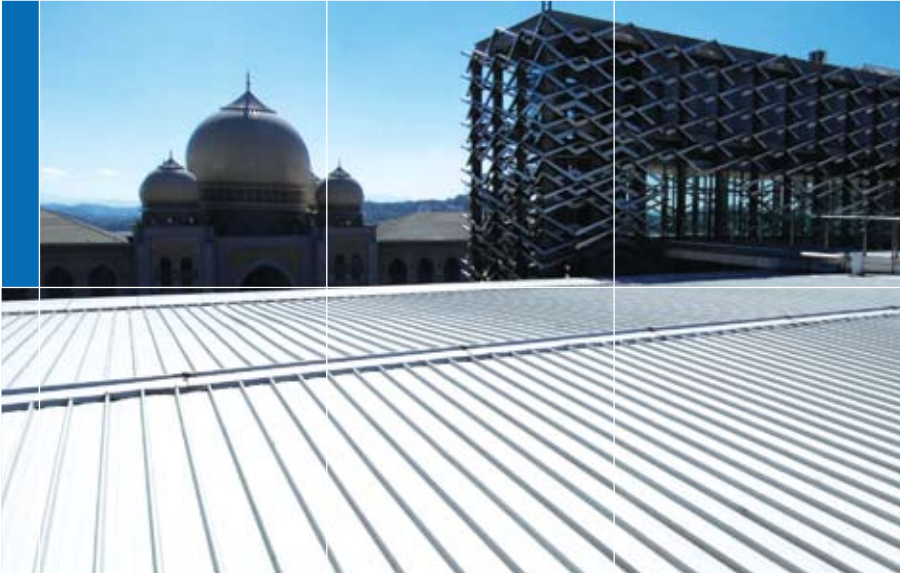


BLUESCOPE LYSAGHT SINGAPORE

LYSAGHT® KLIP-LOK® OPTIMA™

The Widest
Concealed-Fixed Cladding



Structural Solutions



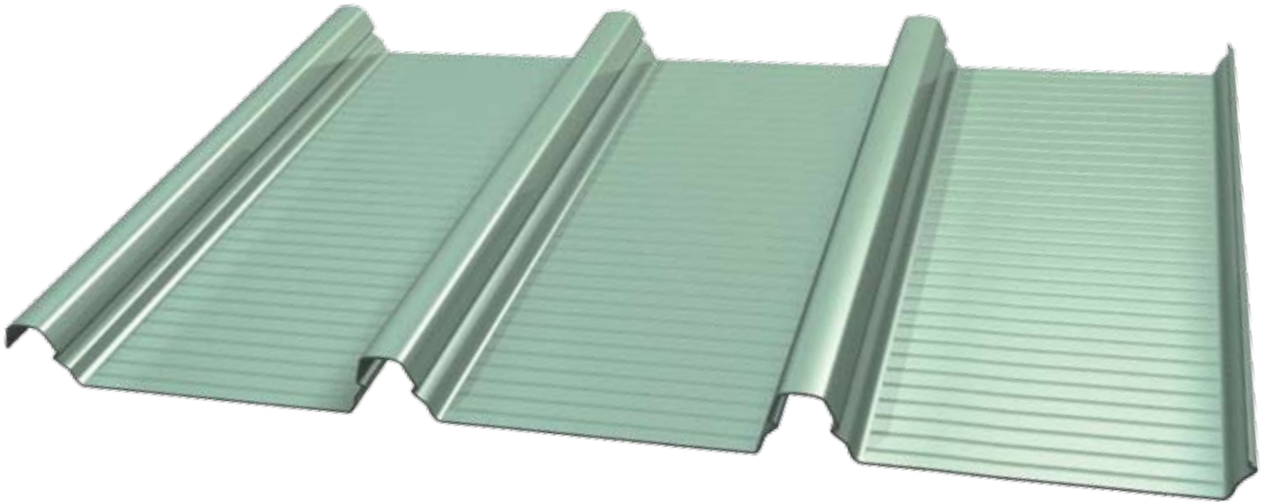
Roofing & Walling Solutions



House Framing Solutions

LYSAGHT® KLIP-LOK® OPTIMA™

The Widest Concealed-Fixed Cladding



LYSAGHT® KLIP-LOK® OPTIMA™ is the new generation of high-strength cladding that spans wider and offers better uplift performance than other comparable profiles. Our extensive research shows that its conceal fixed system and long lengths make it the best profile for controlling

thermal expansion and contraction. A patented innovation, the wide-cover LYSAGHT® KLIP-LOK® OPTIMA™ ensures economy as well as ease of installation and is suitable for both general and coastal environments.

Finishes	Base Metal Thickness (mm)	Total Coating Thickness (mm)	kg/m	kg/m ²
ZINCALUME® steel	0.48	0.53	4.80	4.9
Clean COLOURBOND® steel	0.48	0.53	4.87	4.98
ZINCALUME® steel	0.60	0.65	5.95	6.08 **
Clean COLOURBOND® steel	0.60	0.65	6.02	6.15 **

** Non standard offer

SIMPLE, LOW-COST, CONCEALED-FIXING

With no exposed fasteners, the long, straight lines of LYSAGHT® KLIP-LOK® OPTIMA™ remain clean and smooth.

At the heart of our system is our fixing clip, which can be laid in place and fixed simpler and faster than ever before. This is because the OPTIMA™ clip is fixed with hex. head screws, which are easier to drive.

The clip gives roofers the ability to accommodate up to 50mm of insulation.

TRANSVERSE FLUTING

Our patented transverse fluting significantly adds to the performance of this revolutionary product, making it superior to any other concealed-fixed cladding.

Longitudinal fluting is also available from the mobile rollformer for long length spring-curved applications.

- LYSAGHT® KLIP-LOK® OPTIMA™ is the new generation of our wide-cover concealed-fixed cladding.
- LYSAGHT® KLIP-LOK® OPTIMA™ is now available in rolled on-site lengths and an extra thickness.
- Visually, a bold rib makes a strong statement rising from flat pans which are transverse micro-fluted.
- We have patented this outstanding innovation. LYSAGHT® KLIP-LOK® OPTIMA™ is truly a superior product.



PRODUCT PROFILE

MATERIAL SPECIFICATIONS

LYSAGHT® KLIP-LOK® OPTIMA™ is made from:

- ZINCALUME® aluminium/zinc alloy-coated steel complying with AS-1397 - 2001 G550, AZ150 (550MPa minimum yield stress, 150g/m² minimum coating mass).

The Clean COLORBOND® prepainted steel complies with AS/NZS 2728:1997.

LENGTHS

Long length are available for roll on site. They are custom cut to required lengths. Factory sheets cut to order subject to maximum transportable length.

TOLERANCES

Length: + 0mm, - 15mm

Width: + 4mm, - 4mm

Make allowance for thermal expansion or contraction for long length roofs at sheeting ends.

The equation $\Delta L = \alpha \times \Delta T \times L$ gives an indication of the sheeting extent or contraction (ΔL).

$\alpha = 12 \times 10^{-6}$ (coefficient of linear expansion for steel)

ΔT = temperature change in °C

L = sheet length in mm

COLOURS

LYSAGHT® KLIP-LOK® OPTIMA™ is available in an attractive range of colours in Clean COLORBOND® steel and in unpainted ZINCALUME® aluminium/zinc alloy-coated steel.

ZINCALUME® steel provides a minimum of twice the life of conventional galvanised steel in the same environment.

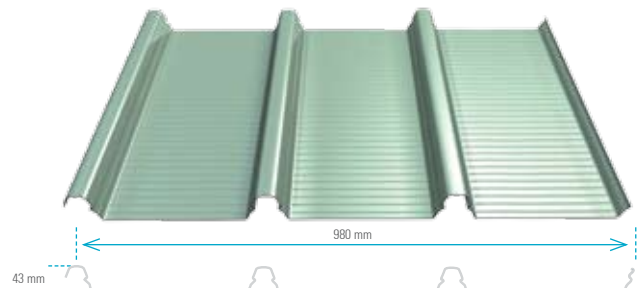
The standard Clean COLORBOND® steel offers a full range of contemporary colours suitable for all building projects.

MINIMUM ROOF PITCH

Our unique anti-capillary side lap allows you to use LYSAGHT® KLIP-LOK® OPTIMA™ on roof pitches from as low as 2 degree (1 in 30). It can also be used on walls.

PHYSICAL PROPERTIES OF LYSAGHT® KLIP-LOK® OPTIMA™

Steel Grade (MPa)	G550 (550MPa minimum yield stress)
Effective Width of Coverage	980mm
Depth of Rib	43mm
Minimum Recommended Roof Pitch	2° (1 in 30)
Base Metal Thickness	0.48mm & 0.60mm



PERFORMANCE

MAXIMUM SUPPORT SPACINGS

LYSAGHT® KLIP-LOK® OPTIMA™				
Type of Span	Without Edge Stiffeners		With Edge Stiffeners	
	BMT (mm) / TCT (mm)		BMT (mm) / TCT (mm)	
	0.48/0.53	0.60/0.65	0.48/0.53	0.60/0.65
Roofs (mm)				
Single Span	1000	1500	1000	1500
End Span	1200	1500	1200	1500
Internal Span	2200	3000	2200	3500
Unstiffened Eaves Overhang	200	250	200	250
Stiffened Eaves Overhang	500	550	500	550
Walls (mm)				
Single Span	2000	2500	2400	2500
End Span	2300	2700	2500	2700
Internal Span	3600	3600	3660	3600
Overhang	200	250	200	250

- For roofs: the data are based on foot-traffic loading.
- For walls: the data are based on pressures (see wind pressures table).
- Table data are based on supports of 1mm BMT.
Basic wind speed (Strength Limit State) = 57m/sec
Terrain category co-efficient = 0.83
Shielding factor = 0.85
Topography factor = 1
Design wind speed Strength Limit State (with above factors) = 40.2m/sec
Basic wind speed (Strength Limit State) = 40m/sec
Terrain category co-efficient = 1
Shielding factor = 1
Topography factor = 1
Design wind speed Strength Limit State (with above factors) = 40m/sec

Walls

$C_{pe} = -0.65$, $K_1 = 2$ for single and end spans, $K_1 = 1.5$ for internal spans
 $C_{pi} = +0.2$

Roofs

$C_{pe} = -0.9$, $K_1 = 2$ for single and end spans, $K_1 = 1.5$ for internal spans
 $C_{pi} = +0.2$

These spacings may vary by Serviceability and Strength Limit States for particular projects.

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

Peak rainfall intensity (mm/hr)	Roof Slope (degrees)					
	2	3	4	5	8	10
100	502	588	663	732	873	1003
150	334	392	442	488	582	669
200	251	294	331	366	436	502
250	201	235	265	293	349	401
300	167	196	221	244	291	334
400	125	147	166	183	218	251
500	100	118	133	146	175	201

Penetrations will alter the flow of water on a roof. For assistance in design of roofs with penetrations, please seek advice from our information line.

LYSAGHT® KLIP-LOK® OPTIMA™: LIMIT STATE WIND PRESSURE CAPACITIES (kPa)

LYSAGHT® KLIP-LOK® OPTIMA™ 0.48mm BMT / 0.53mm TCT		Without edge stiffener (mm)									
Span type		900	1200	1500	1800	2100	2400	2700	3000	3300	3600
Single	Serviceability	1.11	1.00	0.89	0.79	0.69	0.59	0.50	0.41	0.32	-
	Strength*	2.40	2.12	1.85	1.61	1.40	1.25	1.13	1.04	0.97	-
End	Serviceability	1.20	1.18	1.14	1.05	0.94	0.82	0.71	0.62	0.53	0.45
	Strength*	2.34	2.29	2.25	2.01	1.68	1.39	1.33	1.27	1.22	1.16
Internal	Serviceability	1.18	1.17	1.15	1.10	0.99	0.87	0.77	0.69	0.64	0.58
	Strength*	2.21	2.15	2.03	1.79	1.52	1.30	1.28	1.27	1.26	1.24
LYSAGHT® KLIP-LOK® OPTIMA™ 0.60mm BMT / 0.65mm TCT		Without edge stiffener (mm)									
Span type		900	1200	1500	1800	2100	2400	2700	3000	3300	3600
Single	Serviceability	1.72	1.53	1.34	1.16	0.99	0.83	0.67	0.53	0.38	-
	Strength*	3.74	3.39	3.05	2.73	2.41	2.11	1.82	1.53	1.25	-
End	Serviceability	1.77	1.76	1.69	1.54	1.33	1.12	0.95	0.81	0.70	0.60
	Strength*	3.58	3.05	2.57	2.20	1.90	1.67	1.46	1.30	1.20	1.10
Internal	Serviceability	2.03	1.94	1.82	1.67	1.49	1.32	1.16	1.00	0.86	0.72
	Strength*	3.25	3.21	3.06	2.73	2.30	1.90	1.63	1.48	1.40	1.36

* A capacity reduction factor of 0.9 is applied to strength capacities.

These capacities are based on tests conducted at BlueScope Steel's NATA registered testing laboratory using a direct pressure testing rig.

LYSAGHT® KLIP-LOK® OPTIMA™ : LIMIT STATE WIND PRESSURE CAPACITIES (kPa)

LYSAGHT® KLIP-LOK® OPTIMA™ 0.48 mm BMT / 0.53mm TCT		With edge stiffener (mm)									
Span type		900	1200	1500	1800	2100	2400	2700	3000	3300	3600
Single	Serviceability	2.57	2.07	1.60	1.19	0.85	0.62	0.46	0.36	0.29	-
	Strength*	7.13	6.07	5.07	4.19	3.51	3.07	2.81	2.68	2.63	-
End	Serviceability	1.73	1.54	1.36	1.18	1.03	0.89	0.77	0.66	0.56	0.47
	Strength*	3.78	3.26	2.74	2.24	1.81	1.48	1.40	1.33	1.26	1.18
Internal	Serviceability	1.43	1.19	1.02	1.01	0.98	0.94	0.89	0.81	0.69	0.56
	Strength*	3.65	2.76	2.10	2.00	1.90	1.80	1.76	1.65	1.29	1.29
LYSAGHT® KLIP-LOK® OPTIMA™ 0.60 mm BMT / 0.65mm TCT		With edge stiffener (mm)									
Span type		900	1200	1500	1800	2100	2400	2700	3000	3300	3600
Single	Serviceability	3.56	2.78	2.05	1.42	1.03	0.71	0.53	0.43	0.38	-
	Strength*	8.80	7.34	5.96	4.78	3.90	3.71	3.53	3.33	3.15	-
End	Serviceability	2.54	2.33	2.09	1.79	1.46	1.17	0.95	0.80	0.69	0.61
	Strength*	4.63	3.85	3.14	2.54	2.06	1.70	1.45	1.30	1.19	1.12
Internal	Serviceability	2.08	1.81	1.61	1.58	1.56	1.54	1.44	1.26	1.04	0.78
	Strength*	4.29	3.81	3.33	2.88	2.48	2.15	1.92	1.76	1.64	1.55

* A capacity reduction factor of 0.9 is applied to strength capacities.

These capacities are based on tests conducted at BlueScope Steel's NATA registered testing laboratory using a direct pressure testing rig.

LIMIT STATES WIND PRESSURES

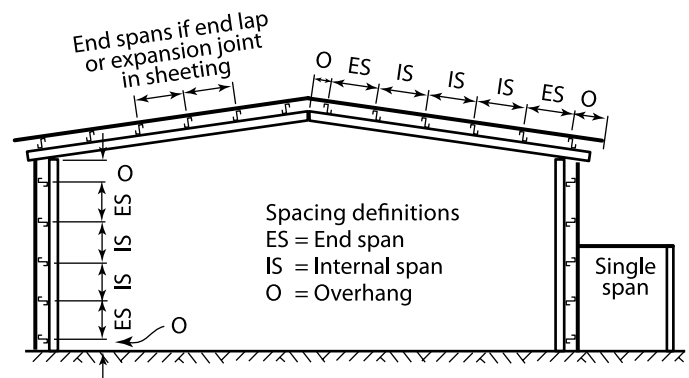
LYSAGHT® KLIP-LOK® OPTIMA™ offers the full benefits of the latest methods for modelling wind pressures. The wind pressure capacity table is determined by full scale tests conducted at BlueScope Lysaght's NATA-registered testing laboratory, using the direct pressure-testing rig.

Testing was conducted in accordance with AS 1562.1 - 1992 Design and Installation of Sheet Roof and Wall Cladding - Metal, and AS 4040.2 - 1992 Resistance to Wind Pressure for Non-cyclonic Regions.

The pressure capacities for serviceability are based on a deflection limit of $(\text{span}/120) + (\text{maximum fastener pitch}/30)$.

The pressure capacities for strength have been determined by testing the cladding to failure (ultimate capacity). These pressures are applicable when the cladding is fixed to a minimum of 1.0mm, G550 steel.

For material less than 1.0mm thick, seek advice from our information line.



METHOD STATEMENT AND GENERAL NOTES

WALKING ON ROOFS

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.

Be careful when moving between supports. Do not walk in the pan immediately adjacent to flashings or translucent sheeting. Walk at least one pan away.

Fasteners without Insulation		
Fixing to steel up to 0.75mm BMT	Fixing to steel 0.75mm to 3mm BMT	Fixing to timber
Self drilling, self tapping screws 12 - 14 x 30 OR Type 17 Self screws with hex & washer-head 12 - 11 x 25	Self drilling, self tapping screws with hex & washer-head 12 - 14 x 30	Self drilling, self tapping wood screws with hex & washer-head <i>Softwood:</i> 12 - 11 x 40 <i>Hardwood:</i> 12 - 11 x 25
Note: use two screws per clip.		

ADVERSE CONDITIONS

If this product is to be used in marine, severe industrial, or unusually corrosive environments, ask for advice from our information line.

METAL & TIMBER COMPATIBILITY

Lead, copper, free carbon, bare steel and green or some other chemically-treated timbers are not compatible with this product. Don't allow any contact of the product with those materials, nor discharge of rainwater from them onto the product. Supporting members should be coated to avoid problems with underside condensation. If there are doubts about the compatibility of other products being used, ask for advice from our information line.

MAINTENANCE

Optimum product life will be achieved if all external walls are washed regularly. Areas not cleaned by natural rainfall (such as the tops of walls sheltered by eaves) should be washed down every six months.

STORAGE AND HANDLING

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

Handle materials carefully to avoid damage: don't drag materials over rough surfaces or each other; don't drag tools over material; protect from swarf.

TURN UP-DOWN TOOLS

On all roofs of pitches less than 15 degrees, the high end of all sheets must be turned up to stop water from being driven under the flashing and into the building.

Similarly, the pans at the gutter end must be turned down to stop water running back along the underside of the sheets.

Tools are available for both applications.

NOTCHING TOOL

A tool is available for on-site notching of transverse flashings and cappings.

CUTTING

For cutting thin metal on site, we recommend a circular saw with a metal-cutting blade because it produces fewer damaging hot metal particles and leaves less resultant burr than a carborundum disc does.

Cut materials over the ground and not over other materials.

Sweep all metallic swarf and other debris from roof areas and gutters at the end of each day and at the completion of the installation. Failure to do so can lead to surface staining when the metal particles rust.

FASTENERS

Where insulation is to be installed, you may need to increase the length of the screws given below, depending on the density and thickness of the insulation. When the screw is properly tightened:

- into metal: there should be at least three threads protruding past the support you are fixing to, but the Shankguard must not reach that support;
- into timber: the screw must penetrate the timber by the same amount that the recommended screw would do if there were no insulation;
- Fasteners should comply to AS3566, Class 3 and Class 4.

CURVING

Please contact your nearest BlueScope Lysaght office for spring curving advice.

SEALED JOINTS

For sealed joints use screws or rivets and neutral-cure silicone sealant branded as suitable for use with galvanised or ZINCALUME® steel.

END LAPS/EXPANSION JOINTS

Please contact your nearest BlueScope Lysaght service centre for advice on use of an expansion joints. (Or use long length sheets from a mobile rollformer.)

EXTRA VERSATILITY OF MOBILE ROLLFORMING

The mobile rollformer delivers on-site rolling for extra long lengths. In some cases the mobile rollformer has the unique ability to 'roll-to-roof' saving you time and money for transport and craneage.

INSTALLATION

PREPARATION

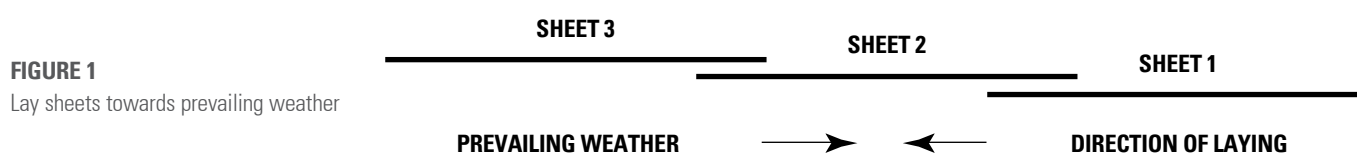
Before starting work ensure that:

- The supports for your cladding are truly in the same plane;
- The minimum roof slopes conform to our recommendations; and
- The overhangs of sheets from the top and bottom supports don't exceed our recommendations.
- The first and last supports and clips should be at least 75mm from each end of the sheet to keep maximum holding power.

Make any necessary adjustments before you start laying sheets, because they will be difficult to rectify later.

ORIENT SHEETS BEFORE LIFTING

Consider which end of the building is best to start from. For maximum weather-tightness, start laying sheets from the end of the building that will be downwind of the worst-anticipated or prevailing weather (Figure 1).



It is much easier and safer to turn sheets on the ground than up on the roof. Before lifting sheets on to the roof, check that they are the correct way up and the overlapping side is towards the edge of the roof from which installation will start.

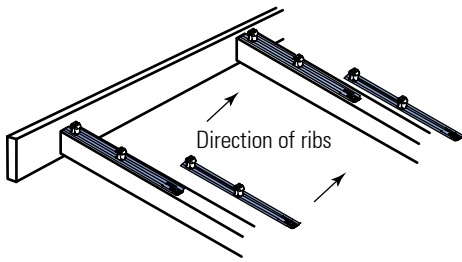
Place bundles of sheets over or near firm supports, not at mid span of roof members.

STEPS FOR INSTALLATION

- 1 Lay and fix wire mesh to the supports in accordance with the appropriate building requirements. (Figure 2)
- 2 Position the first clips on each support by placing onto the support nearest the gutter. (Figure 3)
- 3 Fix the first clip on the support so they point in the direction of laying. Ensure the clip is 90 degrees to the edge of the sheet.
- 4 Align the clips with the spacer using a string line (or the first sheet as a straight edge) to align the clips as you fix a clip to each support working towards the high end of the roof.
- 5 Drive hex-head screws through the top of the clip, into the support.
- 6 Work along the edge of the gutter, ensuring it aligns correctly at its ends in relation to the gutter and ridge (or parapet or transverse wall).
- 7 Place the glass wool insulation between the supports.
- 8 Measure the distance from the gutter end of the sheet to the support.
- 9 Position the first sheet so that it overhangs the desired amount (usually 50mm) to the gutter. It is important to ensure this first sheet is placed square to adjacent edges. (Figure 4.)
- 10 Engage the sheet with clips using vertical foot pressure on all the ribs over each clip. (Figure 5)
- 11 Fix the next row of clips, one to each support with the slots and tabs engaged. Be sure the clip is 90 degrees to the edge of the sheet.
- 12 As before, place the next sheet over its clips ensuring you also engage the edge of the preceding sheet.
- 13 Accurately position the sheet so that it overhangs the desired amount into the gutter. It is important that you keep the gutter-end of all sheets in a straight line.
- 14 Fully engage the two sheets along the overlapping rib. You can do this by walking along the full length of the sheet with one foot in the centre pan of the previous sheet and the other foot applying vertical pressure to the top of the interlocking ribs at regular intervals. It is important that you don't walk in the unsupported pan beside the overlap (Figure 5)
- 15 Similarly, engage all the clips by applying vertical foot pressure to the top of the other two ribs over each clip.

It is essential that the sheets interlock completely. It is important that your weight is fully on the sheet you are installing.

LYSAGHT® KLIP-LOK® OPTIMA™: Starting method



LYSAGHT® KLIP-LOK® OPTIMA™

FIGURE 2

Fix the first rows of clips. Fix the next (and subsequent) clips and sheets.

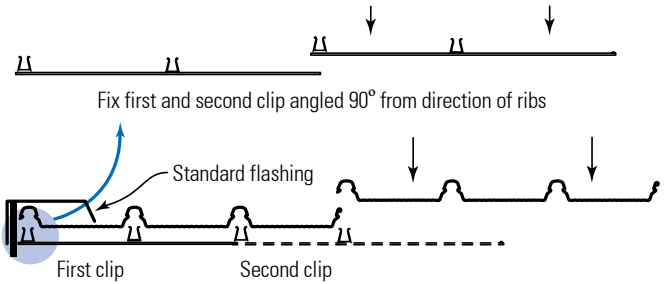


FIGURE 3

Place first sheet on clip and snap onto clip. Add subsequent clips and sheets as required.

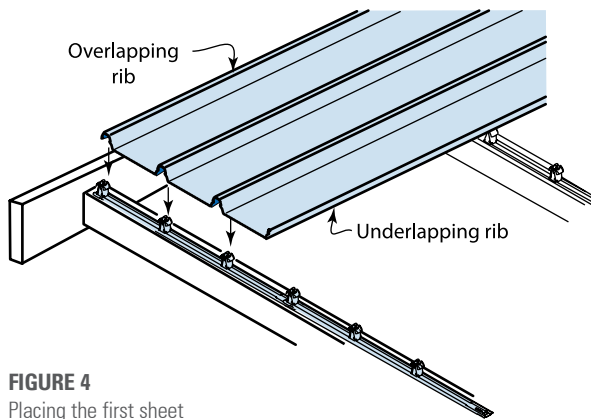


FIGURE 4

Placing the first sheet

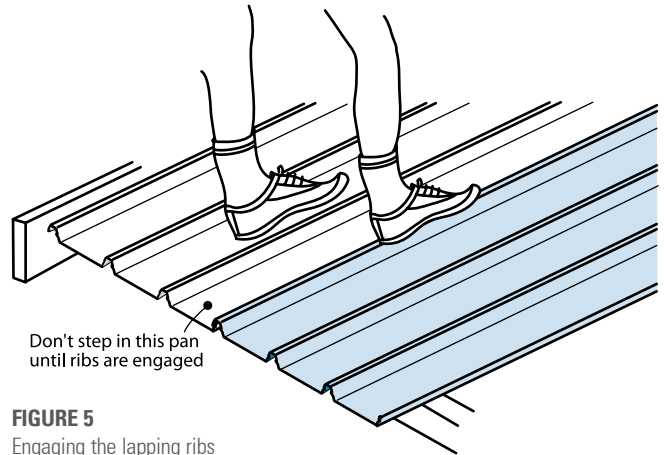


FIGURE 5

Engaging the lapping ribs

CHECK ALIGNMENT OCCASIONALLY

Occasionally check that the sheets are still parallel with the first sheet, by taking two measurements across the width of the fixed sheeting.

At about half way through the job, perform a similar check but take the measurements from the finishing line to aim for the final sheet to be parallel with the end of the roof. If the measurements are not close enough, lay subsequent sheets very slightly out of parallel to gradually correct the error. (Figure 6) To allow this to happen, flatten the tabs on the base of subsequent clips - the slot in the clip will allow the clips to be fixed out of standard pitch.

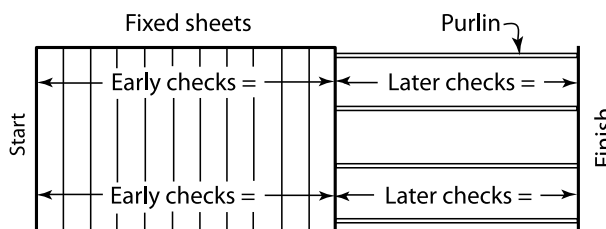


FIGURE 6

Check alignment occasionally

FIX THE LAST SHEET

If the final space is less than the full width of a sheet, you can cut a sheet along its length and shorten the clips as appropriate. It is desirable to fix the sheet at one end.

INSTALLING LYSAGHT® KLIP-LOK® OPTIMA™ WALLS

The installation procedure for walls is similar to that described for roofs. To prevent LYSAGHT® KLIP-LOK® OPTIMA™ from sliding downward in the fixing clips, you should pierce-fix through each sheet under the flashing or capping, along the top of the sheets.

INSTALLING TRANSLUCENT SHEETS WITH LYSAGHT® KLIP-LOK® OPTIMA™

Because of its greater thermal expansion, translucent cladding should be fixed using oversized holes and sealing washers recommended by the cladding manufacturer. When used with concealed fixed claddings, ensure the fasteners do not penetrate the steel cladding. There are translucent products available that easily accommodate this.

Note: Don't exceed the maximum support spacing specified by the translucent cladding manufacturer. Use of translucent sheeting may result in lower limit state capacities.

LYSAGHT® RAINWATER GOODS

Whether you're searching for a distinctive look for a new home or looking for an economic solution for a large commercial project BlueScope Lysaght offer an extensive range of rainwater solutions.

Our domestic rainwater goods are manufactured from ZINCALUME® steel with Clean COLORBOND® steel colours available, so they'll stand up to years of the harshest Australian climate.

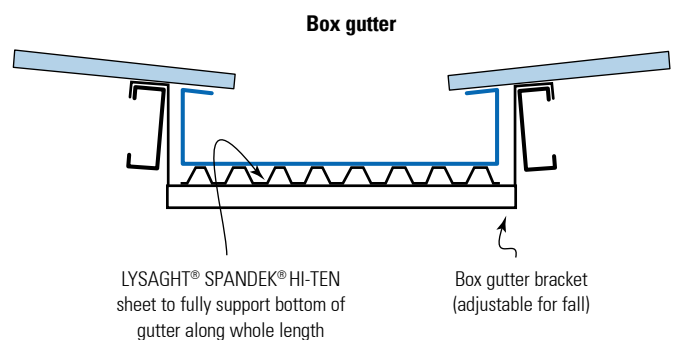
The choice of colours and styles is extensive, covering everything you could need from gutters and downpipes, to fascia, flashings and cappings, as well as fasteners and fixing clips.

COMMERCIAL/INDUSTRIAL DRAINAGE SYSTEMS

There is a standard procedure for designing the drainage of a roof using an eaves & gutter system. It is assumed that the gutters will have a gradient steeper than 1:500. Box gutter systems can be more complex and are thoroughly treated in AS/NZS 3500.3.2:1998.

We manufacture the perfect guttering system for your structure, whichever type is appropriate.

All designs can be complemented with our complete range of square and round downpipes and rainwater accessories. To ensure quick and easy installation there is also a full range of matching fixing clips.



COMMERCIAL RAINWATER SOLUTIONS

A TOTAL SOLUTION

BlueScope Lysaght provides a broad range of roofing and rainwater products for industrial building solutions which complement long length LYSAGHT® KLIP-LOK® OPTIMA™. Our gutter systems can be tailor-made for your project.

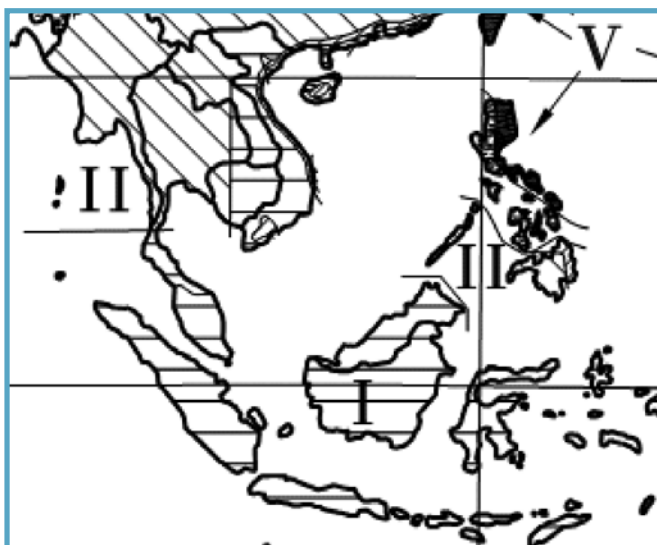
WHY YOU SHOULD ALWAYS INSIST ON BLUESCOPE LYSAGHT

When you specify LYSAGHT® products you have the added advantage of dealing with a company whose expertise and experience with steel stretches back for well over a century. A company with a reputation for consistently producing top quality products at competitive prices.

Our products are backed by a performance warranty* for up to 25 years. When a BlueScope Lysaght warranty* is granted, it guarantees in writing that your products will perform exactly to specifications when installed and maintained in accordance with our recommendations.

NON-CYCLONIC AREAS

The information in this brochure is suitable for use only in areas where a tropical cyclone is unlikely to occur as defined in AS 1170.2-2002. Map and table (below) taken from HB212-2002.



Wind speeds versus return period

(3 s gust, 10 m height, open country terrain)

Handbook Level	Description	Equation for V_R	V_{50}	V_{500}
I	Strong thunderstorms and monsoon winds	$70 - 56R^{-0.1}$	32	40
II	Moderately severe thunderstorms and extra-tropical gales	$67 - 41R^{-0.1}$	39	45
III	Severe thunderstorms and moderate or weakening typhoons/tropical cyclones	$106 - 92R^{-0.1}$	44	57
IV	Strong typhoons/tropical cyclones	$122 - 104R^{-0.1}$	52	66
V	Very strong typhoons/tropical cyclones	$156 - 142R^{-0.1}$	60	80

Table summarises the proposed relationships between 3 s gust wind speed and return period for the five levels in the handbook (see map). The values are for 50 years and 500 years return periods.

* Warranty terms and conditions apply.

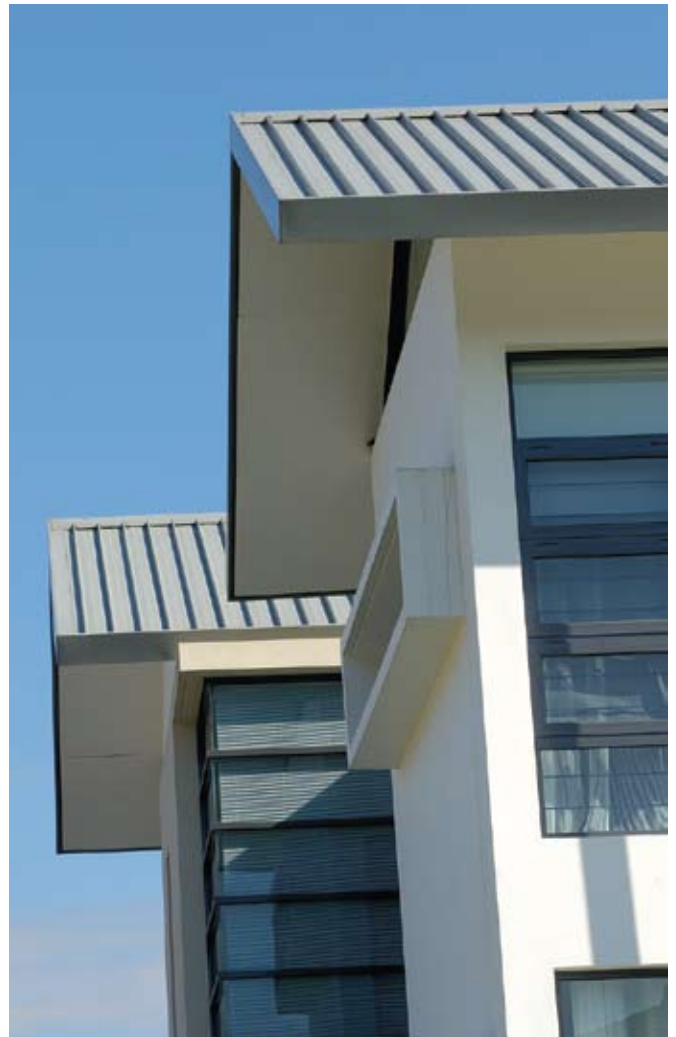
PROJECT REFERENCES



Choa Chu Kang Sports Complex



NRE, Putrajaya



Bungalow, Sarawak

PROJECT REFERENCES



Kuching Airport, Sarawak



King Centre, Sarawak



Changi International Airport, Terminal 2

THERMATECH™

SOLAR REFLECTANCE INDEX (SRI) - ASTM E1980

85 	81 	69 	43 
Enduring White (Off-White) ○ △ □	Cosmic Grey ○ □	Ultimate Grey (Gull Grey) ○ △ □	Gracious Grey (Marine Grey) ○ △ □
83 	55 	80 	64 
Urban Beige	Forever Beige (Beige) ○ △ □	Solaris Yellow	Luxury Gold (Gold) ○ △ □
82 	46 	23 	41 
Wasabi Green	Intimate Green (Mist Green) ○ △ □	Ever Green (Caulfield Green) ○ △ □	Eternal Red (Autumn Red) ○ △ □
82 	30 	40 	30 
Nexus Blue	Constant Blue (Torres Blue) ○ △ □	Inspiring Ocean (Aquamarine) ○ △ □	Mesmerizing Brown (Copperstone) ○ △ □

Standard Offer: ○ Lysaght Klip-Lok® series in 0,54mm TCT
 △ Lysaght Spandek® & Lysaght Trimdek® series in 0,48mm TCT
 □ Lysaght Locked Seam®, Lysaght Select Seam® series & Lysaght Prestige® Panel II in 0,61mm TCT