

# SmartRafter™



## SmartRafter™

SmartRafters are a new engineered wood product developed by Timber Imagineering and licensed to Tilling Timber Pty Ltd. It combines highly reliable plywood and LVL to form a composite 'C' section beam. The composite beam allows an economical formation of a wide variety of geometric shapes, including, but not limited to, linear tapered, top edge curved and to fully curved.

Refer to page 3 for other geometries.

SmartRafters are designed and fabricated to Australian standards, and are structurally certified by Timber Imagineering, 20 Sydney Road, Bayswater Vic 3153.

SmartRafters can come in a variety of profiles to suit all geometrical roof shapes not suitable for existing construction methods.

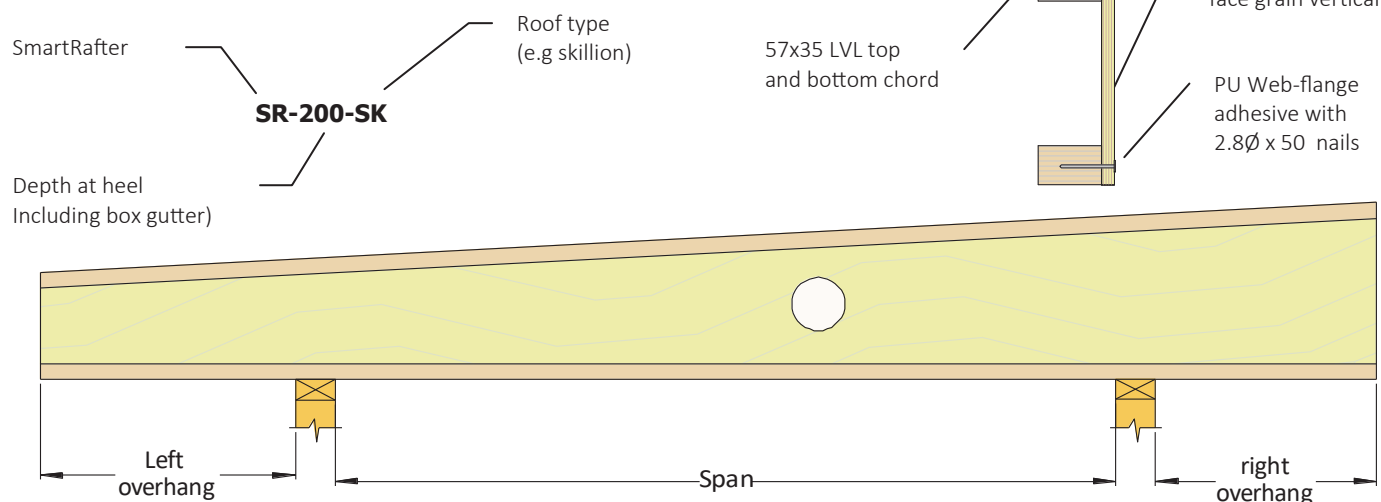
Whilst SmartRafters are often used without an eave overhang, several different overhang details are possible and can be included at fabrication. I.e. exposed hardwood or softwood

outrigger, tapered top and horizontal eave soffit, profiled and standard. The materials are profiled using state-of-the-art CNC machines which enables these to be made with ease.

### Advantages

- Light-weight and easy to handle
- Custom shapes
- Direct fixing of ceiling lining
- No need for raking battens as roof pitch is built-in
- Large spans
- Trimmable on site
- Box gutters can be built into the rafter on request
- Penetrations can be fabricated in on request
- Internal supports may be eliminated due to span capabilities.

### Specifying SmartRafter



### Loadings

#### 1. Dead load

##### Mass of typical roof constructions

Roof mass (kg/m <sup>2</sup> )	Material
10	Steel sheet roofing 0.50 mm thick and battens
20	Metal sheet tiles or medium gauge steel sheet roofing, battens, 12 mm softwood ceiling lining, sarking and lightweight insulation
30	Steel sheet roofing 0.75 mm thick, 13 mm plaster ceiling, roof and ceiling battens, sarking and lightweight insulation
40	Steel sheet roofing 0.75 mm thick, battens, graded purlins and high density fibreboard ceiling lining

#### 2. Live load

Uniformly distributed action = maximum  $[(1.8/A + 0.12), 0.25]$  kPa  
Concentrated action = 1.4 kN

#### 3. Wind load

Wind class		Design gust wind speed	
Region A and B Non - Cyclonic	Region C and D Cyclonic	Serviceability limit state	Ultimate limit state
N1	-	26	34
N2	-	26	40
N3	C1	32	50
N4	C2	39	61
N5	C3	47	74

#### 4. Design

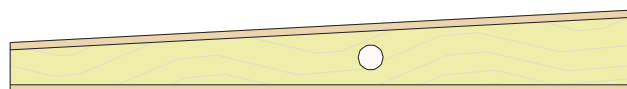
SmartRafters are designed in accordance with the relevant Australian standards and the first principles of structural mechanics.

- AS 1170.1 Structural design actions, permanent, imposed and other actions
- AS 4055 Wind loads for housing
- AS 1720.1 Timber structures design methods
- AS 1720.3 Timber structures design criteria for timber-framed residential buildings

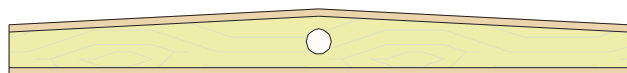


## 5. Profiles

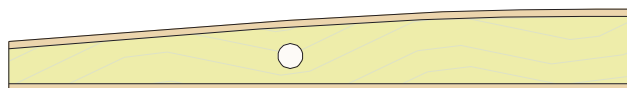
Below are some standard profiles but others may be available on request



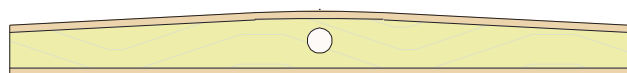
Skillion (SK)



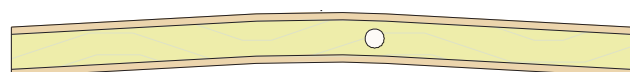
Gable (GA)



Half top curved (CH)



Flat top curved (CF)

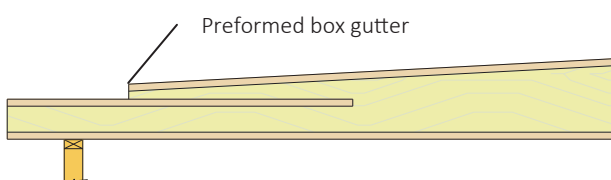


## 6. Box Gutter

Box gutter end details were one of the major driving forces behind the SmartRafters' invention. SmartRafters are ideal for use in low pitch roofs where a concealed box gutter is necessary, and limits unnecessary beams and support.

Unlike many traditional roof framing products, SmartRafters do not need large a heel depth to accommodate a gutter.

The box gutter detail below is pre-manufactured into the Smart Rafter during production, therefore it is important that all details including the dimensions of the box gutter rebate are supplied as part of the order.



## 7. Roof & Ceiling Battens

SmartRafters specified within this guide are designed to have roof battens fixed to top edge at a maximum 1200 mm ctrs. The ceiling is to be either attached directly or with ceiling battens at 600 mm ctrs. Suspended ceiling systems do not meet the requirement of bottom chord restraint and will require internal blocking as specified by engineer.

## 8. Web holes

A 40 mm diameter hole is permitted anywhere within the web area.

Larger circular, rectangular, and square holes are also permitted for services. As a general rule of thumb, larger service penetrations are installed in the centre  $\frac{1}{3}$  of the span. Contact techsupport@tilling.com.au for specific design advice.

## 9. Tie Down

Wind loadings on light roofs can produce net uplift pressures. The same requirements and methods of tie down apply to SmartRafters as for solid timber roof members except that any tie down system in cyclonic areas must extend over the top flange. Guidance for tie down requirements are provided in AS 1684 or from techsupport@tilling.com.au

## 10. Site Trimming

SmartRafters can be trimmed on-site, however, it should be kept to a minimum and where necessary seek advice.

## 11. Safety

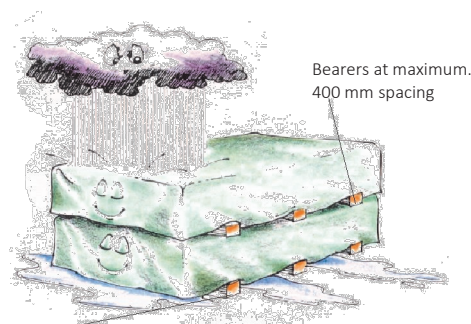
Blocking, bracing and temporary fixings must be installed before any construction loads including workers are placed on rafters.

Blocking along supports is to be provided as per detail 2 or 3 below at centres no greater than 1800 mm.

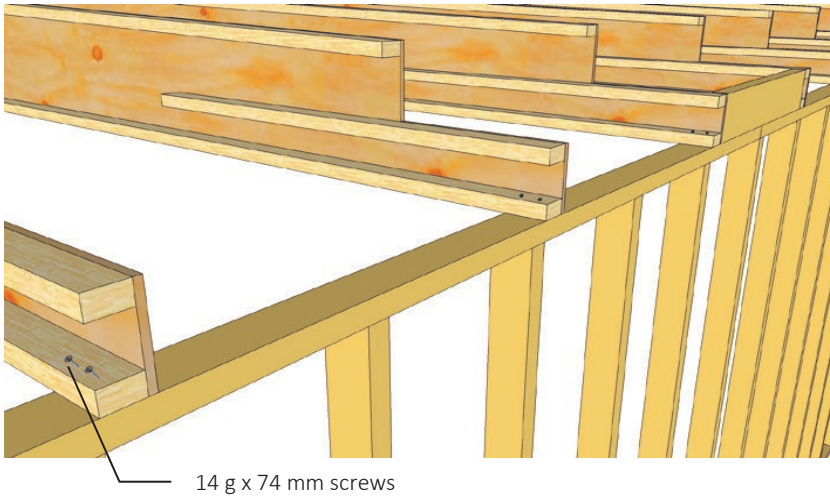
Green timber (unseasoned) shall not be used anywhere in the connection or bracing structure of a SmartRafter roof.

## 12. Handling and Storage Guidelines

- SmartRafter should be protected from the weather and stored lying flat.
- Keep SmartRafters off of ground during storage.
- Store SmartRafters in wrapped bundles, provide air circulation and support with 90mm bearers.
- Protect from the weather on the job site both before and after installation. SmartRafter is intended for use in covered, dry conditions only.
- Except as described in this product guide, consult engineer to see if SmartRafter can be cut, drilled or notched.
- Do not install wet or visually damaged product.

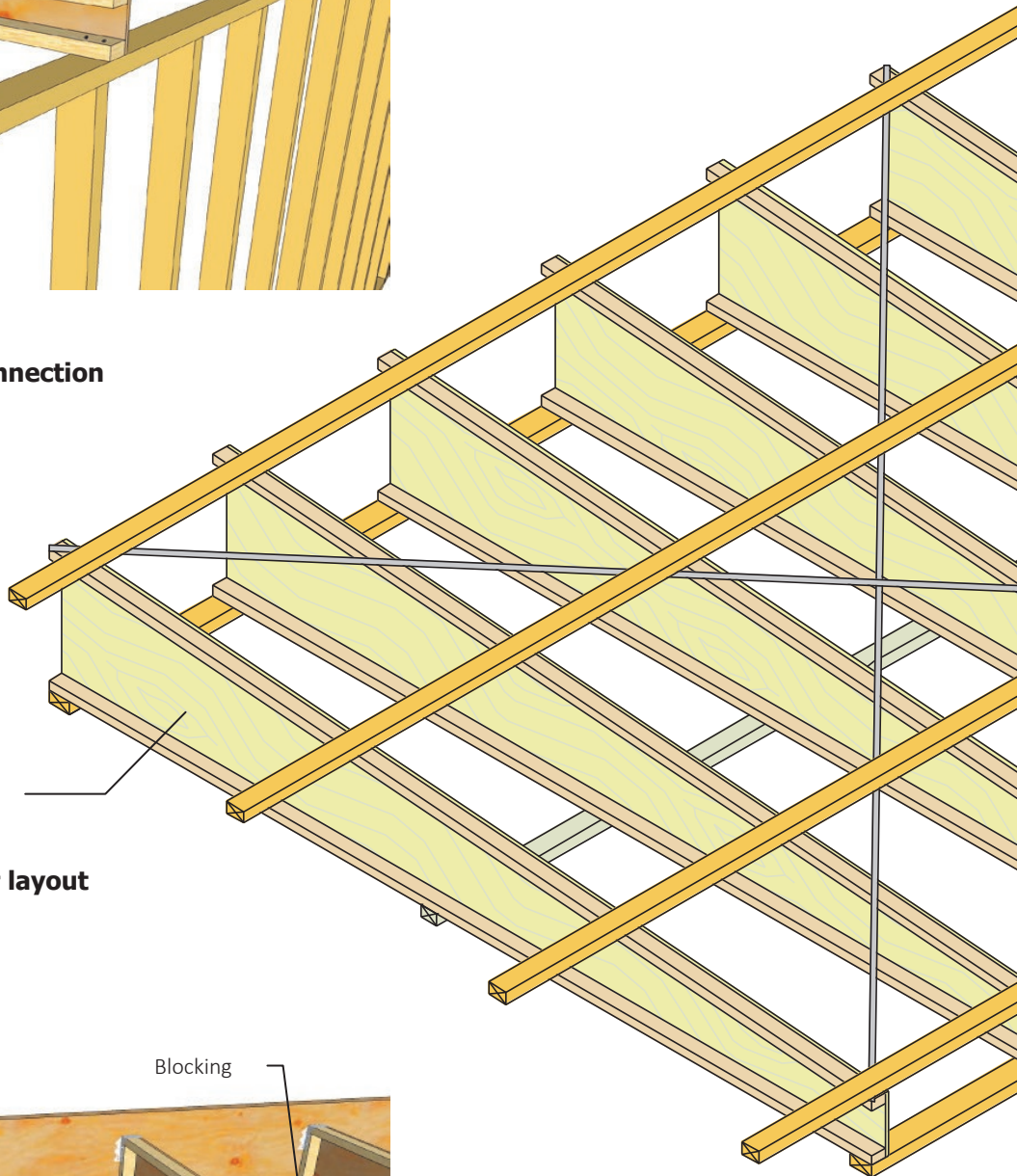


Use bearers to keep stacked material away from damp surfaces. Align bearers vertically

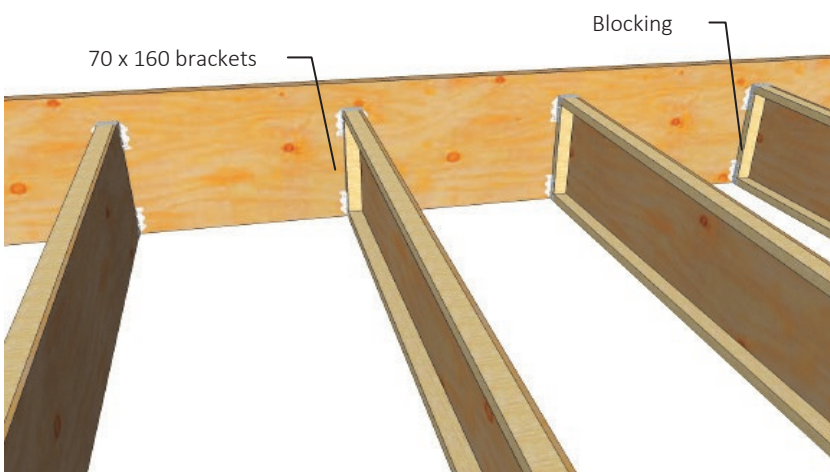


**Detail 1 - Screwed wall connection**

SmartRafters

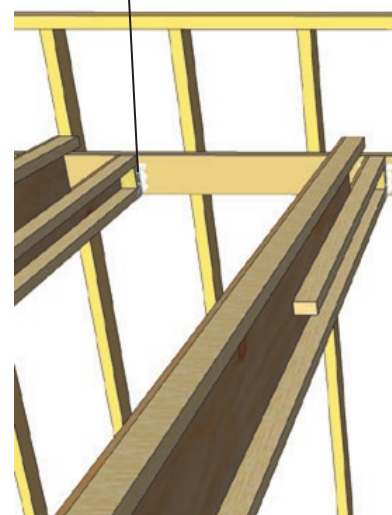


**Detail 2 - General rafter layout**



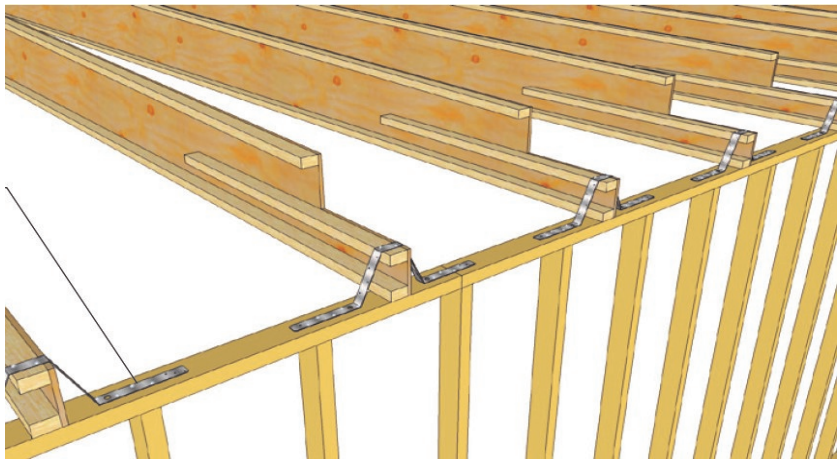
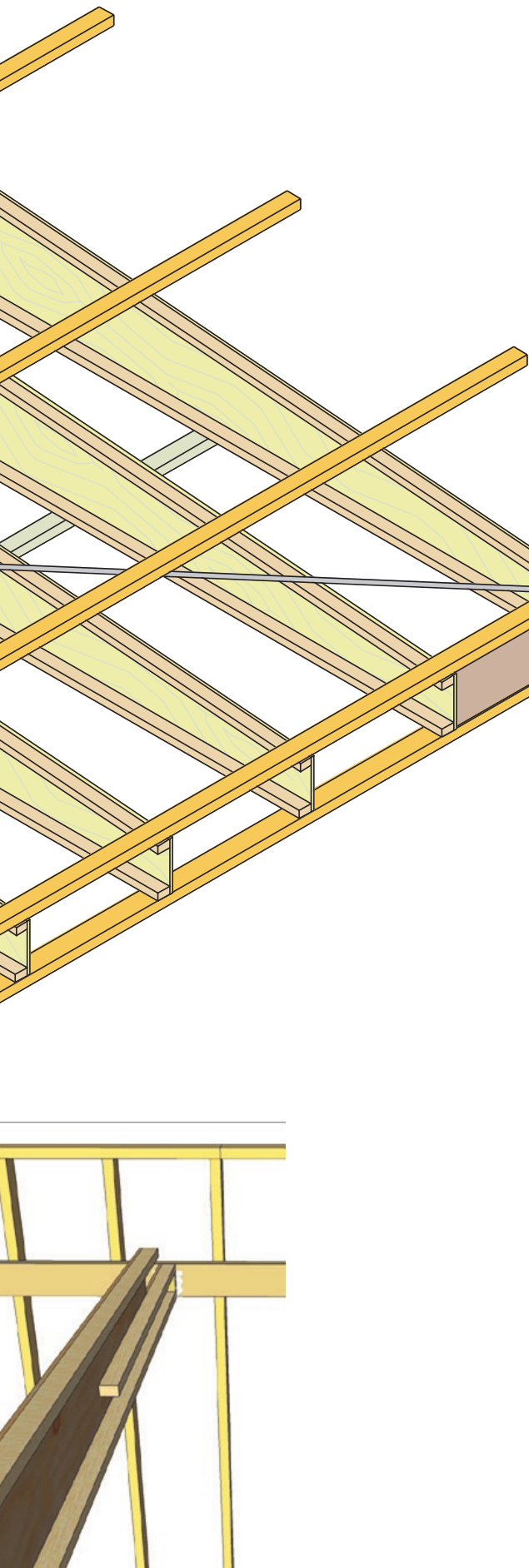
**Detail 3 - Bracket beam connection**

70 x 160 brackets



**Detail 4 - Bracket timber wall**

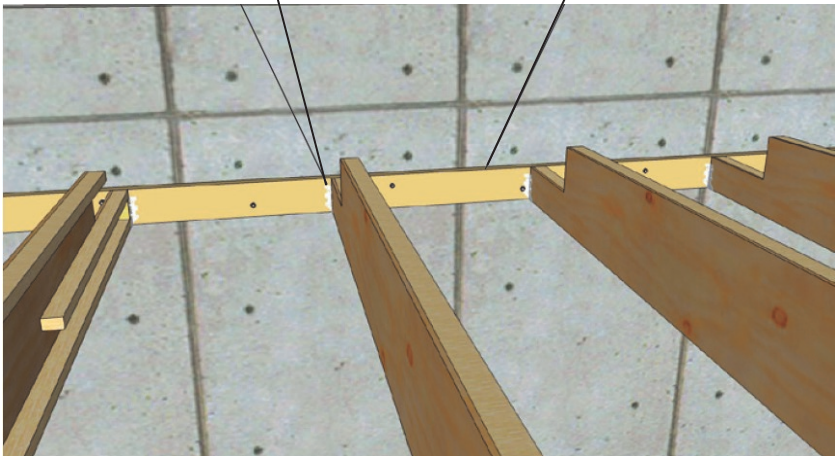
# DETAILS



**Detail 5 - Strap wall plate connection**

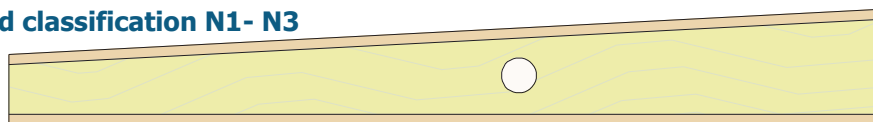
70 x 160 brackets

Wall plate

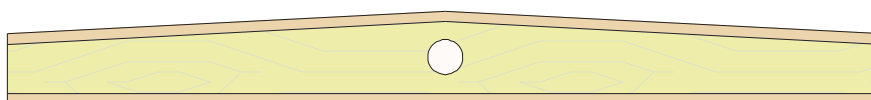


**Detail 6 - Bracket concrete wall plate connection**

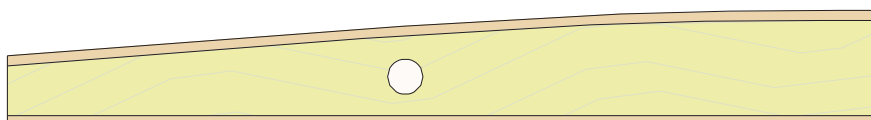
## Span tables—Wind classification N1- N3



Rafter slope Spacing (mm) SmartRafter Code	Roof mass (kg/m <sup>2</sup> )	1 deg			2 deg			3 deg		
		600	900	1200	600	900	1200	600	900	1200
		Maximum recommended span (m)								
SR120-SK	20	5.6	4.8	3.9	6.8	6.0	5.3	7.8	6.9	6.3
	30	4.8	4.1	3.6	6.0	5.1	4.4	6.9	6.1	6.0
	40	4.3	3.6	3.2	5.3	4.4	3.8	6.3	5.3	4.5
SR150-SK	20	6.4	5.7	5.1	7.5	6.7	6.2	8.5	7.6	6.9
	30	5.7	4.9	4.3	6.7	5.9	5.2	7.6	6.7	6.1
	40	5.1	4.3	3.8	6.2	5.2	4.5	6.9	6.1	5.3
SR170-SK	20	6.8	6.2	5.6	7.9	7.1	6.5	8.9	7.9	7.3
	30	6.2	5.4	4.8	7.1	6.3	5.7	7.9	7.0	6.4
	40	5.6	4.8	4.2	6.5	5.7	4.9	7.3	6.4	5.7
SR200-SK	20	7.4	6.7	6.2	8.4	7.6	7.0	9.4	8.5	7.8
	30	6.7	6.0	5.4	7.6	6.8	6.2	8.5	7.5	6.9
	40	6.2	5.4	4.8	7.0	6.2	5.6	7.8	6.9	6.2
SR240-SK	20	8.1	7.4	6.8	9.1	8.2	7.6	10.1	9.1	8.4
	30	7.4	6.6	6.1	8.2	7.4	6.8	9.1	8.1	7.4
	40	6.8	6.1	5.5	7.6	6.8	6.2	8.4	7.4	6.7



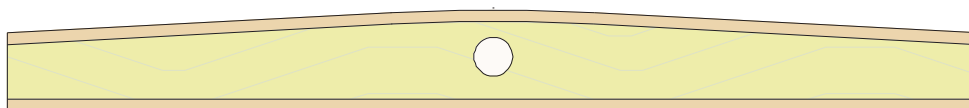
Rafter slope Spacing (mm) SmartRafter Code	Roof mass (kg/m <sup>2</sup> )	1 deg			2 deg			3 deg		
		600	900	1200	600	900	1200	600	900	1200
		Maximum recommended span (m)								
SR120-GA	20	5.2	4.5	4.0	6.2	5.4	4.7	7.0	6.3	5.6
	30	4.5	3.8	3.4	5.4	4.5	3.9	6.2	5.3	4.5
	40	4.0	3.4	3.0	4.7	3.9	3.4	5.6	4.5	3.9
SR150-GA	20	6.1	5.4	4.8	6.9	6.2	5.6	7.7	6.9	6.3
	30	5.4	4.6	4.1	6.2	5.3	4.7	6.9	6.1	5.3
	40	4.8	4.1	3.6	5.6	4.7	4.1	6.3	5.3	4.6
SR170-GA	20	6.5	5.9	5.3	7.3	6.6	6.1	8.1	7.2	6.7
	30	5.9	5.1	4.5	6.6	5.8	5.1	7.2	6.4	5.8
	40	5.3	4.5	4.0	6.1	5.1	4.5	6.7	5.8	5.0
SR200-GA	20	7.1	6.5	6.0	7.9	7.1	6.6	8.6	7.8	7.1
	30	6.5	5.8	5.1	7.1	6.4	5.8	7.8	6.9	6.3
	40	6.0	5.1	4.6	6.6	5.8	5.1	7.1	6.3	5.6
SR240-GA	20	7.8	7.1	6.6	8.5	7.7	7.2	9.3	8.4	7.7
	30	7.1	6.4	5.9	7.7	6.9	6.4	8.4	7.5	6.8
	40	6.6	5.9	5.3	7.2	6.4	5.8	7.7	6.8	6.3



Rafter slope Spacing (mm) SmartRafter Code	Roof mass (kg/m <sup>2</sup> )	1 deg			2 deg			3 deg		
		600	900	1200	600	900	1200	600	900	1200
		Maximum recommended span (m)								
SR120-CH	20	6.7	6.1	5.6	8.1	7.4	7.0	9.2	8.5	7.9
	30	6.1	5.4	4.9	7.4	6.8	6.3	8.5	7.7	7.2
	40	5.6	4.9	4.4	7.0	6.3	5.8	7.9	7.2	6.7
SR150-CH	20	7.2	6.6	6.2	8.6	7.9	7.4	9.6	8.9	8.3
	30	6.6	6.0	5.5	7.9	7.1	6.7	8.9	8.1	7.5
	40	6.2	5.5	4.9	7.4	6.7	6.2	8.3	7.5	7.0
SR170-CH	20	7.5	6.9	6.5	8.8	8.1	7.6	9.9	9.1	8.5
	30	6.9	6.3	5.8	8.1	7.4	6.9	9.1	8.3	7.7
	40	6.5	5.8	5.2	7.6	6.9	6.4	8.5	7.7	7.2
SR200-CH	20	8.0	7.3	6.9	9.2	8.5	8.0	10.3	9.4	8.9
	30	7.3	6.7	6.2	8.5	7.7	7.2	9.4	8.6	8.0
	40	6.9	6.2	5.7	8.0	7.2	6.7	8.9	8.0	7.4
SR240-CH	20	8.6	7.9	7.4	9.7	9.0	8.4	10.7	9.9	9.3
	30	7.9	7.2	6.7	9.0	8.2	7.6	9.9	9.0	8.4
	40	7.4	6.7	6.2	8.4	7.6	7.1	9.3	8.4	7.8



## Span tables—Wind classification N1- N3



Rafter slope Spacing (mm) SmartRafter Code	Roof mass (kg/m <sup>2</sup> )	1 deg			2 deg			3 deg		
		600	900	1200	600	900	1200	600	900	1200
		Maximum recommended span (m)								
SR120-CF	20	6.4	5.9	5.3	7.7	7.1	6.6	8.8	8.1	7.6
	30	5.9	5.2	4.6	7.1	6.5	6.0	8.1	7.4	6.8
	40	5.3	4.6	4.1	6.6	6.0	5.4	7.6	6.8	6.3
SR150-CF	20	7.0	6.4	6.0	8.2	7.5	7.0	9.2	8.5	7.9
	30	6.4	5.7	5.2	7.5	6.8	6.4	8.5	7.7	7.1
	40	6.0	5.2	4.7	7.0	6.3	5.9	7.9	7.2	6.6
SR170-CF	20	7.3	6.7	6.3	8.5	7.8	7.3	9.5	8.7	8.1
	30	6.7	6.1	5.5	7.8	7.1	6.6	8.7	7.9	7.3
	40	6.3	5.5	5.0	7.3	6.6	6.1	8.1	7.4	6.8
SR200-CF	20	7.8	7.1	6.7	8.9	8.2	7.6	9.8	9.0	8.5
	30	7.1	6.5	6.0	8.2	7.4	6.9	9.0	8.2	7.7
	40	6.7	6.0	5.4	7.6	6.9	6.4	8.5	7.7	7.1
SR240-CF	20	8.3	7.7	7.2	9.4	8.6	8.1	10.3	9.5	8.9
	30	7.7	7.0	6.5	8.6	7.9	7.3	9.5	8.6	8.0
	40	7.2	6.5	6.0	8.1	7.3	6.8	8.9	8.0	7.4

## Batten tables— Wind classification N1- N3

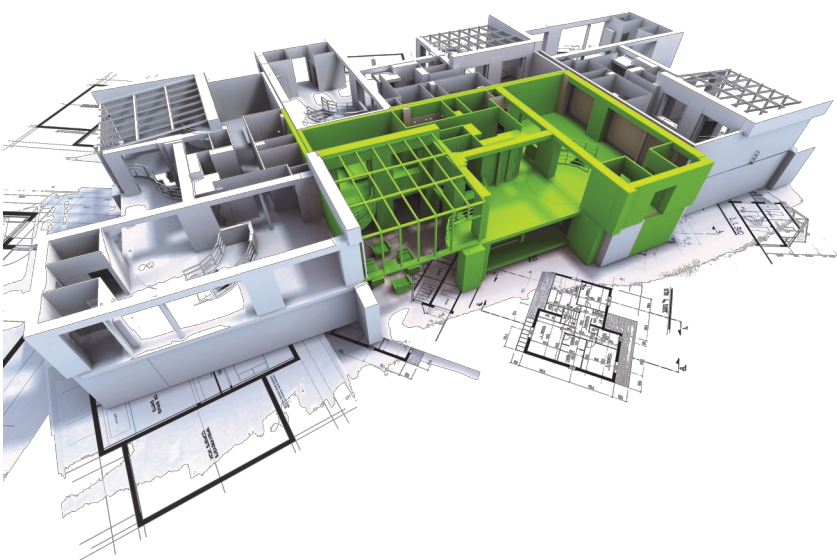
10 kg/m<sup>2</sup> roof dead load

SmartRafter spacing (mm)	Batten spacing (mm)	Batten material			
		F5	F17	MGP10	SmartLVL 15
600	600	35 x 70	35 x 42	35 x 70	35 x 90
	900	45 x 70	35 x 42	35 x 90	35 x 90
	1200	45 x 90	35 x 70	45 x 70	35 x 90
900	600	45 x 70	35 x 42	35 x 90	35 x 90
	900	45 x 90	35 x 70	45 x 70	35 x 90
	1200	-	35 x 70	45 x 90	35 x 90
1200	600	45 x 90	35 x 70	45 x 70	35 x 90
	900	-	35 x 70	45 x 90	35 x 90
	1200	-	35 x 90	-	35 x 90

## Notes:

1. Maximum overhang = 50% of back span
2. During construction, roof battens should only be walked on at support points
3. It is recommended that battens be screwed to the top of the SmartRafter with 14 - 10 x 75 mm Galvanised Bugle Batten Screws

Information for wind loads outside the N1-N3 Tables shown above or for alternative configurations may be obtained by contacting the Tech support Customer helpline on 1300 668 690 or [techsupport@tilling.com.au](mailto:techsupport@tilling.com.au).



## SMARTFRAME Design Compendium

### Design Compendium Contents

Specifications software

Technical Support

Design Guides (PDF)

Technical Illustrations

Fixing Details

Software Tutorial

### Interactive



### Printable



### PC



Never before has so much user-friendly computer power you been unleashed into the hands of building industry professionals to allow the design and detailing of engineered timber products. This software, in conjunction with the SmartFrame Design Centre and SmartFrame Engineered Wood products themselves, combines to form the most sophisticated structural timber option ever available to the Australian market.

The Smart Frame Engineered Timber Solution represents an entirely new and revolutionary concept in the delivery of the 21st century technology and service to the building industry.

Available from:

### Head Office

#### Victoria

31-45 Orchard Street,  
Kilsyth Vic 3137

email: [sales@tilling.com.au](mailto:sales@tilling.com.au)

Phone +61 3 9725 0222

Fax +61 3 9725 3045

#### New South Wales

109 Kurrajong Avenue,  
Mt Druitt, NSW 2770

email: [nswsales@tilling.com.au](mailto:nswsales@tilling.com.au)

Phone +61 2 9677 2600

Fax +61 2 9677 2500

#### Queensland

84 Magnesium Drive,  
Crestmead QLD 4132

email: [qldsales@tilling.com.au](mailto:qldsales@tilling.com.au)

Phone +61 7 3440 5400

Fax +61 7 3440 5444

#### Western Australia

10 Cartwright Drive  
Forrestdale WA 6112

email: [wasales@tilling.com.au](mailto:wasales@tilling.com.au)

Phone +61 8 9399 1609

Fax +61 8 9399 1065

#### South Australia

5-9 Woomera Ave  
Edinburgh SA 5111

email: [sasales@tilling.com.au](mailto:sasales@tilling.com.au)

Phone +61 8 8345 1966

Fax +61 8 8345 1977

**Technical support 1300 668 690**

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