



# Building with tile roofs in bushfire prone areas.

A guide for builders and roof tilers.



ROOFING TILE  
ASSOCIATION  
OF AUSTRALIA





# Introduction

**The Australian Standard “AS3959-2009 Construction of buildings in bushfire-prone areas” is called up in the 2010 edition of the BCA for application in all states and territories commencing May 2010.**

AS 3959-2009 provides construction details appropriate for a variety of Bushfire Attack Levels (BALs). There are now five BALs: BAL-Low, BAL-12.5, BAL-19, BAL-29, BAL-40 and BAL-FZ (flame zone). The BALs are based on an assessment of the potential exposure of a site to ember attack and to radiant-heat thresholds, expressed as kW/m<sup>2</sup>. For example BAL-29 is primarily concerned with protection from ember attack and from radiant heat up to and including 29 kW/m<sup>2</sup>.

Homeowners planning to build on allotments in areas that have been assessed as bush fire prone under the new Australian Residential Bushfire Standard areas can now choose a compliant tile roofing system following the completion of independent research and testing.

The development of these complying tile roof systems was jointly funded by all Australian manufactures of concrete and terracotta tiles with the Roofing Tile Association of Australia managing the project on their behalf.



# Construction details

\* The sarking shall-

- a have a flammability index of not more than 5;
- b be located directly below the roof battens;
- c cover the entire roof area including the ridge; and
- d be installed so that there are no gaps that would allow the entry of embers where the sarking meets fascias, gutters, valleys and the like.

For each BAL there are specific requirements for the construction of tile roofs;

**BAL-LOW**, the Standard does not impose any additional requirements. This Standard does not provide construction requirements for buildings assessed in bushfire-prone areas in accordance with Section 2 as being BAL—LOW.

**BAL-12.5 and BAL-19:** Normal Fixing Requirements plus approved-grade sarking\*.

In addition the RTAA recommends the use of anti-ponding board as detailed in manufacturers fixing instructions to prevent water “ponding” behind the fascia.

**BAL-29 and BAL-40** Normal Fixing Requirements plus approved-grade sarking\*.

In addition the RTAA recommends the use of anti-ponding board as detailed in manufacturers fixing instructions to prevent water “ponding” behind the fascia.

In **BAL-29 and BAL-40** the RTAA recommends fixing every tile to the battens as shown in manufacturers fixing instructions. This recommendation is based on the wind speeds (up to 150 km/h or 42 m/sec) associated with bushfires that, while below the lower end of the cyclonic wind range (198 km/h or 55 m/sec), are high enough to warrant careful attachment of the roof structure to the building. The requirements of the local authority should be followed.





# Construction details (cont.)

\* The sarking shall-

- a have a flammability index of not more than 5, when tested to AS 1530.2;
- b be located directly below the roof battens;
- c cover the entire roof area including the ridge; and
- d extend into gutters and valleys.

**BAL-FZ** Tile roofs are permitted provided it is part of a system tested according to the method described in AS 1530.8.

The following pages set out the construction requirements for tile roofs in BAL-FZ as tested by Exova Warringtonfire. The Regulatory Information Assessment Report issued by Exova Warringtonfire can be downloaded at <http://www.rooftile.com.au/pdf/rir-23987-02.pdf>.

The development of these complying tile roof systems was jointly funded by all Australian manufactures of concrete and terracotta tiles with the Roofing Tile Association of Australia managing the project on their behalf.

The new roof system must be constructed strictly in accordance with the frame, batten, insulation and fascia detail as certified.

## Disclaimer

This manual is current at May 2010. Information has been sourced from recognised third parties and is current at the time of printing. Systems, Standards and Building Codes are subject to change. To ensure the information is current, contact your roof tile supplier. No responsibility is assumed for any errors that may inadvertently appear in this manual. The RTAA directs builders, tile fixers and any other parties associated with the construction to properly assess the requirements of AS3959-2009 before proceeding.

# Roof Construction in Bushfire Prone Areas BAL-Low to BAL-40

## BAL (Bushfire Attack Level)

Please refer to the approved building plans to confirm what level is required for the dwelling being built.

- BAL Low: Normal Fixing Requirements
- BAL 12.5: Normal Fixing Requirements plus approved grade sarking\*
- BAL 19: Normal Fixing Requirements plus approved grade sarking\*
- BAL 29: Normal fixing requirements plus approved grade sarking.\*\*
- BAL 40: Normal fixing requirements plus approved grade sarking.\*\*

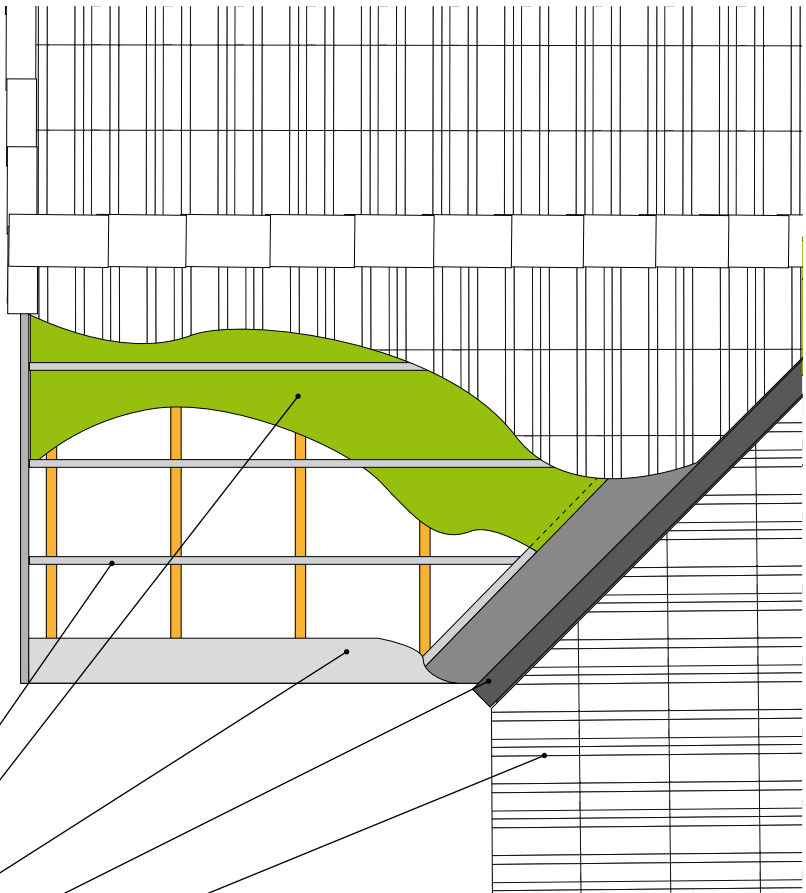
- 
- Batten timber or metal
  - Approved grade sarking
  - Standard anti-ponding board
  - Valley seal
  - Fix every tile

Figure 1 | BAL Roof plan view

\* For BAL-12.5 to BAL19 the RTAA recommends the use of anti-ponding board as detailed in manufacturers fixing instructions.

\*\* For BAL-29 to BAL-40 the RTAA recommends the use of anti-ponding board, valley seal and mechanically fix every tile as per manufacturers instructions.

## BAL-FZ (Fire Zone)

The following requirements need to be allowed for when building homes in this fire zone.

For more detail related to the materials used and the method by which they are installed refer to the Materials and Installation table on pages 5-7.

### Sarking

- Approved grade sarking to be installed over total roof area

(NOTE: Sarking must cover complete roof and extend over hips and ridges. It must also protrude over the fascia by at least 50mm).

### Anti-ponding Board

- Anti-ponding board (approved 16mm fire rated plasterboard, Boral / CSR) to be fixed to counter batten and to finish behind pine fascia. (Any gap under APB and insulation blanket must be filled with Rockwool)
- Plasterboard spacer positioned between underside of valley iron and top of fascia
- Front edge of APB to be sealed with Bostick Fire-Ban 1® sealant

### Roof Tile Battens

- Concrete roof tiles to be screw fixed to battens
- Steel roof tile battens (Rondo or similar) to be fitted over sarking and screw fixed to counter battens

### Fascia Construction

- Pine 15mm pine plywood fixed with 50mm screws
- Boral Firestop® or CSR Frychek® 16mm plasterboard fixed with 6g x 30mm plasterboard screws
- Fascia board 190mm x 19mm radiata pine fixed with 75mm nails

### Eaves Construction

- 35mm x 35mm x 0.50mm galvanised framing angle
- 15mm pine plywood fixed with 50mm screws
- Boral Firestop® or CSR Frychek® 16mm plasterboard fixed with 6g x 30mm plasterboard screws
- 4.5mm fibre cement sheet

## Roof Construction in Bushfire Prone Areas

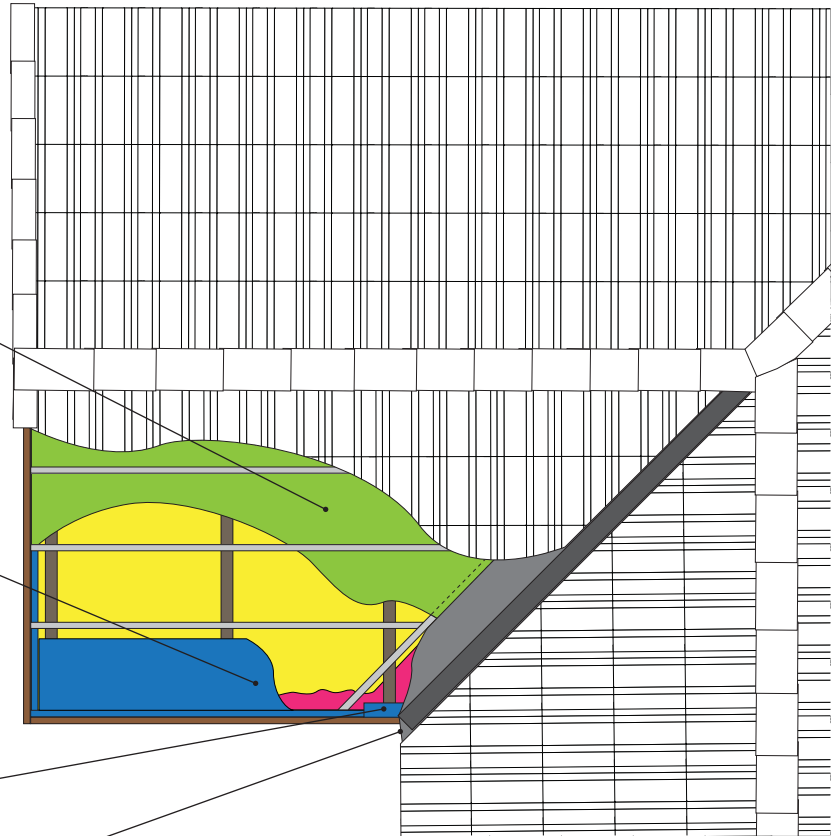


Figure 2 | FZ Roof plan view

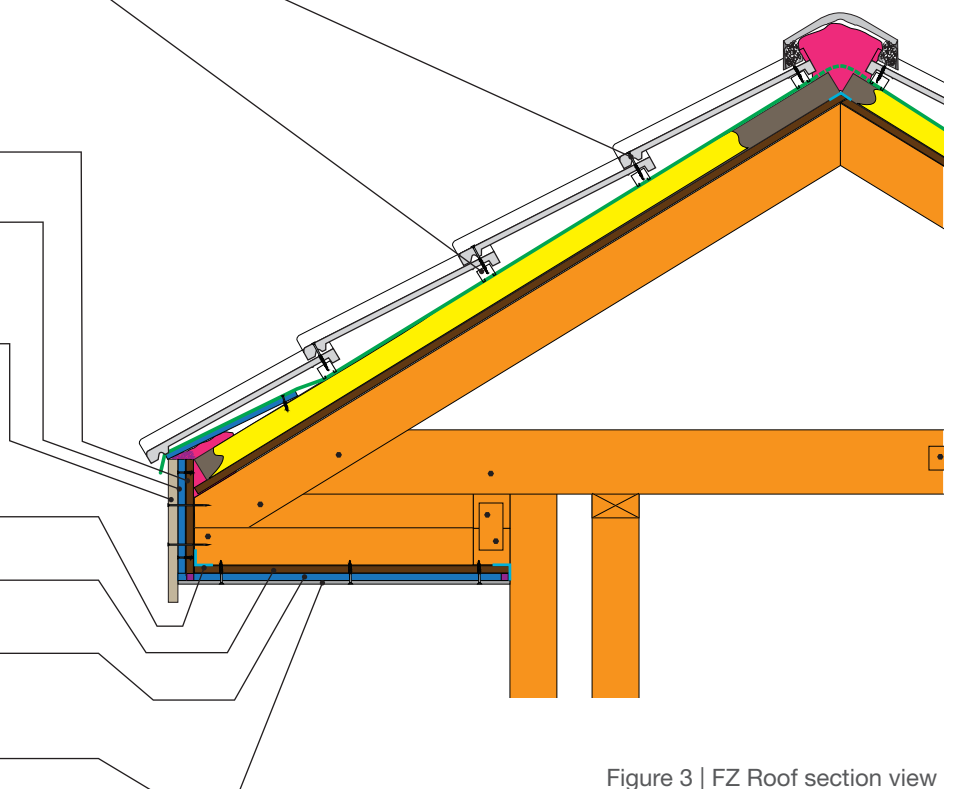


Figure 3 | FZ Roof section view

# Roof Construction in Bushfire Prone Areas

## Counter Battens

- Top-span 40® counter battens to be installed over insulation blanket, one edge to be screwed through ply and into truss / rafter, the other edge into ply only.

## Ply & Blanket Enclosure

- FZ. (Fire Zone): Roof area to be fully enclosed with 15mm plywood
- Then covered with 38mm, 22KG CSR Bradford Flexitel® insulation blanket

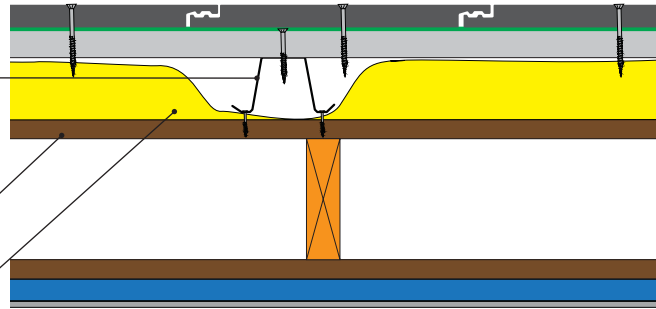


Figure 4 | Roof frame end section

## Valley Iron and Support

- Valleys to be constructed using Top-Span 40® battens as valley boards, one under the centre of the valley iron and one either side. The valley iron should finish half way across the Top-Span 40® batten on each side to allow a steel roof tile batten, on its side, to run the full length of the valley iron to act as a valley batten and to facilitate the fixing of the tile battens.

(Note: The sarking should be wrapped around the valley batten and must not be left to finish in the valley)

- The junction of the valley iron and fascia will require Rockwool under the valley to eliminate the gap created by the difference in pitch.
- This junction will also require fire rated plasterboard between the valley iron and the top of the ply fascia member.
- Any gaps created by the difference in materials to be sealed with Bostick Fire-Ban 1®.

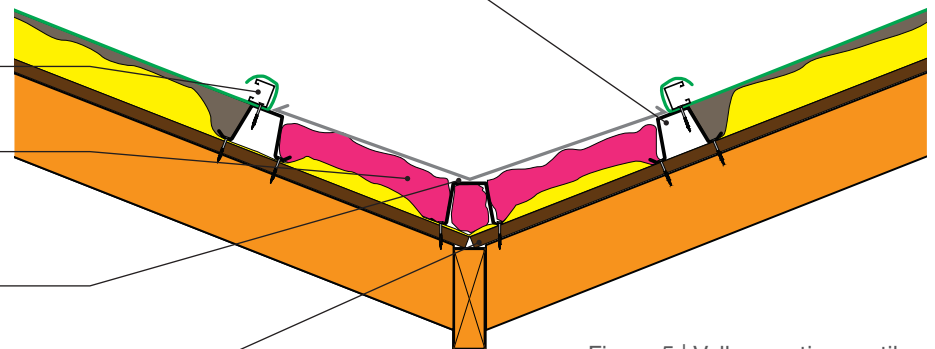


Figure 5 | Valley section no tiles

## Valley Guard

- Roof tiles are to be finished to the valley guard
- Valley guard must also be installed, located centrally up the valley iron (The rubber strip used as a tile support must be removed) this is to be replaced with a steel roof tile batten.

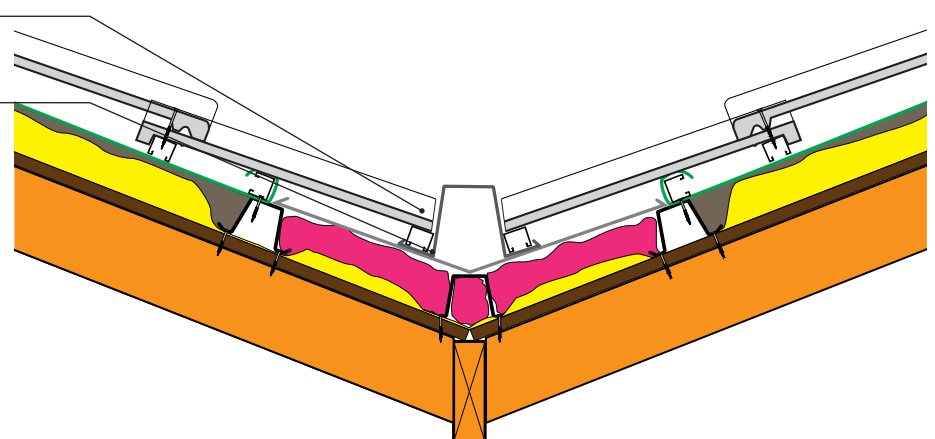


Figure 6 | Valley section with tiles

# Roof Construction in Bushfire Prone Areas

## Gables

- Gables to have barge (steep ridge) tile finish
- Gaps under barge tile to be filled with Rockwool
- Rear and bottom of barge to be bedded and pointed

(Note: Starting / last tile must not be in contact with ply fascia member)

- Framing angle
- Bostic Fireban® One polyurethane sealant

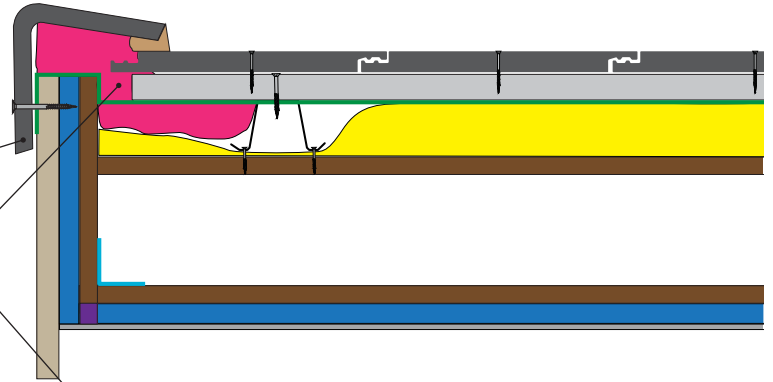


Figure 7 | Barge section (Flat Profile)

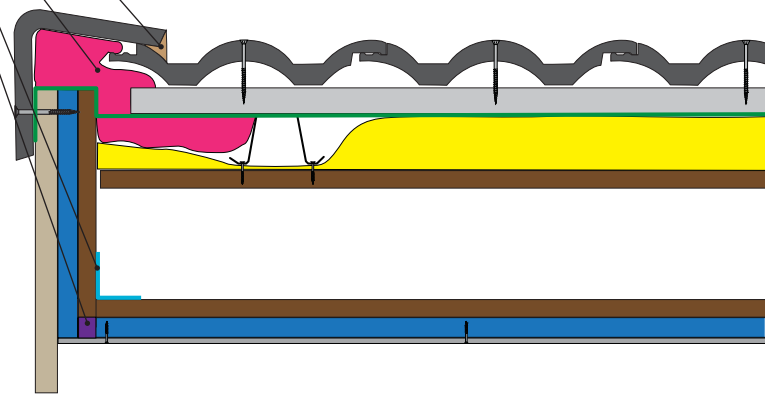


Figure 8 | Barge section (Shaped Profile)

## Ridges / Hips

- Ridge and hip tiles must be installed over Rockwool to eliminate gaps.
- Bed with standard 4:1 mix and finish with flexible pointing.

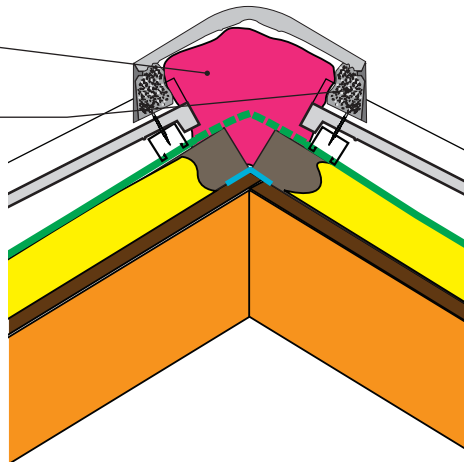


Figure 9 | Ridge section

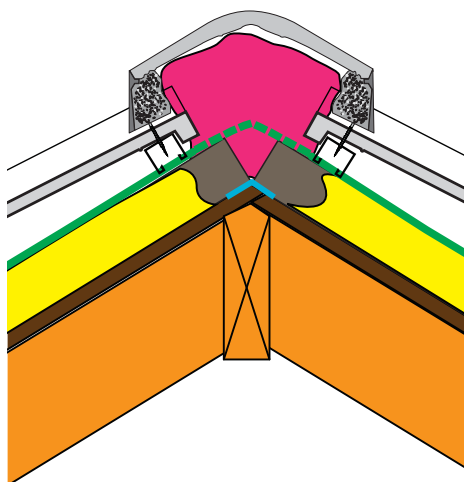


Figure 10 | Hip section



# Material Specifications & Installation Method

## Roof Construction in Bushfire Prone Areas

1	Name	Sealant
	Material	Bostic Firebar® One polyurethane sealant
	Installation	Installed into gap 8mm wide at eaves/fascia wall junction of the plasterboard as well as the junction of fascia and anti-ponding board
2	Name	Framing angle
	Material	35mm x 35mm x 0.50mm galvanised steel angle
	Installation	Fixed to the truss along the wall/rafter interface, with the leg position downward capping the back edge of the eaves lining and located on the unexposed side of the plywood/eaves, fascia interface.
3	Name	Fascia Linings
	Material	16mm Boral Firestop® or CSR Frychek® plasterboard
	Installation	Plasterboard orientated so that butt joints do not fall on joints in plywood. Joints shall be left open and 6-10mm wide gaps filled with sealant (see item 1). Plasterboard to be fixed to plywood at 150mm centres at the top and bottom of the fascia. Plasterboard to be fixed with 6g x 30mm plasterboard screws.
4	Name	Roof Lining Fixings
	Material	Particleboard screws
	Installation	Roof lining held in place by screws as required
5	Name	Fascia Board
	Material	Radiata pine nominally 190mm high x 19mm thick and deep enough to cover the fascia linings.
	Installation	Positioned on the face of the plasterboard, fixed with 2 x 75mm nails into the end of each rafter. Joints may be square cut butt joints unfilled.
6	Name	Roof Lining
	Material	15mm thick (minimum) seasoned pine plywood
	Installation	Plywood arranged such that all butt joints fall on framing and tongue and groove joints are not backed and run generally perpendicular to framing. Fixing of lining to framing shall be as for flooring in accordance with timber framing codes. Butt joints in sheets shall be backed by framing or additional nogging.
7	Name	Cavity Closure Insulation
	Material	Bradford Fibretex 650 Rockwool®   115mm thick and 80kg/m³ density (Measured)
	Installation	Nominal 100mm wide strip positioned at the roof/fascia interface either side of the valley iron. The Rockwool is installed under the valley iron to a distance of between 120mm and 300mm from the fascia.

# Material Specifications & Installation Method

## Roof Construction in Bushfire Prone Areas

8	Name	Roof Tile
	Material	Concrete or terracotta roof tiles of various profiles manufactured in accordance with AS2049 can be used. The tile may vary in mass from 46kg/m <sup>2</sup> to 54kg/m <sup>2</sup> . The tile profile can vary from shaped to flat provided provided tile distortion does not exceed that specified in AS2049 clause 5.3 when tested to AS4046.1
	Installation	Each tile shall be screw or clip fixed to the tile batten (item 10)
9	Name	Roof Cavity Insulation
	Material	CSR Bradford Flexitel™ 38mm thick - 24kg.m <sup>3</sup>
	Installation	Position directly over the plywood under the counter battens (item 13) which are screw fixed to the plywood through the insulation and positioned so that there are no visible gaps in the plywood.
10	Name	Roof Tile Batten
	Material	Light gauge steel nominally 25mm wide 20mm high
	Installation	Designed for framing spacing and fixed to roof framing in accordance with AS2050 and manufacturers recommendations
11	Name	Adjacent Wall Construction
	Material	Wall construction that has been tested or assessed in accordance with AS1530.8.2-2007 to meet the BAL-FZ or a wall deemed BAL-FZ AS3959
12	Name	Plasterboard Strip
	Material	16mm Boral Firestop® or CSR Frychek® plasterboard
	Installation	Installed between the bottom of the valley iron and the top of the fascia linings
13	Name	Counter Batten
	Material	Top Span 40 or similar product must be 40mm wide at the top, 95mm wide at the base which includes a 14mm lip on each side and 40mm high.
	Installation	Screw fix to the plywood and framing below tabs using screws spaced at nominal 400mm centres or as required by relevant structural standards. Refer figures 4,5,6,7 and 8
14	Name	Roof Framing - for Timber frame
	Material	Solid timber framing or timber trusses shall be sized in accordance with the relevant framing and design standards
	Installation	Truss or rafter spacing may be optionally less than 600mm or up to 900mm.
15	Name	Roof Framing - for Steel frame
	Material	Steel framing or steel trusses shall be designed in accordance with the relevant framing and design standards
	Installation	Truss or rafter spacing may be optionally less than 600mm or up to 900mm.



# Material Specifications & Installation Method

## Roof Construction in Bushfire Prone Areas

16	Name	<b>Sarking</b>
	Material	CSR Bradford Enviroseal® roof sarking
	Installation	Installed over the entire roof system between the tiles and the battens and the counter battens. It carries over all hips and ridges, projects 50mm over fascias and barge lines and terminates on the valley battens
17	Name	<b>Ridge Capping</b>
	Material	Concrete or terracotta ridge tiles manufactured in accordance with AS2049
	Installation	Ridge capping is installed over the ridge of the roof with approximately 20mm overlap from one tile to the next and bedded into position with approved bedding and pointing see (item 20)
18	Name	<b>Eaves Lining</b>
	Material	Fibre Cement sheet 4.5mm thick over 16mm Boral Firestop® or CSR Frychek® plasterboard over 15mm pine plywood.
	Installation	<p>Position the plywood so that all joints fall on framing members or framing angles (item 2) at fascia or at wall. Sheets are fixed to roof framing at nominal 200mm centres with screws a minimum of 50mm long.</p> <p>Position plasterboard so that butt joints do not fall on the plywood joints. Fix plasterboard to plywood at 150mm centres at the perimeter and rows 600mm centres apart with fixings at 200mm centres in the field. Fix with 6g plasterboard screws.</p> <p>The fibre cement sheet is screw fixed to the trusses on the eaves on the exposed surface. Sheets fixed with 6g x 45mm screw at nominal 200mm centres at the perimeter to the plywood.</p>
19	Name	<b>Anti-ponding Board</b>
	Material	16mm x 300mm wide Boral Firestop® or CSR Frychek® plasterboard
	Installation	Board is laid over Rockwool and secured with screws to the counter battens (item 13). See figures 2 and 3
20	Name	<b>Bedding Mortar</b>
	Material	Cement and suitable sand mixed in a 4:1 ratio
	Installation	Ridge tiles are bedded and pointed to roof in accordance with AS2050
21	Name	<b>Valley Iron</b>
	Material	Zincalume steel nominally 0.7mm thick
	Installation	Position valley iron on the counter battens set as shown in figures 5 and 6. Secure valley iron to the counter battens with screws at 300mm centres
22	Name	<b>Valley Guard</b>
	Material	Zincalume steel nominally 0.7mm thick, 60mm wide at the top x 80mm wide at the base x 65mm high with a 40mm wide flange on each side with an 8mm lip on each edge of the flange.
	Installation	Installed on top of valley iron (item 21) as shown in figure 6