

permalite



ALUMINIUM

The stylish answer
for the toughest conditions

RESIDENTIAL SOLUTIONS

Table of Contents

1.0	Materials	4	5.0	Rainwater Systems	18
1.1	Testing Standards	4	5.1	Gutters and Accessories	18
1.2	Wind Forces on Roofs	4	5.2	Fascia and Fascia Cover	18
1.3	Materials and Finishes	5	5.3	Half Round Gutters	19
1.4	Alloy Mechanical Properties	5	5.4	Quad 150 & Quad 175 Gutters	19
1.5	Fixings	5	5.5	Other Available Gutters	19
1.6	Quality Assurance	5	5.6	Gutter Fixing	20
1.7	Thermal Protection	6	5.7	Timber and Metal Compatibility	23
1.8	Storage & Handling Prior To Use	6	5.8	Walking on Roofs	23
1.9	Environmental Conditions	6	5.9	Flashings and Accessories	24
2.0	PERMALITE® Residential Product Range	7	5.10	Flashing Materials	24
2.1	PERMALITE WAVELINE® Sheeting	7		Residential Products Order Form	25
2.2	PERMALITE LT7® Sheeting	11		Custom Flashings Order Form	26
3.0	Sheeting Installation	13			
3.1	WAVELINE® Sheeting Installation	13			
3.2	Design of Drainage	14			
3.3	Turn Up WAVELINE® Cladding	14			
3.4	Minimum Roof Slopes	14			
3.5	Maximum Roof Slopes	14			
3.6	Installation Safety	14			
3.7	Preparation	14			
3.8	Squareness	15			
3.9	Batten Isolation	15			
3.10	Sheet Installation	15			
3.11	Sheet Cutting	15			
3.12	Wall Cladding	15			
3.15	Post Painting	15			
3.16	Translucent Sheeting	15			
3.17	Sealants	15			
3.16	Ordering Sheet	15			
3.17	End Laps	15			
3.18	Expansion Fixing For Thermal Expansion	16			
4.0	Fasteners	17			
4.1	Fastener Specifications	17			





Introduction

Aluminium is a long lasting, durable, lightweight alternative to other cladding materials. Aluminium provides high thermal insulation and minimal maintenance to remain corrosion-free. It is easier to transport and erect because it is significantly lighter than many alternate cladding materials.

This book is a guide to the installation of aluminium roofing and walling manufactured by Lysaght. We intend that it be used by all trades and professions involved with specifying and applying the residential range of our products. Reference to this manual will allow you to maximise the benefits of aluminium in your next project.

We refer only to genuine PERMALITE® aluminium roofing and walling manufactured by us and marketed under our brand names. Our recommendations should only be used for our products because they are based on comprehensive testing of our profiles, Base Metal Thicknesses (BMT) and material finishes.

Our products are engineered to perform according to our specifications only if they are used in the appropriate conditions and installed to the recommendations in this manual and our other publications.

Where we recommend use of third party materials, ensure you check the qualities and capabilities of those products with the relevant manufacturer before use.

Walls

When you design PERMALITE® aluminium cladding into your building you have a range of profiles from which to choose. Whilst cladding obviously needs to keep out the weather, it also has significant effects on the looks, cost and durability of a building.

Roofs

There are many factors in designing roofs including:

- the shape: is the roof to be 'flat' or pitched or curved?
- the supporting structure and support spacing;
- the wind forces that the roof must sustain;
- the pitch which affects the looks, the profile's ability to efficiently carry rain to the gutters, and fixing details;
- the attributes of other materials used in the roof design.

This manual provides tables of span capabilities.

The appropriate design will depend on your particular needs and circumstances. You should get advice from the relevant specialists where required.

Eco-Friendly & Recyclable

Choosing the optimum material for your next project should take account of the full lifetime of the material. This will include construction, use, maintenance and disposal. Materials which can be recycled easily and economically and which do not require landfill disposal should be preferred.

Aluminium's formability, high strength-to-weight ratio, corrosion resistance, and ease of recycling makes it the ideal material for a wide range of building applications. It is almost uniquely suited for projects in harsh industrial and marine environments.

Benefits

Durability:

The outstanding benefit of PERMALITE® Aluminium Roofing Products is their long-term durability in aggressive environments. PERMALITE® roofs have been installed in Australia since the 1960s. This proven track record in Australia's harshest conditions means you can be assured of an effective roof life significantly longer than for most other roofing materials. In fact PERMALITE® Roofing and Cladding products may be backed by warranty periods of up to 40 years in some applications. (Terms and conditions apply)

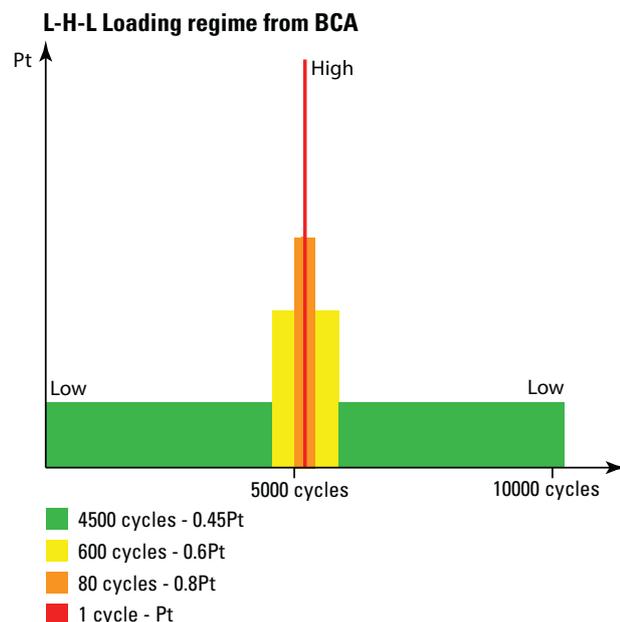
Thermal efficiency:

Unpainted aluminium can reduce heat transmission by up to 9.5°C due to its high thermal insulation properties. This is significant in reducing the ever-increasing operating cost of air conditioning.

Weight:

The lighter mass of aluminium may provide a reduction of the cost of transport to remote locations.

Figure 1.1 The sequence L-H-L loading regime is shown in the graph above where Pt is the ultimate limit state test pressure.



1.0 Materials

1.1 Testing Standards

AS 1562.1:1992 specifies the design and installation of sheet metal roof and wall cladding. Our PERMALITE® profiles satisfy all the requirements of this Standard, including the ability of the roof to withstand concentrated loads according to AS 4040.1 and wind pressure in non-cyclonic regions according to AS 4040.2.



Note on testing for cyclonic areas

The Building Code of Australia (BCA) currently requires all metal roof claddings, its connections and immediate supporting members to withstand a low-high-low (LHL) pressure sequence. PERMALITE® aluminium claddings are subjected to cyclonic conditions, according to the BCA definition, and as such, must be tested using the LHL cyclonic testing methodology to determine their capacity.

James Cook University's Cyclone Testing Station has performed comprehensive simulated wind loading pressure tests of the entire range of PERMALITE® aluminium claddings fastened to 1.9mm BMT G450 steel purlins for the most accurate results. These tests were conducted on a direct air pressure rig in the University's Cyclone Testing Station laboratory.

1.2 Wind Forces on Roofs

Winds create considerable forces on both the topside and the underside of roof cladding, and you must consider these forces in the design and fixing of any roof. The forces are:

- inward forces tending to collapse the roof cladding inwards, caused by wind acting directly on the windward side; and
- outward forces tending to lift the roof cladding from its framing, and the entire roof structure from the rest of the building. Outward forces can be caused both by uplift from negative wind pressures, outside the building; and by positive wind pressure inside the building.

Generally the greatest wind forces imposed on roofs are due to the outward forces. Because the dead weight of roofing materials is relatively small, the outward forces must be resisted by the roof fasteners.

It is very important that the battens and roof framing are adequately fixed to the rafters and walls, and that under extreme conditions the wall framing is anchored to the footings. Special anchoring provisions may apply in cyclonic areas. Specialist advice should be sought in these circumstances.

1.3 Materials and Finishes

PERMALITE WAVELINE® and flashings are produced from marine grade aluminium alloy entirely. No coatings or claddings are required to enhance performance or economy; you don't have to consider coating thicknesses.

The new generation polyester paints used on PERMALITE® sheeting have outstanding colour and gloss retention characteristics. This coupled with their resistance to scratching during transportation and installation; make these paints suitable for the majority of severe marine and industrial environments. Polyester paint systems have been extensively tested in Australia's tough environment over many years.

WAVELINE® is manufactured entirely from aluminium alloy 5251 or 5052 produced by Permalite to AS/NZS 1734:1997.

Alloys 5251/5052 are high strength marine grade alloys with exceptional resistance to corrosion in marine environments.

The profile is available in two finishes:

Mill Finish – an unpainted smooth lustrous finish which will dull relatively quickly and enhances corrosion resistance.

Painted Finish – a range of quality painted finishes are available.

Colour Selection

The PERMALITE® residential range is available in 7 standard colours.



Brochure colours are only approximate - refer to painted colour chips for actual colour.

Other colours from the PERMALITE® sheeting range or indeed special colours are also available on request on a POA basis, however minimum order quantities and extended lead times will apply.

Colour Equivalents:

COLORBOND® Steel Colour Name	PERMALITE® Equivalent Colour Name
Bushland	Bush Smoke
Pale Eucalypt	Enduro Green
Deep Ocean	Eternal Blue
Classic Cream	Full Cream
Surfmist	Glacier White
Shale Grey	Gull Grey
Manor Red	Heritage Red
Ironstone	Iron Grey
Jasper	Jasmine Brown
Windspray	Moon Shadow
Wilderness	Perpetual Green
Headland	Resilient Red
Dune	Sahara
Woodland Grey	Slate Grey
Monument	Obelisk Grey®
Wallaby	Pademelon®
Night Sky	Midnight sky

1.4 Alloy Mechanical Properties

The following properties are typical of mill finish, unpainted sheet.

Alloy	5251	5052
Temper	H38	H38
Minimum Yield Strength, MPa	225	220
Ultimate Tensile Strength	260	270
Elongation 0.90 BMT	4%	4%
Coefficient of Thermal Expansion	24 x 10 ⁻⁶ per °C NOTE: As an approximation, aluminium expands 1.2mm/m over 50° temperature change	

1.5 Fixings

The PERMALITE® range of fixings are 304 Stainless Steel (316 SS available upon request) to provide the maximum protection in marine environments.

1.6 Quality Assurance

The in-line painting and rollforming of PERMALITE® aluminium roofing and walling products are conducted in Australia in accordance with BlueScope's strict quality control guidelines. Lysaght holds Quality Certification to AS/NZS 9001:2008.

1.7 Thermal Protection

The low emissivity of unpainted aluminium roofing greatly reduces heat gain in a building where an air space is provided on the underside of the roof. The factors of reflectivity and absorptivity of unpainted aluminium are also favourable, particularly when the underside of the roof is insulated.

On painted roofs, the use of light colours will help to reduce the thermal absorptivity of the paint coating.

Table 1.1: Thermal factors

	Unpainted (Weathered)	Galvanised Steel (New to Weathered)
Reflectivity	0.74	0.34 to 0.11
Absorptivity	0.26	0.66 to 0.89
Emissivity	0.11	0.28 to 0.42

The following thermal transmittance values (U) are applicable to a weathered aluminium roof with no ceiling.

Aluminium Roofing Sheet Under Roof Insulation	U Value Summer	(W/m ² K) Winter
50mm Wool and Reflective Foil	0.43	0.58
40mm Space and 50mm Wool and Reflective Foil	0.36	0.51

1.8 Storage & Handling Prior to Use

Aluminium roofing requires care during handling and installation. Installation damage can be avoided by taking reasonable care and following the recommendations of this manual.

Keep the product dry and clear of the ground. If stacked or bundled product becomes wet, separate it, wipe it with a clean cloth and stack it to dry thoroughly.

Product that has become wet in transport is to be unpacked immediately and each section dried thoroughly prior to repacking.

Bundled sections and accessories should not be left exposed in the open for any period as water staining may result between any aluminium surfaces in contact with each other. Mill finish aluminium is particularly susceptible to this type of staining.

Contact with moisture, cement dust, lime or abrasive dust is to be avoided. If not required for immediate use, sections should be neatly stacked off the ground, covered and on a slight slope so that water can drain away.

It should be noted that whilst water staining is unsightly it will not affect the structural integrity or durability of the product in any way. Packs of sheet stored on the roof must be placed over trusses or purlin supports.

1.9 Environmental Conditions

Aluminium products are generally specified for severe environmental conditions including locations near breaking surf, near swimming pools or other aggressive conditions.

To get the best performance from our products in these conditions, or other unusually corrosive environments, seek advice from our technical representatives.

2.0 PERMALITE® Residential Product Range

The PERMALITE® residential range has been developed to cater for coastal residential applications. The timeless simplicity of corrugated roof sheeting is married to classic gutter profiles to provide an elegant and stylish solution that is also extremely durable in coastal environments.

An alternate solution is PERMALITE LT7®, with its strong trapezoidal lines and low pitch capacity, PERMALITE LT7® can provide greater design freedom for those seeking differentiation.

2.1 PERMALITE WAVELINE® Sheeting

The classic Australian profile is used in traditional as well as modern applications.

PERMALITE WAVELINE® is available in 990mm and 762*mm cover widths. PERMALITE WAVELINE® provides a roofing sheet which can also be used effectively on walls.

Thickness Range	0.70mm - 0.90mm
Length Range	800mm to 11000mm
Pan Cross Section Area	26,000mm ² / metre sheet width
Tolerances	Length +0mm -15mm
	Width ±4mm

Other thicknesses available subject to minimum order quantity.

Full design capacity information including Limit State Wind Pressure capacities are available in the PERMALITE® Aluminium Roofing Solutions manual.
(Available from www.permalite.com.au)



PERMALITE WAVELINE®

The traditional corrugated style and 762*mm or 990mm cover widths of this product provides minimum wastage and quick installation.

Whether you want a traditional style or the modern look, the universal appeal of WAVELINE® is the right choice.

Table 2.1 Profile properties PERMALITE WAVELINE®

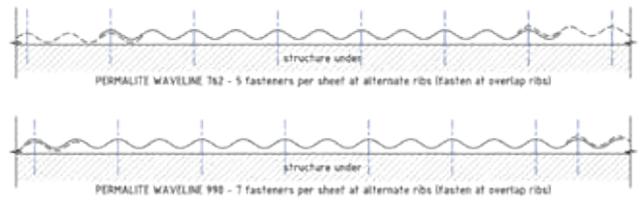
Thickness (mm)	Cover Width (mm)	kg/m ² Cover width (Mill finish)	kg/m Length (Mill finish)
0.70	762*	2.340	1.783
0.70	990	2.338	2.314
0.90	762*	3.009	2.293
0.90	990	3.006	2.976

* 762 cover subject to availability, extended lead times and minimum order quantities.

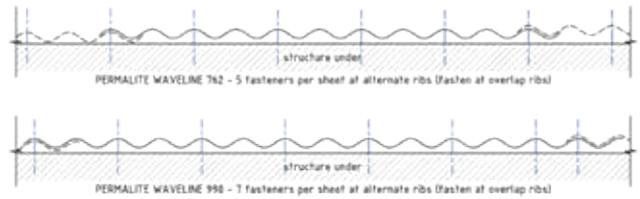
Fastener Positions

Figure 2.2 Fastener positions

Non-cyclonic



Cyclonic



NOTES:

1. Screws may be placed on every rib to achieve better wind pressure capacity, however batten connections to the roof frame need to be considered in this case as these are often the governing design factor.
2. Pan wall fixing (Non-cyclonic only) uses the same pattern as shown here for crest fixing.
3. WAVELINE® 762 cover subject to availability, extended lead times and minimum order quantities.

Figure 2.1 WAVELINE® profile

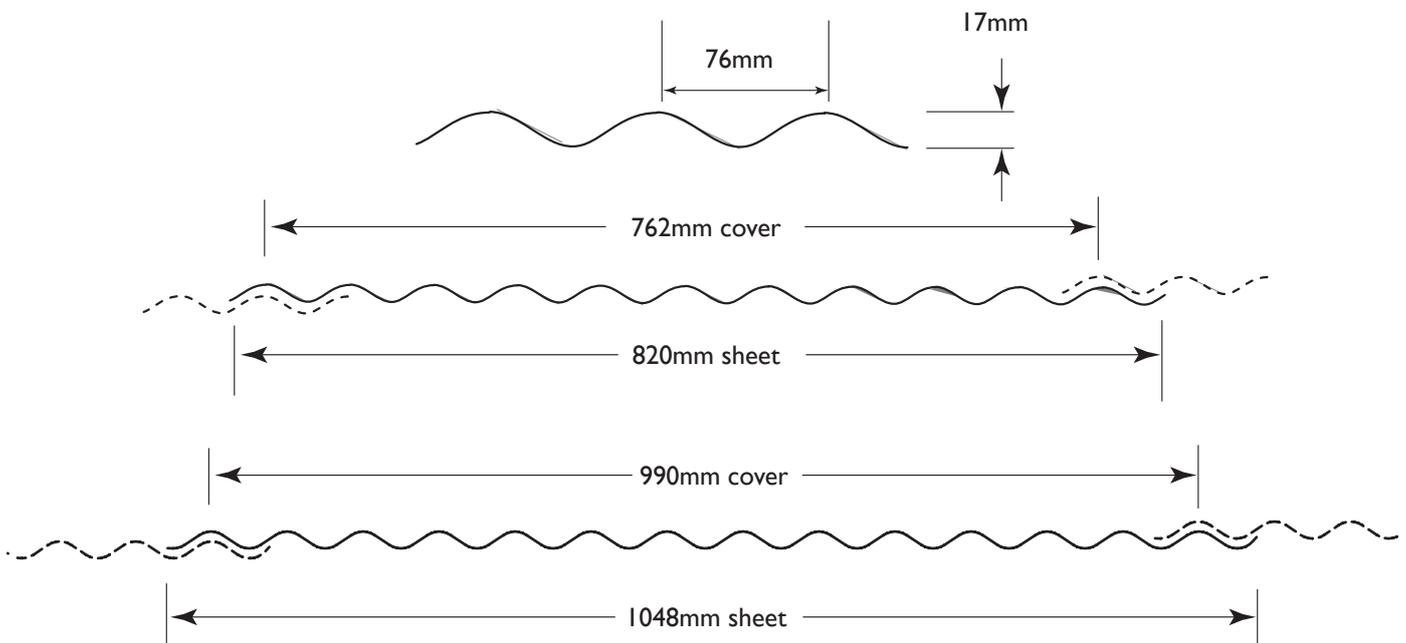


Table 2.1 WAVELINE® Maximum Spans (Non-cyclonic)

WAVELINE® 0.7mm BMT ROOFS

Wind Class to AS 4055-2012	Wind zones to AS 4055-2012	Ultimate strength pressure kPa	Maximum TS4055 spacing (WAVELINE® 0.7mm span), mm			
			Supports (Trusses) at maximum spacing, mm			
			450	600	900	1200
N1	Within 1200mm Zone	1.25	1200	1200	1200	1200
	General Areas	0.69	1200	1200	1200	1200
N2	Within 1200mm Zone	1.73	1200	1200	1200	1140
	General Areas	0.95	1200	1200	1200	1200
N3	Within 1200mm Zone	2.7	1200	1200	970	730
	General Areas	1.49	1200	1200	1200	1200
N4	Within 1200mm Zone	4.02	1050	980	650	490
	General Areas	2.21	1200	1200	1190	890
N5	Within 1200mm Zone	5.91	670	670	440	330
	General Areas	3.25	1150	1150	810	600
N6	Within 1200mm Zone	7.99	480	480	330	240
	General Areas	4.39	990	900	600	450

All supports (trusses) are minimum 1mm BMT G550 steel or F7 timber (pine) with TS40 battens fixed to supports in accordance with manufactures recommendations.

WAVELINE® 0.7mm BMT WALLS

Wind Class to AS 4055-2012	Wind zones to AS 4055-2012	Ultimate strength pressure kPa	Maximum TS4055 spacing (WAVELINE® 0.7mm span), mm			
			Supports (Trusses) at maximum spacing, mm			
			450	600	900	1200
N1	Within 1200mm Zone	0.94	1200	1200	1200	1200
	General Areas	0.62	1200	1200	1200	1200
N2	Within 1200mm Zone	1.3	1200	1200	1200	1200
	General Areas	0.86	1200	1200	1200	1200
N3	Within 1200mm Zone	2.03	1200	1200	1200	970
	General Areas	1.35	1200	1200	1200	1200
N4	Within 1200mm Zone	3.01	1170	1170	870	650
	General Areas	2.01	1200	1200	1200	980
N5	Within 1200mm Zone	4.44	970	890	590	440
	General Areas	2.96	1190	1190	890	660
N6	Within 1200mm Zone	5.99	650	650	440	330
	General Areas	3.99	1060	990	660	490

All supports (trusses) are minimum 1mm BMT G550 steel or F7 timber (pine) with TS40 battens fixed to supports in accordance with manufactures recommendations.

WAVELINE® 0.9mm BMT ROOFS

Wind Class to AS 4055-2012	Wind zones to AS 4055-2012	Ultimate strength pressure kPa	Maximum TS4055 spacing (WAVELINE® 0.9mm span), mm			
			Supports (Trusses) at maximum spacing, mm			
			450	600	900	1200
N1	Within 1200mm Zone	1.25	1200	1200	1200	1200
	General Areas	0.69	1200	1200	1200	1200
N2	Within 1200mm Zone	1.73	1200	1200	1200	1140
	General Areas	0.95	1200	1200	1200	1200
N3	Within 1200mm Zone	2.7	1200	1200	970	730
	General Areas	1.49	1200	1200	1200	1200
N4	Within 1200mm Zone	4.02	1120	980	650	490
	General Areas	2.21	1200	1200	1190	890
N5	Within 1200mm Zone	5.91	720	670	440	330
	General Areas	3.25	1200	1200	810	600
N6	Within 1200mm Zone	7.99	480	480	330	240
	General Areas	4.39	1010	900	600	450

WAVELINE® 0.9mm BMT WALLS

Wind Class to AS 4055-2012	Wind zones to AS 4055-2012	Ultimate strength pressure kPa	Maximum TS4055 spacing (WAVELINE® 0.9mm span), mm			
			Supports (Trusses) at maximum spacing, mm			
			450	600	900	1200
N1	Within 1200mm Zone	0.94	1200	1200	1200	1200
	General Areas	0.62	1200	1200	1200	1200
N2	Within 1200mm Zone	1.3	1200	1200	1200	1200
	General Areas	0.86	1200	1200	1200	1200
N3	Within 1200mm Zone	2.03	1200	1200	1200	970
	General Areas	1.35	1200	1200	1200	1200
N4	Within 1200mm Zone	3.01	1200	1200	870	650
	General Areas	2.01	1200	1200	1200	980
N5	Within 1200mm Zone	4.44	1000	890	590	440
	General Areas	2.96	1200	1200	890	660
N6	Within 1200mm Zone	5.99	700	660	440	330
	General Areas	3.99	1120	990	660	490

Table 2.2 WAVELINE® Maximum spans (cyclonic)

WAVELINE® 0.9mm BMT ROOFS

Wind Class to AS 4055-2012	Wind zones to AS 4055-2012	Ultimate strength pressure kPa	Maximum TS4075 spacing (WAVELINE® 0.9mm span), mm			
			Supports (Trusses) at maximum spacing, mm			
			450	600	900	1200
C1	Within 1200mm Zone	3.38	1200	1200	1200	1200
	General Areas	2.16	1200	1200	1200	1200
C2	Within 1200mm Zone	5.02	1200	1200	1200	1200
	General Areas	3.21	1200	1200	1200	1200
C3	Within 1200mm Zone	7.39	1200	1200	1200	890
	General Areas	4.73	1200	1200	1200	1200
C4	Within 1200mm Zone	9.98	800	800	800	590
	General Areas	6.39	1200	1200	1200	1090

All fasteners to include cyclonic washers.

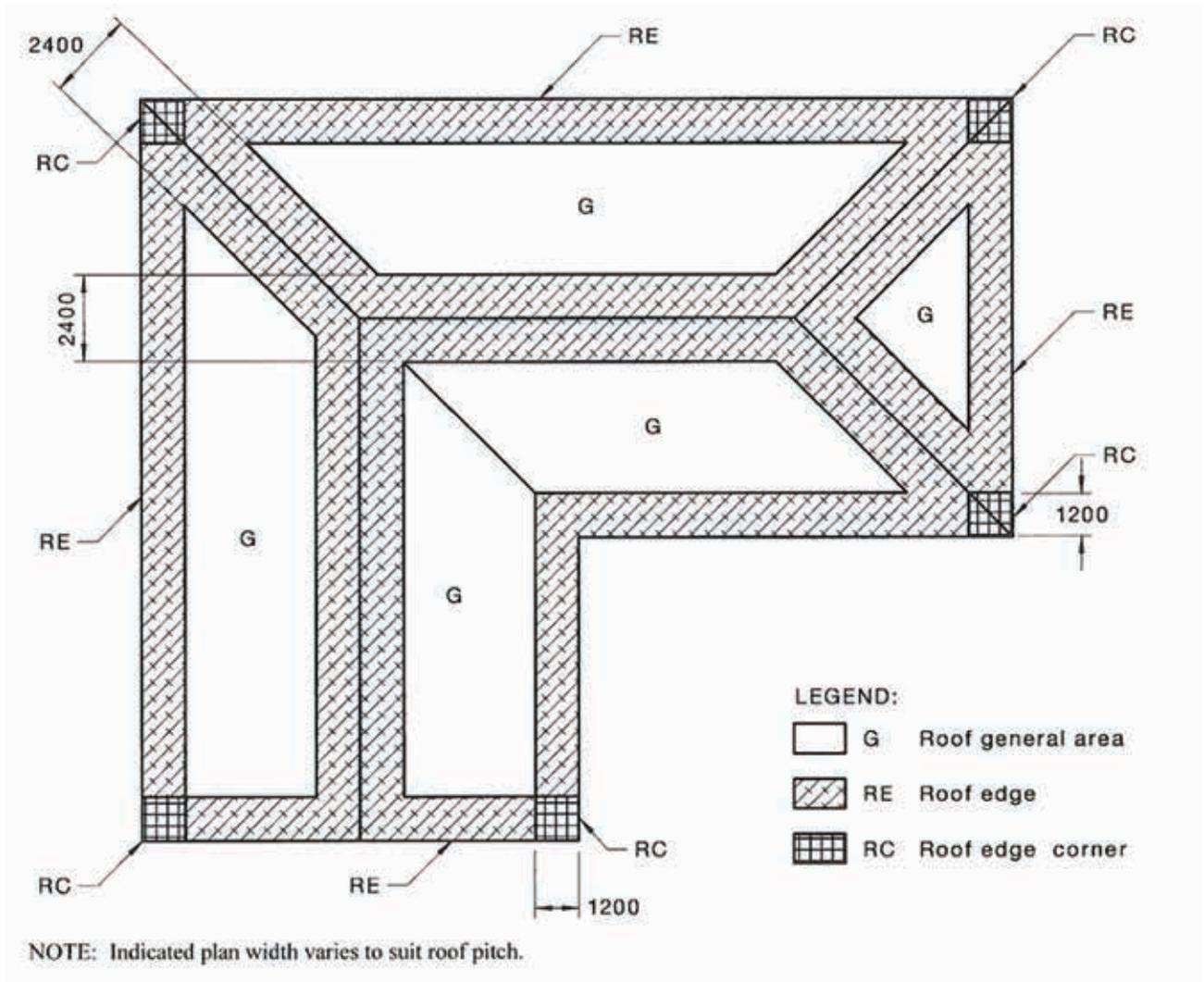
All supports (trusses) are minimum 1mm BMT G550 steel or F7 timber (pine) with TS40 battens fixed to supports in accordance with manufactures recommendations.

WAVELINE® 0.9mm BMT WALLS

Wind Class to AS 4055-2012	Wind zones to AS 4055-2012	Ultimate strength pressure kPa	Maximum TS4075 spacing (WAVELINE® 0.9mm span), mm			
			Supports (Trusses) at maximum spacing, mm			
			450	600	900	1200
C1	Within 1200mm Zone	2.7	1200	1200	1200	1200
	General Areas	1.8	1200	1200	1200	1200
C2	Within 1200mm Zone	4.02	1200	1200	1200	1200
	General Areas	2.68	1200	1200	1200	1200
C3	Within 1200mm Zone	5.91	1200	1200	1200	1180
	General Areas	3.94	1200	1200	1200	1200
C4	Within 1200mm Zone	7.99	1120	1120	1120	800
	General Areas	5.33	1200	1200	1200	1190

All fasteners to include cyclonic washers.

All supports (trusses) are minimum 1mm BMT G550 steel or F7 timber (pine) with TS40 battens fixed to supports in accordance with manufactures recommendations.



Roof edge (RE) batten spacing requirements apply to roof slopes less than 10 degrees.

In accordance with AS4055:2012, for Roof edge corner applications (RC) where the local pressure factor KI=3 for building corners with roof pitch < 10 degrees, it is recommended to provide an additional batten, thereby reducing the batten spacing in the corner areas.

2.2 PERMALITE LT7®

The versatility of this profile is due to its strength, water-carrying capacity and fixing economy. It is widely used for roofing and can be reversed for a bold wall effect.

Thickness Range	0.70mm, 0.90mm, 1.2mm
Length Range	850mm to 23 metres
Pan Cross Section Area	26,000mm ² / metre sheet width
Tolerances	Length +0mm, -15mm
	Width ±4mm
Finishes	Mill, Stucco Embossed, Painted



Figure 2.3 PERMALITE LT7® profile

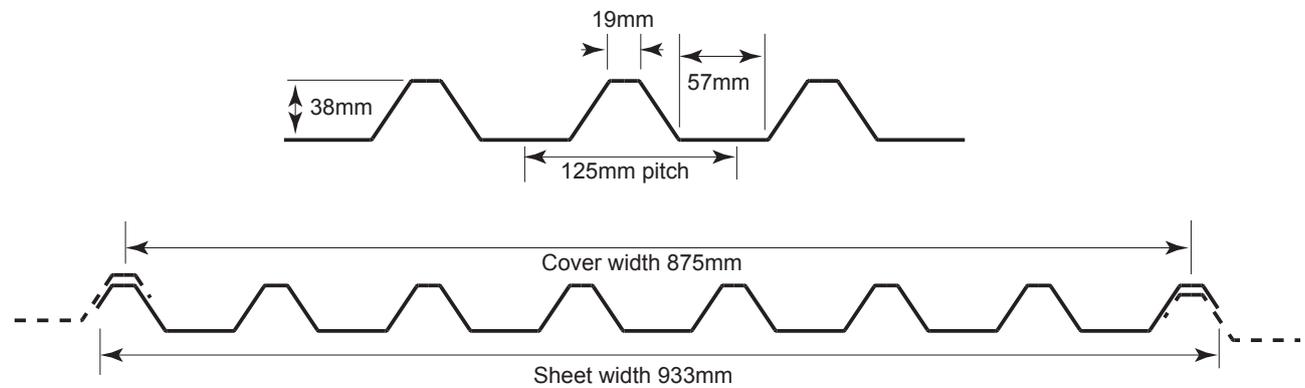
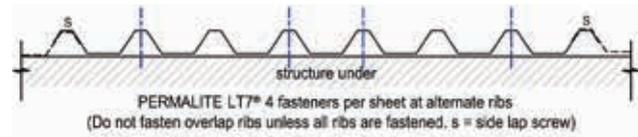


Table 2.3 Profile properties PERMALITE LT7®

Thickness (mm)	kg/m ² Cover Width (Mill Finish)	kg/m Length (Mill Finish)
0.70	2.645	2.314
0.90	3.401	2.976
1.20	4.534	3.967

Fastener positions

Non-cyclonic



Cyclonic

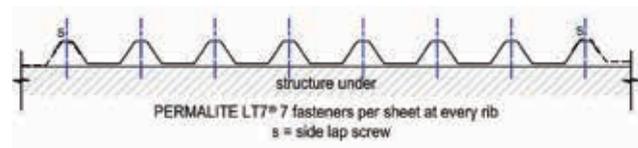


Table 2.4 LT7® Maximum spans (Non-cyclonic) - without aluminium formed washers

LT7® 0.7mm BMT ROOFS

Wind Class to AS 4055-2012	Wind zones to AS 4055-2012	Ultimate strength pressure kPa	Maximum TS4055 spacing (LT7® 0.9mm span), mm			
			Supports (Trusses) at maximum spacing, mm			
			450	600	900	1200
N1	Within 1200mm Zone	1.25	1200	1200	1200	1200
	General Areas	0.69	1200	1200	1200	1200
N2	Within 1200mm Zone	1.73	1200	1200	1200	1140
	General Areas	0.95	1200	1200	1200	1200
N3	Within 1200mm Zone	2.7	1200	1200	970	730
	General Areas	1.49	1200	1200	1200	1200
N4	Within 1200mm Zone	4.02	1140	980	650	490
	General Areas	2.21	1200	1200	1190	890
N5	Within 1200mm Zone	5.91	550	550	440	330
	General Areas	3.25	1200	1200	810	600
N6	Within 1200mm Zone	7.99	N/S	N/S	N/S	N/S
	General Areas	4.39	1070	900	600	450

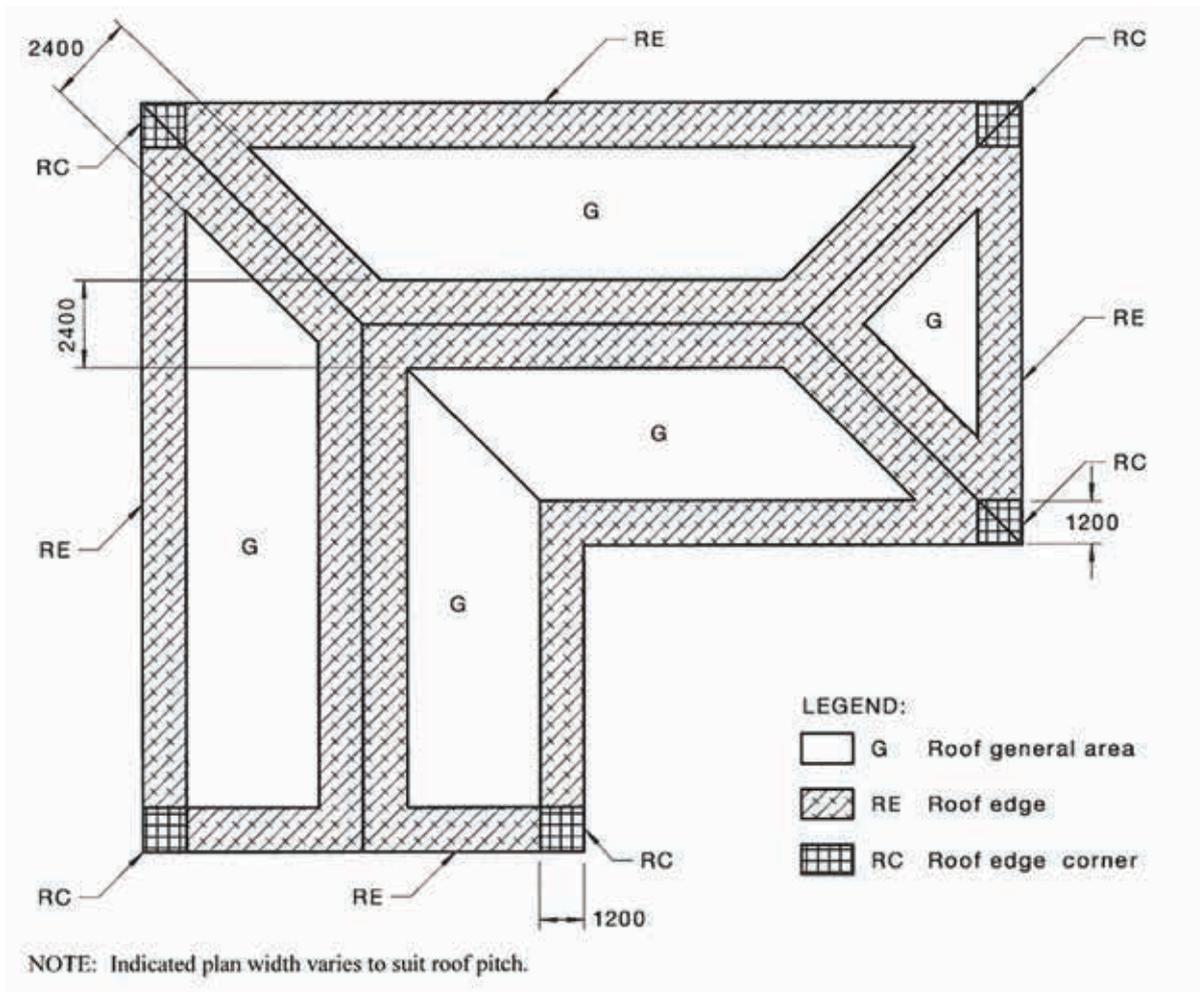
All supports (trusses) are minimum 1mm BMT G550 steel or F7 timber (pine) with TS40 battens fixed to supports in accordance with manufactures recommendations.

LT7® 0.7mm BMT WALLS

Wind Class to AS 4055-2012	Wind zones to AS 4055-2012	Ultimate strength pressure kPa	Maximum TS4055 spacing (LT7® 0.9mm span), mm			
			Supports (Trusses) at maximum spacing, mm			
			450	600	900	1200
N1	Within 1200mm Zone	0.94	1200	1200	1200	1200
	General Areas	0.62	1200	1200	1200	1200
N2	Within 1200mm Zone	1.3	1200	1200	1200	1200
	General Areas	0.86	1200	1200	1200	1200
N3	Within 1200mm Zone	2.03	1200	1200	1200	970
	General Areas	1.35	1200	1200	1200	1200
N4	Within 1200mm Zone	3.01	1200	1200	870	650
	General Areas	2.01	1200	1200	1200	980
N5	Within 1200mm Zone	4.44	1060	890	590	440
	General Areas	2.96	1200	1200	890	660
N6	Within 1200mm Zone	5.99	510	510	440	330
	General Areas	3.99	1140	990	660	490

All supports (trusses) are minimum 1mm BMT G550 steel or F7 timber (pine) with TS40 battens fixed to supports in accordance with manufactures recommendations.

Note: For cyclonic Limit State Wind Pressure capacities, please refer to the PERMALITE® Aluminium Roofing Solutions Manual.



Roof edge corner (RC) batten spacing requirements apply to roof slopes less than 10 degrees - consult Permalite for further advice.

3.0 Sheeting Installation

3.1 WAVELINE® Sheeting Installation

3.1.1 Convex Curved Roofs

In addition to aesthetic appeal, curved roofing avoids the requirement for a ridge cap flashing. This is a benefit on low slope ridged roofs.

Sheet may be curved over the full width of the roof or curved only at the ridge. Curved sheet at the eaves may also form effective sun control, roof drainage or cyclonic security.

There are 3 methods of curving sheet applicable to WAVELINE® and LT7®:

1. Spring curving – Straight sheet is held to the roof curve by the fixing screws, all purlins must be set at 90° to the arc tangent and there should be no curve between the eave purlins. End laps may be used on straight roof sections only.
2. Roll curving – This factory process is only suitable for WAVELINE® 762.
3. Crimp curved – This factory process forms a curve by crimping the profile at controlled intervals providing a striking visual effect and a small radius of curvature. Concave curves may also be supplied. (Note: This factory process is only suitable for LT7®).

3.1.2 Spring Curved Roofs

Sheets in a spring-arched (convex) roof are curved in a radius from eave to eave. WAVELINE® can be spring-curved for an arched roof. Table 2.5 shows the acceptable radii.

The top face of all purlins / battens must accurately follow and be tangential to the radius of the arch. The radius of curvature can be calculated from the formula in Figure 2.4.

3.1.3 Condensation

Condensation occurs on the underside of all metal roofing when the roof metal temperature falls below the dew point of humid air held against the underside of the roof.

Control of under roof condensation can be affected through the reduction of the moisture content of the air under the roof by one or more of the following procedures.

1. Providing ample ventilation, which allows air to move through the ceiling space.
2. Using ceiling linings with a moisture barrier on the upper surface.
3. Stretching 50mm insulation blanket, with aluminium foil laminated to the underside, over the purlins before laying the roof. All joins in the blanket and around penetrations should be sealed with waterproof adhesive tape.

Of the above b) provides the best ceiling/roof condensation control. Although c) may be less effective in controlling ceiling condensation it significantly reduces the effect of roof noise.

Consideration should also be given to the effect of condensation on the underside of exposed exterior roofing such as eaves or awning. The unsightly discolouration which can occur may be avoided by placing a lining underneath with a 100mm air gap between the lining and the metal roof. Alternatively, painting the underside of the roof sheeting will retard discolouration but not condensation.

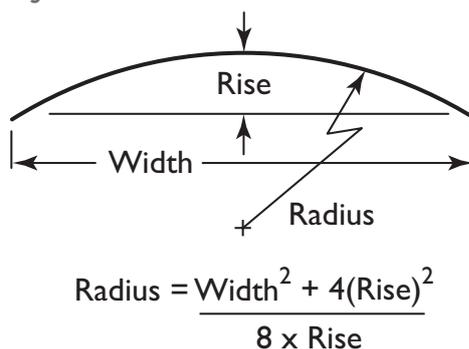
Table 3.1 Recommended radii for convex spring-curving

Minimum Curving Radius	Minimum Radius (m)	Purlin Spacing at Minimum Radius (mm)	Maximum Radius ¹ (m)
LT7® (Spring Curve)	18	1400	60
LT7® (Crimp Curve)	0.5	1400	60
WAVELINE® (Spring Curve)	12	1000	30
WAVELINE® 762 (Roll Curve) (Applies to 762mm cover only)	0.6	1000	30

¹Maximum radius is to provide sufficient drainage near crest of arch.

NOTE: Stucco embossed can not be roll or crimp curved.

Figure 3.1 Calculation of radius



3.2 Design of Drainage

Roof drainage systems can be affected by a number of variables and must be designed and detailed by a suitable qualified trade or professional. The design of roof drainage aims to protect people, property and the building. The designed drainage system must be installed under the supervision of a qualified trade or professional. The steps of the design process are illustrated below.

1. Determine average recurrence interval (ARI)
2. Obtain rainfall intensity of site
3. Work out roof dimensions.
4. Determine catchment area with slope
5. Determine area for proposed eaves gutter.
6. Determine catchment area per downpipe
7. Determine number of downpipes required
8. Determine location of downpipes and high points
9. Check catchment area for each downpipe.
10. Determine downpipe size
11. Determine overflow measures

More guidance is given in BCA, AS/NZS 3500.3:2003, HB114:1998 and Bluescope Lysaght publication - Roofing & Walling Installation Manual.

The minimum gutter fall should be 1:200 for effective gutter operation and prevention of ponding.

3.3 Turn-up WAVELINE® Cladding

At the high end of roofing, wind can drive water uphill, under the flashing or capping, into a building. To minimise this problem, you turn up the valleys (or pans) at the high end of roofing. (The process is called turning-up (or stop-ending).

All roofing on slopes below 1 in 2 (25°) should be turned-up.

During the turn-up operation, care should be exercised to prevent tearing or puncturing the steel sheets.

You can turn-up sheets before or after they are fixed on the roof. If you do the latter, you must have sufficient clearance for the turn-up tool at the top end of the sheets (about 50mm).

With pliers, multi-grips or a shifting spanner closed down to approximately 2mm, grip the valley corrugations 20mm in from the end of the sheet and turn up as far as possible. Be careful not to tear the sheet.

Turn-up tools are available for the LT7® profile.

3.4 Minimum Roof Slopes

On very low slopes care must be taken to ensure that purlin sag or misalignment does not result in water ponding on the roof, particularly if end laps are used.

Minimum recommended roof slopes for WAVELINE® is 5° (degrees) and 1° (degree) for LT7®.

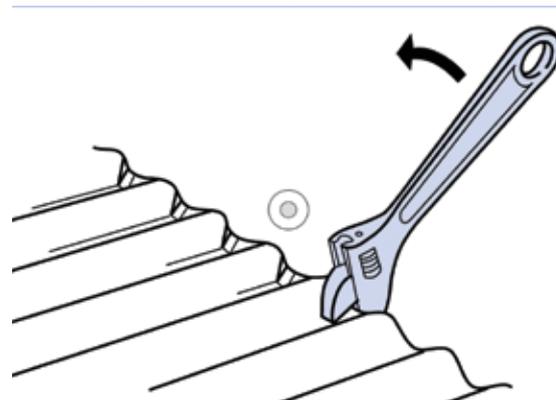
3.5 Maximum Roof Slopes

The high discharge velocity of rainwater from slopes over 25° can result in side lap leakage. Where the slope exceeds 25°, a continuous run of silicone sealant is to be placed under the outer leg of the side lap during sheet installation.

Table 3.2 maximum lengths for drainage (m)

Intensity (mm/hr)	Roof Slope (degrees)								
	1°	2°	3°	5°	7.5°	10°	15°	20°	25°
LT7®									
100	90	111	131	163	194	223	247	274	298
150	60	74	87	108	129	149	165	183	198
200	45	56	65	81	97	111	123	137	149
250	36	45	52	65	78	89	99	110	119
300	30	37	44	54	65	74	82	91	99
333	27	33	39	49	58	67	74	82	89
500	18	22	26	33	39	45	49	55	60
WAVELINE®									
100	-	-	-	23	28	32	35	39	42
150	-	-	-	15	18	21	23	26	28
200	-	-	-	12	14	16	18	20	21
250	-	-	-	9	11	13	14	16	17
300	-	-	-	8	9	11	12	13	14
333	-	-	-	7	8	10	11	12	13
500	-	-	-	5	6	6	7	8	8

Figure 3.2 Turning-up WAVELINE®



3.6 Installation Safety

It is most important for safety reasons that during sheet laying walking on the roof is reduced to an absolute minimum and along the battens only.

3.7 Preparation

Before commencing to lay the sheet, consideration should be given to the installation of gutter and eave flashings, insulation and the location of roof penetrations such as vents, skylights etc.

A pencil of any colour may be used except black or so-called lead pencils. Don't use black pencils to mark roofing or walling because the graphite content can create an electric cell when wet and thus cause deterioration of the finish. You can also use a string line with chalk dust, or a fine, felt-tipped marker.

3.8 Squareness

Check the roof or wall structure for squareness before commencing to lay sheet. Sheet must be laid square to the ridge wherever practical. Out-of-square which exceeds 100mm over the sheet length should be corrected by trimming the edge of the sheet laid against the out-of-square edge. Any sag of roof support should be corrected before commencement.

Insulation should be laid with the roofing to avoid the possibility of rain wetting the insulation.

3.9 Batten Isolation

In most situations the face of a timber support against which the sheeting is fastened, is to be painted with a bituminous paint, or in the case of metal purlins / battens or supports, a good quality (and appropriate width i.e. support width + 20mm) adhesive PVC or polyethylene tape with a minimum thickness of 250microns. Alternatively, the common practice of laying foil bound insulation blankets over roof battens will provide effective isolation between the batten and sheet although special attention is required at building edges to prevent wind borne moisture ingress and ensure isolation is maintained as per 5.6.2 Gutter apron.

3.10 Sheet Installation

Customary practice is to lay out an area of sheet and secure each sheet with a crest fastener at the centre of the ends and middle, at the same time checking the profile to avoid profile spread. The area of sheet laid out should be no more than that which can be fully fixed within the day of laying. When the area of sheet has been laid, install the balance of crest fasteners.

Wherever possible commence laying the sheet farthest from the expected direction of the heaviest rain or wind and from the eave toward the ridge.

The top end of the sheet should be not more than 100mm from the ridge or fascia line and the bottom end should extend 50mm into the gutter. The ridge and eave ends are to have the pans upturned and downturned respectively. Roof slopes greater than 25° require side lap sealing, with a continuous run of silicone sealant

3.11 Sheet Cutting

Where possible, you should minimise site-work by using sheets cut to length in the factory. Aluminium is best cut with a wax-lubricated fine tooth circular saw.

3.12 Wall Cladding

Wherever possible, commence fixing farthest from the expected direction of the heaviest wind or rain. Where more than one length is used for the wall height an overlap of 100mm should be allowed at a girt with the upper sheet overlapping the lower as for roofing end laps.

For non-cyclonic applications, the sheet is hard fixed to battens through the pan next to the rib using the RA018 stitching screws at battens.

For cyclonic applications wall sheeting shall be installed as per cyclonic roof sheeting (i.e. with washer at each rib)

Note: Expansion fixing notes

3.13 Post Painting

Manual post painting is not recommended.

3.14 Translucent Sheeting

Translucent fibreglass sheets are available for PERMALITE LT7®.

In the PERMALITE WAVELINE® profile, translucent sheets are only available in 762mm cover width.

The recommendations for end lapping roofing sheet apply also to the placement of translucent sheets into a roof.

Because of slight differences in profile all overlapping surfaces should have silicone sealant placed between them. Fasteners must have a sealing washer under the head. All ribs at the ends of the sheeting, and alternate ribs at intermediate purlins, are to be fastened with crest fasteners and washers.

3.15 Sealants

Silicone sealants used with aluminium sheeting must be neutral cure.

Neutral-cure silicone sealants:

- have good adhesion to the clean surface of all our roofing and walling;
- are water resistant and non-corrosive;

3.16 Ordering Sheet

The quantity and length of sheet should not be determined from drawings but from actual measurements of the structure making due allowance for squareness of the structure.

Where sheets are to be lapped, the minimum lap length on the underlapped sheet will be 300mm and must occur over a support. The longest sheet to be used is 11 meters for WAVELINE®. Requirements in excess of this 11m length are to be met by end lapping sheets or providing a step in the roof.

3.17 End Laps

When endlaps are required an 7mm pre-drilled hole will be required through both sheets to allow for thermal expansion. The fastener should then be fixed through the centre of this hole and fixed to the support below.

3.18 Expansion Fixing for Thermal Expansion

To allow for thermal expansion of aluminium, Permalite advise expansion fixing is required as set out in this manual.

For roof lengths in excess of 9m, "Hard" fixing is used for the first 9m from the ridge or skillion head. Expansion fixing is used for the remainder of the sheet length and follows the same procedure as hard fixing with the exception that the hole in the rib crest is slotted after drilling the tapping hole (using tool RA165 for the LT7® profile).

On large projects contact your Permalite sales representative regarding use of this tool (RA165).

Note that for expansion fixing a rubber washer with an elongated hole and Teflon facing on one side is used. This washer must be installed with the Teflon side facing up toward the head of the screw. For WAVELINE®, expansion is provided by drilling an 7mm hole in lieu of slots noted above.

All flashing runs over 9m shall make allowance for expansion. Each lap within the run shall be sealed with a non-curing silicone sealant to allow for movement. Lap fasteners shall have the upper flashing pre-drilled with a 7mm hole.

Although aluminium has twice the coefficient of expansion of steel (24 x 10⁻⁶ compared to 12 x 10⁻⁶ °C) the effect of this is often over estimated. NOTE: As an approximation, aluminium expands 1.2mm/m over 50° temperature change.

Figure 3.3 Commencing installation

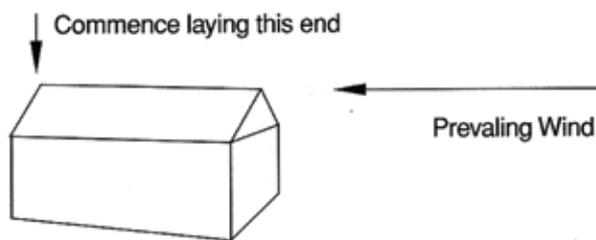


Table 3.3 Use of washers (cyclonic only)

	WAVELINE®
Formed washer	RAWLCYCP
Hard fix Rib seal	RAWLCYSW
Expansion Fix Rib seal	RAWLCYSW

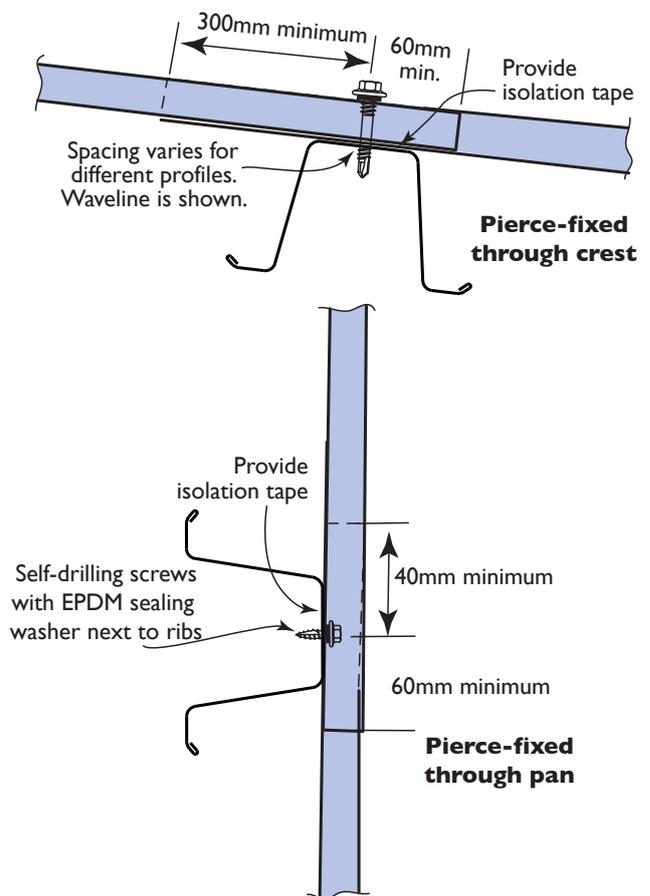
Note: Hard fix top 9m of each sheet.

Table 3.4 Rib Fasteners - Non-cyclonic
(per square metre of roof sheet,
assumes 1200mm c/c roof battens)

	WAVELINE®	LT7®
Intermediate battens	7.8	5.8
Eave/Ridge battens	7.8	5.8

1. Based on fixing alternate ribs.
2. Based on 0.9 metre purlin centres, to be increased proportionally as purlin centres are reduced.

Figure 3.4 Attachment to battens



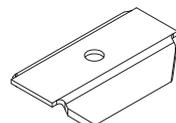
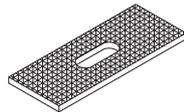
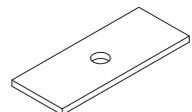
4.0 Fasteners

Table 4.1 Use of Fasteners

Fixed to:	LT7®	WAVELINE®	Notes
Crest fixed to steel less than 3mm but greater than 0.50mm or aluminium less than 5mm but greater than 3mm	RA115	RASH1450	
Crest fixed to steel between 0.42mm and 0.48mm or aluminium between 1mm and 3mm	RA206	RA205	4.5mm diameter pilot hole may be required into steel between 0.42mm and 0.48mm with screw installed below 750rpm
Crest fixed to timber	*RA206	RA205	4.5mm diameter pilot hole required into hardwood
Valley fixed to steel less than 3mm but greater than 0.75mm or aluminium less than 5mm but greater than 3mm	RA114	RA114	
Valley fixed to steel between 0.42mm and 0.75mm or aluminium between 1mm and 3mm	RA018	RA018	4.5mm diameter pilot hole required into steel over 0.55mm
Valley fixed to timber	RA009	RA009	4.5mm diameter pilot hole required into hardwood
Sidelap Fastening	RA018	N/A	Full aluminium Rivets may be used in lieu of screws. Permalite recommend trifold rivets
Flashings to roof sheet	RA018	RA018	
Flashings thru roof sheet to supports	As per crest fix fastener for sheet		

4.1 Fastener Specification

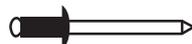
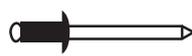
LT7®

	*RA206 14X80 stainless steel Roofzip screw with aluminium bonded washer.
	RA115 14X80 hex. head stainless steel Teks® self drilling screw with aluminium bonded washer
	RA023 57 x 20mm aluminium formed washer with 6mm diameter hole for expansion fixing and cyclonic regions.
	RA033 45 x 20 x 2mm EPDM/Teflon flat washer with slot. Teflon faced on one side for expansion fixing
	RA036 50 x 20 x 2mm EPDM flat washer with 6mm diameter hole for cyclonic regions only.

WAVELINE®

	RA205 14X52 stainless steel Roofzip screw with aluminium bonded washer.
	RASH1450 - 14X52 hex. head stainless steel Teks® self-drilling screw with aluminium bonded washer for fixing into steel battens and purlins up to 3.5mm thick.
	RAWLCYCP - WAVELINE® stainless steel cyclonic plate used in conjunction with RAWLCYSW for cyclonic regions only.
	RAWLCYSW - WAVELINE® cyclonic sealing washer used in conjunction with RAWLCYCP (Hard fix for cyclonic regions only.)

Fasteners common to both profiles

	RA009 - 14X25 hex. head stainless steel Type 17 screw with aluminium bonded washer		RA016SH - 10X25 Wafer. head self-drilling stainless steel screw for fixing of Quad gutter brackets to Fascia cover or fascia system.
	RA114 - 14X31 hex. head stainless steel Teks® self-drilling screw with aluminium bonded washer for pan fixing wall cladding to steel frames up to 3.5mm thick.		RA016TH - 8X25 Button head S point stainless steel screw for fixing of Fascia cover to timber.
	RA018 - 12X20 hex. head stainless steel stitching screw with aluminium bonded washer for stitching of flashings and sheeting		RA017TH - 10X38 Button head S point stainless steel screw for fixing of Quad gutter brackets through Fascia cover into timber.
			PLRIVETAL1000 - 3.2x7.0mm [AA-4-2] all aluminium rivet.
			PLRIVETAA64 - 4.8x11.4mm [AA-6-8] all aluminium rivet with a grip range of 4.8 - 6.4mm.

* Screw may need to be up-sized to ensure min embedment of 25mm in to timber

For comprehensive fixing details please refer to the PERMALITE® Aluminium Roofing Solutions Manual available at: www.permalite.com.au

5.0 Rainwater Systems

5.1 Gutters and Accessories

Permalite offers a complete solution for your residential project with a range of aluminium gutters and custom flashings all with a maximum length of 6.5m. The PERMALITE® range of gutters and flashings are manufactured from marine grade aluminium for outstanding durability in line with the roofing performance. (Aluminium alloys 5251 or 5052, in H32 temper)

In addition to the standard range included in this manual Permalite are able to offer wide range of customised gutters and accessories to suit your requirements. Please contact Permalite for more information.

As you would expect Permalite are able to provide accessories for these gutters such as:

- Stainless steel powder coated gutter brackets
- Aluminium stop ends
- Aluminium downpipe spigots or spouts
- Aluminium 90 or 100mm tapered downpipes
- Screw and rivet fixings
- Neutral cure silicone



5.2 Fascia and Fascia Cover

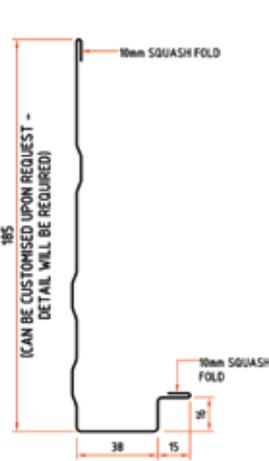
Permalite also offer a marine grade aluminium fascia cover to allow you to cover warped, discoloured or peeling timber fascia. Thus giving you a fresh look without having the expense of removing the old fascia board! This low maintenance fascia cover may be simply screw fixed to the existing timber fascia board.

In addition to the fascia cover Permalite are able to offer a Marine Grade Aluminium Alluline™ Fascia system including aluminium rafter brackets, fascia corners, joiners etc. This fascia system is based on the popular Lysaght Novaline® fascia. It should be noted however, that the longest length for the Alluline™ fascia is 5m.

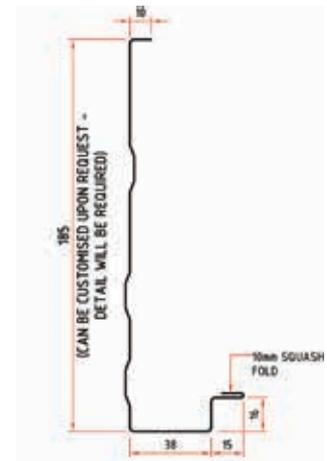
Figure 5.1 Nominal Dimensions (customisable)

Dimensions for the fascia cover are able to be customised to suit your project requirements. Customised Internal and external corners are also available to simplify the installation process.

Fascia type 1



Fascia type 2



Alluline™ Fascia



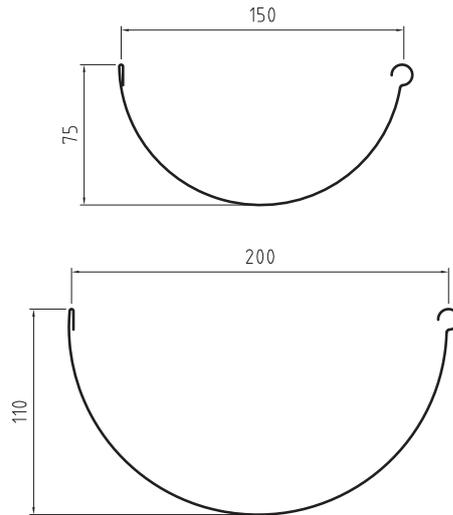
5.3 Half Round Gutters

Permalite offer traditional half round gutters in a size range from 150 to 300mm, all with the full range of accessories in our residential colour range.

Permalite are also able to offer flat back gutters and associated accessories if required. Min orders quantities and extended lead times may apply. The half round gutter range are supported by 316 SS external gutter brackets painted to match gutter colours.



Half Round Gutters

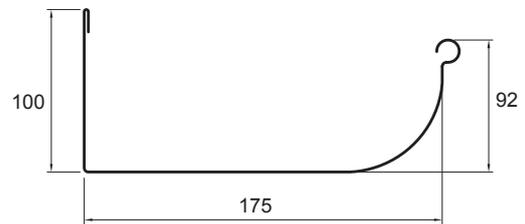
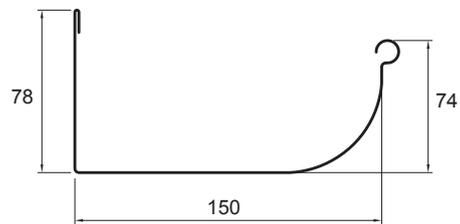


5.4 Quad 150 & Quad 175 Gutters

Permalite offer a 150mm and 175mm quad gutters in marine grade aluminium, in the standard residential colour range. These gutters are affixed using external 316 SS brackets painted to match the gutter colour.



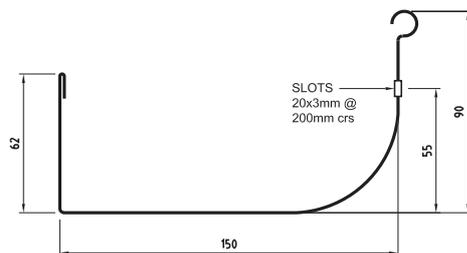
Low Front Quad gutters



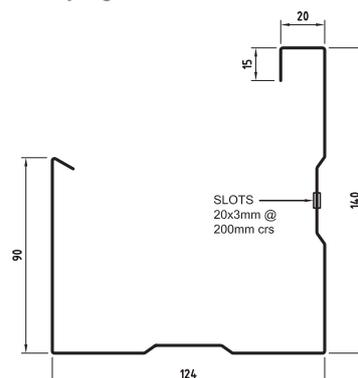
5.5 Other Available Gutters

Permalite are also able to offer other gutter styles and associated accessories if required. Please contact us for more details.

High Front Slotted Quad gutter



'M' Style gutter



5.6 Gutter Fixing

All PERMALITE® gutters are designed to be fixed with supports spaced at no more than 900mm intervals, including stop ends. All screw fasteners must be minimum 304 SS with rivet fasteners being full aluminium. Lap joints should have a minimum overlap of 25mm in the direction of water flow and be sealed and fastened.

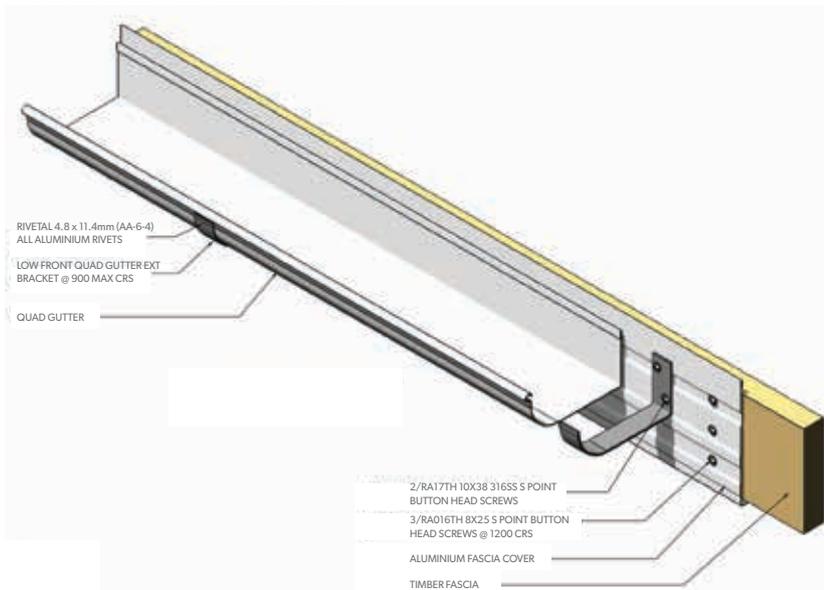
Gutter fixings to the PERMALITE® Aluminium Alluline™ fascia system require special attention to ensure that the fascia system is able to support the weight of full gutters in storm events. Fixing details for both quad and 1/2 round gutter systems are shown in the following pages.

5.6.1 Fall

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

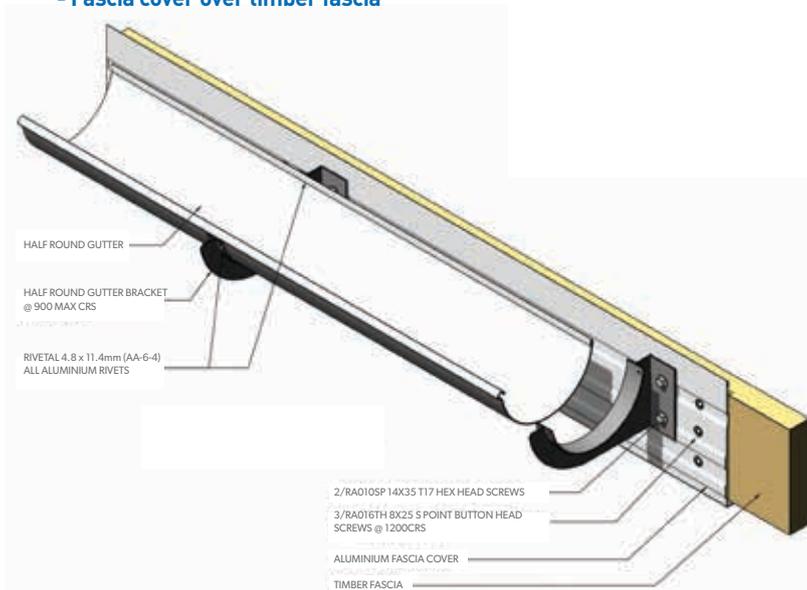
Low front quad gutter fixing detail

- Fascia cover over timber fascia



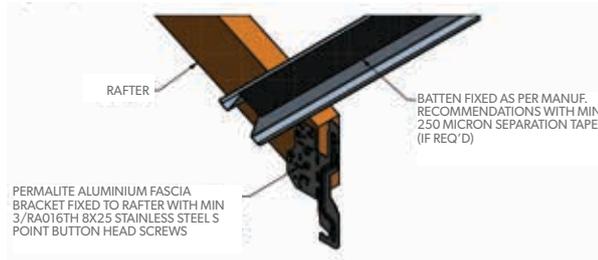
Half round gutter fixing detail

- Fascia cover over timber fascia

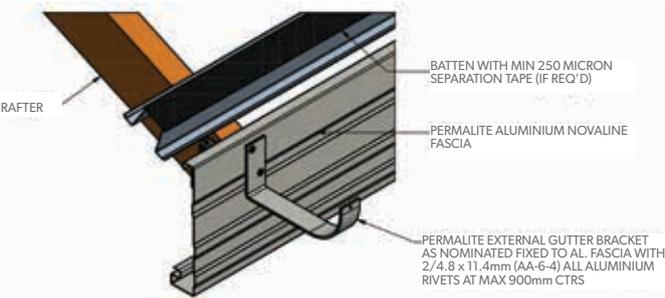


Low water carrying (lightweight) gutter fixing detail - Alluline™ fascia (quad gutter shown as example)

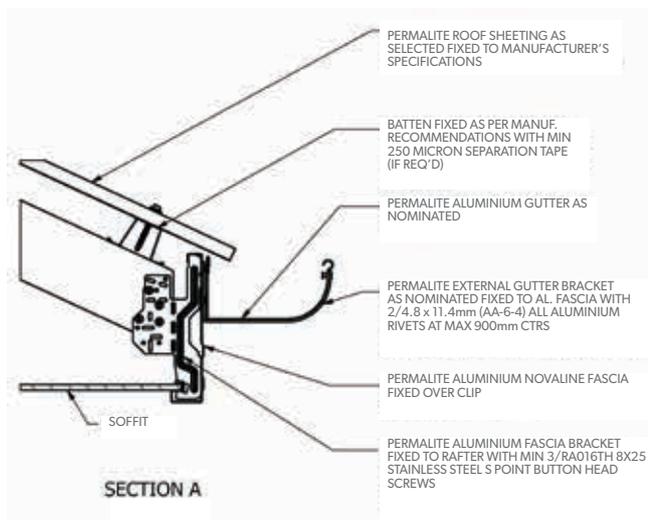
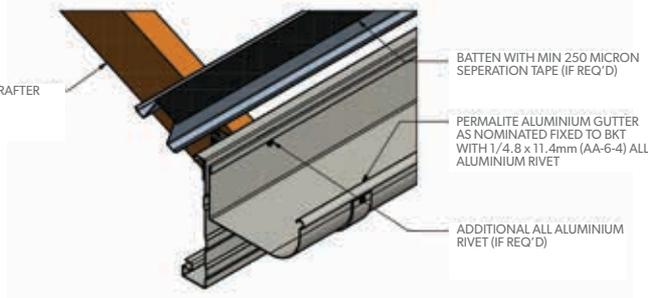
Fascia bracket detail



Gutter bracket detail

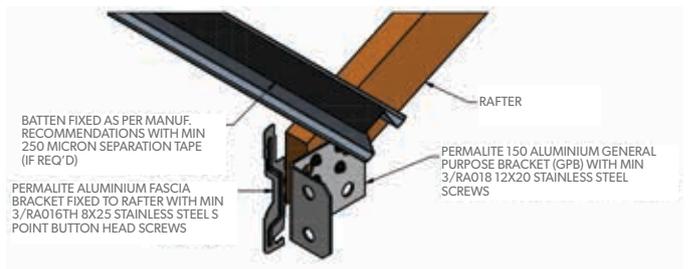


Gutter detail

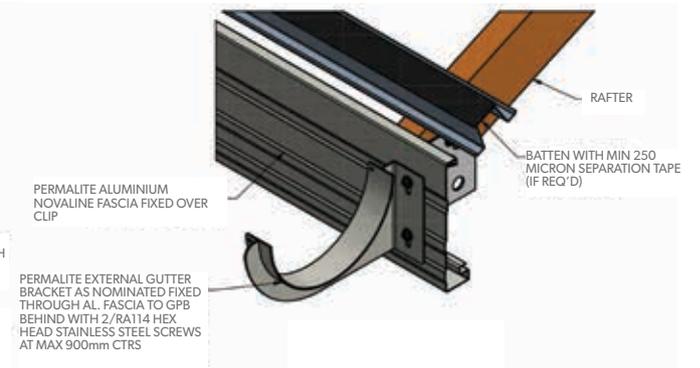


High water carrying (heavyweight) gutter fixing detail - Alluline™ fascia (half round gutter shown as example)

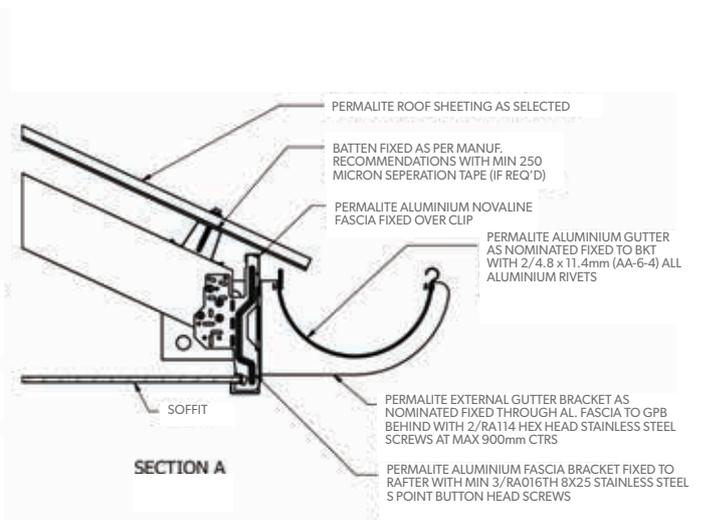
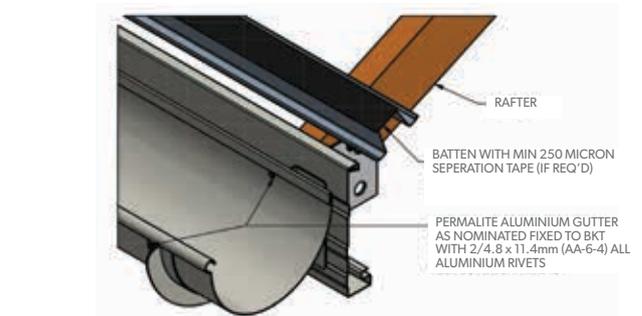
Fascia bracket and GPB detail



Gutter bracket detail



Gutter detail



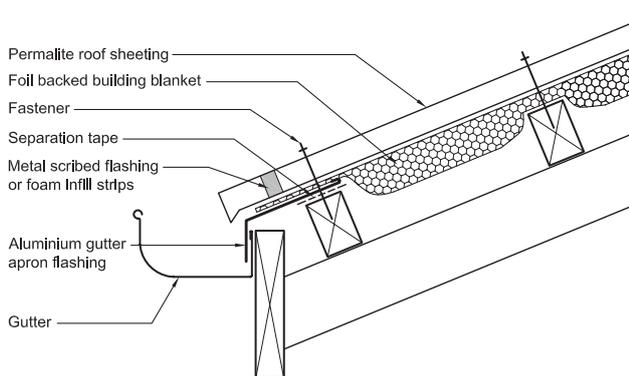
5.6.2 Gutter apron

Where the ends of roof cladding are exposed to contaminants such as sea salt or industrial pollutants it is better practice to provide an over flashing which discharges into the gutter or spouting for the following reasons. (see Figures 4.14 & 4.15)

- It provides a measure of protection to the underside of the roof cladding and the underlay.
- It provides support for the roofing underlay which is subject to damage from wind and UV.
- If there is no spouting or it has a low front.
- It provides protection against wind-borne embers.
- Where the ends of roof cladding are exposed in a severe environment, contaminants can be driven up the ribs of the cladding. Metal scribe flashings or filler blocks can be used to prevent or inhibit ventilation.

The over-flashing should extend 50mm into the gutter and the underlay finishes on the down-slope of the flashing. If there is no over-flashing to the gutter a suitable 250 micron isolation tape should be extended into the gutter by a minimum of 50mm.

Gutter apron detail



5.7 Timber and Metal Compatibility

Under no circumstances should galvanised steel, ZINCALUME® steel, lead, copper, brass, or copper alloys be placed in contact with aluminium, nor should you permit water run-off from these materials to discharge onto aluminium sheets.

Care must be taken to avoid contact with building materials such as unseasoned or chemically treated timber, lime cement, concrete, mortar or plaster during construction and to provide impermeable barriers against long term contact.

In most situations the face of a dissimilar metal or timber support, against which the sheeting is fastened, is to be painted with chromate based primers/bitumous paint or good quality (and appropriate width) adhesive PVC tape.

Under severe marine and/or aggressive industrial environments Denso tape or closed cell polyethylene tape should be used to completely fill the sheet/structure interface to avoid moisture retention by capillary action. Permalite will provide advice in such situations.

If there are doubts about the compatibility of other products being used, seek advice from our technical representative.

Sealed Joints

For sealed joints use screws or rivets and a neutral cure silicone sealant branded as suitable for use with marine grade aluminium.

Maintenance

The roof drainage system (gutter, downpipes, overflow devices and all other components) must be cleaned out on a regular basis.

5.8 Walking on Roofs

It is important that you walk on roofing carefully, to avoid damage to either the roofing or yourself. Generally, keep your weight evenly distributed over the soles of both feet to avoid concentrating your weight on either heels or toes. Always wear smooth soft-soled shoes; avoid ribbed soles that pick up and hold small stones, swarf and other objects.

When you walk across the ribs, walk over or close to the roofing supports. (Usually over fastener locations.) Be careful when moving between supports. Do not walk on the rib immediately adjacent to flashings or translucent sheeting. Walk at least one rib away.

Temporary plank walkways should be provided while other trades walk on the roof.

Always take particular care when walking on wet or newly laid sheets — particularly on steeply pitched roofs.

Clean up

Remove all plastic cover strips from product and dispose of correctly.

Sweep all metallic swarf and other debris from roof areas, gutters, downpipes, overflow devices and all other roof drainage components, at the end of each day and at the completion of the installation.

Table 5.1: Compatibility of direct contact between metals or alloys

Roof Drainage System Components & Any Cladding Material	Accessories or Fastener or (Upper Surface)								
	ZINCALUME®	Galvanised Steel	Zinc	COLORBOND® Including Ultra & Metallic	COLORBOND® Stainless	Stainless Steel (2)	Aluminium Alloys	Copper & Copper Alloys (1)	Lead
Aluminium Alloys	No (4)	No	Yes	No	No	Yes	Yes	No	No
ZINCALUME® steel (4)	Yes	Yes	Yes	Yes	No	No	No	No	No
Galvanised steel (4)	Yes	Yes	Yes	Yes	No	No	No	No	No
Zinc	Yes	Yes	Yes	Yes	No	No	Yes	No	No
COLORBOND® steel (Plus Ultra & Metallic)	Yes	Yes	Yes	Yes	No	No	No	No	No
COLORBOND® Stainless	No	No	No	No	Yes	Yes	No	No	No
Stainless steel	No	No	No	No	Yes	Yes	No	No	No
Copper & Copper Alloys (1)	No	No	No	No	No	No	No	Yes	No
Lead	No	No	No	No	No	No	No	Yes	Yes

(1) Monel - copper/nickel alloy

(2) For further guidance refer to AS/NZS 3500.3:2003

(3) Fixings only

(4) Our experience is that these materials are not compatible in extremely corrosive environments, so our advice differs from AS/NZS 3500.3:2003

Table 5.2: Acceptability of drainage from an upper surface to a lower metal surface

Lower Roof Drainage System Material	Upper Cladding or Roof Drainage System Material									
	ZINCALUME®	Galvanised Steel	Zinc	COLORBOND® Including Ultra & Metallic	COLORBOND® Stainless	Stainless Steel	Aluminium Alloys	Copper & Copper Alloys (1)	Lead	Glazed Tiles, Glass & Plastic
Aluminium Alloys	No	No	Yes(2)	Yes	Yes	Yes	Yes	No	No	Yes
ZINCALUME® steel	Yes	Yes	Yes	Yes	Yes	Yes	Yes(3)	No	No	Yes
Galvanised steel	No	Yes	Yes	No	No	No	No	No	Yes	No
Zinc	No	Yes	Yes	No	No	No	No	No	Yes	No
COLORBOND® steel (Plus Ultra & Metallic)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
COLORBOND® Stainless	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stainless steel	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Copper & Copper Alloys (1)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lead	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(1) Monel - copper/nickel alloy

(2) For further guidance refer to AS/NZS 3500.3:2003

(3) Our experience is that these materials are not compatible in extremely corrosive environments, so our advice differs from AS/NZS 3500.3:2003

5.9 Flashings and Accessories

Permalite offer a full range of custom flashings in aluminium alloy 5251 or 5052 H32 to ensure the best finish to your project. In addition to the industry standard range of custom flashings Permalite also offer Gable roll and Rolltop ridges for the classic colonial finish to your WAVELINE® roof.

50mm Gable Roll/ Barge Roll – Made from 0.8mm marine grade aluminium pre-painted finish in lengths up 3m.

55mm Roll Type Ridge - Made from 0.8mm marine grade aluminium pre-painted finish in lengths up to 6m.

RAWL762 – Foam Closure Strip

Permalite also offer the entire range of custom flashings and Trade work made to your drawings in both mill finish and painted marine grade aluminium.

5.10 Flashing Materials

It is very important that flashings be made from materials that are compatible with the cladding.

Lead flashing is not recommended, however it will usually be retained when re-roofing, because it is usually cemented into the structure. In these cases:

- the top surface of the lead flashing must be painted with a good quality exterior paint system (to limit contamination with lead compounds in water running off the flashing); and
- there must be a barrier between the lead flashing and the cladding: either a plastic strip (such as polythene dampcourse), or paint.

Flashings should conform to AS/NZS 2179.1:1994, and AS/NZS 3500.3:2003, and be compatible with the cladding.

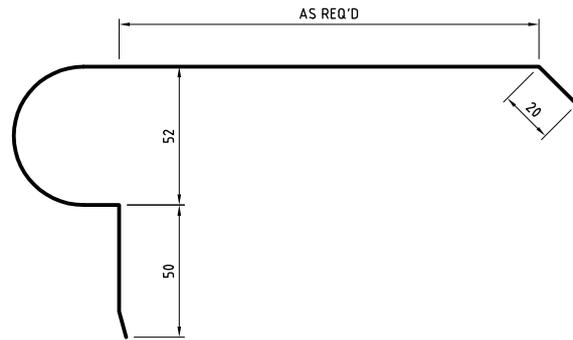
In all cases it is important to have ample cover provided by the flashing and proper turn-up of the cladding underneath.

The correct installation of flashings to seal the roof perimeters or penetrations is essential to the security and weather-tightness of the roof. Consideration should be given to movement between the roof and building walls and to length expansion of flashings.

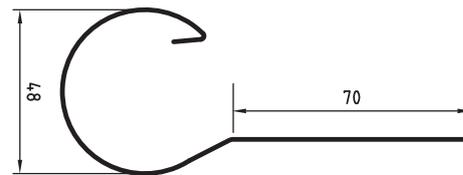
Permalite is able to supply a range of flashings which are provided to the same metal specification as the roofing sheet. Where custom made flashings are required the metal should be to the following specification.

Alloy	5251/5052 preferred 5005 alternatively
Temper	H32 or H34
Thickness	0.90mm /0.8mm
Bend Radius	0.9mm / 0.8mm - 0t where "t" represents thickness of the pre-painted material

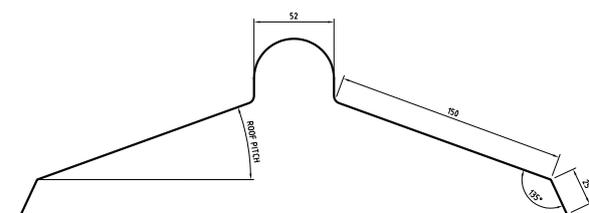
Barge Roll



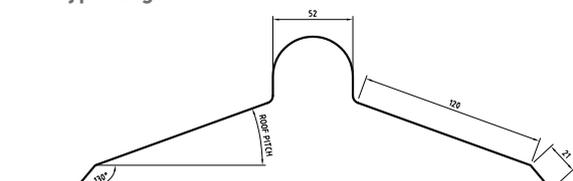
Gable Roll



Roll Type Ridge - Standard



Roll Type Ridge - NSW



5.11 Aluminium Top Hat Sections

Permalite are able to offer a range of aluminium extruded top hat sections for the use of roof, wall and ceiling battens. The top hat sections are available in a 6000 series grade aluminium, with the following properties:

	ALLOY/TEMPER:	MASS:	STOCK LENGTHS:
Top Hat 16	6063 T5	0.791kg/m	6.5m
Top Hat 25	6063 T5	0.913kg/m	6.5m
Top Hat 37	6005A T5	1.384kg/m	6.5m
Top Hat 40	6005A T5	1.594kg/m	6.5m

Other alloys/temperers are available, subject to MOQ's, lead times and availability.

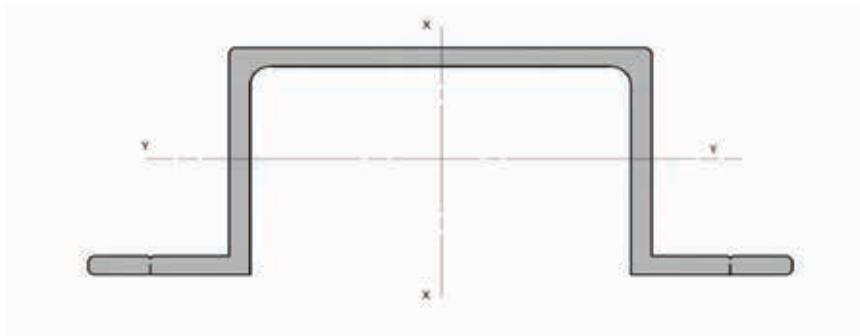
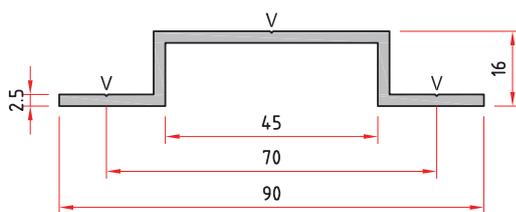


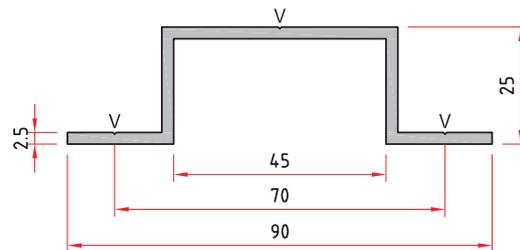
Table 5.3: Top Hat Sections

Product	Thickness (mm)	Area (mm ²)	Mass per Unit Length (kg/m)	Second Moment of Area (x10 ⁴ mm ⁴)		Shear centre to centroid distance (mm)	Section Modulus (X10 ³ mm ³)			Radius of Gyration (mm)		Torsion Constant (mm ⁴)	Warping Constant (10 ⁶ mm ⁶)	Mono-symmetry Constant By (mm)
				I _x	I _y		Z _x	Z _y	Z ₀	r _x	r _y			
Top-Hat 16	2.5	292.5	0.791	0.19	0.01137	10.94	4.221	1.4745	1.3717	25.487	6.235	609.4	2.572	91.59
Top-Hat 25	2.5	337.5	0.913	0.2153	0.03328	18.74	4.785	2.755	2.576	25.257	9.930	703.1	8.538	77.27
Top-Hat 37	3.0	507.9	1.384	0.4157	0.10556	29.3	8.314	6.18	5.299	28.610	14.417	1512	38.32	91.91
Top-Hat 40	3.0	609.9	1.594	0.8418	0.1686	33.38	13.58	10.725	6.944	37.153	16.627	1818	109.7	116.2

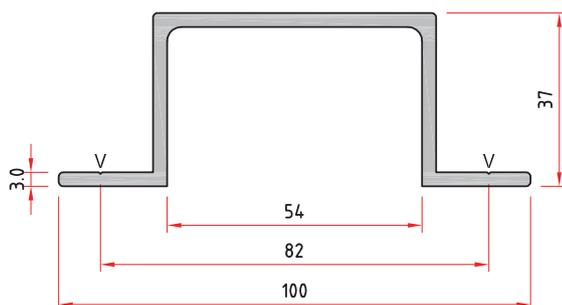
Top Hat 16



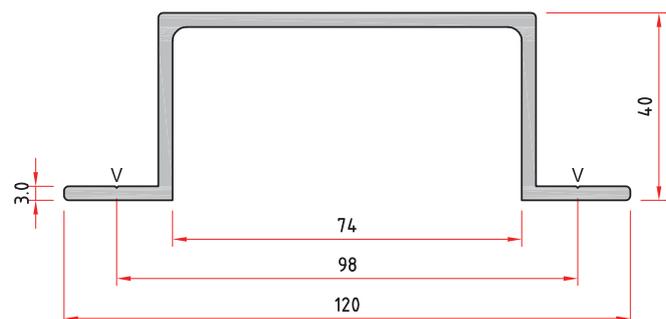
Top Hat 25



Top Hat 37



Top Hat 40





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 Web: www.permalite.com.au
 ABN 16 000 011 058

Custom Flashings Order Form

Project	
Required Del date	
Residential Products + Custom Flashings Page _____ of _____	

Customer name	
Project address	
Site contact Name / Contact number	

Colour:	Qty	Length (m)	Colour:	Qty	Length (m)

Colour:	Qty	Length (m)	Colour:	Qty	Length (m)

Colour:	Qty	Length (m)	Colour:	Qty	Length (m)

Colour:	Qty	Length (m)	Colour:	Qty	Length (m)

NOTE: Please ensure colour side, all angles and lengths are nominated clearly on flashing drawings

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