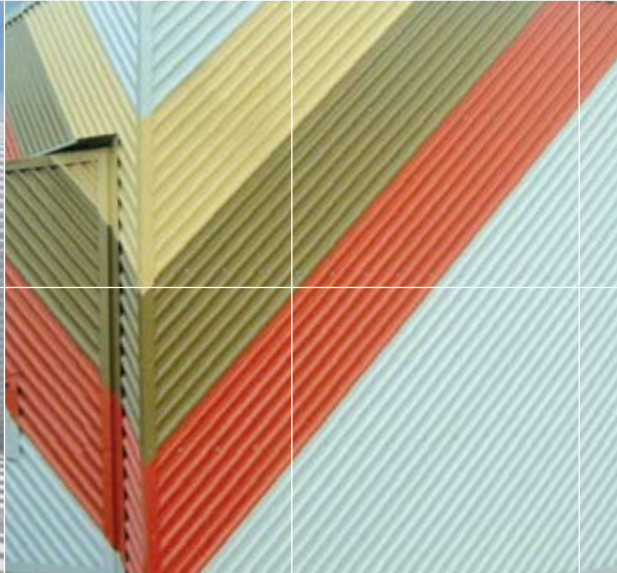
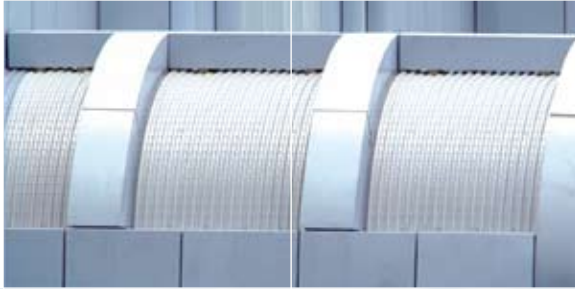


BLUESCOPE LYSAGHT SINGAPORE

# LYSAGHT® SPANDEK® OPTIMA™

Trapezoidal steel cladding  
with longer spanning capability



Structural Solutions



Roofing & Walling Solutions

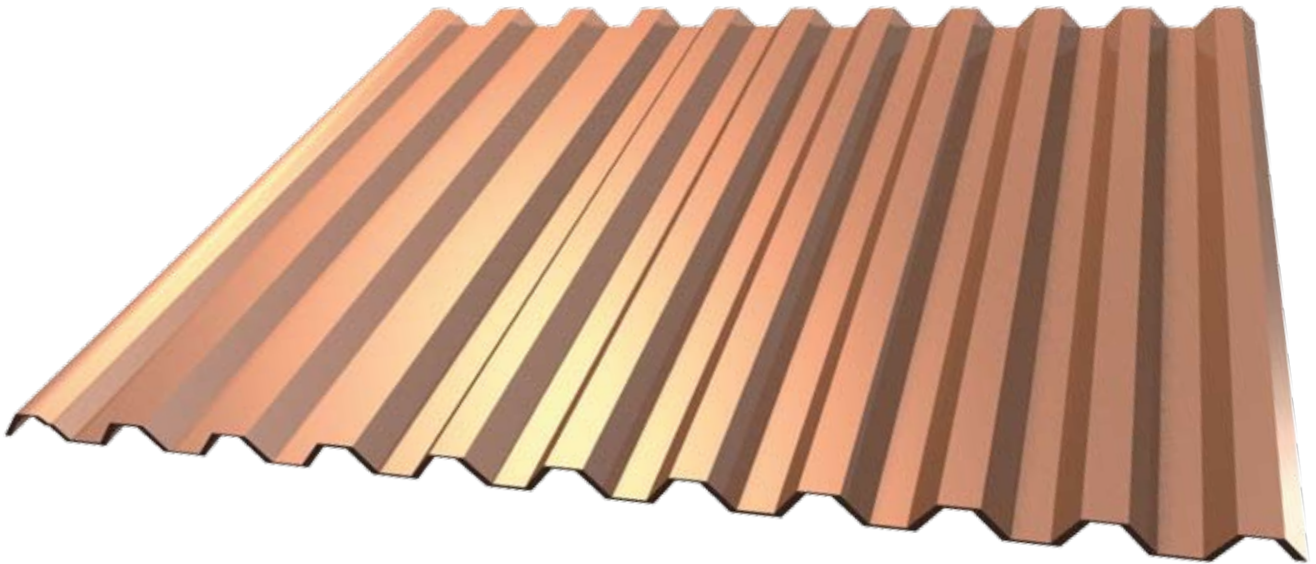


House Framing Solutions



# LYSAGHT® SPANDEK® OPTIMA™

Trapezoidal steel cladding with longer spanning capability



LYSAGHT® SPANDEK® OPTIMA™ is a contemporary-looking, trapezoidal profile which is ideal where a stronger, bolder, more modern corrugated appearance is required.

LYSAGHT® SPANDEK® OPTIMA™ was originally designed as a strong attractive roofing material for industrial and commercial construction - however LYSAGHT® SPANDEK®

OPTIMA™ has proved equally popular for homes and public buildings, underlining its versatility and pleasing appearance.

LYSAGHT® SPANDEK® OPTIMA™ combines strength with lightness, rigidity and economy.

Finishes	Base Metal Thickness (mm)	Total Coating Thickness (mm)	kg/m	kg/m <sup>2</sup>
ZINCALUME® steel	0.42	0.47	4.23	4.52
Clean COLOURBOND® steel	0.42	0.47	4.30	4.60
ZINCALUME® steel	0.48	0.53	4.80	5.13
Clean COLOURBOND® steel	0.48	0.53	4.87	5.21

- Contemporary-looking, trapezoidal profile which is ideal where a stronger, bolder, sharper corrugated appearance is required.
- LYSAGHT® SPANDEK® OPTIMA™ combines strength with lightness, rigidity and economy.
- The strength, spanning ability, lightness and rigidity of LYSAGHT® SPANDEK® OPTIMA™ means wide support spacings can be used with safety.
- A special anti-capillary groove in the under lap allows you to use LYSAGHT® SPANDEK® OPTIMA™ on roof pitches as low as 3 degrees.



## PRODUCT PROFILE

### MATERIAL SPECIFICATIONS

LYSAGHT® SPANDEK® OPTIMA™ is made from:

- ZINCALUME® aluminium/zinc alloy-coated steel complying with AS-1397 - 2001 G550, AZ150 (550MPa minimum yield stress, 150g/m<sup>2</sup> minimum coating mass);

The Clean COLORBOND® steel complies with AS/NZS2728:1997.

### LENGTHS

Sheets are supplied custom cut.

### TOLERANCES

Length: + 0mm, - 15mm

Width: + 4mm, - 4mm

### COLOURS

LYSAGHT® SPANDEK® 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.

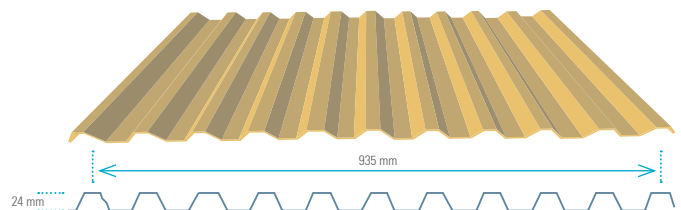
The standard Clean COLORBOND® steel offers a full range of contemporary colours suitable for all building projects. Clean COLORBOND® XPD steel provides superior aesthetic qualities, and Clean COLORBOND® ULTRA steel is intended for severe coastal or industrial environments.

### MINIMUM ROOF PITCH

Long lengths and a special anti-capillary groove in the under lap allows you to use LYSAGHT® SPANDEK® OPTIMA™ on roof pitches as low as 3 degrees (1 in 20).

## PHYSICAL PROPERTIES OF LYSAGHT® SPANDEK® OPTIMA™

Steel Grade (MPa)	G550 (550MPa minimum yield stress)
Effective Width of Coverage	935mm
Depth of Rib	24mm
Minimum Recommended Roof Pitch	3° (1 in 20)
Base Metal Thickness	0.42mm & 0.48mm



## PERFORMANCE

### MAXIMUM SUPPORT SPACINGS

LYSAGHT® SPANDEK® OPTIMA™		
<b>Type of span</b>		
Base Metal Thickness (mm)	0.42	0.48
Total Coating Thickness (mm)	0.47	0.53
<b>Roof (mm)</b>		
Single Span	1500	2200
End Span	2100	2400
Internal Span	2300	3300
Unstiffened Overhang	200	250
Stiffened Overhang	450	500
<b>Walls (mm)</b>		
Single Span	2200	2300
End Span	3100	3200
Internal Span	3300	3300
Overhang	150	150

- 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  
 $C_{pi} = +0.20$

### Roofs

$C_{pe} = -0.9$ ,  $K_1 = 2$  for single and end spans,  $K_1 = 1.5$  for internal spans  
 $C_{pi} = +0.20$

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)			
	3	5	7.5	10
100	122	147	170	191
150	82	98	113	127
200	61	73	85	95
250	49	59	68	76
300	41	49	57	64
400	31	37	43	48
500	24	29	34	38

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.



Storage room, Singapore

## LYSAGHT® SPANDEK® OPTIMA™: LIMIT STATE WIND PRESSURE CAPACITIES (kPa)

LYSAGHT® SPANDEK® OPTIMA™ 0.42mm BMT / 0.47mm TCT											
Span Type	Fasteners per sheet per support		For roofs (c/c) Span (mm)								
			900	1200	1500	1800	2100	2400	2700	3000	3300
Single	5	Serviceability	3.46	2.67	1.94	1.29	0.80	0.48	0.32	0.24	-
		Strength*	10.85	8.70	6.70	4.98	3.68	2.92	2.58	2.53	-
End	5	Serviceability	3.12	2.71	2.31	1.93	1.58	1.27	0.99	0.74	-
		Strength*	7.94	6.46	5.08	3.88	2.95	2.36	2.04	1.92	-
Internal	5	Serviceability	3.47	2.99	2.54	2.13	1.76	1.46	1.21	0.99	0.79
		Strength*	9.09	7.53	6.08	4.79	3.78	3.11	2.69	2.48	2.34

LYSAGHT® SPANDEK® OPTIMA™ 0.48mm BMT / 0.53mm TCT											
Span Type	Fasteners per sheet per support		For roofs (c/c) Span (mm)								
			900	1200	1500	1800	2100	2400	2700	3000	3300
Single	5	Serviceability	3.97	3.07	2.21	1.42	0.91	0.55	0.35	0.27	0.24
		Strength*	11.07	9.53	8.06	6.72	5.57	4.65	3.93	3.33	2.80
End	5	Serviceability	4.11	3.49	2.89	2.34	1.85	1.44	1.09	0.79	0.52
		Strength*	9.00	7.42	5.93	4.64	3.64	2.99	2.63	2.46	2.39
Internal	5	Serviceability	4.28	3.59	2.93	2.33	1.83	1.44	1.15	0.93	0.73
		Strength*	10.28	8.49	6.80	5.32	4.15	3.36	2.87	2.54	2.41

\* 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. Supports must not be less than 1mm BMT.

## LIMIT STATES WIND PRESSURES

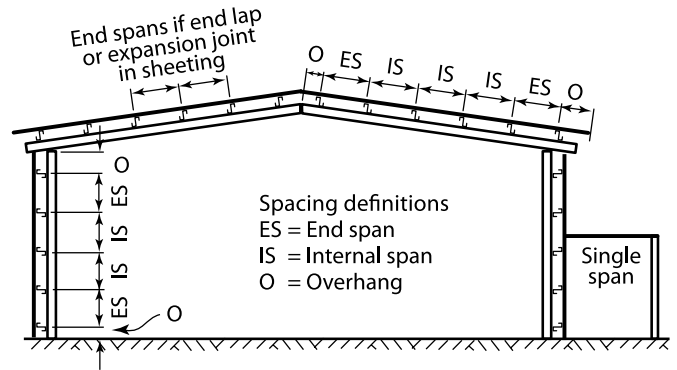
The wind pressure capacities are based on tests conducted at BlueScope Lysaght's NATA registered testing laboratory. Testing was conducted in accordance with AS 1562.1 - 1992 Design and Installation of Sheet Roof and Wall Cladding - Metal, and AS 4040.2 - 1992 Resistance to Wind Pressure for Non-cyclonic 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 technical sales representatives.



## METHOD STATEMENT AND GENERAL NOTES

### WALKING ON ROOFS

Generally, keep your weight evenly distributed over the soles of your 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 walking across the width of the roof, walk over, or close to, the roof supports.

Fasteners without Insulation			
	Fixing to steel up to 0.75mm BMT	Fixing to steel >0.75mm to 3mm BMT	Fixing to timber
Crest fixed	Self drilling screws with hex. washer-head & EPDM seal, 12 - 11 x 50 (M5.5 - 11 x 50)	Self drilling screws with hex. washer-head & EPDM seal, 12 - 14 x 45 (M5.5 - 14 x 45)	Type 17 Self drilling screws with hex. washer-head & EPDM seal, <i>Softwood:</i> 12 - 11 x 65 (M5.5 - 11 x 65) <i>Hardwood:</i> 12 - 11 x 50 (M5.5 - 11 x 50)
Valley fixed	Self drilling screws with hex. washer-head & EPDM seal, 10 - 12 x 20 (M4.8 - 12 x 20) OR Self drilling screws with hex. washer-head & EPDM seal, 10 - 16 x 16 (M4.8 - 16 x 16)	Self drilling screws with hex. washer-head & EPDM seal, 10 - 16 x 16 (M4.8 - 16 x 16)	Type 17 Self drilling screws with hex. washer-head & EPDM seal <i>Softwood:</i> 10 - 12 x 30 (M4.8 - 12 x 30) <i>Hardwood:</i> 10 - 12 x 20 (M4.8 - 12 x 20)
Side lap & accessories	Self drilling hex. head screws with washer & EPDM seal	10 - 16 x 16 OR EPDM seal: 8 - 15 x 15	

### FASTENERS

LYSAGHT® SPANDEK® OPTIMA™ requires 5 fasteners per sheet per support as shown below. Fasteners should comply to AS3566, Class 3 and Class 4.

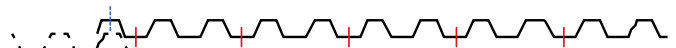
#### Roof - Screw fix through rib

Crest - 5 fixing



#### Wall - Screw fix through pan

Valley - 5 fixing



### FASTENING SHEETS TO SUPPORTS

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

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

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

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



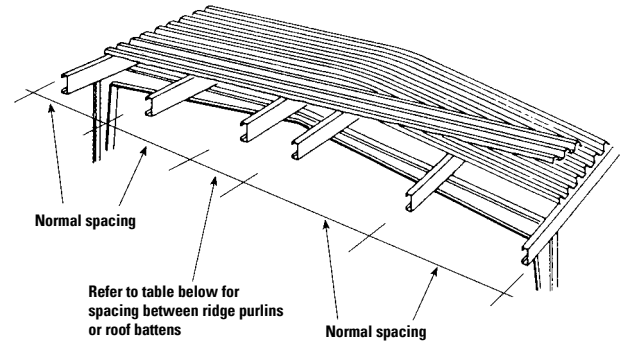
## CURVATURE WITH LYSAGHT® SPANDEK® OPTIMA™ PROFILE

### [A] SPRUNG CURVED RIDGE

One excellent method of sheeting low slope gable roofs is to run continuous lengths of roof sheeting from eave to eave, across the full width of the roof, allowing the roofing sheets to spring or naturally curve between ridge purlins that are spaced widely apart. This method provides a particularly neat and attractive roof whilst eliminating the ridge capping. Nevertheless, using LYSAGHT® SPANDEK® OPTIMA™ profile for construction such as this requires certain precautions to be observed (refer to table below).

### MINIMUM RIDGE PURLIN SPACING FOR SPRUNG CURVED RIDGE LYSAGHT® SPANDEK® OPTIMA™ PROFILE

Roof Pitch	Standard (0.42mm BMT/ 0.47mm TCT)	NonStandard (0.48mm BMT/ 0.53mm TCT)
3° (1 in 20)	1,400mm	1,500mm
4° (1 in 15)	1,500mm	1,600mm
5° (1 in 12)	NOT RECOMMENDED	1,700mm



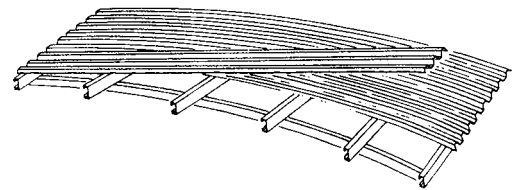
It should be noted that side laps should be sealed for the length of the curvature (i.e. between the two centre purlins) with BlueScope Lysaght recommended sealants. Each sheet should be first fastened to one side of the roof and then pulled down and fastened to the slope on the other side of the ridge curve. Alternative sheets should be laid from opposite sides of the roof. It should also be noted that over the ridge purlins or battens, very slight crease marks may appear in the trays or valleys of the curved sheeting when subject to foot traffic.

### [B] SPRUNG ARCHED / CONVEX ROOF

LYSAGHT® SPANDEK® OPTIMA™ sheeting can also be sprung curved over an arched roof, provided the radius of the arch is not less than the minimum listed in table below.

### RECOMMENDED RADIUS OF CONVEX SPRUNG CURVING LYSAGHT® SPANDEK® OPTIMA™ PROFILE

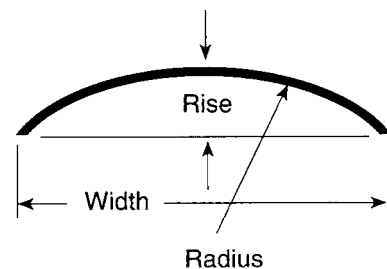
	Min Radius	Purlin Spacing at Min Radius #	Max Radius*
LYSAGHT® SPANDEK® OPTIMA™ Profile (Standard) 0.42mm BMT/0.47mm TCT	20,000mm	1,200mm	60,000mm
LYSAGHT® SPANDEK® OPTIMA™ Profile (Non-standard) 0.48mm BMT/0.53mm TCT	20,000mm	1,400mm	60,000mm



# For radius of curvature greater than the recommended minimum, the purlin spacing must not exceed 2400mm for LYSAGHT® SPANDEK® OPTIMA™ Profile 0.42mm BMT and 3000mm for LYSAGHT® SPANDEK® OPTIMA™ Profile 0.48mm BMT.

\* Maximum recommended radius to provide sufficient drainage near crest of curvature.

Please note that side laps should be sealed with BlueScope Lysaght recommended sealants over the crest of the arch where the slope is less than the recommended minimum for that sheet profile. If end laps are necessary, they should not be located at or near the crest of the arch and each sheet length must span at least three purlin spacings. The top face of all purlins must accurately follow and be tangential on the arch curvature. Each alternate sheet should be laid from opposite sides of the roof. It should also be noted that very slight crease marks may appear in the trays or valleys over the supports, when curved sheeting is subjected to foot traffic.



$$\text{Radius} = \frac{\text{Width}^2 + 4 (\text{Rise})^2}{8 \text{ Rise}}$$

From the overall width and required rise of an arched roof, the radius of curvature can be calculated from the formula below:-

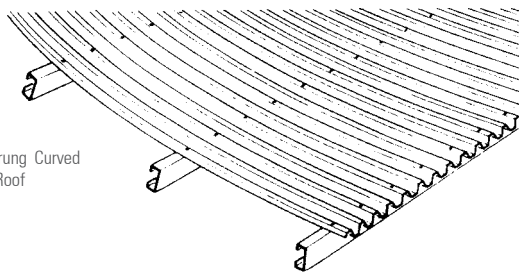
**[C] SPRUNG CONCAVE ROOF**

LYSAGHT® SPANDEK® OPTIMA™ Profile can also be sprung curved to the minimum radius shown in table below for concave roof applications.

**RECOMMENDED RADIUS AND PURLIN SPACING FOR CONVEX SPRUNG CURVING LYSAGHT® SPANDEK® OPTIMA™ PROFILE**

	Min Radius	Purlin Spacing at Min Radius #
LYSAGHT® SPANDEK® OPTIMA™ Profile (Standard) 0.42mm BMT/0.47mm TCT	18,000mm	1,200mm
LYSAGHT® SPANDEK® OPTIMA™ Profile (Non-standard) 0.48mm BMT/0.53mm TCT	20,000mm	1,400mm

Note: For radius of curvature greater than the recommended minimum, the purlin spacing can be increased. However, the spacing must not exceed 2400mm for LYSAGHT® SPANDEK® OPTIMA™ Profile 0.42mm BMT and 3000mm for LYSAGHT® SPANDEK® OPTIMA™ Profile 0.48mm BMT.



Sheeting Sprung Curved on Concave Roof

LYSAGHT® SPANDEK® OPTIMA™ Profile sprung curved on concave roof application. At the minimum radius, purlin spacing must not exceed the recommendation radius shown in table above. Roof slope at the lower end of the sheeting must not be less than 3°.

**[D] CRIMP CURVED CONVEX ROOF**

Crimp curved LYSAGHT® SPANDEK® OPTIMA™ steel cladding is designed to provide versatility and creativity to bring new and refreshing designs to commercial, industrial and domestic buildings. The combination of curves and contours in convex shapes with flats and angles in LYSAGHT® SPANDEK® OPTIMA™ Profile have produced many aesthetically pleasing buildings.

This design freedom has resulted in significant cost savings in construction, mainly due to:-

- Less supporting framework required for fascias, parapets and roofs.
- Simplified and reduced work involved in installation of fascia cladding.
- Reduction or elimination of many flashings and cappings.
- Less cladding material required to cover a given curve.

**SUPPORT SPACINGS FOR CRIMP CURVED LYSAGHT® SPANDEK® OPTIMA™ PROFILE (NON CYCLONIC AREAS)**

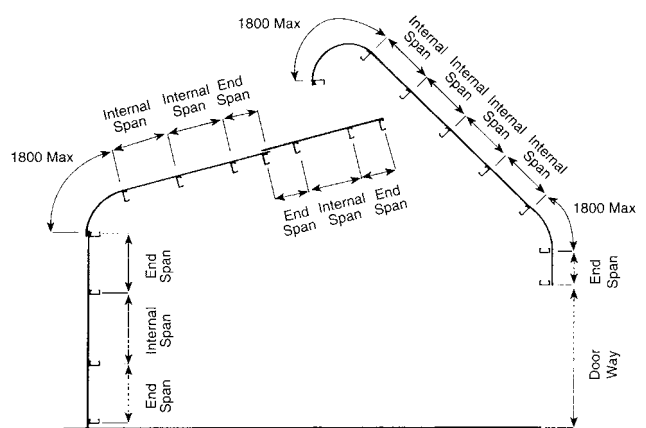
**Straight Portion of Crimp Curved LYSAGHT® SPANDEK® OPTIMA™ Profile:**

- Maximum allowable spacings for the straight portion of Crimp Curved LYSAGHT® SPANDEK® OPTIMA™ profile should follow the recommendations.
- End spans refer to the spacing between the first and second supports from any free end of a sheet, except where that end of the sheet is crimp curved.
- The spacing between supports either side of an end lap should be as recommended for end spans.

**Crimp Curved Portion of Crimp Curved LYSAGHT® SPANDEK® OPTIMA™ Profile:**

This will depend on the radius of curvature but the following guidelines are recommended:-

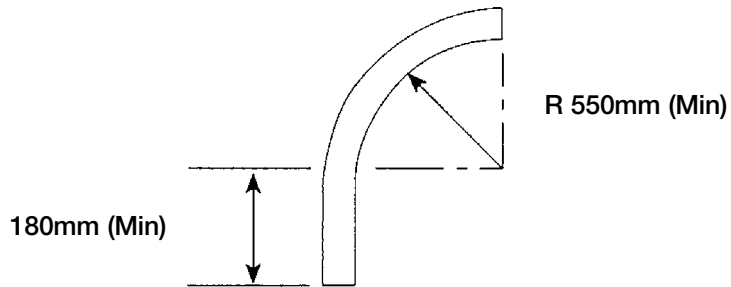
- For sheets curved to a radius of curvature not more than 3000mm, supports should be placed at centres not greater than 1800mm.
- Where a curve of small included angle occurs (up to approximately 15°, for example at a ridge), support spacing should not exceed 1200mm.



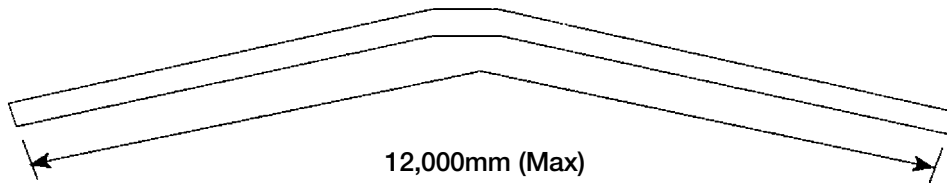
SPAN TERMINOLOGY FOR CRIMP CURVED LYSAGHT® SPANDEK® OPTIMA™ PROFILE

## REQUIREMENTS OF CRIMP CURVED LYSAGHT® SPANDEK® OPTIMA™ PROFILE

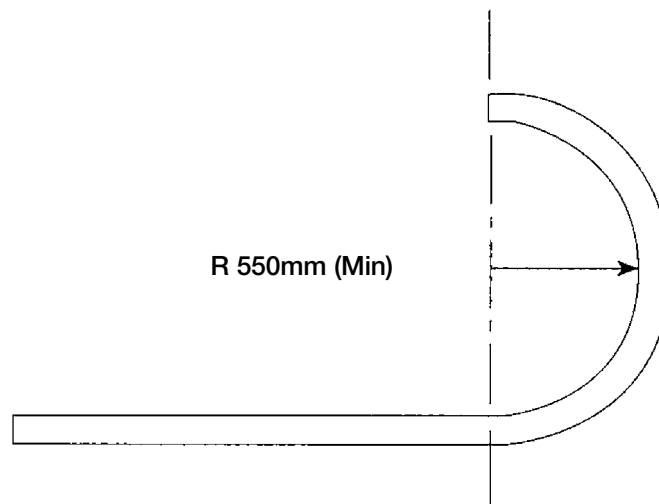
- Minimum radius of curvature for convex is 550mm to underside or pan of sheet, minimum straight length of sheet at one end of a curve is 180mm.



- Maximum length of sheet that can be crimp curved for ridge application is approximately 12,000mm. The curve must be convex only. Concave Crimp Curved LYSAGHT® SPANDEK® OPTIMA™ Profile is not available.

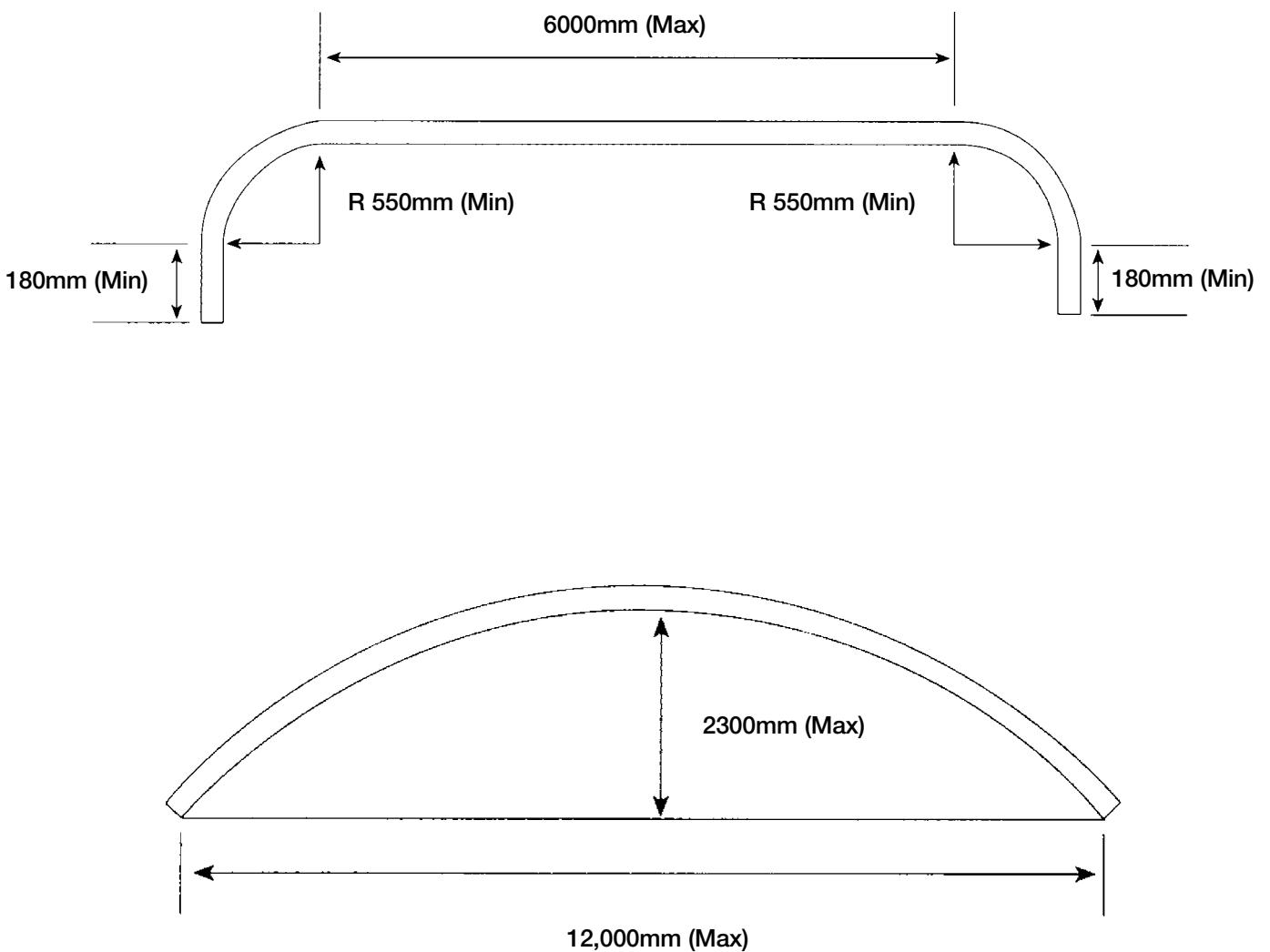


- The sheet can be crimp curved to three quarters of a full circle but to facilitate side lapping, semi circle maximum is recommended.





- When both ends are crimp curved, the maximum recommended straight distance between the two curves should be 4,500mm.
- For length exceeding 12,000mm, please consult BlueScope Lysaght.
- For easy transportation and maximum protection for the crimp curved sheets, the maximum height and length of the sheeting should be 2,300mm and 12,000mm respectively.



\*\* Alternatively, for crimp-less profile, please ask for our LYSAGHT® SELECT SEAM® Profile or LYSAGHT® LOCKED SEAM® Profile

**SIDE-LAPS**

The edge of LYSAGHT® SPANDEK® OPTIMA™ with the anti-capillary groove is always the underlap (see figures on this page). It is generally considered good practice to use fasteners along side-laps however, when cladding is supported as indicated in Maximum Support Spacings, side-lap fasteners are not usually needed for strength.

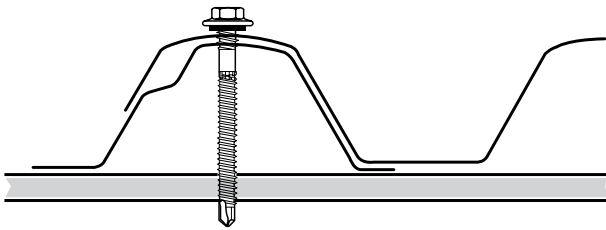
**END LAPPING**

End-laps are not usually necessary because LYSAGHT® SPANDEK® OPTIMA™ is available in long lengths.

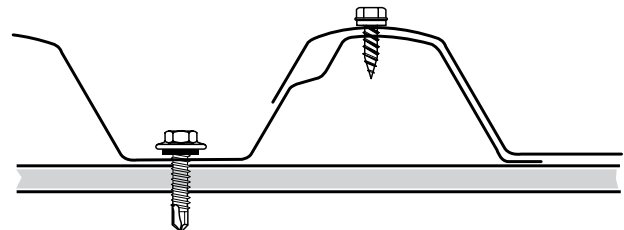
If you want end-laps, seek advice from our information line on the sequence of laying and the amount of overlap.

**ENDS OF SHEETS**

It is usual to allow roof sheets to overlap into gutters by about 50mm. If the roof pitch is less than 25° or extreme weather is expected, the valleys of sheets should be turned-down at lower ends, and turned-up at upper ends by about 80°.



Crest fixing for roof or walls



Valley fixing for walls only

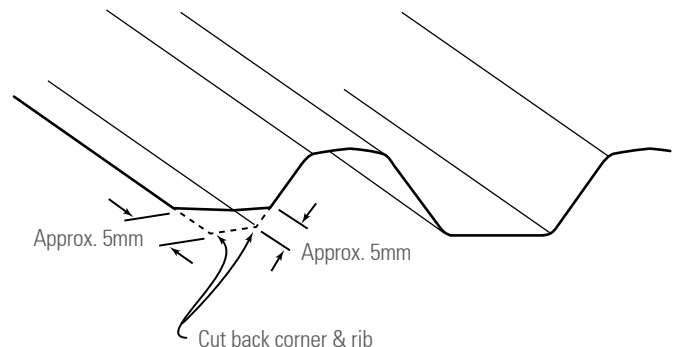
**LAYING PROCEDURE**

For maximum weather-tightness, start laying sheets from the end of the building that will be in the lee of the worst-anticipated or prevailing weather.

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.

**SHEET-ENDS ON LOW SLOPES**

When LYSAGHT® SPANDEK® OPTIMA™ is laid on slopes of 5 degrees or less, cut back the corner of the under-sheet, at the downhill end of the sheet, to block capillary action.

**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, stainless steel, bare steel and green or some chemically-treated timber 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.

**SAFETY, STORAGE AND HANDLING**

LYSAGHT® product may be sharp and heavy.

It is recommended that heavy-duty cut resistant gloves and appropriate manual handling techniques or a lifting plan be used when handling material.

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.

### 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.

Cut materials over the ground and not over other materials.

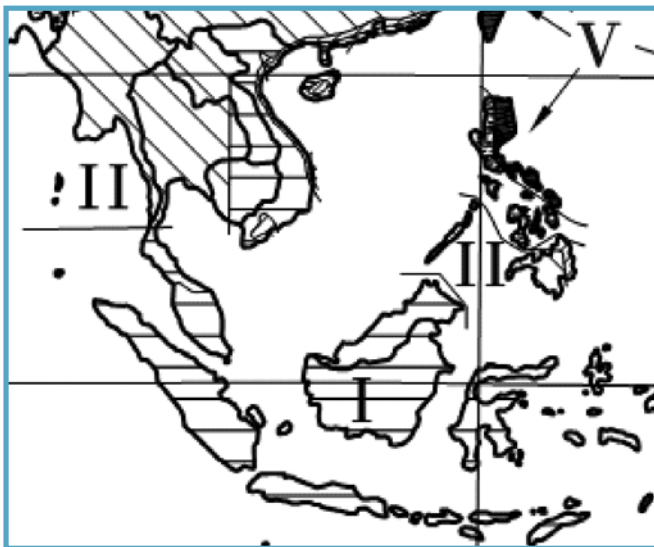
Sweep all metallic swarf and other debris from roof areas and gutters at the end of each day and at the completion of the installation. Failure to do so can lead to surface staining when the metal particles rust.

### SEALED JOINTS

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

## 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.



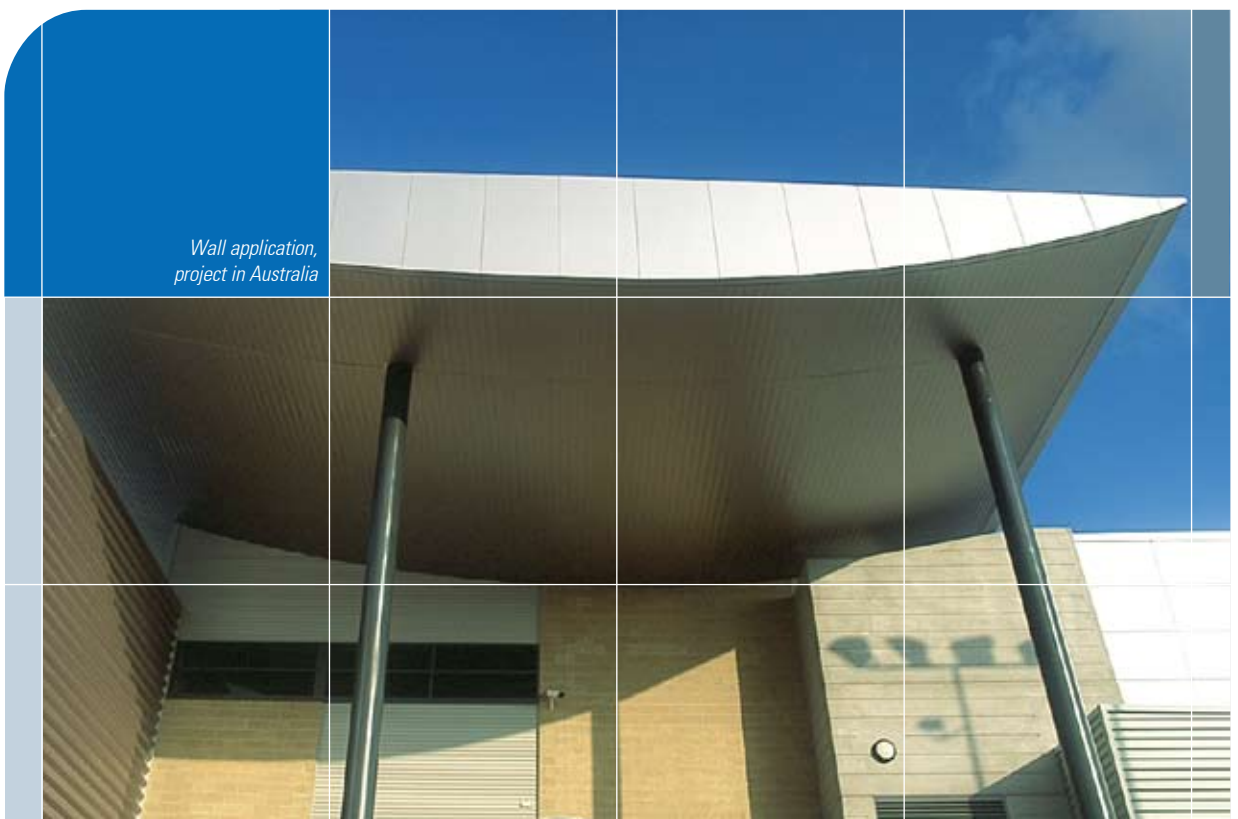
### Wind speeds versus return period

(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.

Wall application,  
project in Australia



# THERMATECH™

## SOLAR REFLECTANCE INDEX (SRI) - ASTM E1980

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

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 △ Lysaght Spandek® & Lysaght Trimdek® series in 0,48mm TCT  
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