

ROOF SLOPE

D E S I G N G U I D E



ROOF SLOPE GUIDE

Selecting the optimum roofing profile for applications where roof slope is a key consideration. Incorporates detailed regional rainfall intensities.



Important note

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Roof slope factors

The major factors when considering roof slopes are

- **Economy**
- **Drainage**
- **Durability**
- **Wind resistance**
- **Safety**
- **Services**
- **Aesthetics**

This guide focuses particular attention on drainage and gives comprehensive information on the drainage characteristics of **Stramit®**'s range of roofing profiles. This, along with rainfall data for major locations, will enable easy selection of the best product for each application.

Economy

Roof slope can have a significant effect on the cost of a building. The extent of this effect is dependent on building size and proportions. Generally the longer the roof slope and the lower the building height the greater the cost reduction from minimising roof slope. These savings are in the wall structure and wall cladding. It should be realised however that increasing the roof slope sufficiently could reduce wind pressures and lower the roof structure cost.

Drainage

Design basis

All roof slope/drainage capacities in this publication are based on rainfall intensity of a 100 year ARI (Average Recurrence Interval) of 5 minutes duration.

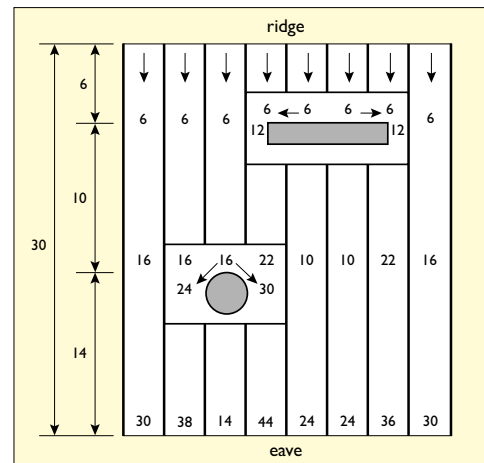
The effective flow areas of roofing profiles are conservative. They are based on water being limited to the depth fully below each profile anti-capillary feature, and further reduced by a freeboard allowance. Recent tests at University of Technology, Sydney on several **Stramit®** profiles have confirmed the adequacy of the data.

Roof run length

The roof run length is the combined length of roofing run contributing to water flow in any one sheeting pan (or trough) at the lowest edge. If roof penetrations or spreaders are present it is likely that the maximum roof run length will exceed the distance from the ridge to the eaves.

(Note – if practical place roof penetrations towards the top of a roof slope where water flow is less significant.)

Water flow is complex. However a simplified method of estimating water flow is generally satisfactory. The illustration shows a typical roof arrangement where two penetrations influence the roof run length in various sheeting pans. Although the nominal roof length is 30m, the Maximum Roof Run Length is 44m in this case. This increase will be lower if water is re-directed back into the original pans below the penetrations.

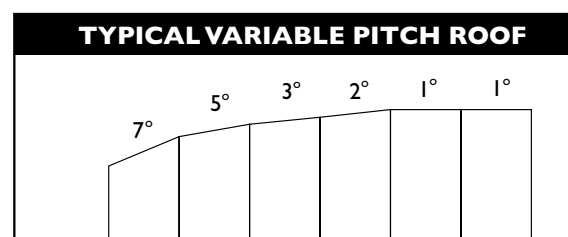


Curved roofs

Spring-curved convex roofs can provide an excellent solution to roof drainage, particularly on large roofs. A convex curve approximates the increasing volume of water along the roof run and therefore can lead to efficient structures. Information on spring-curving of Stramit profiles can be found in the publication *Spring Curving Guide*.

Variable pitch roofs

On very large roofs drainage can lead to increases in roof slope and consequent increases in structure cost. A practical method to reduce the structure in these cases is to vary the pitch down the roof. Taking advantage of occasional expansion joints, each segment of roof sheeting can be at the optimised slope. For each roof segment the maximum roof run length is only considered from the lowest point of that segment to the ridge. The effects of any roof penetrations must be accounted for.



Durability

Durability is considered from the perspective of minimum fall and the benefit of additional fall.

Minimum slope

It is essential that the minimum fall of roof is maintained to ensure that water drains away. This minimum must be maintained over the entire roof, and throughout the life of the building. Water ponding on the roof will gather dirt and airborne particles. This compounds the problem by retaining moisture after most water has dried, and also soaking up condensation and dew. The ensuing prolonged exposure of a section of the roof to a damp 'chemical soup' will reduce life expectancy.

The minimum slopes set by Stramit for its profiles are based on two factors. These are sheeting stiffness (which resists permanent deflection) and the ability of a profile to be turned up or down at the sheet ends to prevent incursion of wind blown rain.

The benefit of additional slope

Further durability benefits can be gained from increasing slope. The major benefit comes from increased cleanliness. Increasing slope increases water velocity and assists gravity and wind in removing debris. A minimum slope of around 5° is considered necessary to achieve these benefits.

Wind Resistance

Many factors influence wind pressure on a building, and on the roof in particular. These include site factors such as location, topography and exposure, as well as building geometry factors such as height, plan ratio and permeability. The slope of the roof is another factor. The influence of slope on wind pressures is inter-dependent on the building geometry factors. There is however a trend worth considering in building design.

As wind uplift pressure is often the limiting criterion in roof sheet sizing and spacing, it can be worth minimising. This can only be achieved by increasing the slope to 10° or more. At 20° the pressure can actually halve. Further increases to 45° have little effect, and beyond this pressures generally increase. Use ASI 170.2 when considering changes to roof slope to reduce wind pressure.

Safety

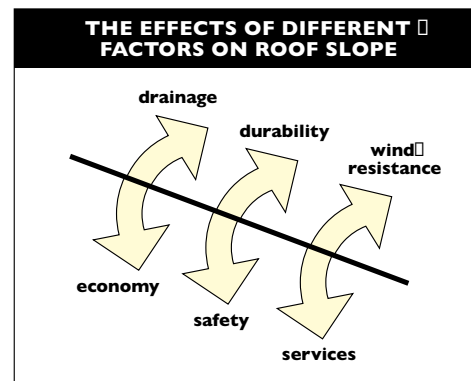
Metal roof sheeting has a relatively smooth surface and, particularly in combination with oil from manufacture or surface water, can be slippery. Increasing the slope increases this risk. It is difficult to define a safe slope; however, roofs with a slope of more than around 25° require the use of ladders or walkways.

Services

Where services are to be installed on the roof it is generally more convenient to minimise the roof slope. This will make installation and maintenance easier, improve safety and may reduce the visual impact.

Aesthetics

For many buildings the roof forms a major visual component. Whether it be minimising slope to hide necessary rooftop services, or increasing the slope for overall visual balance, this guide will assist in selecting the correct product for the desired slope.



How to use

1. Calculate the maximum roof run length.
2. Establish the rainfall intensity for the location of the building. These can be read from the table for many Australian locations, or find the rainfall intensity from the Bureau of Meteorology web site using Latitude and Longitude.
3. Using the Roof Slope table for the next highest rainfall intensity, select a roofing profile and slope to match the maximum roof run length.
4. Check that the selected product is available for the building location using the Regional Product Availability chart.

Regional rainfall intensity

Values of rainfall intensity in the table have been derived from the National Construction Code Volume Two and the Bureau of Meteorology website. Specific data for any location can be obtained from the Bureau of Meteorology website based on the Latitude and Longitude. It should however be emphasised that the extent and longevity of records in Australia are limited and any such data therefore carries with it a degree of uncertainty.

100 YEAR RAINFALL INTENSITIES (mm/hr)			
Australian Capital Territory		Queensland	
Canberra	193	Brisbane	305
New South Wales		Bundaberg	340
Albury	180	Cairns	278
Armidale	238	Charleville	238
Batemans Bay	268	Charters Towers	250
Bathurst	164	Cloncurry	278
Bowral	220	Goondiwindi	258
Broken Hill	219	Gympie	278
Coffs Harbour	382	Innisfail	301
Cowra	190	Longreach	251
Dubbo	222	Mackay	316
Forbes	205	Mt.Isa	260
Gosford	313	Noosa Heads	331
Goulburn	156	Proserpine	293
Kempsey	287	Rockhampton	300
Lismore	270	Southport	335
Lithgow	196	Toowoomba	268
Maitland	266	Townsville	300
Mittagong	222	Warwick	252
Moss Vale	217	Tasmania	
Newcastle	316	Burnie	180
Nowra	247	Hobart	116
Orange	186	Launceston	121
Parramatta	209	Victoria	
Penrith	244	Ballarat	188
Port Macquarie	313	Geelong	144
Riverstone	234	Lakes Entrance	198
Robertson	248	Melbourne	187
Sydney	262	Mildura	218
Ulladulla	306	Stawell	186
Wagga Wagga	208	Western Australia	
Wollongong	308	Albany	178
Wyong	320	Broome	287
Northern Territory		Bunbury	199
Alice Springs	239	Derby	256
Darwin	274	Geraldton	193
Katherine	250	Perth	172
South Australia		Port Headland	230
Adelaide	184		
Mt.Gambier	144		
Port Augusta	199		

Product availability

Not all profiles listed in this guide are available in all locations. The table below gives an indication of availability by region.

REGIONAL PRODUCT AVAILABILITY									
<i>sheeting/decking</i>	N.TER	N. QLD	S. QLD	NSW	ACT	VIC	TAS	S. AUS	W. AUS
Stramit® Corrugated	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stramit Longspan®	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stramit MonoClad®	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stramit MegaClad®	X	X	X	✓	✓	X	X	X	X
Stramit Speed Deck® 500	X	X	X	X	X	X	✓	X	X
Stramit Speed Deck Ultra®	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stramit® Capacity Plus 660	✓	✓	✓	X	X	X	X	X	X
	✓ readily available ? available subject to enquiry and minimum order quantity X not normally available								

MINIMUM ROOF SLOPES (degrees) for a rainfall intensity of 160mm/hr

sheeting/decking	total roof run length (m)															Minimum roof slope (degrees) for sheeting/decking	Maximum roof run length (m) at minimum slope
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150		
Stramit® Corrugated	5.0		11	23	exceeds the scope of this guide											5.0	22
Stramit Longspan®	1.5			2.0	3.0	4.5	6.5	8.0	10	13	15	18	21	24		1.5	46
Stramit Monoclad®	2.0								2.5	3.0	3.5	4.5	5.0	6.0		2.0	98
Stramit Megaclad®	2.0										3.0	3.5	4.0	4.5		2.0	111
Stramit Speed Deck® 500	1.0															1.0	172
Stramit Speed Deck Ultra®	1.0															1.0	183
Stramit Capacity Plus™ 660	1.0															1.0	199

MINIMUM ROOF SLOPES (degrees) for a rainfall intensity of 190mm/hr

sheeting/decking	total roof run length (m)															Minimum roof slope (degrees) for sheeting/decking	Maximum roof run length (m) at minimum slope	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150			
Stramit® Corrugated	5.0	6.0	17	exceeds the scope of this guide											5.0	19		
Stramit Longspan®	1.5			2.0	3.0	5.0	7.0	9.0	12	15	18	22	25		1.5	39		
Stramit Monoclad®	2.0								3.0	3.5	4.5	5.5	6.5	7.5	9.0	2.0	82	
Stramit Megaclad®	2.0										2.5	3.5	4.0	5.0	6.0	6.5	2.0	94
Stramit Speed Deck® 500	1.0															1.5	1.0	145
Stramit Speed Deck Ultra®	1.0															1.0	154	
Stramit Capacity Plus™ 660	1.0															1.0	168	

MINIMUM ROOF SLOPES (degrees) for a rainfall intensity of 220mm/hr

sheeting/decking	total roof run length (m)															Minimum roof slope (degrees) for sheeting/decking	Maximum roof run length (m) at minimum slope			
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150					
Stramit® Corrugated	5.0	8.5	24	exceeds the scope of this guide											5.0	16				
Stramit Longspan®	1.5			2.5	4.5	6.5	9.5	13	16	20	24			1.5	34					
Stramit Monoclad®	2.0								3.0	4.0	5.0	6.0	7.5	9.0	11	12	2.0	71		
Stramit Megaclad®	2.0										3.0	4.0	5.0	5.5	7.0	8.0	9.5	2.0	81	
Stramit Speed Deck® 500	1.0															1.5	1.5	2.0	1.0	125
Stramit Speed Deck Ultra®	1.0															1.5	1.5	1.0	133	
Stramit Capacity Plus™ 660	1.0															1.5	1.0	145		

MINIMUM ROOF SLOPES (degrees) for a rainfall intensity of 250mm/hr

sheeting/decking	total roof run length (m)															Minimum roof slope (degrees) for sheeting/decking	Maximum roof run length (m) at minimum slope				
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150						
Stramit® Corrugated	5.0	12.0	exceeds the scope of this guide												5.0	14					
Stramit Longspan®	1.5			3.5	6.0	9.0	13	17	21				1.5	30							
Stramit Monoclad®	2.0								3.0	4.0	5.5	6.5	8.0	10	12	14	16	2.0	63		
Stramit Megaclad®	2.0										3.0	4.0	5.0	6.0	7.5	9.0	11	12	2.0	71	
Stramit Speed Deck® 500	1.0															1.5	2.0	2.5	3.0	1.0	110
Stramit Speed Deck Ultra®	1.0															1.5	1.5	2.0	2.5	1.0	117
Stramit Capacity Plus™ 660	1.0															1.5	1.5	2.0	1.0	127	

MINIMUM ROOF SLOPES (degrees) for a rainfall intensity of 280mm/hr

sheeting/decking	total roof run length (m)															Minimum roof slope (degrees) for sheeting/decking	Maximum roof run length (m) at minimum slope
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150		
Stramit® Corrugated	5.0	16	exceeds the scope of this guide													5.0	12
Stramit Longspan®	1.5	2.5	4.5	7.5	12	16	21	exceeds the scope of this guide								1.5	26
Stramit Monoclad®	2.0				2.5	4.0	5.0	7.0	8.5	11	13	15	18	20	2.0	56	
Stramit Megaclad®	2.0					3.0	4.0	5.0	6.5	8.0	9.5	12	14	16	2.0	63	
Stramit Speed Deck® 500	1.0								1.5	1.5	2.0	2.5	3.0	3.5	1.0	98	
Stramit Speed Deck Ultra®	1.0								1.5	2.0	2.0	2.5	3.0	1.0	104		
Stramit Capacity Plus™ 660	1.0									1.5	2.0	2.0	2.5	1.0	114		

MINIMUM ROOF SLOPES (degrees) for a rainfall intensity of 310mm/hr

sheeting/decking	total roof run length (m)															Minimum roof slope (degrees) for sheeting/decking	Maximum roof run length (m) at minimum slope
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150		
Stramit® Corrugated	5.0	21	exceeds the scope of this guide													5.0	11
Stramit Longspan®	1.5	3.0	6.0	9.5	14	19	exceeds the scope of this guide								1.5	24	
Stramit Monoclad®	2.0				3.5	5.0	6.5	8.5	11	13	16	19	22	25	2.0	50	
Stramit Megaclad®	2.0					2.5	3.5	5.0	6.5	8.0	10	12	14	17	19	2.0	57
Stramit Speed Deck® 500	1.0								1.5	1.5	2.0	3.0	3.0	4.0	4.5	1.0	89
Stramit Speed Deck Ultra®	1.0								1.5	2.0	2.5	3.0	3.5	4.0	1.0	94	
Stramit Capacity Plus™ 660	1.0									1.5	2.0	2.5	3.0	3.0	1.0	103	

MINIMUM ROOF SLOPES (degrees) for a rainfall intensity of 380mm/hr

sheeting/decking	total roof run length (m)															Minimum roof slope (degrees) for sheeting/decking	Maximum roof run length (m) at minimum slope	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150			
Stramit® Corrugated	6.0	exceeds the scope of this guide														5.0	9	
Stramit Longspan®	1.5	2.0	5.0	9.0	15	22	exceeds the scope of this guide								1.5	19		
Stramit Monoclad®	2.0				3.5	5.5	7.5	10	13	17	20	24	exceeds the scope of this guide			2.0	41	
Stramit Megaclad®	2.0					2.5	4.0	6.0	8.0	10	13	16	19	22	25	2.0	47	
Stramit Speed Deck® 500	1.0								1.5	2.0	3.0	3.5	4.5	5.0	6.0	7.0	1.0	72
Stramit Speed Deck Ultra®	1.0								1.5	2.0	2.5	3.0	4.0	4.5	5.5	6.5	1.0	77
Stramit Capacity Plus™ 660	1.0									1.5	2.0	2.5	3.0	4.0	4.5	5.0	1.0	84

Note: Depth of flow in pan = 60% height of underlap (agreed industry standard)



The Stramit web page can be found at:

www.stramit.com.au

Details of many **Stramit**® products can also be seen on the AIA site 'Product Selector' at:

www.selector.com.au

		prices	availability	general	technical
contact numbers for information			products coating colours	other	advice product data
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