12.28	3.61	8.53	2.35
" 136	5 x 5 x 1/2	16.16	4.75	11.04	3.08
" 137	5 x 5 x 5/8	19.93	5.86	13.37	3.78
" 138	5 x 5 x 3/4	23.59	6.94	15.54	4.46
ASEA 132	4 x 4 x 5/16	8.17	2.40	3.61	1.24
" 133	4 x 4 x 3/8	9.72	2.86	4.26	1.48
" 134	4 x 4 x 1/2	12.75	3.75	5.46	1.93
BSEA 110	4 x 4 x 5/8	15.67	4.61	6.56	2.36
BSEA 109	3½ x 3½ x 1/4	5.74	1.70	1.96	0.76
ASEA 129	3½ x 3½ x 5/16	7.11	2.09	2.38	0.94
" 130	3½ x 3½ x 3/8	8.45	2.48	2.80	1.12
" 131	3½ x 3½ x 1/2	11.05	3.25	3.57	1.46
BSEA 109	3½ x 3½ x 5/8	13.55	3.98	4.27	1.77
	3 x 3 x 3/16	3.73	1.10	0.93	0.42
ASEA 125	3 x 3 x 1/4	4.89	1.44	1.20	0.55
" 126	3 x 3 x 5/16	6.05	1.78	1.47	0.68
" 127	3 x 3 x 3/8	7.17	2.11	1.72	0.81
" 128	3 x 3 x 1/2	9.35	2.75	2.18	1.05
	3 x 3 x 5/8	11.42	3.36	2.59	1.27

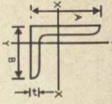
Reference Number	Size A x B x t inches	Weight per ft. lb.	Sect. Area sq. in.	M. of I. about XX	Min. mod. of Sect. about XX
	2½ x 2½ x 3/16	3.10	0.92	0.53	0.29
ASEA 121	2½ x 2½ x 1/4	4.04	1.19	0.68	0.38
" 122	2½ x 2½ x 5/16	4.98	1.46	0.83	0.47
" 123	2½ x 2½ x 3/8	5.90	1.73	0.96	0.55
" 124	2½ x 2½ x 1/2	7.65	2.25	1.21	0.71
ASEA 117	2¼ x 2¼ x 3/16	2.77	0.81	0.39	0.23
" 118	2¼ x 2¼ x 1/4	3.61	1.06	0.49	0.30
" 119	2¼ x 2¼ x 5/16	4.45	1.31	0.59	0.37
" 120	2¼ x 2¼ x 3/8	5.26	1.55	0.69	0.44
	2 x 2 x 1/8	1.67	0.49	0.18	0.12
ASEA 113	2 x 2 x 3/16	2.43	0.72	0.26	0.18
" 114	2 x 2 x 1/4	3.19	0.94	0.34	0.24
" 115	2 x 2 x 5/16	3.92	1.15	0.41	0.29
" 116	2 x 2 x 3/8	4.62	1.36	0.47	0.34
	1½ x 1½ x 1/8	1.46	0.43	0.12	0.09
ASEA 110	1½ x 1½ x 3/16	2.11	0.62	0.17	0.14
" 111	1½ x 1½ x 1/4	2.76	0.81	0.22	0.18
" 112	1½ x 1½ x 5/16	3.39	1.00	0.26	0.22
	1½ x 1½ x 3/8	4.02	1.18	0.31	0.26
	1¼ x 1¼ x 1/8	1.23	0.36	0.07	0.07
ASEA 107	1¼ x 1¼ x 3/16	1.79	0.53	0.11	0.10
" 108	1¼ x 1¼ x 1/4	2.34	0.69	0.13	0.13
" 109	1¼ x 1¼ x 5/16	2.85	0.84	0.16	0.16
ASEA 104	1¼ x 1¼ x 1/8	1.02	0.30	0.04	0.05
" 105	1¼ x 1¼ x 3/16	1.48	0.43	0.06	0.07
" 106	1¼ x 1¼ x 1/4	1.91	0.56	0.07	0.09
	1¼ x 1¼ x 5/16	2.34	0.69	0.09	0.11
ASEA 101	1 x 1 x 1/8	0.80	0.23	0.02	0.03
" 102	1 x 1 x 3/16	1.15	0.34	0.03	0.04
" 103	1 x 1 x 1/4	1.49	0.44	0.04	0.05



Unequal Angles Properties

The tabulated values of section moduli for single angles, when used for the determination of bending stresses in angles, apply only to sections consisting of two angles back to back or toe to toe, for which twice the tabulated values are the section moduli.

Reference Number	Size A x B x t inches	Wgt. per ft. lb.	Sect. Area inches	Min. mod. of Section Abt. XX	Abt. YY
	6½ x 4½ x 3/8	13.54	3.98	3.82	1.95
	6½ x 4½ x 1/2	17.84	5.25	5.03	2.56
	6½ x 4½ x 5/8	22.04	6.48	6.21	3.16
	6½ x 4½ x 3/4	26.13	7.69	7.33	3.72
ASUA 124	6 x 4 x 3/8	12.28	3.61	3.23	1.54
" 125	6 x 4 x 1/2	16.16	4.75	4.25	2.02
" 126	6 x 4 x 5/8	19.93	5.86	5.23	2.48
" 127	6 x 4 x 3/4	23.59	6.94	6.16	2.91
	6 x 4 x 7/8	27.10	7.98	7.10	3.38
	6 x 4 x 1	30.60	9.00	8.03	3.86
BSUA 116	6 x 3½ x 5/16	09.32	2.74	2.65	1.00
ASUA 121	6 x 3½ x 3/8	11.63	3.42	3.16	1.18
BSUA 116	6 x 3½ x 7/16	13.54	3.99	3.65	1.36
ASUA 122	6 x 3½ x 1/2	15.30	4.50	4.15	1.54
" 123	6 x 3½ x 5/8	18.86	5.55	5.11	1.89
	6 x 3½ x 3/4	22.31	6.56	6.02	2.22
	6 x 3 x 3/8	11.00	3.24	3.07	0.87
	6 x 3 x 1/2	14.45	4.25	4.06	1.14
	6 x 3 x 5/8	17.80	5.24	5.02	1.41
	6 x 3 x 3/4	21.05	6.19	5.90	1.66
	5 x 4 x 5/16	09.15	2.69	1.92	1.30
ASUA 118	5 x 4 x 3/8	11.00	3.24	2.28	1.52
" 119	5 x 4 x 1/2	14.45	4.25	2.99	1.98
" 120	5 x 4 x 5/8	17.80	5.24	3.67	2.43
	5 x 4 x 3/4	21.05	6.19	4.35	2.88
	5 x 3 x 1/4	6.60	1.94	1.48	0.59
BSUA 112	5 x 3 x 5/16	8.17	2.40	1.83	0.72
ASUA 116	5 x 3 x 3/8	9.72	2.86	2.18	0.85
BSUA 112	5 x 3 x 7/16	11.30	3.33	2.52	0.98
ASUA 117	5 x 3 x 1/2	12.75	3.75	2.86	1.11
	5 x 3 x 5/8	15.67	4.61	3.50	1.36
	4 x 3 x 1/4	5.75	1.67	0.98	0.58
BSUA 109	4 x 3 x 5/16	7.11	2.09	1.20	0.71
ASUA 114	4 x 3 x 3/8	8.45	2.48	1.42	0.84
BSUA 109	4 x 3 x 7/16	9.83	2.89	1.63	0.96
ASUA 115	4 x 3 x 1/2	11.05	3.25	1.85	1.09
	4 x 3 x 5/8	13.55	3.98	2.26	1.33
ASUA 111	3½ x 3 x 1/4	5.32	1.56	0.74	0.56
BSUA 107	3½ x 3 x 5/16	6.58	1.93	0.92	0.69
ASUA 112	3½ x 3 x 3/8	7.81	2.30	1.10	0.83
" 113	3½ x 3 x 1/2	10.20	3.00	1.42	1.07
	3½ x 3 x 5/8	12.49	3.67	1.73	1.30
	3½ x 2½ x 3/16	3.74	1.10	0.56	0.30
ASUA 109	3½ x 2½ x 1/4	4.89	1.44	0.73	0.39
BSUA 106	3½ x 2½ x 5/16	6.05	1.78	0.90	0.49
ASUA 110	3½ x 2½ x 3/8	7.17	2.11	1.07	0.58
	3½ x 2½ x 1/2	9.35	2.75	1.39	0.73
	3 x 2½ x 3/16	3.40	1.00	0.42	0.30
ASUA 107	3 x 2½ x 1/4	4.46	1.31	0.54	0.39
BSUA 105	3 x 2½ x 5/16	5.51	1.62	0.67	0.48
ASUA 108	3 x 2½ x 3/8	6.54	1.92	0.79	0.56
	3 x 2½ x 1/2	8.50	2.50	1.02	0.72
BSUA 104	3 x 2 x 3/16	3.03	0.90	0.41	0.19
ASUA 105	3 x 2 x 1/4	4.04	1.19	0.52	0.25
BSUA 104	3 x 2 x 5/16	4.98	1.47	0.65	0.30
ASUA 106	3 x 2 x 3/8	5.90	1.74	0.76	0.36
	3 x 2 x 1/2	7.65	2.25	0.99	0.46
ASUA 101	2½ x 2 x 3/16	2.75	0.81	0.29	0.19
ASUA 102	2½ x 2 x 1/4	3.61	1.06	0.37	0.24
ASUA 103	2½ x 2 x 5/16	4.45	1.31	0.46	0.30
ASUA 104	2½ x 2 x 3/8	5.26	1.55	0.54	0.35



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