

Concrete Roof Tiles

Technical Manual

roof tiles.
people look
up to bristile

Technical Manual



concrete roof tiles technical manual contents

Bristle Roofing

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Bristle Roofing

Introduction

Essential

The utmost care has been taken in compiling this manual. Bristle Roofing is not liable nor responsible for the contents of the manual (including any printing or typographical errors) and urges that all standards and recommendations are checked independently. Note: Instructions and details in this manual refer to both concrete and terracotta tiles (unless expressly noted).

Specifications

Bristle Roofing advise that material contained in this manual is correct at the time of publishing, specifications are subject to change without notice.

Local Authorities

Product specifications and installation standards contained within this manual are minimum recommendations based on Australian good trade practice. The appropriate fixing standard for specific regions will vary in accordance with the environmental conditions. Where applicable, it is advised Bristle Roofing's local office be consulted, together with other local authorities.

Behaviour

Bristle Roofing roof tiles will behave as documented if installed in accordance with good trade practice and following the recommendations contained in this and other relevant manuals. Preferred methods and standards of fixing tiles are documented in this manual which includes the complete range of Bristle Roofing tiles.

Consider the following points:

- » Impress the highest standards of trade practice to guarantee attractive and enduring roof finishes
- » Encourage affinity between overlapping trades on the building site
- » The full range of products may not be available or applicable to all states at this time
- » Consistent installation methods are stated, but this may vary from state to state, gain advice from local authorities.
- » High wind areas require special installation standards

Standards

Australian standards and installation specifications should be adhered to when installing roofing tiles. These standards and specifications are provided to convey up-to-date information for industry (architects, building contractors as well as purchasers and installers).

Where ever a standard is referred to in this manual it will be the most current version of that standard at the time of publishing.



Bristle Roofing

Roofing Terminology

Abutment	Where the roof tiles meet a structure above the roof line.
Accessory	A product (concrete or terracotta) used to complete the roof eg. apex, ridge and barge tiles.
"A" Frame Roof	Steep pitched gable roof, each pitch extending from near ground line to meet at the ridge.
Apex	The intersection of all ascending hips where they meet either a ridge or another ascending hip. Note: Also the name of a three or four-way fitting used to cover this point.
Apron Flashing	A one-piece flashing, such as is used at the lower side of a chimney that penetrates a sloping roof.
Barge Board/Verge Board/Gable Board	A sloping board installed to the pitched edges of a gable, covering the ends of roof timbers.
Anti-Ponding Board	A sarking or underlay-support of various materials, (steel, corrugate, fibrous cement etc), installed along the eaves lines from the top of the fascia back to the rafter with a clearance of 50mm below the first batten. This prevents water "ponding" behind the fascia. Anti-ponding boards should be installed on all low pitched roofs or roofs with no overhang.
Barge Course/Verge Course	The tiles next to the gable.
Bastard Valley or Hip	A valley or hip formed in an abnormal or non-parallel line on which tiles are fixed.
Batten (Metal)	Metal battens shall be designed in accordance with AS 4600. They shall be manufactured from galvanised steel, of at least commercial grade, with a corrosion-resistant coating with a minimum thickness of 300g/m of zinc.
Batten (Timber)	Timber battens are nailed to the roof frame and support the tiles at the correct set out. Timber battens are supplied in various dimensions depending on the roof specifications. Timber battens must comply with specifications detailed in AS 1684.2, AS 1684.3 or AS 1720.1 as appropriate.
Bedding	A composition of clean, sharp sand and cement for fixing ridge capping on hips and ridges. The edges are finished off with a flexible pointing material.
Bellcast Batten (Tilting Batten)	A batten installed on the toe of the rafters in a vertical line with the plumb cut, to keep the eaves course of tiles on the same rake as the other courses. (The fascia board usually serves this purpose).
Bond	The system of aligning tiles on the roof in relationship to each other. With a straight bond, the sides of tiles form straight lines from bottom to top course. With a staggered, broken or cross bond, tiles in each alternate course overlap, by half, the tiles above and below them.
Box Gutter	An internal roof gutter between the slopes of a roof or a roof and a wall that discharges water internally through a sump.
Capillary Break	A groove or space left between two surfaces, large enough to prevent capillary movement of water into a building.
Ceiling Joists	The joists that carry the ceiling and also form a tie between the feet of the common rafters.

Cleat	A small piece of wood that reinforces another, or is used to locate positively another timber.
Clipping Batten	A batten installed to the rafters directly behind the fascia. The clipping batten is used for installing the bottom course of tiles when sarking is not specified. Generally it is only used on homes with metal fascias, and only in high wind areas.
Collar Tie	The timber used to connect two rafters at or near their centres.
Concealed Gable Flashing	Subject to regional specification in the use of the galvanised metal flashing, a concealed gable flashing is a fibre cement verge strip running to the gutter line.
Counter Battens	A batten normally installed on top of and parallel to the rafters over the ceiling lining, where the ceiling lining is fixed on top of the rafters (exposed beams). Tiling battens are then installed to the counter battens, creating an air space which allows sarking to dish between the rafters.
Dormer or Dormer Window	A vertical window or opening, coming through a sloping roof, usually provided with its own-pitched roof.
Dormer Cheek	The upright side to a dormer.
Dutch Gable	A roof that has a gable near the ridge, with the lower part hipped.
Eaves	The lowest over hanging part of a sloping roof beyond the external wall.
Eaves Fascia	A board on edge installed along the feet of the rafters. It often carries the eaves gutter.
Eaves Overhang	The inclined distance (line of rafter) from the outside of the external wall to the inner face of the fascia.
Eaves Width	The horizontal distance from the inner face of the fascia board to the outside of the external wall.
Edge of Roof	The area of a roof bounded by the eaves, ridge and barge, extending towards the centre of the roof for a distance equal to 0.1 multiplied by the minimum plan dimension of the building, measured from eaves to eaves, or barge to barge.
Facade	The face or front of a building.
Fall	The slope or pitch of a roof or gutter.
Fascia Board	A wide board set vertically on edge and fixed to the rafter ends or wall, which carries the gutter.
Flexible Pointing	A highly pliable yet durable compound which, once cured, forms a mechanical fixing between the tile and ridge capping.
High Wind Area	Areas in which the basic design and wind velocity, modified for terrain and height in accordance with AS 1170.2 and AS 4055 to give a wind classification of N3 or greater.
Hip	The edge formed by the meeting of two parallel pitched roof surfaces.
Hip Board	The board, set on edge, at which the hip rafters meet.

Bristle Roofing

Roofing Terminology

Hip End Tile	A sloping triangular roof fitting designed to cover the end of a hipped roof.
Hipped Roof End	A gable roof which has two additional sloping planes at either end of the roof.
Lap Head or End Lap	The distance by which one course of tiles overlaps the course below.
Side Lap	The distance by which one tile interlocks with the tile beside it.
Lifts	Roofing trade term for stacks of tiles around the roofs.
Loading	The installing requirements and materials for sarking, battens, tiles and accessories etc, specified by the tile manufacturer as sufficient to withstand the loading requirements of AS 1170.0, AS 1170.1 and AS 1170.2.
Mansard Roof	A roof structure with two pitches. The steep pitch commences at the eaves, and intersects with the lower pitch, which finishes at the ridge. Tiles on the lower pitch overhang the steeper pitch by a slight margin.
Mottle	Used to describe the laying of various coloured tiles at a consistent percentage throughout the roof.
Parapet Roof	Usually a brick or timber structure that rises above the roof line.
Picking Up	The term used when the tiler is trowelling off any excess mortar that may overhang the ridge capping after bedding.
Pitch	The angle or slope of the roof surface to the horizontal expressed either in degrees or as a ratio, eg 15° or 1:3.75.
Rigid Pointing	A mixture of clean sand, cement and oxide colouring used for the completion of joints between ridge or hips and with roof tiles or tiles at gable ends. (Obsolete method that has been replaced by flexible pointing.)
Profile	The shape and design of the tile.
Under Purlin	A horizontal member in a roof at right angles to the principal rafters or trusses. It carries the common rafters.
Rafter	A sloping member that extends from the eaves to the ridge of a roof to support roofing material.
Common Rafter	The main support rafter of the slope between eaves, wall plate and ridge.
Cripple Creeper Rafter	The rafter connecting a hip and valley.
Crippled Jack/Broken Hip Rafter	A rafter connecting the end of a ridge to a valley.
Hip Rafter	A rafter following the line of the intersection of two roof planes.
Hip Creeper Rafter	A rafter connecting a wall top plate and hip.
Jack or Crown End Rafter	A rafter installed at the end of a ridge and the meeting point of two hips.
Principal Rafter	An upper member in a truss that has the same inclination as the common rafters.
Valley Rafter	A rafter following the line of the internal intersection of two roof surfaces.
Valley Creeper Rafter	A rafter connecting ridge and valley.
Rake	The roof's angle of inclination from the horizontal.

Ridge	The horizontal line where two planes of a roof meet together.
Ridge Board	The horizontal board, set on edge, at which the rafters meet.
Ridge Capping	A roof fitting used to cover the ridge-line that can be either 'V' shaped or arched (rounded). This generally consists of a specifically made tile used for both the ridge and hips of a roof.
Roof	A covering to protect a building from the elements.
Roof Tile	A concrete or terracotta product used to cover the field of the roof.
Sarking or Underlay	A reflective, pliable membrane that is installed under the tile battens and conforms to AS/NZS 4200.1.
Sawtooth Roof	A roof structure that is vertical on one side with a slope down from the ridge line on the other.
Secret Gutter	A gutter usually fixed against a wall adjoining the roof slopes, concealed by the roof covering and vertical wall flashing, then spilling into an eaves gutter.
Scribe Board	A type of barge board shaped to match the over hanging profile formed by the under surface of roof tiles that overhang a gable end. The tiles are pointed up on the interlocking joints.
Skillion	The term for a pitched roof with one plane.
Skylight	A glazed window or translucent roof section fitted parallel to the roof slope to admit light.
Sheathing	A close boarding or other material nailed to the frame work of a wall or roof. Sometimes referred to as sheeting.
Soffit	The lining installed under the eaves between the fascia board and external wall.
Soffit Bearer	Timber or metal used to support the soffit.
Storm Seal	A bitumen impregnated foam strip used to weather proof areas of roof to prevent water penetration during storms. can be flexible pointed.
Staggered Bond	The method of laying tiles where the vertical joint of every tile is laid to overlap with a half bond of the tiles in the course below.
Starter/Shell End	The first hip cap at the lowest point of the hip line.
Straight Bond	Where tiles are not staggered but are laid directly on top of the tile in the course below, so that the vertical joints form one straight line up the slope of the roof.
Stud	A vertical wall support.
Top Plate	The horizontal member above a wall on which the truss or rafter sits.
Tilting Batten	Serves the same purpose as a bellcast batten.
Tile Clip	A specially formed metal fastening used to secure tiles to supporting members.
Truss Roofs	A roof supported by self-supporting, triangulated structural framework which is, usually prefabricated and delivered to the job site. This type of construction is commonly used for all types of roofs.
Upright Work	Tiling carried out on a roof pitched close to vertical, normally on a facade or a mansard roof.

Bristle Roofing

Roofing Terminology

Valley	The internal angle formed by the meeting of two sloping surfaces of a roof; the opposite of a hip. A valley iron/tray is installed in this area to direct water to the gutter.
Valley Batten	A tiling batten fixed parallel to each side of the valley board. It must be fixed on all valley where the roof is sarked.
Valley Iron/Valley Tray	A "V" shaped sheet lipped on each outside edge and formed to fit into the angle of a valley.
Vent	Any pipe or tube projecting through the roof covering, normally circular in shape.
Verge	The edge of a sloping roof that overhangs the gable.
Weephole	A small hole (6mm in diameter) inserted into the ridge bedding and pointing line at the water-channel of the tile to allow drainage of water.
Z Flashing	Normally a galvanised strip with an internal lip fixed under the cement verge strip and run into the gutter line.



Company Details

The Bristile Story

Today, that small roof tile company has developed into one of Australia's largest suppliers of concrete and terracotta roof tiles.

In 2700BC the Chinese first developed the glazed terracotta roof tile and they have been a reliable and sought after roofing product ever since. The refinement of concrete roof tiles into a long lasting and cost effective roofing material happened in the middle of the 19th century. The versatility of both products has seen them become popular in such diverse markets as Europe, North America and Asia.

Terracotta tiles were first introduced to the Australian market in 1916. In 1929 Mr. Lance Brisbane established the terracotta division of our business in Perth, Western Australia. Thanks to Mr. Brisbane, from whom the company took its name, and the hard work of dedicated employees through the years, the Bristile brand became synonymous with building products of the highest quality. Concrete tiles were first marketed in the late 1940's and roof tiles, whether concrete or terracotta, quickly became the roofing material of choice due to their durability, profile variation and selection of colours.

In 1974, Besser Roof Tiles (as the company was then known) entered the Queensland market offering one tile profile in eight colours. In those days maximum output was 20,000 tiles per day. In time the company expanded into New South Wales, building factories in Grafton and Sydney. The Pioneer group purchased the company in 1989 and oversaw further development during the next decade including the incorporation of the famous Victorian brand Nubrik which had first made concrete tiles in 1972 under the Whitelaw Roof Tiles brand.

Today, these various roof tile companies, which first started serving the Australian market over 75 years ago, have combined. Now known as Bristile Roofing, we are one of the country's largest suppliers of concrete and terracotta roof tiles, with a comprehensive range of more than 40 colours and seven profiles. Bristile Roofing is part of the national Brickworks group of companies which includes other famous Australian brands like Austral Bricks, Eureka Tiles Australia and Auswest Timbers.

There have been a lot of changes over the years, but one thing that has not changed is our desire to provide our customers with the very best quality products and service. Our focus on quality gives us the confidence to provide a written 10 year installation warranty on our concrete and terracotta product and a 50 year product warranty on our concrete range of tiles. Bristile's La Escandella Collection of terracotta products are covered by our famous "Colour for Life" warranty that states they will retain their colour for life.

For more information on any of our products please call 1300 274 784 or visit our website.



Company Details

Customer Service

Product and Technical Information

Comprehensive product and technical advice is available for the full range of Bristile concrete and terracotta roof tiles at any of our offices Australia wide or via the web at www.bristilerroofing.com.au

Our Representatives

Bristile Roofing sales staff are fully trained to assist you with enquiries concerning pricing, product and technical information, selection and installation, regardless of whether you're building a new house or simply re-roofing.

Samples

Staff at all our sales centres can arrange product samples from our comprehensive range of products. Call 1300 274 784 to request any required samples.

Installation and Service

Customers can be provided with supply and fix quotations based on their working drawings. Our helpful staff can answer any technical or colour selection queries at the same time. Bristile Roofing offers an installation service in most areas using one of our fully qualified and highly experienced sub-contractors. Alternatively in some regions of Australia, Bristile Roofing recommends the roofing services of independent tiling contractors and distributors.

On-Site Delivery

Bristile Roofing tiles are delivered ready for immediate use. For difficult sites, all terrain forklifts may be used to ensure correct placement of tiles.

Environment, Health, and Safety

Environment, health and safety are major considerations that Bristile Roofing recognise as an integral part of our business. We are all responsible for:

- » Preventing injury
- » Preventing occupational illness
- » Minimising the negative environmental impact our activities may cause
- » Complying with all legal requirements

The Bristile Roofing Environment, Health and Safety policies detail our defined responsibilities.

Company Details

Office Locations

Queensland

Brisbane (Head Office Queensland / East Coast)

164 Viking Drive
Wacol QLD 4076
P.O. Box 3040
Darra QLD 4076
Ph: 07 3212 2444 Fax: 07 3212 2499

New South Wales

Beresfield

2 Yangan Drive
Beresfield NSW 2322
Ph: 02 4967 6655 Fax: 4967 6383

Port Macquarie

1/24 Fernhill Road
Port Macquarie NSW 2444
9
Ph: 02 6581 1533 Fax: 02 6581 0618

Horsley Park (Head Office NSW)

738 - 780 Wallgrove Road
Horsley Park NSW 2164
P O Box 2164
Ph: 02 9830 7888 Fax: 02 9830 7889

Victoria

Dandenong (Head Office Victoria)

41 - 55 Elliott Road
Dandenong VIC 3175
P.O. Box 4068
Dandenong South VIC 3164
Ph: 03 8710 8710 Fax: 03 8710 8700

South Australia

Adelaide (Joint Bristle Roofing & Austral Bricks)

Greenwith Road,
Golden Grove SA 5125
P.O. Box 26 Surrey Downs SA 5126
Ph: 08 8282 6331 Fax: 08 8288 7264

Western Australia

Caversham (Head Office West Coast)

Harper Street, Caversham WA 6055
Locked Bag 100, Midland WA 6936
Ph: 08 9261 9999 Fax: 08 9379 2649

Roof Design

Design Consideration

When designing new roofs Australian Standards AS 1170.2 and AS 4055 are to be considered, in conjunction with:

- a) The regional design wind speeds
- b) The terrain category of a building site
- c) The Technical Record 440 (TR440) extension of this code, believed to be the standard for the design of products for most cyclonic areas. Applicable in Australia to areas north of the latitude 25° south, and within 50kms of the coast (including off shore islands).
- d) State and/or local statutory authority requirements and covenants. Exceptional considerations may apply to the site in relation to items a), b) and c)

The installation specifications given in this manual are based on a basic wind speed for greatest strength of 60m/s at a height of 6m from ground level. Suitable for sites in Regions A and B. It is advisable to consult both your building engineer and local Bristle Roofing office in relation to designated cyclonic area installation specifications areas i.e. Regions C and D. This section will cover Bristle Roofing recommended installing specifications based on the design gust wind speed, as well as:

- a) Minimum roof pitch requirements
- b) Maximum rafter length requirements
- c) Batten requirements and rafter and truss spacings
- d) Batten installing requirements
- e) Sarking installation requirements

Specifiers are advised to determine local requirements before proceeding, noting that relevant local authorities may implement special specifications to the final structure.

It is also advisable to consult your local Bristle Roofing office, as they may recommend installing specifications based on regional experience.

Storm Water Drainage: The National Plumbing and Drainage standard AS 3500.3.1 should be consulted to determine the best solutions for managing stormwater run off from a roof.

Code Considerations: The design of a roof requires the consideration of many building codes and standards. The following sections and tables summarise the major design requirements applicable to roof tiles. These requirements are by no means exclusive, as there may be any number of local regulative requirements and covenants. Specifiers are advised to ensure they have fully determined the local requirements.

Standards: Bristle Roofing products comply with the following standard: AS 2049 Roof Tiles. Bristle Roofing fixing complies with the following standard: AS 2050 Installation of Roof Tiles. Bristle Roofing complies with the following standard when installing sarking: AS/NZS 4200.2 Pliable building membranes and underlays – installation requirements.

Wind Forces: Wind forces must be considered when designing or specifying roof structures and roofing materials. The forces involved may take the form of positive or negative pressure (suction).

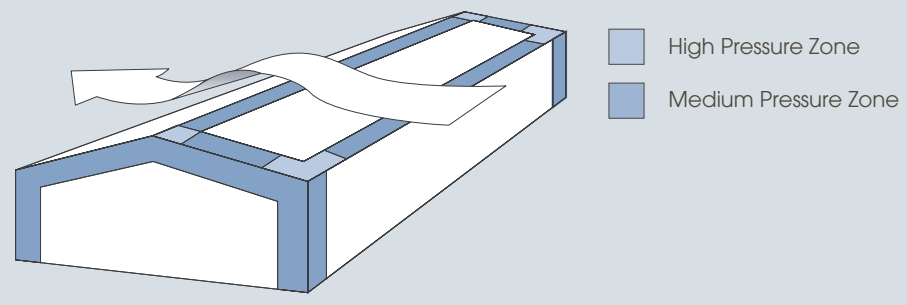
The magnitude of these forces is affected by regional wind velocities, exposure and building configuration. The methods for determining these are set out in Standards Association of Australia Loading Code for Wind Forces AS 1170.2. As an extension to this code, following Cyclone Tracy devastating Darwin in 1974 criteria were developed for the design of structures including roofs. The resultant set of guidelines is called Technical Record 440 (TR440) and is now deemed to be the standard for design of products for most cyclonic areas.



Roof Design

Wind Categories

The pressure created by winds must be considered when specifying roof structures and roofing materials. Determining the wind force affecting a site at height is essential to pinpoint the desired level of security installation, as the negative pressure exerted to the leeward side of a pitched roof at 35m/s can be more than the weight of the tiles.



The following factors affect the magnitude of these wind forces: basic wind speed, direction, terrain and building height.

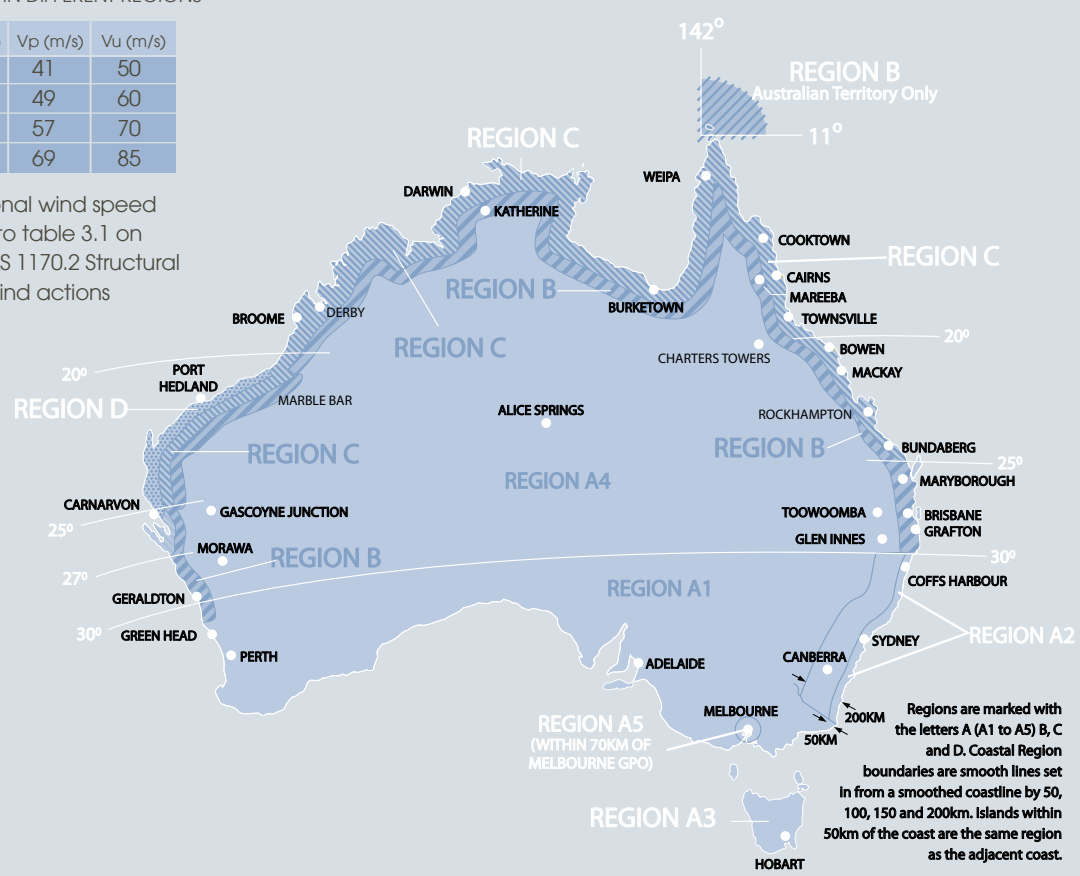
Basic Wind Speed Categories

AS/NZS 1170.2 and AS 4055 provides information on wind speeds commonly affecting different areas throughout Australia. **Bristle Roofing recommends that you consult with qualified specifier to determine the wind category for your project.**

BASIC WIND SPEEDS IN DIFFERENT REGIONS

REGIONS	Vs (m/s)	Vp (m/s)	Vu (m/s)
A	38	41	50
B	38	49	60
C	45	57	70
D	50	69	85

For detailed regional wind speed information refer to table 3.1 on page 13 of AS/NZS 1170.2 Structural design action - Wind actions



Roof Design

Terrain Categories

The effect of local buildings, hills and vegetation is taken into account by the code as local structures and terrain features that will dissipate the force of the wind. The wind load categories in Australia are defined by AS/NZS 1170.2 as follows:

The four defined terrain categories are assessed by the direction and speed of the wind flowing towards a structure. Those quoted are in accordance with AS 1170.2.

Terrain Category 1

Range from 0 - 0.002

Exposed open terrain with few or no obstructions, in which the average height of objects surrounding the structure is less than 1.5 metres. This category includes water surfaces (open sea coast and lakes), flat and treeless plains and open snow fields.

Terrain Category 2

Range from 0.003 - 0.02

Open terrain grassland with few well-scattered obstructions having heights generally from 1.5 to 10.0 metres. This category includes open park-land, and sparsely built up out skirts of towns and suburbs.

Terrain Category 3

Range from 0.03 - 0.2

Terrain with numerous closely spaced obstructions having the size of domestic houses. This includes most suburban areas.

Terrain Category 4

Range from 0.2 - 2.0

Terrain with numerous large high (10.0 to 30.0 metres) and close obstructions, such as a large city centres and well developed industrial complexes.

Basic Wind Loading Categories



Roof Design

Wind Classification

Determining the wind speed affecting a building site and house design, which includes the regions Wind Class together with the Wind speeds affecting a site, is the responsibility of the specifiers.

For non-cyclonic areas, Wind Class is generally between N1 - N4 and should be specified on the roofing structure plan. Where as cyclone affected regions will have a Wind Class from C1 - C4.

Bristle Roofing is able to evaluate the desired level of security installation required for the roof in accordance with AS 2050 Installation Roof Tiles based on the Wind Class specification supplied.

Table 1 (below) summarises the relationship between the Wind Speeds and the Wind Class.

The method includes combinations of regions, terrain categories, topographic effects and shielding of housing shown in Table 2. Wind Classification system N1, N2, N3, N4, N5, N6 for non-cyclonic Regions A and B, and C1, C2, C3 and C4 for cyclonic Regions C and D shall be considered.

Table 1: Design Wind Speed — Equivalent Values

HOUSING PROVISIONS DESCRIPTION	EQUIVALENT VALUES			
	WIND CLASS — AS 4055			DESIGN GUST WIND SPEED (M/SEC)
—	KM/H	FOR NON-CYCLONIC REGIONS A AND B	FOR CYCLONIC REGIONS C AND D	PERMISSIBLE STRESS METHOD ONLY
W28	101	N1	N/A	28
W33	119	N2	N/A	33
W41	148	N3	C1	41
W50	180	N4	C2	50
W60	216	N5	C3	60
W70	252	N6	C4	70

Table 2: Wind Classification System (Refer AS 4055)

WIND CLASSIFICATION																
REGION	TERRAIN CATEGORY	TOPOGRAPHIC CLASSIFICATION														
		T1			T2			T3			T4			T5		
		FS	PS	NS	FS	PS	NS	FS	PS	NS	FS	PS	NS	FS	PS	NS
A	TC 3	N1	N1	N2	N1	N2	N2	N2	N3	N3	N3	N3	N3	N3	N4	N4
	TC 2.5	N1	N2	N2	N2	N3	N3	N2	N3	N3	N3	N4	N4	N3	N4	N4
	TC 2	N2	N2	N3	N3	N3	N3	N3	N3	N4	N3	N4	N4	N4	N5	N5
	TC 1	N3	N3	N3	N3	N4	N4	N4	N4	N4	N4	N5	N5	N5	N5	N6
B	TC 3	N2	N2	N3	N2	N3	N3	N3	N3	N4	N3	N4	N4	N4	N4	N5
	TC 2.5	N2	N3	N3	N3	N3	N4	N3	N4	N4	N4	N4	N5	N4	N5	N5
	TC 2	N3	N3	N3	N3	N4	N4	N4	N4	N5	N4	N5	N5	N5	N5	N6
	TC 1	N3	N4	N4	N4	N5	N5	N4	N5	N5	N5	N6	N6	N6	N6	N/A
C	TC 3	C1	C1	C2	C2	C2	C2	C2	C2	C3	C3	C3	C3	C3	C4	C4
	TC 2.5	C1	C2	C2	C2	C2	C3	C2	C3	C3	C3	C4	C4	C3	C4	C4
	TC 1, TC 2	C2	C2	C2	C2	C3	C3	C3	C3	C4	C3	C4	C4	C4	N/A	N/A
D	TC 3	C2	C2	C3	C2	C3	C3	C3	C4	C4	C4	C4	N/A	C4	N/A	N/A
	TC 2.5	C2	C3	C3	C3	C3	C4	C3	C4	C4	C4	N/A	N/A	N/A	N/A	N/A
	TC 1, TC 2	C3	C3	C3	C3	C4	C4	C4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

FS full shielding

PS partial shielding

NS no shielding

N non-cyclonic

C cyclonic

N/A not applicable

Wind Classification system N1, N2, N3, N4, N5, N6 for non-cyclonic Regions A and B, and C1, C2, C3 and C4 for cyclonic Regions C and D shall be considered. The system includes the combinations of regions, terrain categories, shielding of housing and topographic effects given in Table 2.

Roof Design

Fixing Requirements for Tiles and Accessories

Table 3A: AS 2050 Minimum Mechanical Installing Requirements for Tiles and Ancillaries - Non Cyclonic

WIND CLASSIFICATION	TILE INSTALLING		ANCILLARY INSTALLING
	EDGE OF ROOF	FIELD OF ROOF	RIDGE, HIP AND BARGE TILES
N1 and N2	Mechanically fasten each full tile in second course and then every second tile in every course or every tile in each alternate course.		Mechanically fasten each tile
N3	Mechanically fasten each full tile in second course	Mechanically fasten each second full tile	Mechanically fasten each tile
N4	Mechanically fasten each full tile	Mechanically fasten each full tile	Mechanically fasten each tile

Table 3B: AS 2050 Minimum Mechanical Installing Requirements for Tiles and Ancillaries - Cyclonic

WIND CLASSIFICATION	TILE INSTALLING		ANCILLARY INSTALLING
	EDGE OF ROOF	FIELD OF ROOF	RIDGE, HIP AND BARGE TILES
C1	Mechanically fasten each full tile	Mechanically fasten each	Mechanically fasten every tile
C2 and C3	Mechanically fasten every full tile		Mechanically fasten every tile

Note: 'Mechanically fasten' refers to either screwing, nailing, clipping, or pointing tiles. A qualified roofing installer will be able to determine which of these fixing methods is appropriate based on the project requirements and product chosen. For pitches over 35 degrees extra precautions should be taken.

Table 5: AS 2050 Wind Classification and Maximum Design Gust Wind Speed

WIND CLASSIFICATION	MAXIMUM DESIGN GUST WIND SPEED (M/S)		
	PERMISSIBLE STRESS METHOD (VP)	SERVICEABILITY LIMIT STATE (VS)	ULTIMATE LIMIT STATE (VU)
N1	28 (W28N)	26	34
N2	33 (W33N)	26	40
N3C1	41 (W41N/C)	32	50
N4C2	50 (W50N/C)	39	61
C3	60 (W60C)	47	74

Note: Wind classifications are as defined in AS 4055

Roof Design

Fixing Standards

Table 5: Australian Fixing Recommendations

WIND CLASS	SARKING EDGE OF ROOF	ANTI FLAP PADS	TILE CLIPS	ANTI-PONDING BOARD	FIXING BODY AND EDGE OF ROOF
N1	Optional depending on pitch	Optional	Optional	Required for pitches under 20° subject to state specifications Mandatory	See Table 3
N2					
N3	Mandatory above N3 as detailed in AS 2050 Section 3.1.1				
N4					
C1					
C2					
C3					

Table 6: Batten Fixing Specification for:

- 38, 50 x 25 mm Hardwood Battens - 38 x 38 mm Pine Battens
- 600mm Truss Centres
- Softwood Frame (JD4) and Hardwood Frames (J2)

DESIGN WIND VELOCITY	EDGE OF ROOF FIXING	FIELD OF ROOF FIXING
N1 (W28)	1/65 x 3.05 Plain Shank Nail	1/65 x 3.05 Plain Shank Nail
N2 (W33)	1/65 x 3.05 Plain Shank Nail	1/65 x 3.05 Plain Shank Nail
N3 (W41)	1/75 x 3.05 Deformed Shank Nail	1/65 x 3.05 Plain Shank Nail
N4 (W50)	1/75 x 3.05 Deformed Shank Nail	1/75 x 3.05 Plain Shank Nail
C1 (W41)	1/65 x 3.05 Deformed Shank Nail	1/65 x 3.05 Plain Shank Nail
C2 (W50)	1/75 x 3.05 Deformed Shank Nail	1/75 x 3.05 Deformed Shank Nail
C3 (W60)	1/75 #14 Type 17 Screw	1/65 x 3.05 Deformed Shank Nail

Note 1: Confirm fixing specification for timber battens to metal roof frame with roof frame manufacturer.

Note 2: Confirm fixing specification for metal battens to timber or metal roof frames with metal batten manufacturer.

Roof Design

Fixing Standards

Bristle Roofing tiles are manufactured and tested to cope with a varied range of weather conditions throughout Australia. Factors affecting the design of your roof are as follows:

Selecting the Roof Tile

The depressions in the body of a profiled roof tile act as an unaffected watercourse quickly dispersing water from the roof. On flatter profiled tiles, these depressions are either less prominent or not featured. Therefore, water is more able to be blown across the roof by wind, resulting in water following the tile's under-lapping watercourse.

Profile shape should be considered carefully, particularly on roofs that are built in exposed areas where high winds are probable.

The Pitch of the Roof

The pitch of the roof affects the force of gravity and when combined with wind forces dictates the pull of water from the roof. The greater the pitch, the more effectively the water will disperse, therefore the less the pitch the less effective the water dispersal. Tiling is not recommended for a roof pitch below 15 degrees without special safeguards being put in place. AS 2050 states where it is intended to fix tiles to roofs with a pitch of less than 15 degrees, the tile manufacturer's advice should be adhered to. Sarking is a pliable foil installed prior to fixing the roof battens. Sarking acts as insulation keeping you home cool and free from dust as well as acting as a secondary water catchment. Your Bristle Roofing representative should be consulted when choosing the correct grade of sarking for your roof design. Table 7 (below) demonstrates the minimum roof pitch at which Bristle Roofing tiles are to be installed, showing each region with and without the need for sarking.

Table 7: Pitch and Sarking Requirements

	NSW		VIC & TAS		QLD		SA		WA		Cyclonic Area	
	W/OutSark	With Sark	W/Out Sark	With Sark	W/Out Sark	With Sark	W/Out Sark	With Sark	W/Out Sark	With Sark	W/Out Sark	With Sark
Concrete												
Hacienda	20	15	20	15	20	15	20	15	N/A	N/A	*	17.5
Villa	20	15	20	15	20	15	20	15	N/A	N/A	*	17.5
Yeoman (Shake)	20	15	20	15	25	17.5	20	15	N/A	N/A	*	17.5
Yeoman (Shingle)	20	15	20	15	22.5	15	20	15	N/A	N/A	*	17.5
Lodge (Striated)	*	20	*	20	*	20	*	20	N/A	N/A	*	20
Lodge (Smooth)	*	20	*	20	*	20	*	20	N/A	N/A	*	20

*Sarking required regardless of pitch.

Note: Roofs with pitches of less than 20° with sarking installed require Anti Ponding Boards to be fitted.

Roof Design

Batten Sizes and Truss Spacings

Rafter (Truss) Spacings

Stress on the rafters and specified battens increase the wider the spacing. Timber battens should be sound, and of sufficient length and size to meet regional fixing requirements. Regions have varying batten sizes and types, however must be fixed in accordance with the AS 1684.2, AS 1684.3 or AS 1720.1.

Table 8: Batten Sizes and Rafter Spacings (MM)

RAFTER SPACING	BATTEN MATERIAL SPECIFICATION	
	451–600	601–900*
Queensland	Hardwood 40 x 25	Hardwood 50 x 38
	Softwood 50 x 38	
New South Wales	Hardwood 50 x 25	Hardwood 50 x 38
	Softwood 38 x 38	
	Hardwood 40 x 25	
Victoria	Hardwood 50 x 25	Hardwood 50 x 38
	Softwood 38 x 38	
South Australia	Hardwood 50 x 25	Softwood 63 x 38
	Softwood 38 x 38	Hardwood 38 X 25
Western Australia	Hardwood 38 x 25	Hardwood 50 x 38
Tasmania	Hardwood 50 x 25	Hardwood 50 x 38

Note: Bolded product denotes most popular batten preference

*Contact your local Bristle Roofing office for information relating to the installation of roof tiles on roofs with this truss spacing.

Roof Design

Rafter Lengths and Pitches

The minimum pitch recommended for a roof can be influenced by the water run off depth. Extremely long runs accumulate water to a considerable depth at the bottom of the run, particularly at low pitches, and in heavy rainfall conditions. It is for this reason that Bristle Roofing recommends that any roof with rafter lengths in excess of 4.5 metres should be built at a pitch greater than the minimum stated in Table 9 on page 4.7 of this manual. The specified pitch should increase by 2° for every additional metre of rafter length.

Informative Notes in AS 2050 "Installation of Roof Tiles", state: "Long rafter lengths may require sarking to prevent inundation of the roof. These lengths may vary according to the tile profile used, the pitch of the roof and the exposure. The manufacturer's specification should be consulted." Table 9 indicates the maximum rafter lengths after which sarking must be installed to the area of roof that exceeds the noted maximum length.

Table 9: Sarking Requirements in Relation to Pitch/Rafter Length

ROOF - DEGREES OF PITCH	MAXIMUM RAFTER LENGTH WITHOUT SARKING (MM)
≥18 < 20	4,500
≥20 < 22	5,500
≥22	6,000

Roof Design

Roof Preparation Requirements

The designer should ensure that the roof structure complies with all relevant local and state statutory requirements and standards where applicable.

On delivery the principal contractor or owner should inspect the product for transportation damage. If there is any visible damage, a claim should be filed promptly with Bristle Roofing or the relevant carrier. Examine each pallet for colour, profile and any damage. Check accessory items for proper colour, profile and any damage. If there is any damage to the tiles or quantities delivered are not correct, Bristle Roofing needs to be notified immediately.

Suitable areas of the building site should be made available and access should preferably be provided to all sides of the roof to allow efficient delivery and consequent loading of the roof.

Prior to installation of the roofing tiles, the principal contractor (builder) must ensure that other tradesmen involved in the construction have completed their work, i.e. bricklayers, carpenters, plumbers, electricians, and ceiling fixers for exposed beam areas.

The Australian Standard AS 2050 Fixing of Roof Tiles (Appendix A), covers the need to define the responsibilities (commonly called "Work by other Trades" and "Information supplied by designer or builder") of the main contractor or designer. The following list describes these areas of responsibility.

Key Responsibilities:

Unless otherwise specified in the roof contract the following must be completed before roof tiles can be loaded onto the roof frame:

1. Roof structure and rafters are to be secured, square and correctly braced
2. Fascia boards installed at the correct height with counter (tilt) batten (where applicable)
3. Valley boards and valley irons installed in place
4. Barge boards installed with counter (tilt) battens fitted (where applicable)
5. With exposed rafters, all above rafter boarding and ceiling materials are to be installed
6. Gutters, spouting, down pipes and dry soakers (where applicable) installed
7. Anti-ponding facilities installed (Vic and WA)
8. Chimneys, abutments, vent pipes and roof ventilation installed, complete with flashings and supports
9. Installation of full scaffold, guardrail or safety mesh in accordance with Occupational Health and Safety guidelines. Any uncertainty about the builder's safety provisions should be referred to Bristle Roofing.

Specifications of the construction of the roof frame and installation of related materials prior to installation is covered in this section.

Roof Preparation Requirements

The following table is a simple checklist that can be used by all trades on a job to ensure that all required trade work is completed prior to the arrival of the roof tiler. The reference number displayed allows quick access to information relating to the nominated area of work.

ITEM	PREPARATION	REFERENCE
General	All load bearing walls and partitions framed and braced. Roof structure to be sound, square, straight and true. Adequate supports and bracing installed. Tiles should never be laid on a roof with only temporary supports and bracing.	N/A
Eaves	Fascia or tilt batten fixed, gutter fixed	See page 6.5 of this manual
Gables	Barge board fixed Verge Strip fixed (Bed & Point) Flashing installed (Dry Gables) Brickwork complete	See pages 6.5, 7.14 and 7.15 of this manual
Valleys	Valley boards and valley irons fitted correctly	See page 6.4 of this manual
Change of More Than 6°	Flashings fixed correctly depending on the degree of pitch change	See page 6.12 of this manual
Dutch Gables	Barge board, gable sheeting and flashing installed	See page 6.6 of this manual
Ridge Abutments	Flashing installed	See page 6.9 of this manual
Abutments	Soaker trays fitted, formed flashing installed, apron flashing installed, flashing to brickwork completed	See pages 6.7 and 6.8 of this manual
Exposed Beams	Sheeting boards installed and counter battens correctly fitted	See page 6.3 of this manual
Box Gutters	Over flashing installed, box gutter fitted	See page 6.11 of this manual
Party Wall Insulation	Party wall finished to correct height	See page 7.13 of this manual
Chimney and Vent Pipe	Soaker formed and flashed and lead flashing fitted	See page 6.9 and 6.10 of this manual

Roof Design

Working at Heights/Roof Frames

Working at Heights

State legislation is to be referred for advice about how to manage risk of falls while carrying out:

- » Housing construction; and
- » Any other type of construction work

Fall protection recommendations vary by state. Refer to relevant state's legislation to determine the most suitable hierarchy of control measures.

Detailed control measures to prevent the risk of injury should be outlined in a workplace health and safety risk assessment plan.

Roof Frames

Load bearing internal partitions and wall frames are to be correctly framed and braced. Roofing structures are to be square and straight and true to dimension specifications. The underside of the rafter or truss top chord should be diagonally braced. To assure normal rafter spacing along the eve creeper, rafters must be installed at hip corners. Top edges of hip and ridge boards should be level on their top edge. Slight deviations in a roof plane will be noticeable on a finished roof, and the tiler cannot correct this.

Metal Roof Frames

Metal roof frames must be installed using non-ferrous, stainless steel or steel nails/screws with suitable corrosion resistant coating. Corrosive regions may promote unfavourable galvanic relationships in metallic substrate.

Roof Design

Exposed Rafters

If the roofing design includes exposed rafters or raked ceilings, ceiling linings, counter battens and sarking are to be installed on top of the rafters. Counter battens must be fastened over the rafter centre lines to guarantee the sarking sag complies with AS/NZS 4200.2 giving clearance between the sarking, insulation material and ceiling linings

Figure 1 Cathedral Ceiling with Counter Battens side section

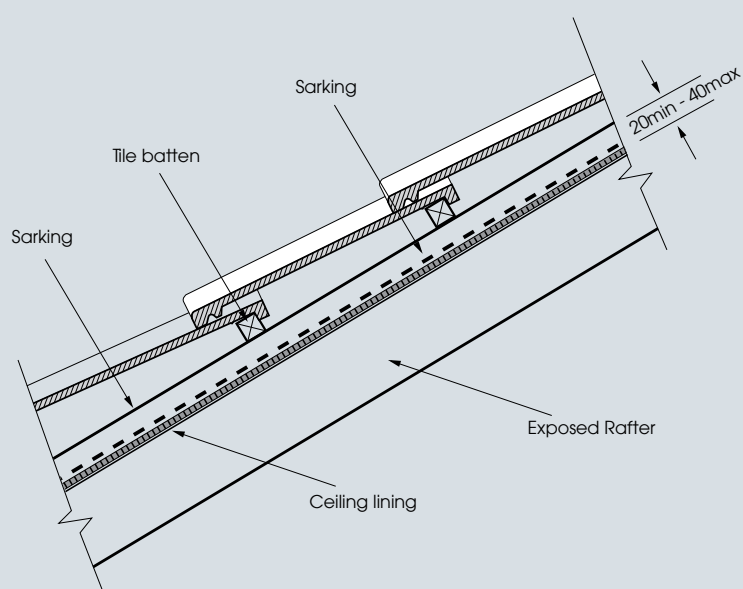
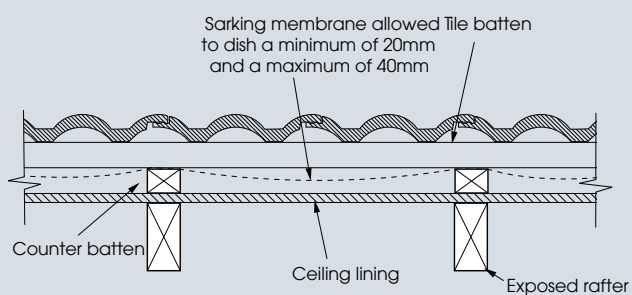


Figure 2 Cathedral Ceiling with Counter Battens end section



Roof Design

Valleys

To ensure that this simple but critical area of the roof performs correctly, cooperation from several trade areas is essential. Firstly the carpenter must install the valley boards. These can be straight, or if available tapered hardwood boards with a minimum thickness of 19mm for roofs using 25mm battens and 30mm thick for roofs where 38mm battens are used. Boards are fixed to the trusses or rafters with the thick edge facing into the centre of the valley.

Now the fascia and gutter fixer fits the valley iron. He lays the iron onto the valley boards and then secures it with bent over nails. He "bird mouths" the end of the valley where it empties into the gutter and makes sure that it has sufficient projection into the gutter. If it is an up and over valley he will need to cut the two sides of the valley and rivet them together sealing the join with silicone. (See illustration)

Figure 3 Valley iron installation

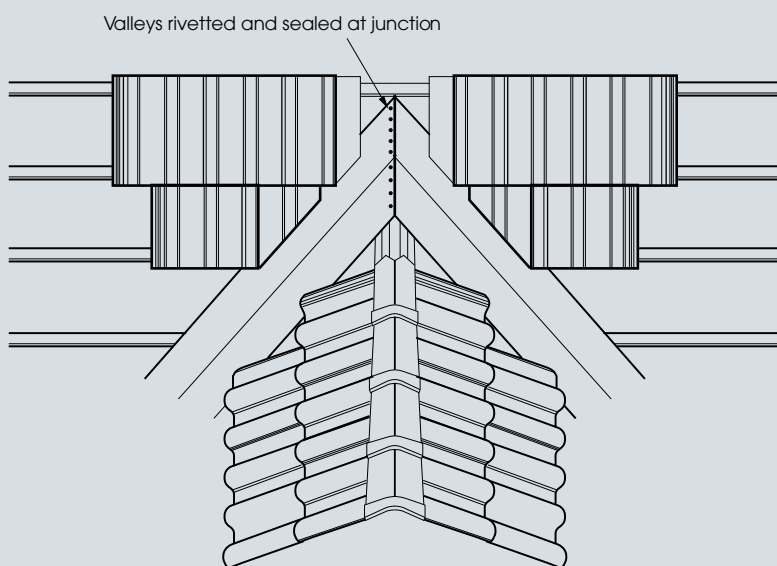
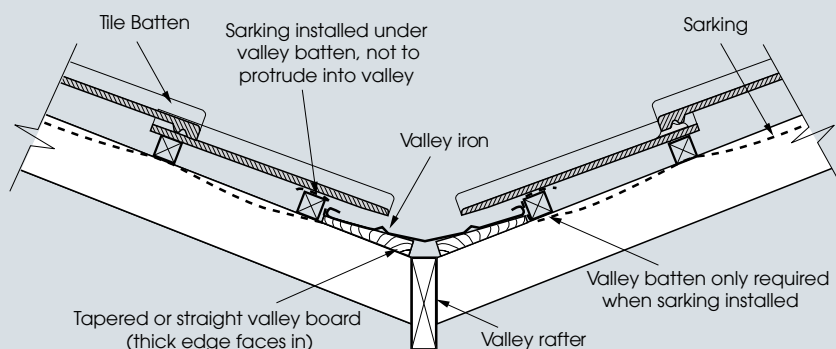


Figure 4 Valley board installation



Roof Design

Fascia Set Up

It is vital to ensure the fascia board height is correct to avoid the last course of tiles on a roof dipping. If a fascia batten is not utilised or the fascia height is incorrect the last course of tiles will not be on the same plane as the remainder of the roof. The fascia board should be secured to the rafters by the top edge, 25mm higher than the tile batten thickness. Therefore, a 25mm thick batten requires a 50mm distance between the top of the rafter and the top of the fascia board. This distance is known as the fascia, tilt or bellcast height. Reduce the measurement of the fascia distance by 10mm if the roof pitch is less than 20 degrees. Alternatively, as the pitch increases toward 45 degrees, the fascia distance must increase too. If a fascia board is not used, or fascia height is not sufficient, a batten referred to as a "fascia", "bellcast" or "tilt" batten must be installed. Fascia batten height should be calculated using the same method, and installed on the top edge of the lower rafter.

Figure 5 Fascia bellcast detail

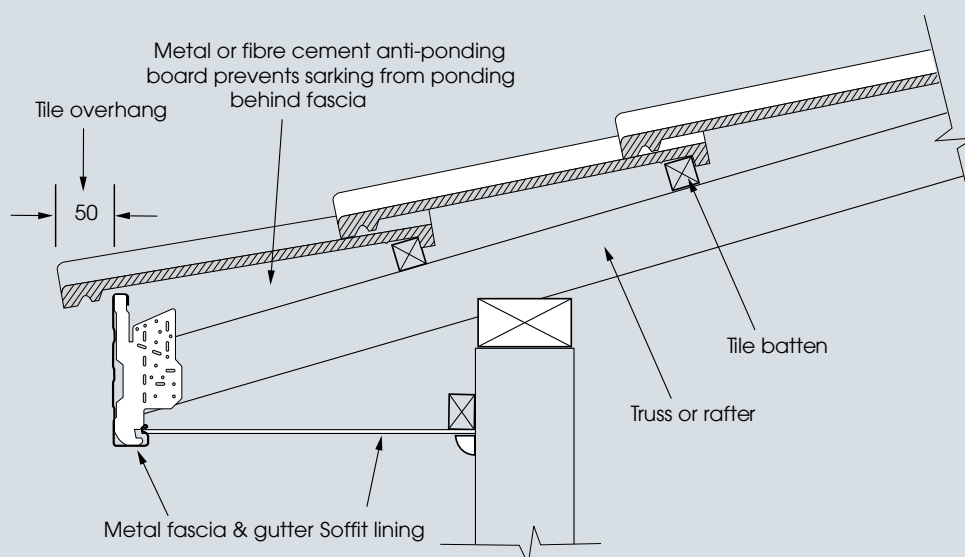
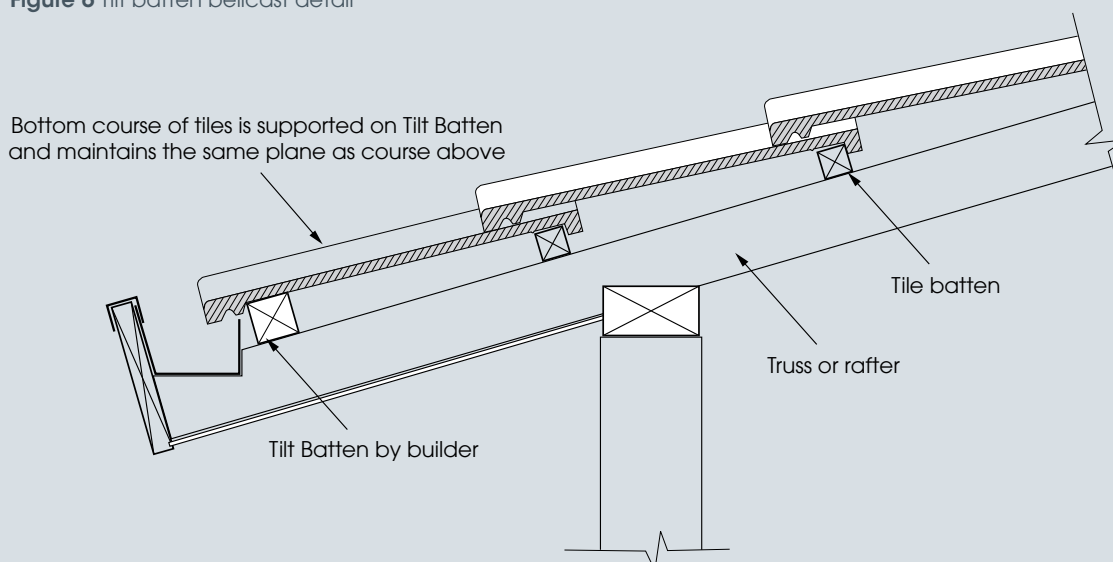


Figure 6 Tilt batten bellcast detail



Roof Design

Flashings

Roof flashings to tile roofs are to be installed by a qualified roof plumber, roof tilers are not responsible for the correct flashing of various roof features. The following details cover some of the more common design scenarios that may occur on roofs, they have been developed over time and work well if installed correctly. On some occasions correct installation of flashings will require coordination between the roof tiler and plumber.

Flashings can be formed out of materials such as Zinalume[®] steel, soft zinc, copper and lead. If lead is used it should be a minimum of 20kg per m². The lead should be sufficiently pliable to allow dressing down over tile profiles. Side flashings should be dressed to fit closely into and against the tile profile, and be a close fit to the vertical wall. Flashing against vertical framework must be sufficiently supported.

When wall sheeting finishes above a tiled roof a clearance gap is required. The distance of this gap must be

sufficient to cater for any batten thickness. The minimum clearance from the top of the rafter or truss and the bottom edge installed flashing needs to be 100mm. The included table details the clearance required depending on the size of battens being used.

Note: Lead flashings must not come into contact with Zinalume[®] steel. On any roof where the roof is part of a potable (drinking water) catchment area lead flashings should be painted.

Dutch Gable Flashing

Figure 7 Dutch gable installation detail

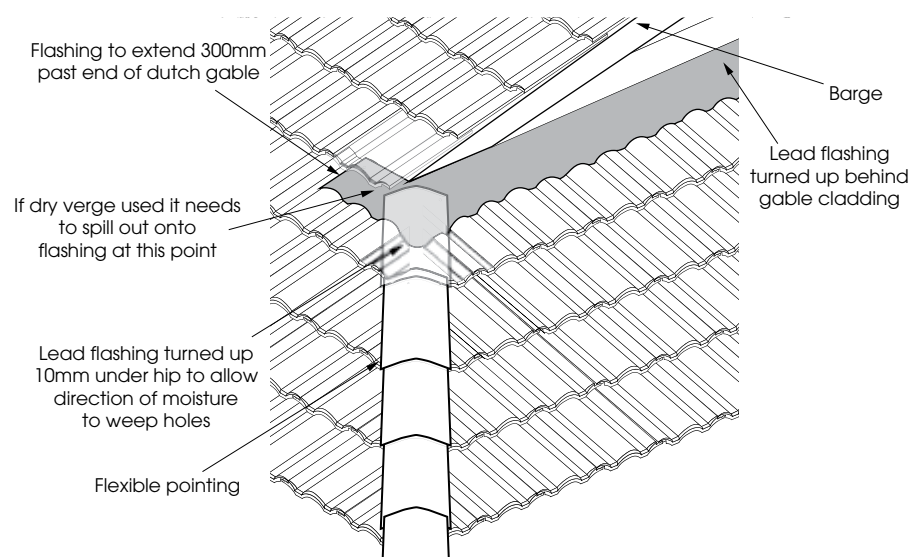
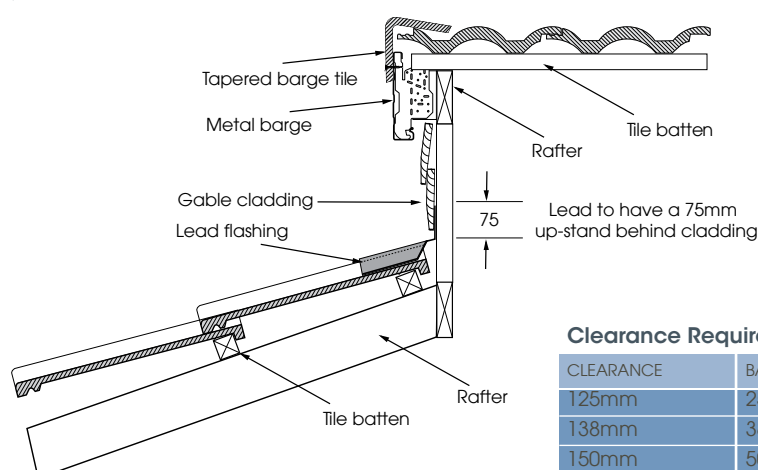


Figure 8 Dutch gable installation detail (section)



Clearance Requirements

CLEARANCE	BATTEN THICKNESS
125mm	25mm
138mm	38mm
150mm	50mm

Roof Design

Abutment Flashing

Figure 9 Abutment flashing to timber frame

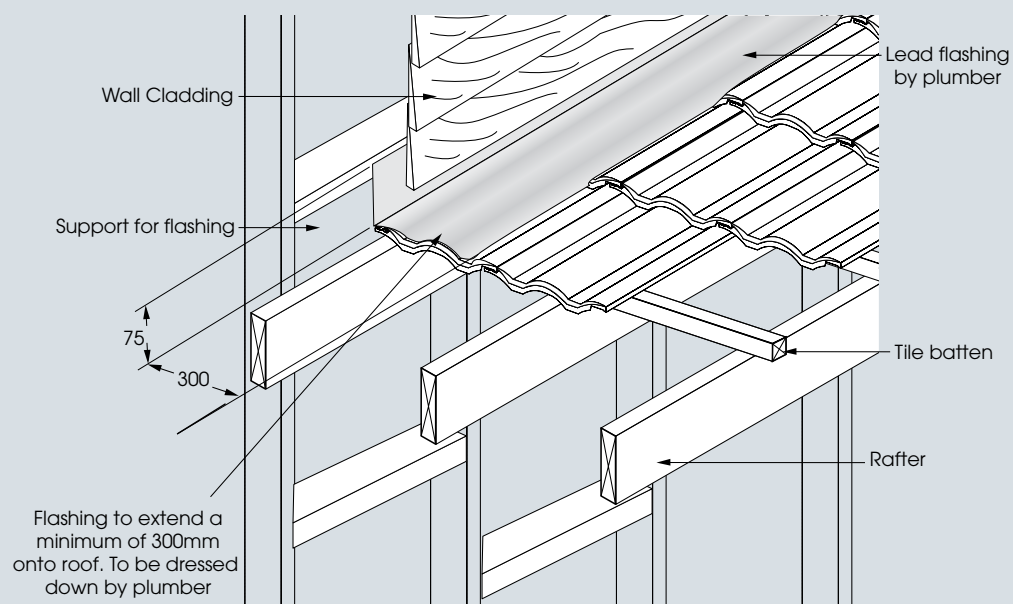
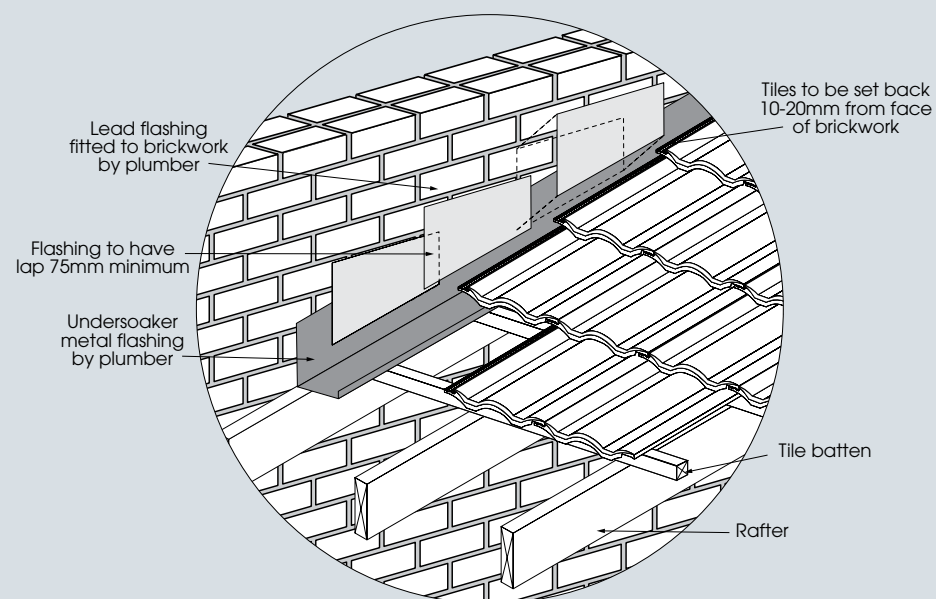


Figure 11 Abutment flashing to brick wall



Roof Design

Abutment Flashing

Figure 10 Flashing at side abutment

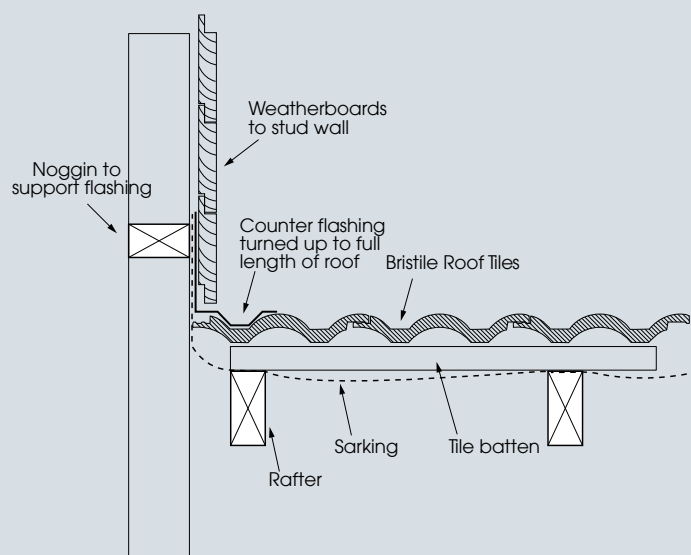


Figure 14 Vertical abutment flashing to brick wall

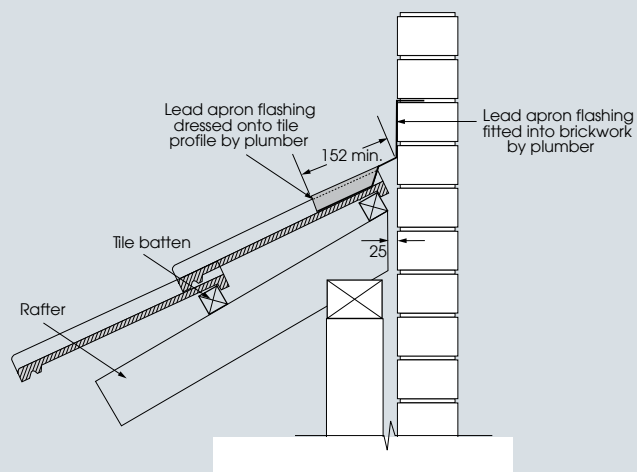


Figure 12 Abutment flashing to brick wall section

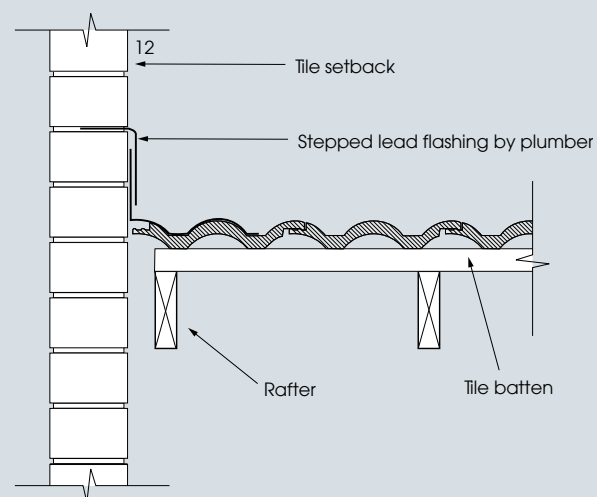
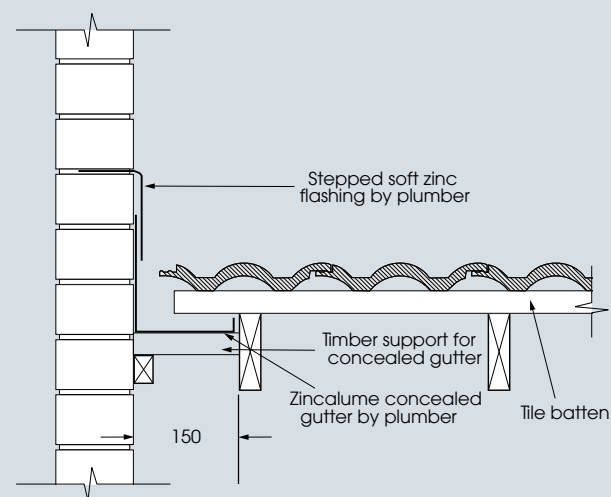


Figure 13 Concealed abutment flashing to brick wall section



Roof Design

Abutment Flashing

Figure 15 Abutment of ridge to gable flashing (plan view)

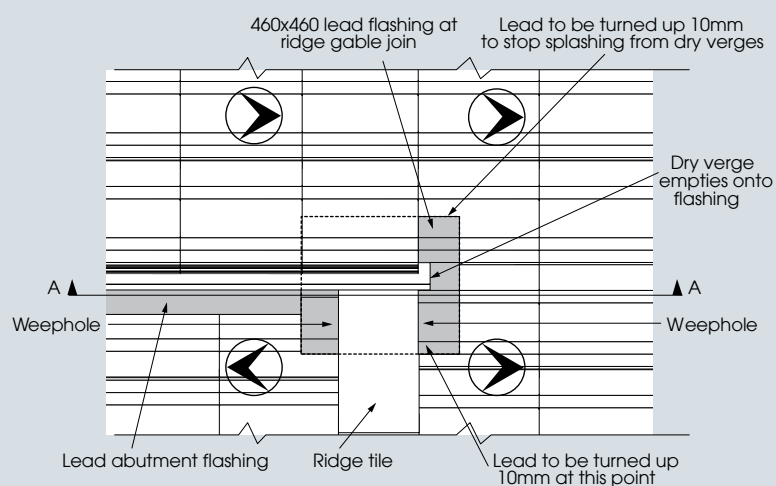
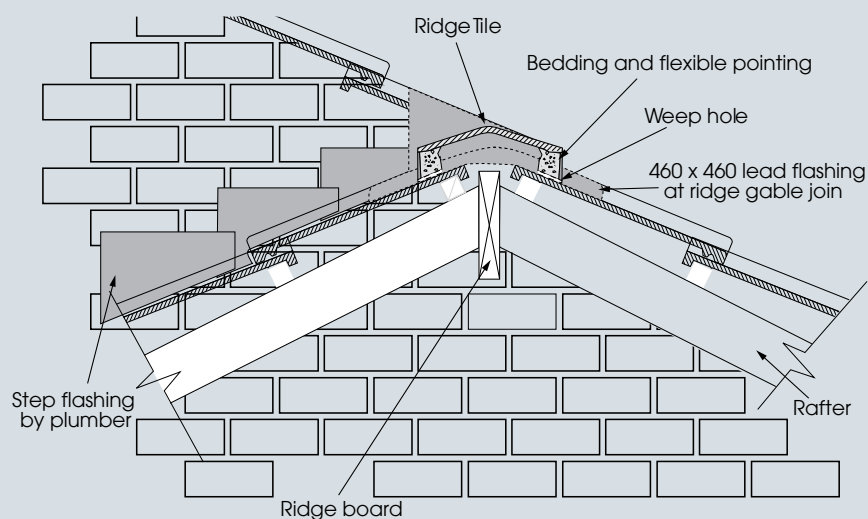


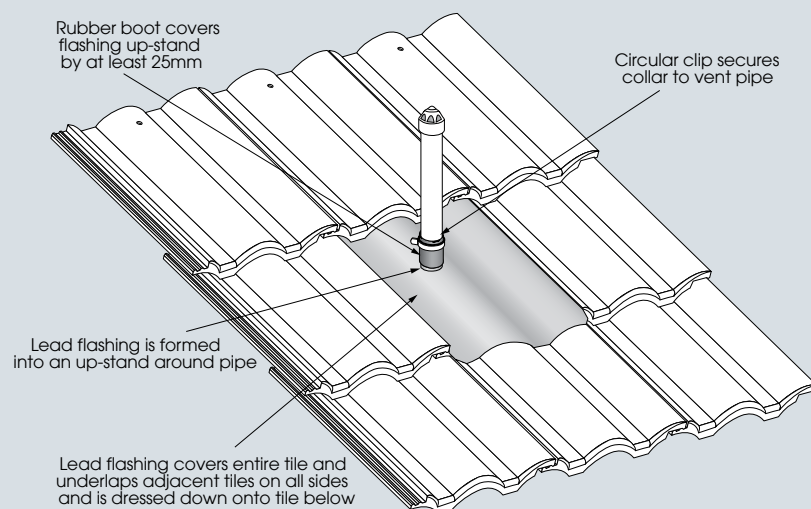
Figure 16 Abutment of ridge to gable flashing (front elevation)



Roof Design

Vent Pipe Flashing

Figure 17 Vent pipe flashing detail



Roof Design

Chimney Flashing

Chimney Flashing

To divert water around the projections and from under flashing, edges around roof penetrations such as chimneys, shafts, vents, skylights and abutments, the flashings should be trimmed and turned up. Also consider the issue of ponding.

Figure 18 Zinalume[®] chimney soaker flashing

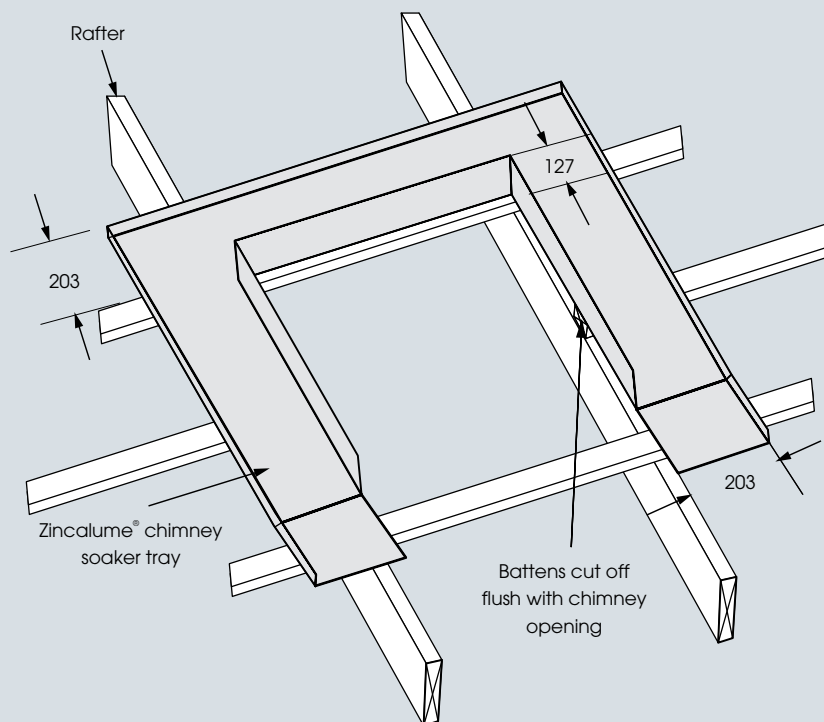
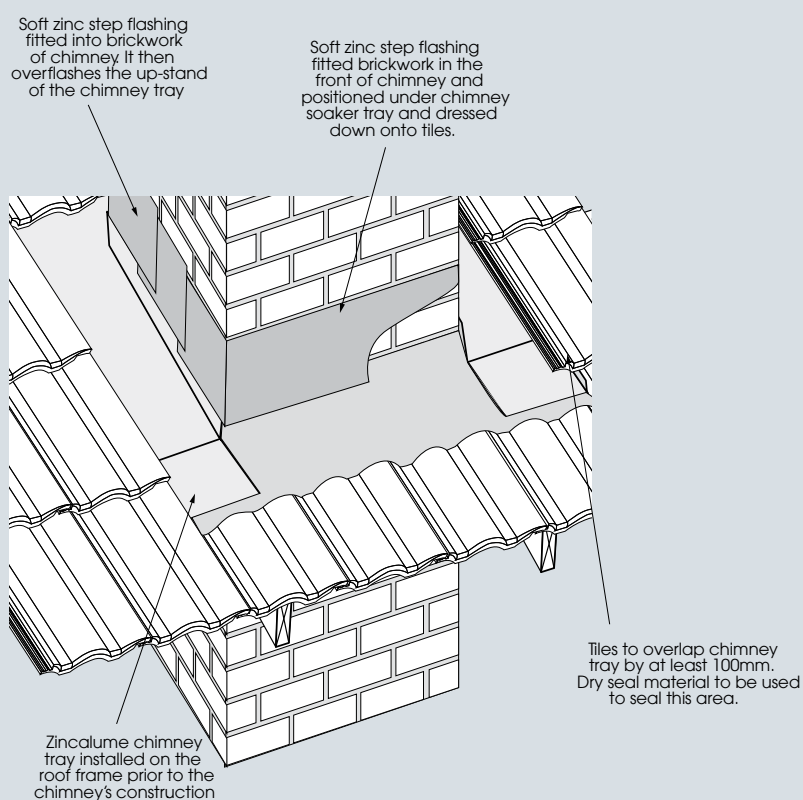


Figure 19 Complete chimney flashing detail



General

All edges and junctions of finished works should be clean and properly sealed against water penetration.

Roof Design

Flashing - Other

Box Gutter Flashing

Box gutters are water collection devices that are installed where two opposing roof lines meet at the base of their rafters, or where one roof meets an abutment. Box gutters are a custom design roof feature, so each one will be different from project to project. Installers should therefore obtain detailed plans from the builder to ensure that they complete the roof as per the designers specification.

For box gutters that are formed at structural abutments, figure 20 gives a typical detail of the general specifications usually required for this type of gutter. However just like the traditional box gutter mentioned previously, these details can change and it is the installer's responsibility to ensure that he fits the tiles in accordance with the specifications and requirements set out in the plan.

Special Barge Flashing

Where a clean line gable finish is required a concealed gutter can be used. The fascia is set up to cover the sides of the tiles and then a one piece gutter flashing is fitted over the fascia and supported on the tile battens. Tiles are then fitted to overlap the concealed gutter with a set-back from the fascia of 20mm.

Note: All gable cuts to be mechanically fixed.

Figure 20 Box gutter adjoining brick wall

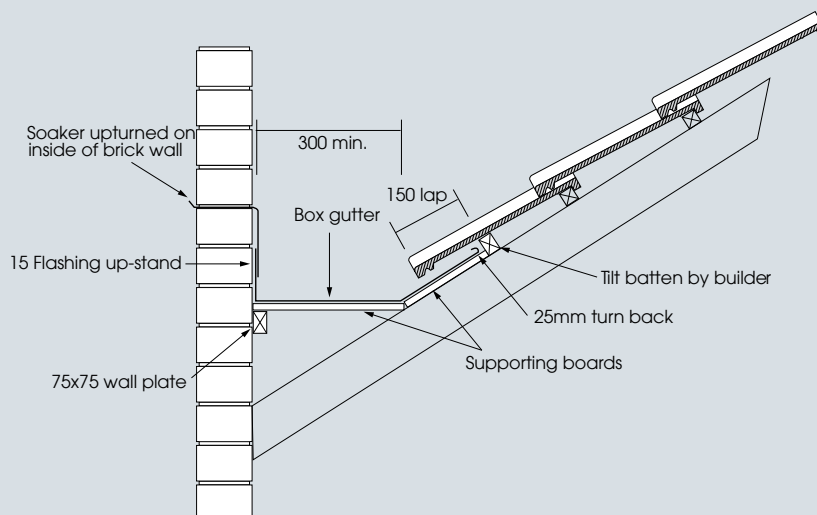


Figure 21 Concealed gutter

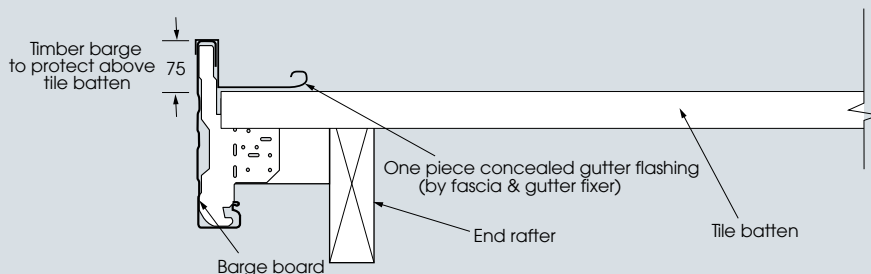
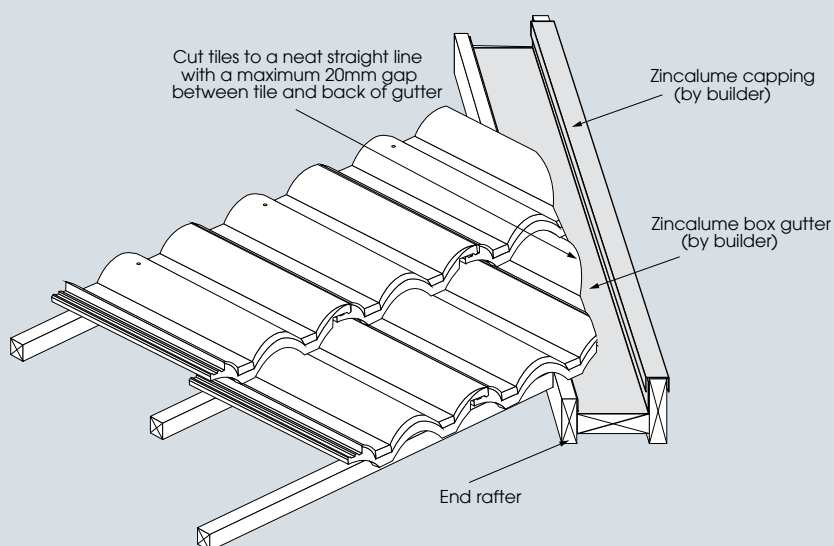


Figure 22 Ship end (splayed gable)



Roof Design

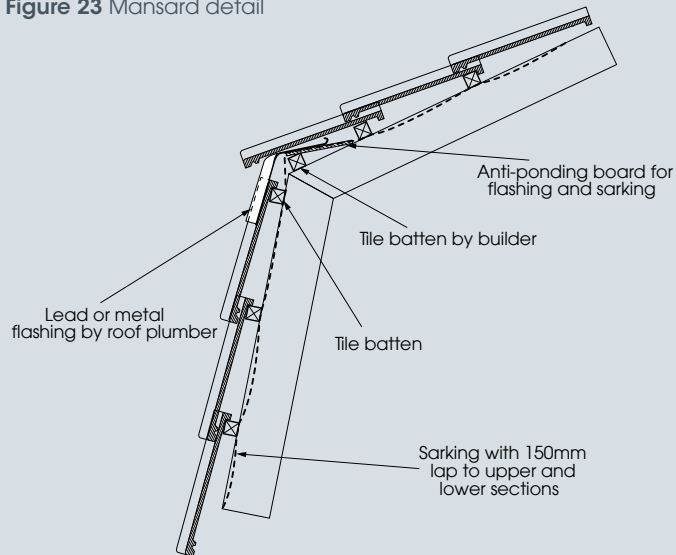
Flashing - Other

Mansard Roof

Where the two roof lines of a Mansard roof intersect, sarking will be carried across over anti-ponding board which supports it where the roof line changes pitch.

Figure 23 shows the specialised metal flashing that is installed by the roof plumber. The nature of the flashing means that the tiler and roof plumber need to work together to ensure that this critical area of the roof is waterproofed correctly.

Figure 23 Mansard detail



Change of Pitch Flashings

Where two roof planes of different pitch meet, a specialised flashing will need to be installed by the plumber to ensure that this area of the roof does not leak. If the pitch variation between the two roofs is $\geq 6^\circ \leq 30^\circ$ then flashing should be fitted as described in Figure 24. If the pitch variation is $> 30^\circ$ then Figure 25 is to be followed.

Figure 24 Change of pitch sarking details 45° and less

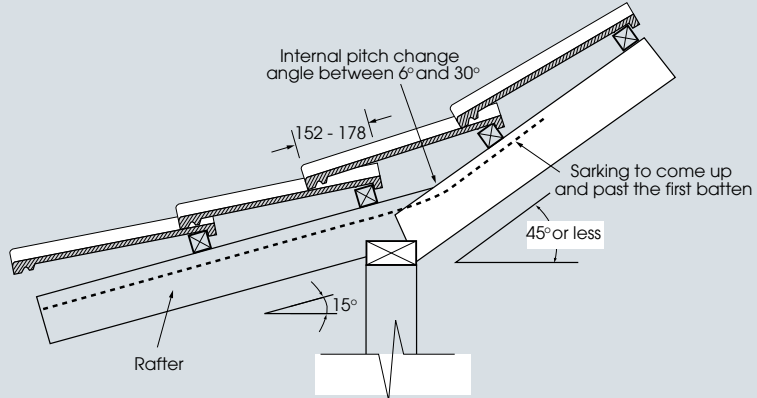
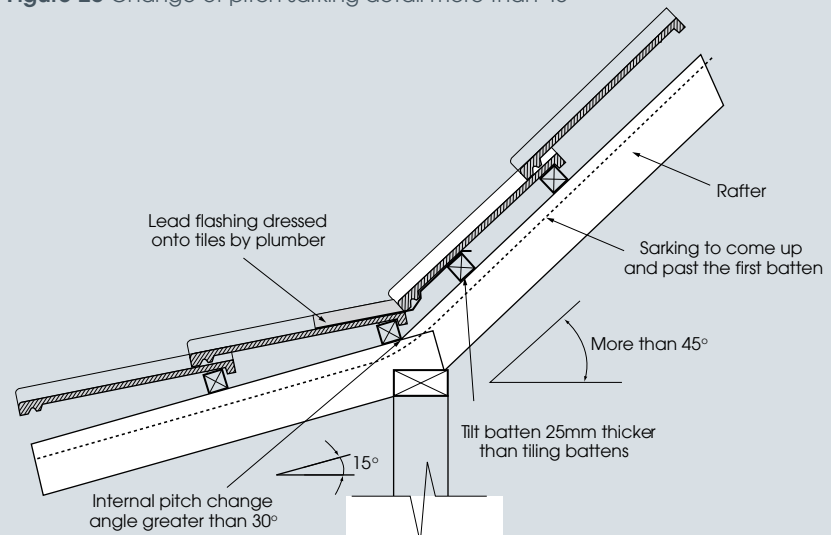


Figure 25 Change of pitch sarking detail more than 45°



Roof Design

Barge

Gable ends can have a number of different finishes. These different types of finishes require different barge board and flashing designs. Listed below are several of the more common barge

details. If the barge is set up correctly for the type of gable finish being used, the tiler will be able to complete his work without delay and the gable will function correctly.

Figure 26 Barge set up for barge tile finish

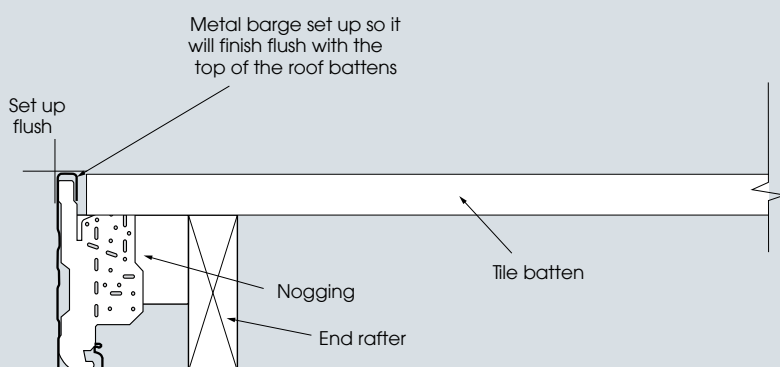
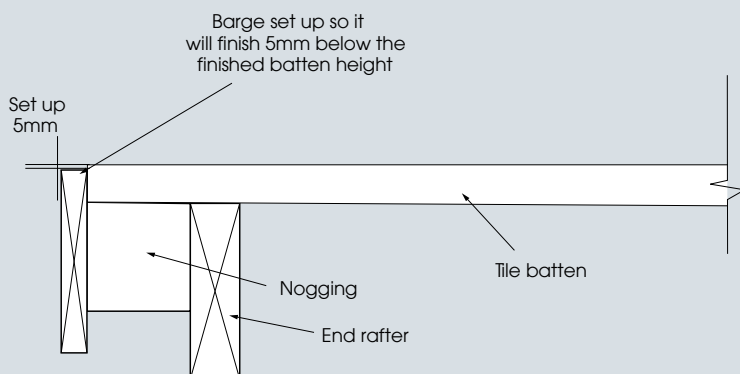


Figure 27 Barge set up for bed and point finish

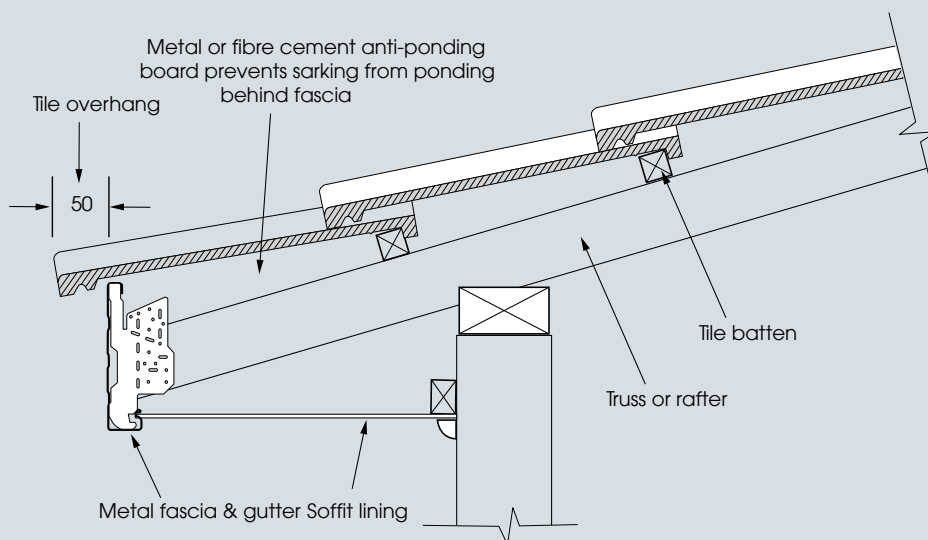


Roof Design

Anti Ponding Boards

To prevent sarking from sagging and ensure that collected water will run-off to the guttering anti-ponding boards should be installed at the eaves line. In accordance with AS 4200.2, low pitched roofs are recommend to have anti-ponding boards installed subject to regional specifications. If there is no eaves overhang the use anti-ponding boards is strongly advised.

Figure 28 Anti-ponding board installation detail





Installation

Laying Tiles

Laying Tiles

Bristle Roofing advises tiles be laid and secured in accordance with AS 2050 "Installation of Roof Tiles." Details of Bristle Roofing's security installation specifications are detailed in this section. Regional experience, research and application have helped to develop these specifications, taking into account the following Building Codes and Standards: a) AS 2050 "Installation of roof tiles" b) AS/NZS 4200.2 "Installation of materials suitable for use as Pliable Building Membranes and underlays - Installation requirements" Variations in regional ideals mean, your roof tiling contractors will:

1. Install an appropriate fall protection system to meet Occupational Health and Safety guidelines (subject to regional practice)
2. Fix anti-ponding boards (subject to regional practice)
3. Install sarking or underlay (as required)
4. Install tile battens
5. Install tiles and related material using a recommended security method
6. Bed and point ridge and hip joins
7. Install fire-resistant batts over party walls (as required)
8. Clean the roof of footmarks and loose debris

Battens

Batten installation to rafters must comply with the loading requirements specified in Clause 1.4.1 of AS 2050.

Security Fixing to Rafter

- » Non-ferrous stainless steel or steel fixings with an appropriate corrosion-resistant coating should be used for fixing of tiles to battens and battens to metal framing
- » Clout nails must comply with AS 2334 (minimum diameter of 2.8mm, and minimum penetration of 15mm into the rafter)
- » Any self-drilling screws used to fix battens must comply with AS 3566.1 self drilling screws for the building and construction industries - general requirements.

Joints in Battens

Three consecutive battens should not be jointed to the same rafter, joints should be staggered over the roof. Batten joints are required to meet in the centre of trusses and rafters.

Hip and Valley Joints

Battens are required to be mitre cut at intersections with hip board and valley battens, securing joints with skew nail to ensure sound support.

Metal Battens

Metal battens are to be manufactured to the standard noted in clause 2.2.2 found in AS 2059 and fitted in accordance clause 3.2.1 of the same standard. As battens may be installed by trades other than roof tilers special attention should be given to batten spacings.

Installation

Laying Tiles

Timber Batten Fixing

Timber batten fixing notes:

- » Fixing of tile battens is to be in accordance with the relevant tables found on page 4.6
- » If the battens are joined in a run, they should be butt jointed at the centre of a rafter or truss.
- » Battens must be mitre cut to hip and valley boards, and attached by skew nailing.
- » Battens must not be connected to, or supported by brickwork, as this will accentuate the normal settlement problem of timber framed roofs. The laying and fixing of tile battens is performed by the tiler.
- » Battens should only be stood on where they cross rafters or trusses. Standing in the middle of a batten where it spans between rafters or trusses could cause the batten to break.
- » Battens shall be aligned to within a tolerance of 20 mm in 4m.

Metal Batten Fixing

Metal batten fixing notes:

- » To minimise cutting, lay all battens in one direction, starting from one end of roof. To obtain correct length of battens, cut with tin snips at each side of the batten, then bend and snap.
- » Overlap battens and snap fix together, lapping of battens takes place over trusses with a minimum joint lap of 40mm required.
- » Battens are nailed to trusses at each support. See diagram (a)
- » On roofs with valleys, a metal valley batten to support and house the ends of the tile battens and prevent sarking damage are used. Valley support should be approximately 20mm deep, metal or timber.
- » Nail or screw valley battens into position alongside the valley support (valley boards). Fix tile battens ensuring that the ends engage securely into the valley batten.
- » Load and spread tiles, using tile clips to fix in position.
- » When using Top Span 40 battens the top and bottom flange is to be fixed to the rafter. Fascia to be installed to suit batten height. Battens should only be stood on where they cross rafters or trusses. Standing in the middle of a batten where it spans between rafters or trusses could cause the batten to buckle.

Figure 29 Timber batten fixing detail

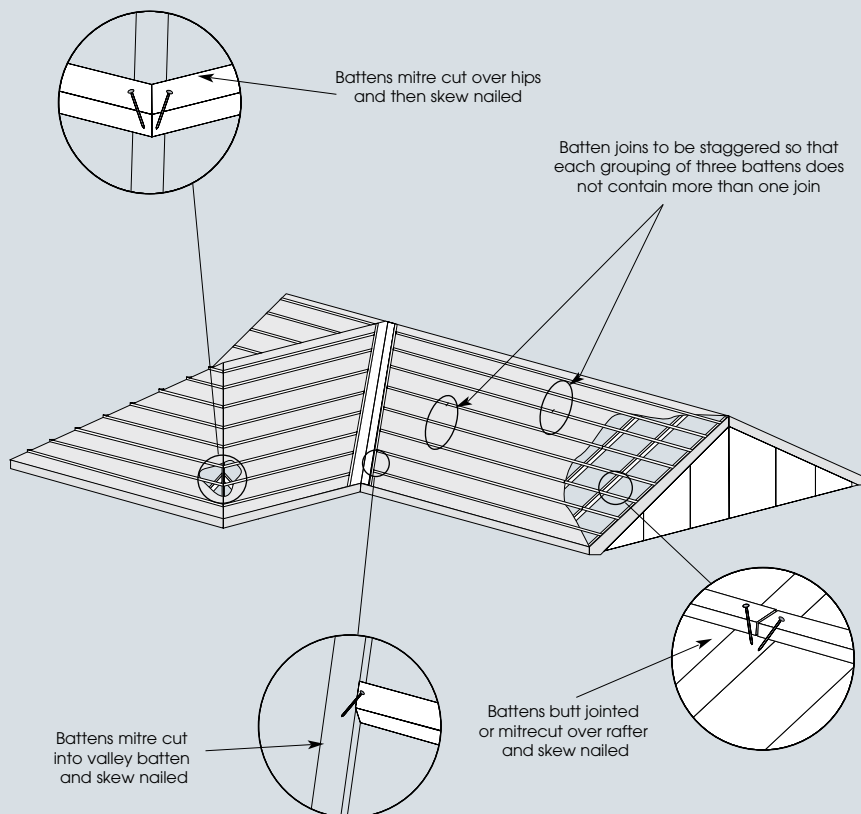
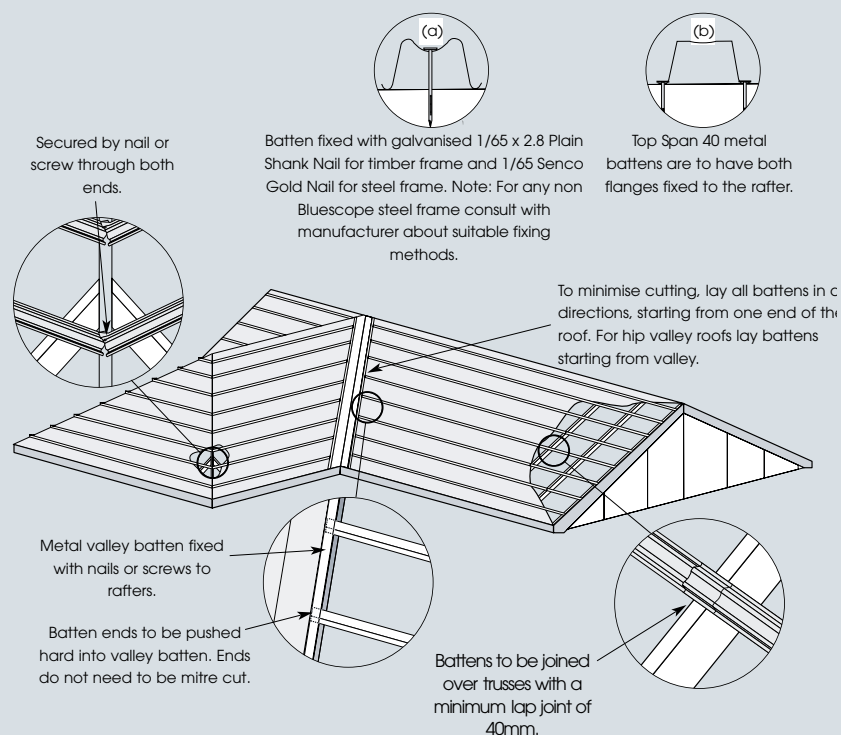


Figure 30 Metal batten fixing detail



Installation

Laying Tiles

Sarking

Sarking is a reflective, water resistant membrane that is installed between the top chord of the roof truss or rafter and the roof battens. It has a number of benefits the most important of which are, the provision of a reflective barrier that minimises heat transmission into the roof space, and as a water resistant membrane that provides a secondary barrier to water entry.

A number of circumstances which dictate the use of sarking as a protective measure against damage, irrespective of roof pitch are listed below.

- » Where local regulatory authorities require the use of sarking
- » Where extreme weather conditions are probable i.e. cliff tops, open exposed sites
- » Bushfire prone areas to prevent flying embers entering the roof space.
- » Mansard roofs.
- » Where design wind velocities exceeds 41m/s (ie. Greater than C1 or N3).

- » Where run off from a high level gutter or valley discharges onto the roof, the roof should be sarked from the point of discharge down to the eaves gutter. Minimum width 1.8 metres on either side of the discharge point. Alternatively lead flashing sufficient to cover the spreader discharge point can be fitted.

Note: Ideally the National Plumbing and Drainage standard AS 3500.3.1 should be consulted to determine the best solutions for managing stormwater run off when the roof is being designed.

- » At any change of roof pitch greater than 6° and extending from there to the eaves gutter.
- » Where radiant heat is a problem and sarking is used to control it.
- » Long rafter lengths

Laying

Sarking should be laid with the reflective side face down.

Over-Lapping Sarking

Sarking should overlap at least 150mm, with the upper layer on top of the lower layer of sarking. The end of a roll of sarking, should have overlapping layers at least one rafter space in length. Sagging should not occur more than 40mm between rafters.

Obstacles in the Roof

Hot Flue

Sarking should be cut back to create a clear space of 50mm.

Penetrations

Water should be diverted from the roof by turning up and sealing sarking at any roof projection. In the case of a fascia batten being used in place of a fascia board (and there is no gutter), the sarking material should be neatly trimmed to the outside edge of the fascia batten.

Use of Security Pads

The use of security pads or anti-flap pads is recommended to avoid constant flexing and to increase the life of the sarking material. Install security pads in a staggered pattern under each second row of battens between each pair of rafters.

Sarking at Eaves

Sarking should extend over the fascia board by a minimum of 25mm and a maximum of 50mm to allow for optimum water run off.

Sarking Support

Approved anti-ponding board is preferable on roofs with a low pitch, in accordance with regional specifications. (Make reference to page 6.14 of this manual). Adequate reinforcement of the sarking, where rafter centres exceed 600mm. Using heavy grade sarking or supporting the existing sarking becomes mandatory where the rafter centres exceed 900mm. Installation of sarking support or safety mesh is performed by other trades as referred to in AS 2050 Appendix A.

Sarking at Valleys

Sarking is secured by fixing a valley batten parallel to the valley gutter. The sarking should either overlap the valley by less than 25mm or be cut at the valley batten. If sarking projects too far into valley the roof is likely to leak.

Installation

Valley Construction

Figure 31 Valley construction detail

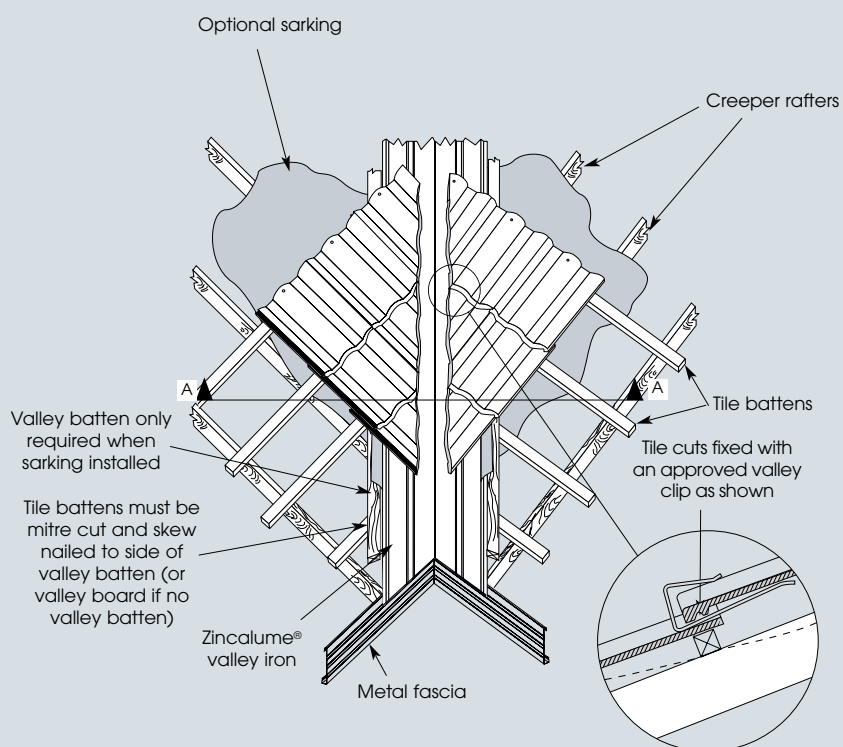
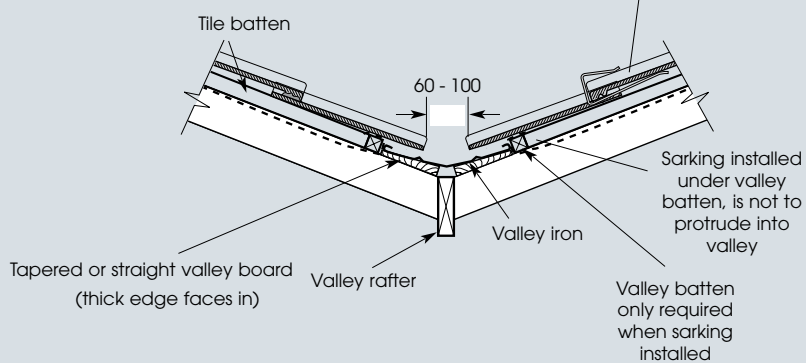


Figure 32 Valley construction detail (Section A-A)



Installation

Laying Tiles - Set Out

Concrete Tile Batten Set Out

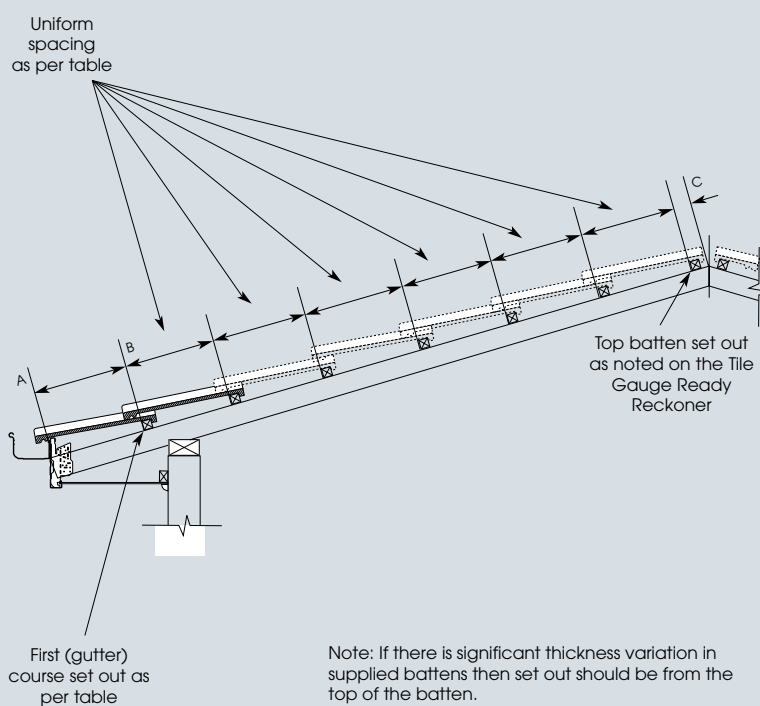
All Bristle Roofing tiles are designed to be consistent in dimension, which allows for easy set out. Concrete tiles can be installed with a variable head lap which allows them to be fitted without the need to cut the top course of tiles. Terracotta tiles though, have minimal head lap tolerances and designers should ensure that the rafter lengths work full tile courses wherever possible. The information below gives a basic understanding of the tile set out procedure. Contact your nearest Bristle Roofing office for more detailed coursing information if required.

Concrete Tile Batten Set Out Procedure:

Correct spacing of tile battens is essential to obtain a uniform appearance of the finished roof. The following procedure is followed when setting out the roof in preparation for tiling:

1. The first set out nail is nailed at the front edge of fascia board or tilt batten, point "A". The next set out nail is positioned to the underside of the first batten, point "B". Required spacing is determined by using the first course set out dimension noted in the Tile Gauge Ready Reckoner found in the Bristle Roofing Specification and Installation manual.
2. The top batten set out nail position is also noted in the Tile Gauge Ready Reckoner and is measured from point "C" which is the apex of the truss or ridge rafters.
3. A measurement is made between points "B" and "C" and is then referred to the Tile Gauge Ready Reckoner which confirms the number of courses required to cover the nominated rafter length.
4. The process is repeated at the other end of the roof.
5. A chalk line is snapped across the top of the rafters at each gauge mark.
6. A set out nail is fixed at each batten rafter/truss crossing.
7. The battens are then laid out on the set out nails ready for final fixing.

Figure 33 Concrete tile batten set out procedure section



Note: If there is significant thickness variation in supplied battens then set out should be from the top of the batten. Roofs installed in Victoria are also set out from the top of the batten.

Installation

Laying Tiles - Set Out

Loading

Battening and sarking of the entire roof must be completed before tiles are loaded onto the roof. In buildings where the rafters are internally exposed, or the length of the truss top chord or rafter exceeds 6 metres, tiles should be loaded onto the structure from each side to ensure that their weight is evenly distributed.

First Course

The first course of tiles should be positioned to provide an adequate projection over the fascia and into the gutter. For Bristile profiles this projection is normally 50mm.

Note: Roman and Swiss terracotta profiles will require a 60mm projection. Due to this requirement the gutter width should be considered when using these profiles.

Laying

Tiles are to be laid and secured in accordance with AS 2050 "Installation of roof tiles". All courses should be aligned horizontally, vertically and diagonally to ensure a straight finish at the roof edge and to achieve good roof aesthetics.

Blending

Layout is crucial due to the varying shades of colour which are a feature of terracotta tiles. Numerous tile colours in blended roofs involve the mixing of many tile shades as they are laid. A visual inspection of the roof should be carried out approximately 75 - 100 tiles into the installation to check courses and even distribution. Visual inspections of the roof should be repeated at regular intervals during installation. The same method should be employed when blending some concrete roof tiles.

Installation

Securing of Tiles

Tile Clips

Bristle Roofing products are secured to the roof frame using a number of purpose made clips which make up our clipping system. These various clips are designed to fix different Bristle Roofing profiles and accessory fittings in a range of installation situations. All clips have been fully tested to comply with relevant fixing standards and are to be installed as per manufacturers specification to ensure the performance of the installed roof.

Included below are a series of illustrations which detail how and where the main types of tile clips are fitted.

Nails

Non-ferrous or galvanised 2.8mm diameter nails, of sufficient length to pierce the rafter a minimum of 15mm should be used. Timber relevant nail requirements and wind loadings are specified in

Table 7 on page 4.6 of this manual. The use of standard and heavy duty clips, eaves tile clips, screws and adhesives are offered in Bristle Roofing's security fixing system. Further relevant information can be found in Section 2.4.2 of AS 2050.

Steep and Vertical Pitch

For roofs pitched between 40-70 degrees all tiles must be mechanically fixed. "Mechanical fixing" is achieved by nailing, screwing or clipping every tile. The method used is often dictated by the regional authority and they should be consulted during the design process. Clips are the preferred method of mechanical fixing where there are extreme conditions. If the roof has a greater pitch than 70 degrees it must be double mechanical fixed and sarked.

Figure 38 Ajax wire clip

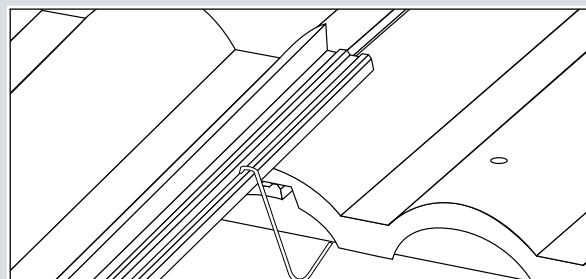


Figure 39 Ramlat clip

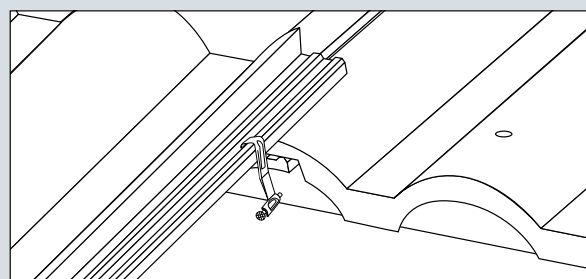
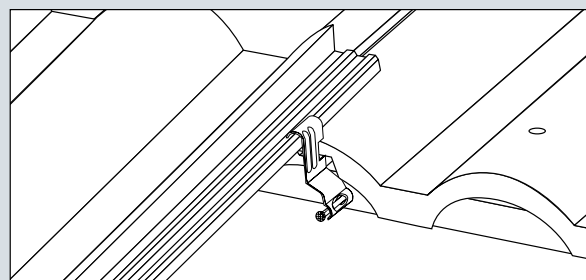


Figure 40 Elabana clip



Installation

Securing of Accessories

Accessory Tiles

The installation of accessory tiles can only begin after the main roof tiles have been laid. Accessories manufactured by Bristle Roofing are detailed in the "Product" sections of this manual. Weatherproofing of all junctions of hip and ridges is mandatory. The pitch, profile and position of the roof join dictates which accessories should be used.

Laying

Whilst allowing for the natural contour of ridge tiles, ridge and hip tiles must be laid in a straight line. Over-lapping ridge tiles should be directed away from prevailing winds where possible.

Ridge

Ridge tiles are laid onto a bed of mortar then finished with flexible pointing material.

Figure 41 Ridge installation detail

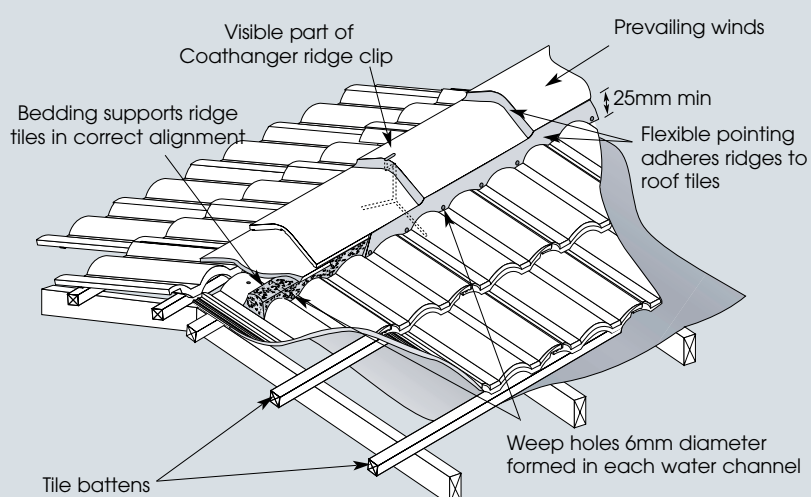
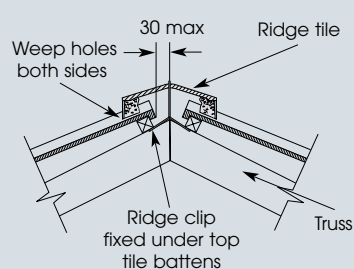
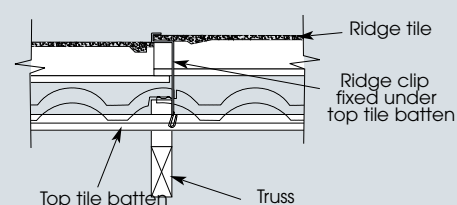


Figure 42 Ridge installation front section



Note: Coathanger ridge clip used only in New South Wales

Figure 43 Ridge installation side section



Installation

Laying Tiles - Hip

Hip

A hip starter or shell end is the beginning of a hip, sited on a bed of mortar at the lower end of the hip. There must be a maximum of 25mm between the planes of cut and laid roof tiles at the join of a hip. In line with the nose of the first course of tiles, a hip starter must be laid to project into the gutter. Alternatively, a ridge tile can be shaped to replace a hip starter.

Figure 44 Hip installation detail

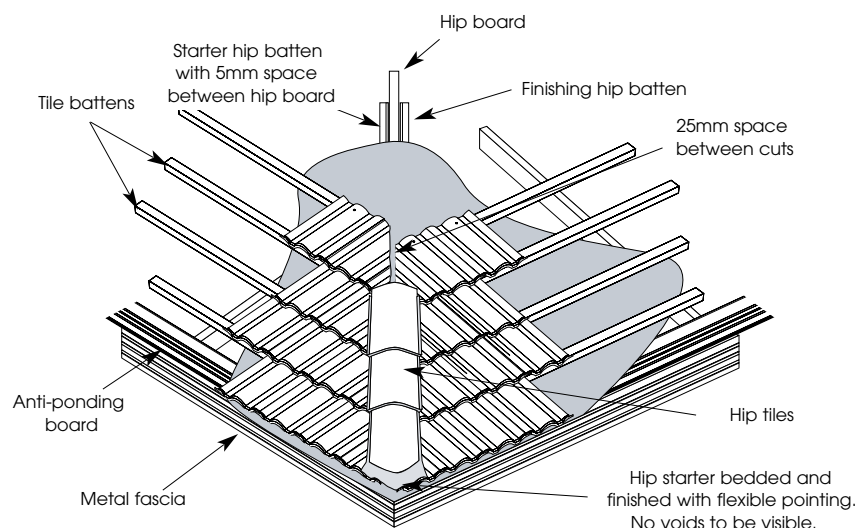


Figure 45 Offset (Bastard) Hip installation

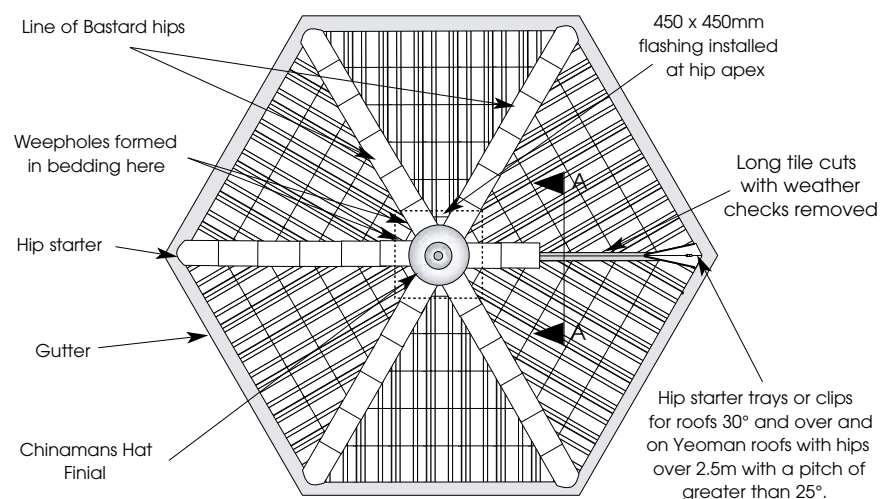
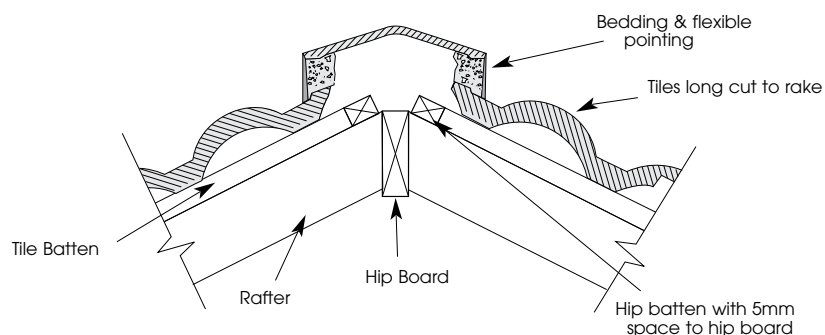


Figure 46 Offset (Bastard) Hip installation (Section A-A)



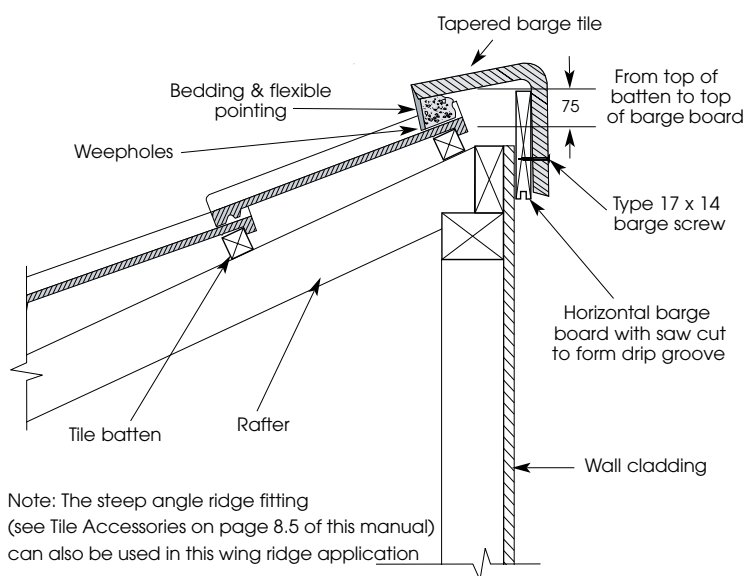
Installation

Laying Tiles - Hip

Wing Ridge

Where roof line terminates at a vertical wall a wing ridge is formed. This line of roof is covered by either a barge tile or steep angle ridge. The capping tile is mechanically fixed with a screw into the horizontal barge board. The edge of the capping tile that covers the roof is bedded and pointed to create a weatherproof seal.

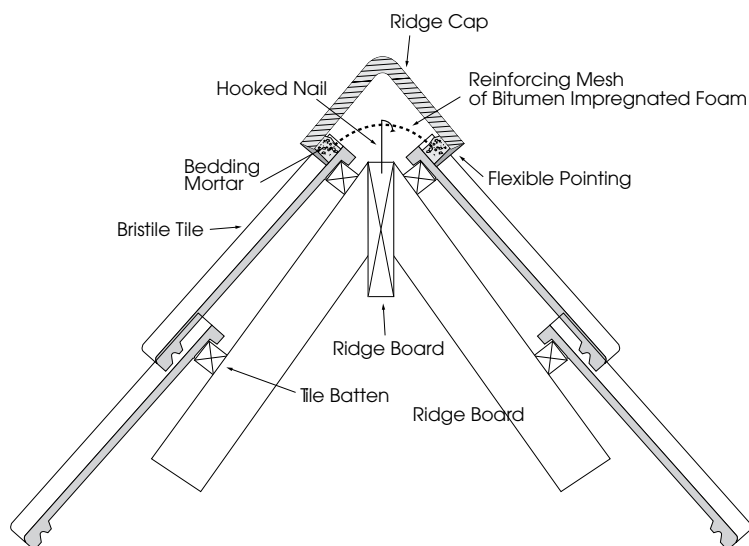
Figure 47 Wing ridge (barge tile) detail



Steep Pitch

Roofs pitched greater than 40 degrees require the use of Barge or Steep Angle Ridge tiles. The bed and pointing of the ridge, hip or gable can be strengthened by using galvanised wire or bitumen-impregnated foam.

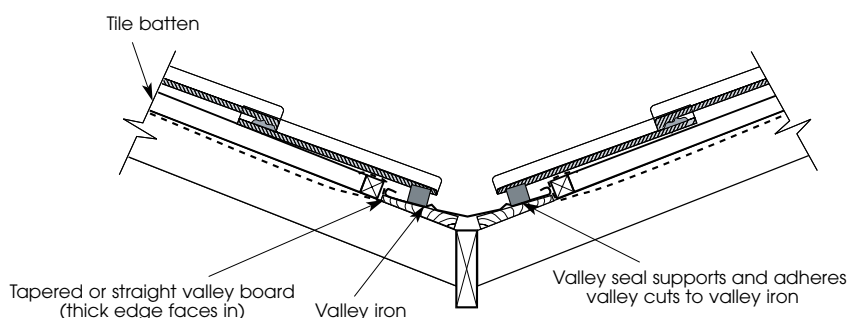
Figure 48 Steep pitch detail



Valley Tiles

The valley width is dependent on regional weather conditions. A gap of 60-100mm between tiles is acceptable, in normal conditions. If the home is in a high rainfall area, valley tiles should be storm sealed. Storm sealing allows the valley gap to be increased to 100mm. AS 2050 states that the roof must overlap each side of the valley gutter by at least 150mm. In high rainfall areas, valley design and downpipe position should be carefully considered when designing the roof.

Figure 49 Valley Seal Installation



Installation

Bushfire Protection

Fire Walls

All partition fire walls require an approved non-combustible material to fill the cavity between the top of the fire wall and the underside of the roof. Bristle Roofing recommends the use of fire batts for this purpose. Apart from sarking and roof battens with a maximum section of 75mm x 50mm no other combustible material is allowed to cross the fire wall. Note: The illustrations to the right are only an example of how party wall insulation may be installed. The actual party wall insulation requirements for a given project should be confirmed on the working drawings.

Figure 50 Party Wall installation front elevation detail

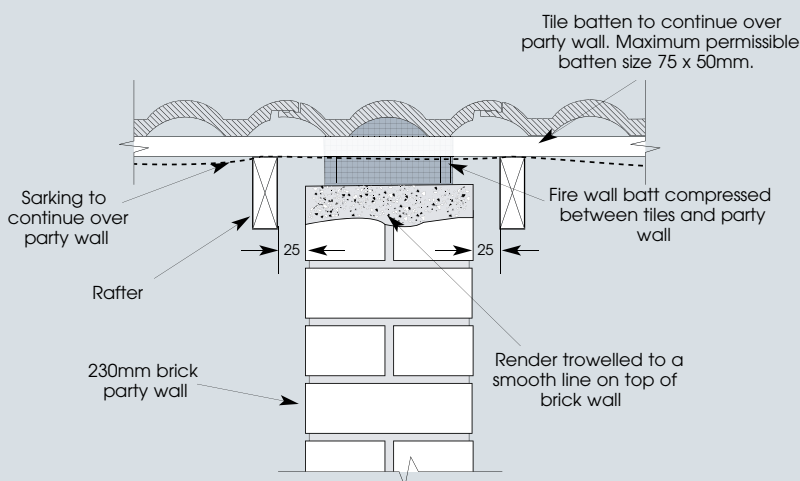
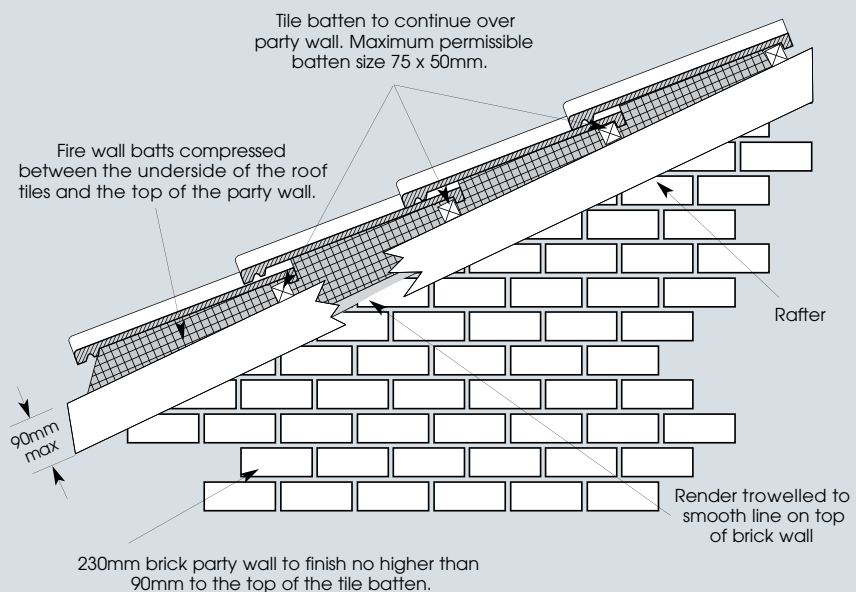


Figure 51 Party Wall installation side elevation detail



Bushfire Protection

Supplementary fixing requirements apply to classified bush fire areas as per AS 3959. High fire hazard area can be identified by State authorities, insurers, country fire authorities or related bodies: For roofs in these areas

- » Sarking/underlay must be used
- » Flexible pointing must be used
- » Every tile must be secured

Where winds are in excess of 41m/s i.e. above N3 or C1, sarking with security pads is recommended regardless of roof pitch. Sarking is mandatory, where winds exceed 47m/s.

Installation

Bed and Pointing/Barge Installation

Bed and Point Finish

Place bedding strip of 5mm fibre cement 100mm wide over the metal "Z" flashing, which sits on top of the barge board and bed roof tile to same. The projection over the barge board shall be a minimum of 10mm and a maximum of 25mm. Bedding is pointed with an approved flexible pointing with no visible trowel marks

With a bed and point finish the projections of gable ends should be left to the discretion of the tiler, thus ensuring the finishing off of a full tile at all left hand gables whenever practical. The exposed side water channel to all left hand gables should be removed, all verge tiles to a perimeter of 1200mm will be mechanically fixed.

The barge board should be set down 5mm from the top side of the batten. This ensures that the AC strip and "Z" flashing slope down which ensures any collected moisture will run away from the roof space.

Concrete and Terracotta Barge Installation

Tapered barge tiles are a purpose made fitting designed to seal the gable end. Barge tiles are installed starting at the bottom of the gable where the first barge is trimmed around the gutter. The void formed is bedded and pointed to vermin proof the gable. Barge tiles are then laid one per tile course up the gable and secured with a Type 17 screw into the barge board. The apex barge is trimmed to match apex barge on opposite side. The join is then finished with flexible pointing. Terracotta barge tiles are fitted in the same way however as they are not tapered, they require bedding and pointing to the roof as shown in figure 54.

Figure 52 Bed and Point verge detail

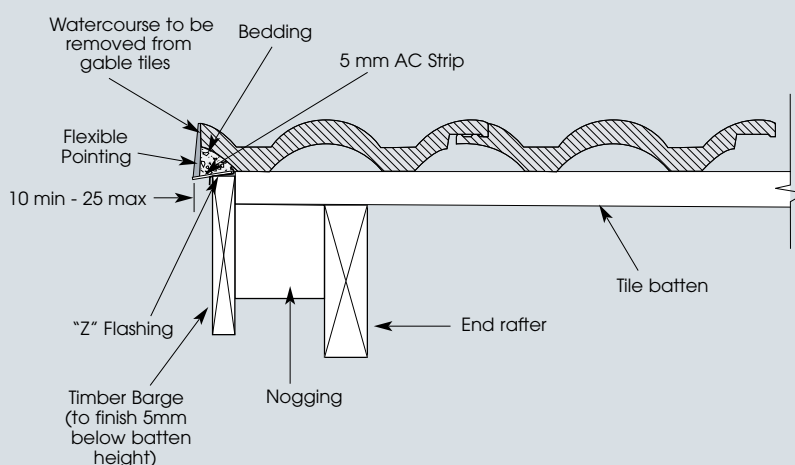


Figure 53 Concrete barge tile installation detail

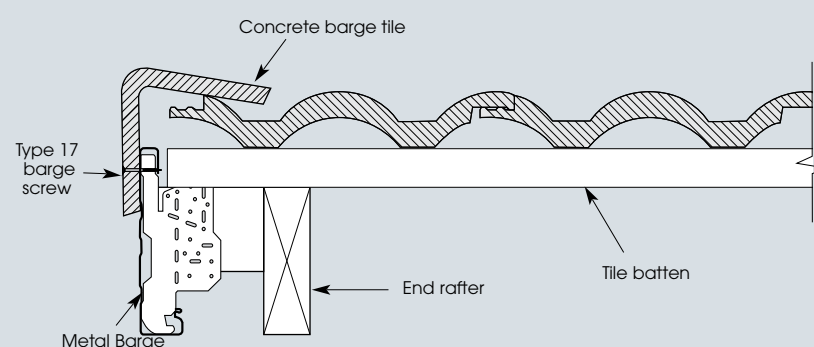
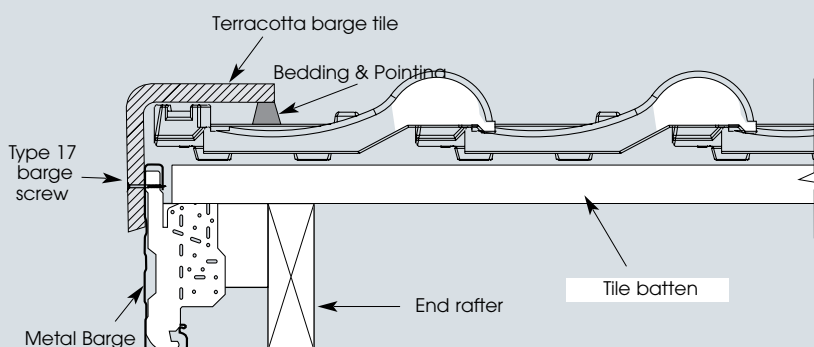


Figure 54 Terracotta barge tile installation detail



Note: It is good practice for roof tiles on gable roofs to finish with equal length tiles at both ends. Local requirements and site exposure may dictate the gable end/verge finish to be used.

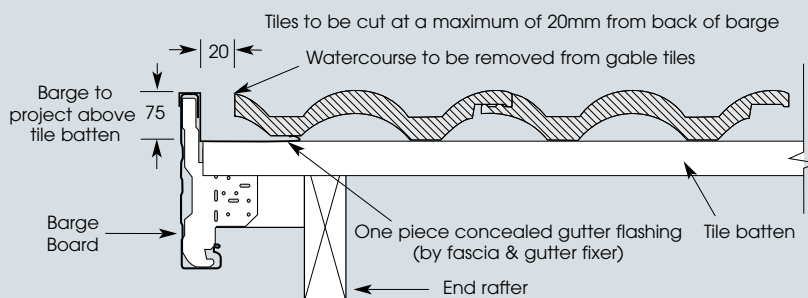
Installation

Concealed Secret Gutter Finish

Concealed Secret Gutter Finish

Where a clean line gable finish is required a concealed gutter can be used. The fascia is set up to cover the sides of the tiles and then a section of guttering is fitted over the fascia and supported on the tile battens. Tiles are then fitted to overlap the concealed gutter with a set back from the fascia of 20mm. Note: All gable cuts to be mechanically fixed.

Figure 55 Concealed gutter installation detail



Bed and Point Materials

Mortar Mix

A sand:cement ratio of four parts clean, sharp sand to one part cement should be used for the bedding mortar mix (As documented in section 2.3 of AS 2050.) The "fattiness" of the mix can be improved by adding lime or mortar plasticisers to the mix where suitable sand is not available.

Flexible Pointing

A very strong bond between the tile and ridge capping can be achieved by using Flexible Pointing, a highly pliable yet durable compound once cured. The use of Flexible Pointing produces the following benefits:

- » It will absorb the movement of a roof and is less prone to cracking than traditional mortar pointing
- » Allows the roof to be completed earlier as there is no need to wait for the roof to "settle" before pointing can begin
- » Saves time and money with a reduction in long-term roof maintenance
- » Reduces the need for mechanical fasteners as the bond between tile and ridge is very strong
- » Is resistant to leaching, efflorescence and fading, thereby maintaining the appearance of the roof for a much longer period
- » Once cured, Flexible Pointing resists moisture ensuring dampness will not seep under the ridge
- » Is flexible enough to allow for the removal and replacement of tiles if necessary
- » Available in a range of modern colours which match all Bristle Roofing products

Roof Completion

Upon completion of the job, tilers should take care to clean and remove all debris from the roof. Particular care should be taken to ensure the removal of metal debris (nails, screws) which may cause staining of the tiles or corrosion of gutters. Broken, cracked or chipped tiles should be replaced following a final roof check to ensure the roof is fully waterproof.

Application

Using an approved formula or pre-mixed pointing material, pointing should be colour matched to the roof tiles. The flexible pointing material should be trowelled to a thickness of 3–5mm, ensuring that the pointing is in complete contact with the edge of the capping creating a neat, clean finish. An allowance for drainage weepholes may be required. Clean and brush free loose mortar and pointing particles from all tiles adjacent to the ridge and hip tiles.

Installation

Caring For Your Roof

Bristle concrete products are structurally guaranteed to perform their function (eg. remaining waterproof), for 50 years. Our terracotta tiles are covered by the Colour for Life warranty (refer to the various warranties found in section 5 of this manual for full details). These warranties do not cover matters beyond Bristle Roofing's control, such as:

- » Damage caused to the roof by other parties, eg. plumbers, TV antenna and air conditioning installers etc.
- » Falling objects
- » Air pollution
- » Acts of nature
- » Tiles being treated with incorrect chemicals or coatings
- » Acts of war or terrorism

Roof traffic should be minimised to ensure the roof remains watertight. Follow the hints below to minimise roof damage:

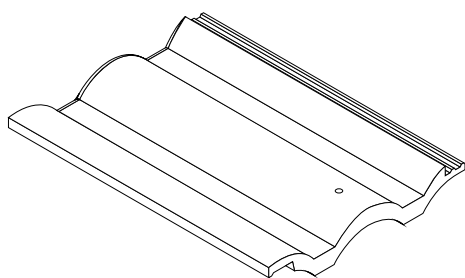
- » Observe safety requirements and only access your roof when absolutely necessary
- » Wear non-slip, soft sole footwear
- » Due to the slippery nature of tiles always be aware of weather and conditions
- » Extend ladders at least 1 metre past the gutter and secure
- » Only step on the lower centre of roof tiles
- » If heavy traffic is necessary secure a walkway of plywood, ladders, planks etc.
- » Use a long stick or rake where possible to remove objects from the roof
- » Remove roof tiles by kicking the lower centre of the tile towards the ridge
- » It is recommended you consult a roofing specialist if maintenance is required for the roof

Some Maintenance Advice for Tiled Roofs

Leaks generally occur due to one of the following points, and are mostly confined to small areas:

- » Cracked or broken cement mortar bedding to the ridge or hip capping. (Capping should be re-bedded or re-pointed.)
- » Cracked or broken roof tiles. (Replace individual roof tiles.)
- » Roof tiles displaced. (Return tiles to their proper position.)
- » Blocked drainage channels under the 'sidelaps' of individual tiles. (Remove any built-up dirt or debris.)
- » Flashings blocked, damaged or displaced. (These problems should be corrected with the assistance of a qualified roof plumber if required).
- » Blocked gutters (including valley gutters) and downpipes. (Obstructing debris should be removed.)

Concrete Roof Tiles Designer/Traditional



The Hacienda profile is the most popular concrete tile profile installed on Australian roofs.

Used in the Designer and Traditional ranges, the Hacienda tile profile offers a shaped profile. This bold tile with its large roll suits a wide range of roof styles from Tuscan to contemporary.

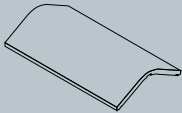
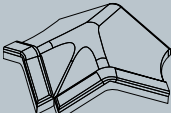
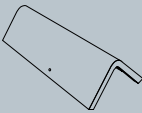
Concrete Roof Tiles

Designer/Traditional

Designer/Traditional Product Specification

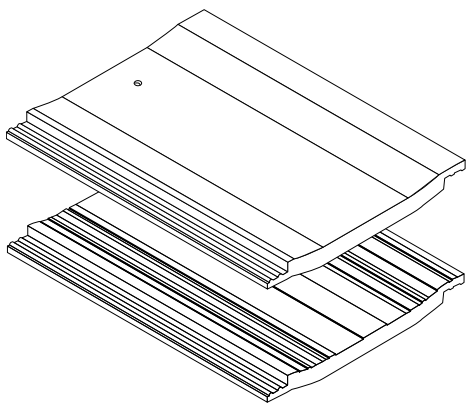
Product Specification	
Min Pitch:	15 Degrees
Set Out:	360mm Max
First Batten:	315 - 335mm
Sarking Requirements:	Refer Table 7 on page 27
Watercourse Width:	36mm
Dimensions:	440mm x 335mm x 53mm
Weight:	4.87kg
Laying Method:	Straight Bonded
Tiles Per m2:	9.26
Cuts per LM:	3
Ridges per LM:	2.5
Batten per M ² :	2.9
Batten:	40 x 25 (QLD) / 38 x 38 (NSW, ACT, VIC, SA, TAS)
Fixing:	Side Lap Clip or Nailed
Pointing LM:	20
Weight per m2:	50.21

Designer/Traditional Fittings

Ridges	Apex	Barges
		
Standard Concrete Ridge	3 Way Apex	Standard Concrete Tapered Barge

Concrete Roof Tiles

Classic Shake and Shingle



For home builders seeking a point of distinction to cap off their masterpiece, Bristle Roofing offers the Classic Range.

Six alluring shades from the timeless Gun Metal and Coal to the eye catching Mulga cater for a wide range of colour schemes.

Equally at home on a country estate or waterfront manor, the sleek, flat profile used in the Classic range adapts to a variety of settings.

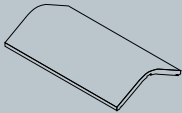
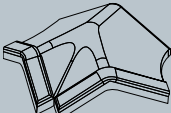
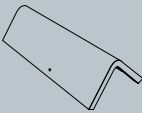
Concrete Roof Tiles

Classic Shake and Shingle

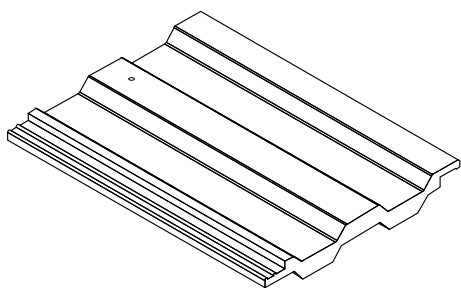
Classic Shake and Shingle Product Specification

Product Specification	
Min Pitch:	15/17.5 Degrees
Set Out:	360mm Max
First Batten:	315 - 335mm
Sarking Requirements:	Refer Table 7 on page 27
Dimensions:	440mm x 335mm x 35mm
Watercourse Width:	36mm
Weight:	5.24kg (Shake), 5.43kg (Shingle)
Laying Method:	Straight Bonded
Tiles Per m2:	9.26
Cuts per LM:	3
Ridges per LM:	2.5
Batten per M ² :	2.9
Batten:	40 x 25 (QLD) / 38 x 38 (NSW, ACT, VIC, SA, TAS)
Fixing:	Side Lap Clip or Nailed
Pointing LM:	17
Weight Per m2:	53.64kg (Shake), 55.40kg (Shingle)

Classic Shake and Shingle Fittings

Ridges	Apex	Barges
		
Standard Concrete Ridge	3 Way Apex	Standard Concrete Tapered Barge

Concrete Roof Tiles Heritage



The Heritage range captures colours of a bygone era.

From the distinctive Stonehenge and Newcastle two tone colours through to the timeless Blackstone, the Heritage range showcases colours which will give your home a historic federation appearance.

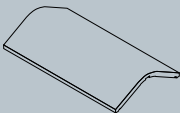
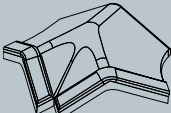
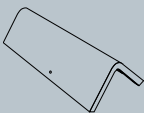
Concrete Roof Tiles

Heritage

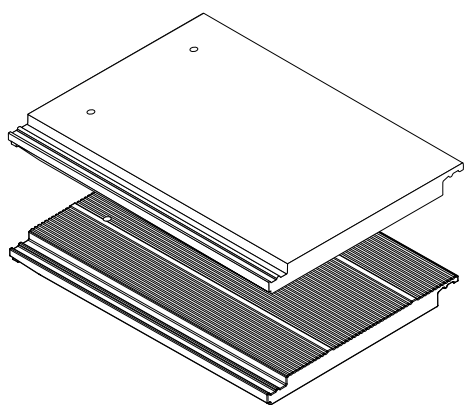
Heritage Product Specification

Product Specification	
Min Pitch:	15 Degrees
Set Out:	360mm Max
First Batten:	315 - 335mm
Sarking Requirements:	Refer Table 7 on page 27
Dimensions:	440mm x 335mm x 35mm
Watercourse Width:	36mm
Weight:	5.5kg
Laying Method:	Straight Bonded
Tiles Per m ² :	9.2
Cuts per LM:	3
Ridges per LM:	2.5
Batten per M ² :	2.9
Batten:	40 x 25 (QLD) / 38 x 38 (NSW, ACT, VIC, SA, TAS)
Fixing:	Side Lap Clip or Nailed
Pointing LM:	12

Heritage Fittings

Ridges	Apex	Barges
		
Standard Concrete Ridge	3 Way Apex	Standard Concrete Tapered Barge

Concrete Roof Tiles Prestige/Premiere



The Prestige and Premiere ranges from Bristle Roofing captures the finesse and style of contemporary living with a sleek, flat profile.

Through understated simplicity this flat tile captures the eye and the imagination, creating a point of difference from traditional roofing materials.

The Prestige and Premiere are premium products that provide exciting new options for creative home builders seeking a touch of class to complement prestigious projects.

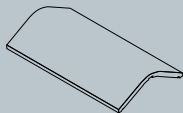
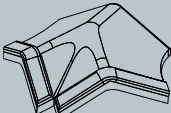
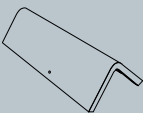
Concrete Roof Tiles

Prestige/Premiere

Prestige Smooth and Striated/Premiere Product Specification

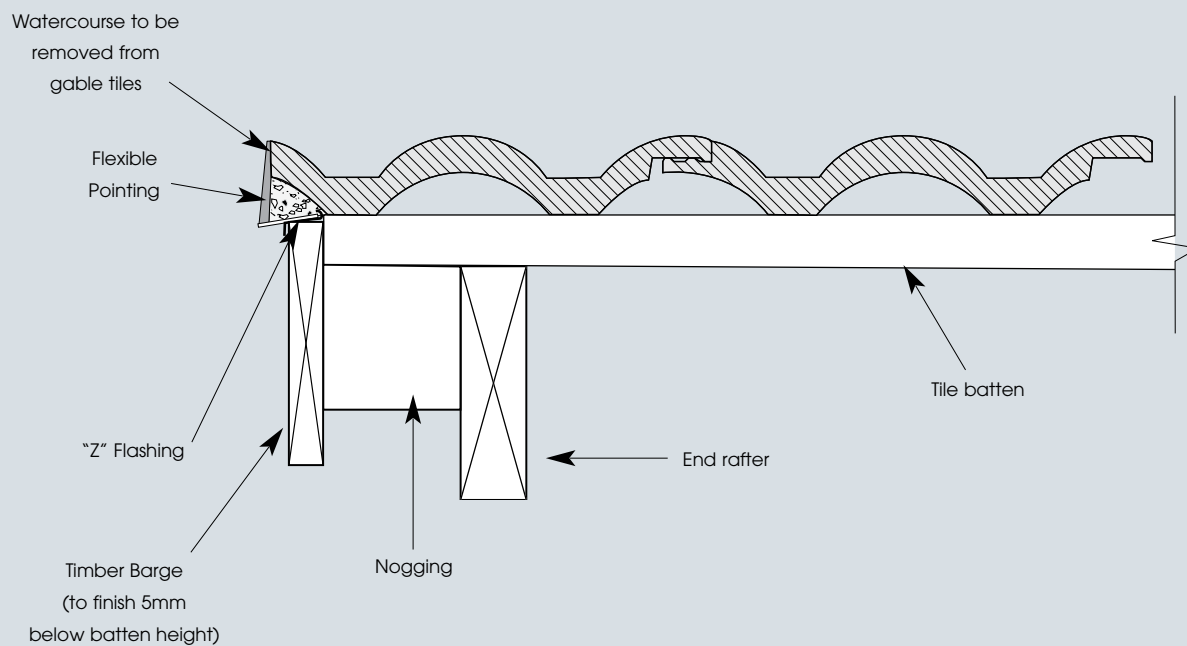
Product Specification	
Min Pitch:	20 Degrees
Set Out:	360mm Max
First Batten:	315 - 335mm
Sarking Requirements:	Refer Table 7 on page 27
Dimensions:	440mm x 335mm x 35mm
Watercourse Width:	36mm
Weight:	5.39kg (Smooth), 5.55kg (Striated)
Laying Method:	Cross Bonded
Tiles Per m ² :	9.2
Cuts per LM:	3
Ridges per LM:	2.5
Batten per M ² :	2.9
Batten:	40 x 25 (QLD) / 38 x 38 (NSW, ACT, VIC, SA, TAS)
Fixing:	Side Lap Clip or Nailed
Pointing LM:	15
Weight per m ² :	55.03kg (Smooth), 56.51kg (Striated)

Prestige Smooth and Striated/Premiere Fittings

Ridges	Apex	Barges
		
Standard Concrete Ridge	3 Way Apex	Standard Concrete Tapered Barge

Architectural Drawings

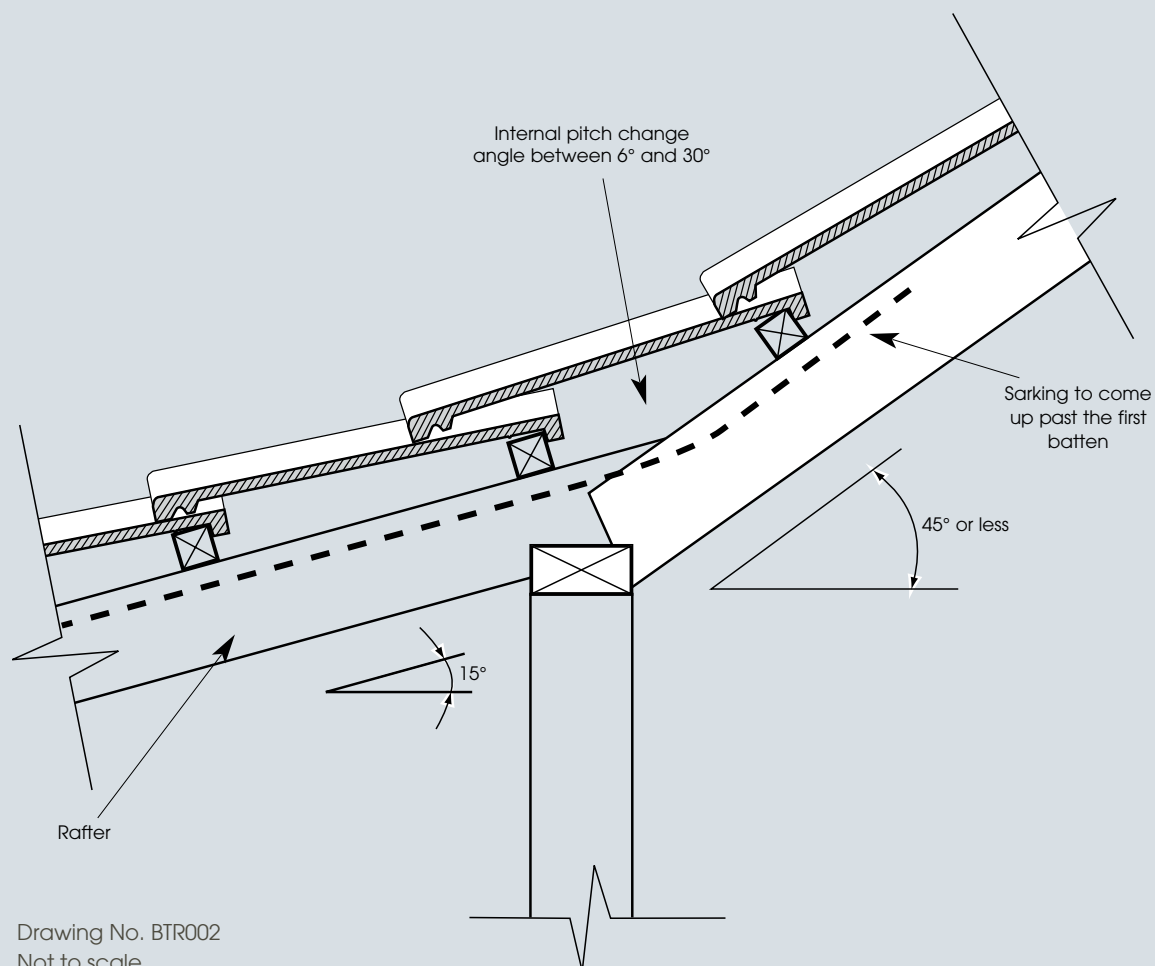
Bed and Point Barge Board Set Up



Drawing No. BTR01
Not to scale
Author: Bristle Roofing

Architectural Drawings

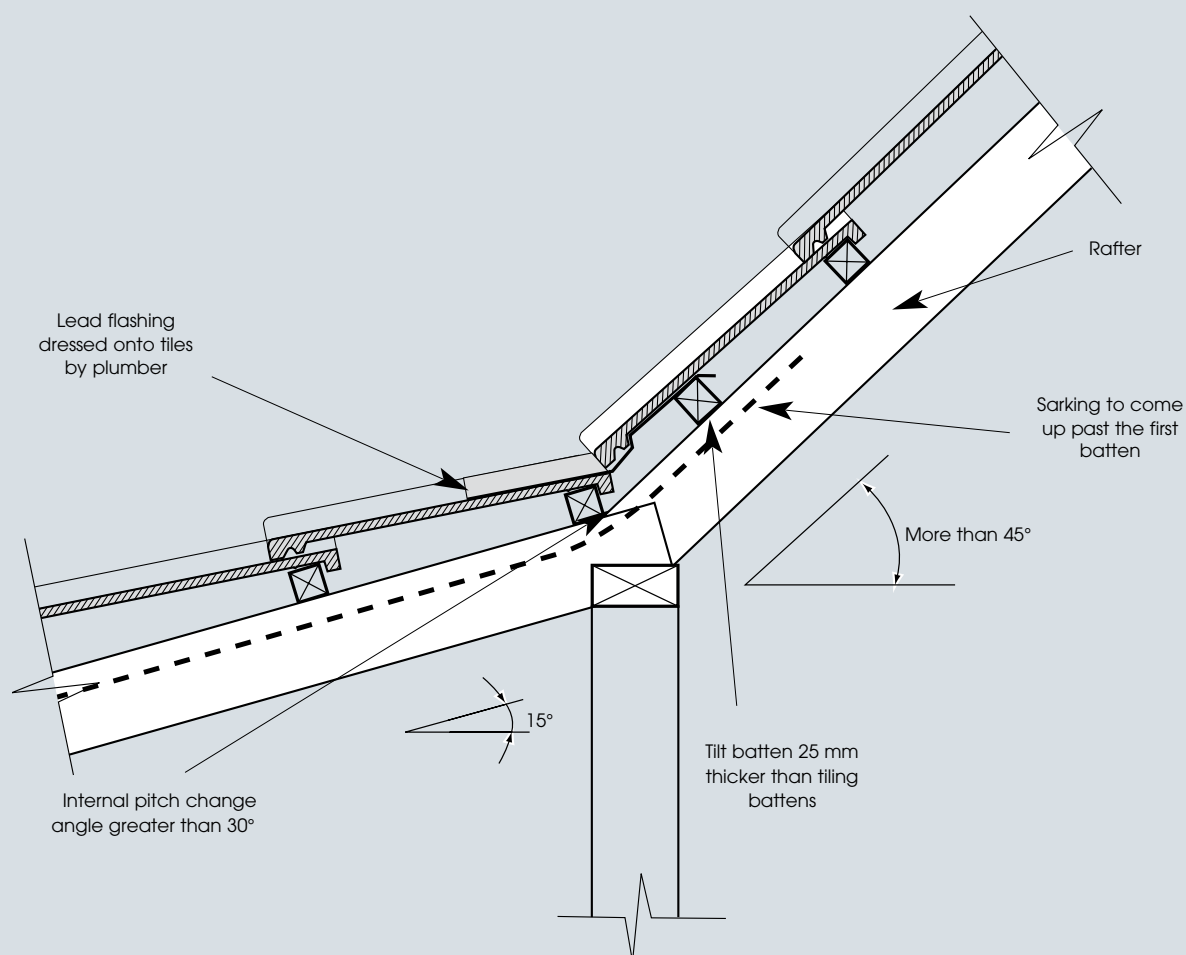
Change of Pitch (45° or Less)



Drawing No. BTR002
Not to scale
Author: Bristle Roofing

Architectural Drawings

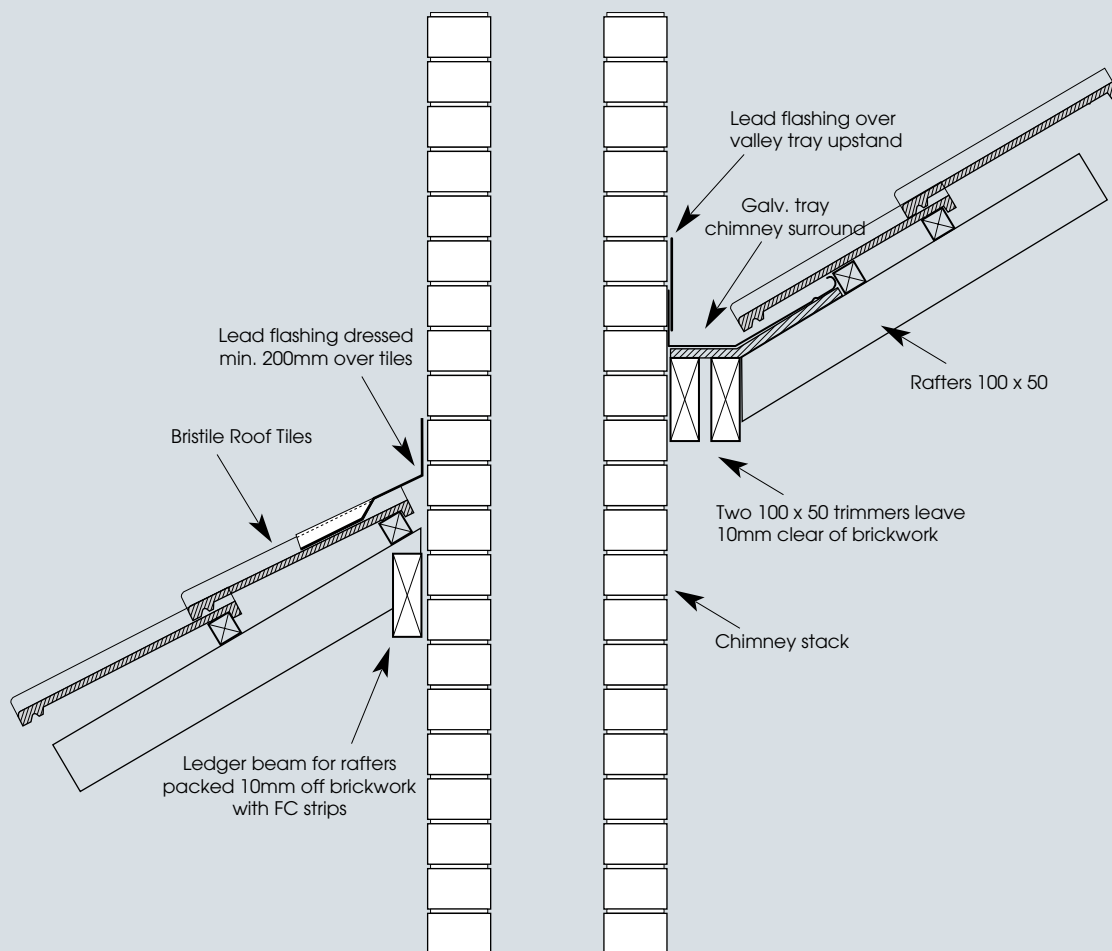
Change of Pitch (More than 45°)



Drawing No. BTR003
Not to scale
Author: Bristle Roofing

Architectural Drawings

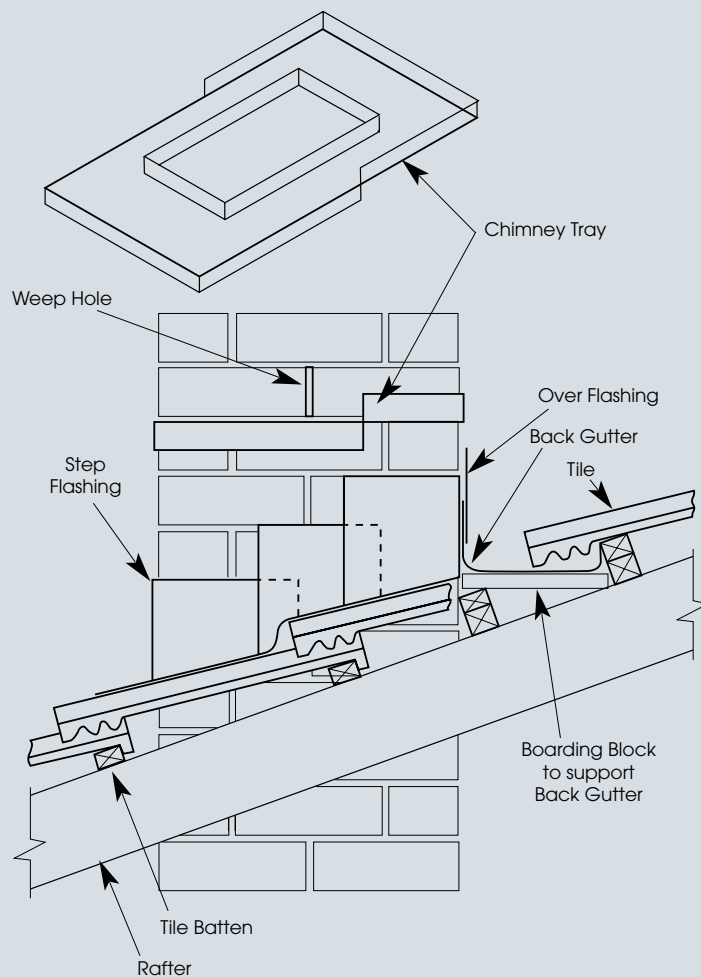
Chimney Flashing



Drawing No. BTR004
 Not to scale
 Author: Bristle Roofing

Architectural Drawings

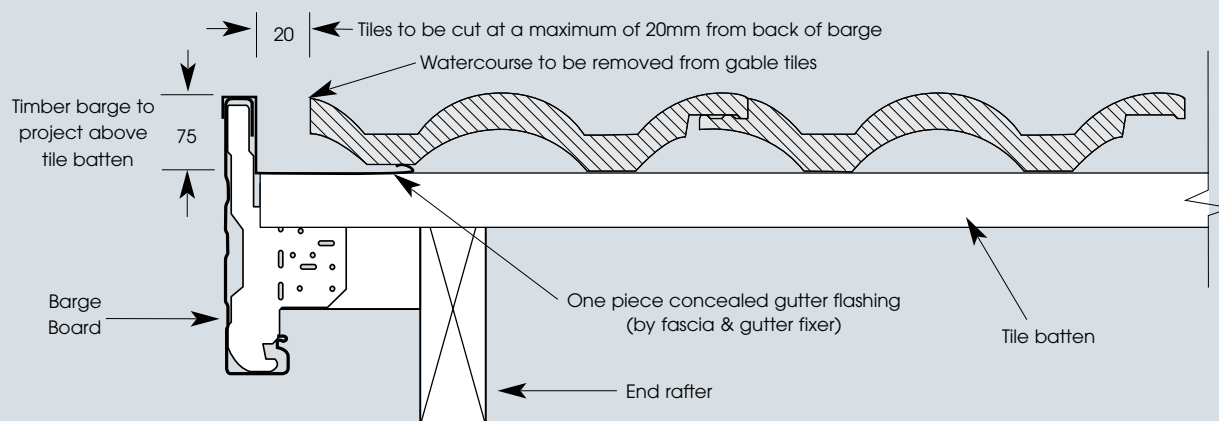
Chimney Tray



Drawing No. BTR005
Not to scale
Author: Bristle Roofing

Architectural Drawings

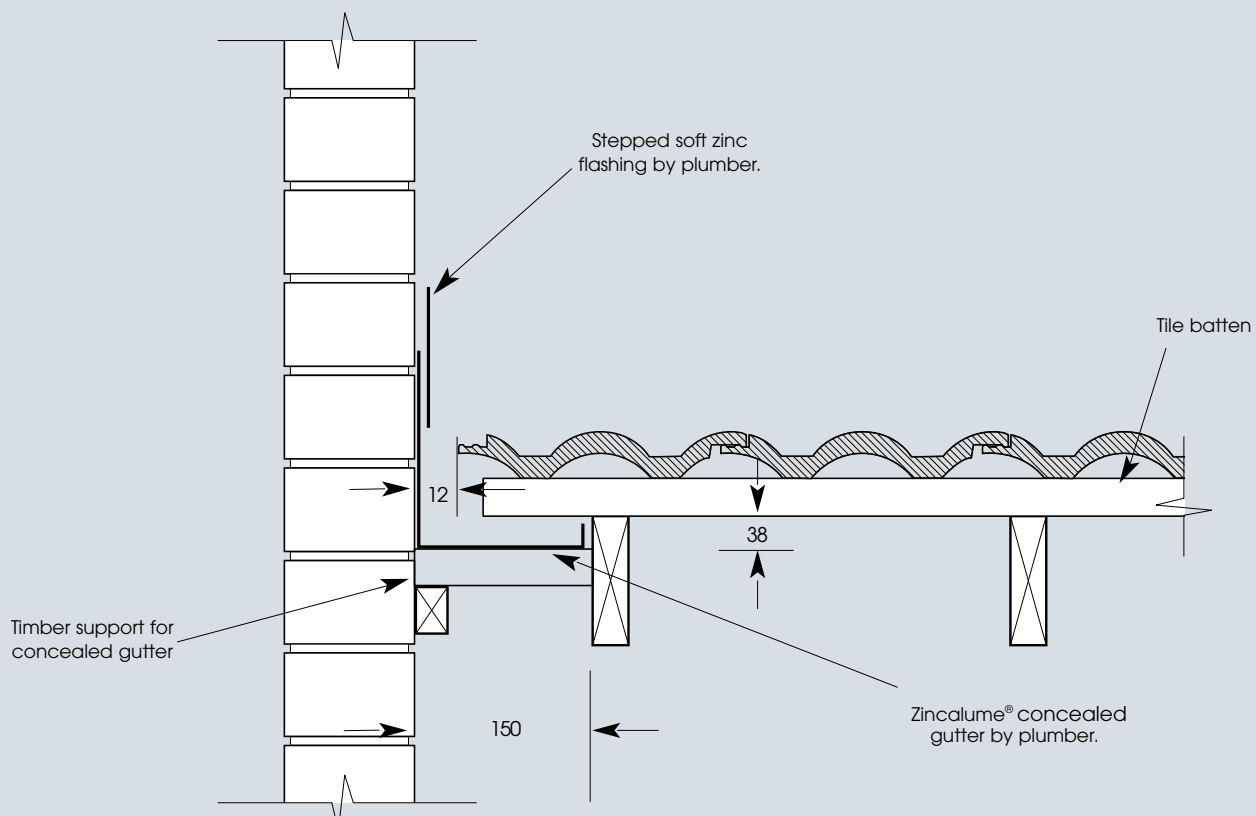
Concealed Flashing to Gable End



Drawing No. BTR006
Not to scale
Author: Bristle Roofing

Architectural Drawings

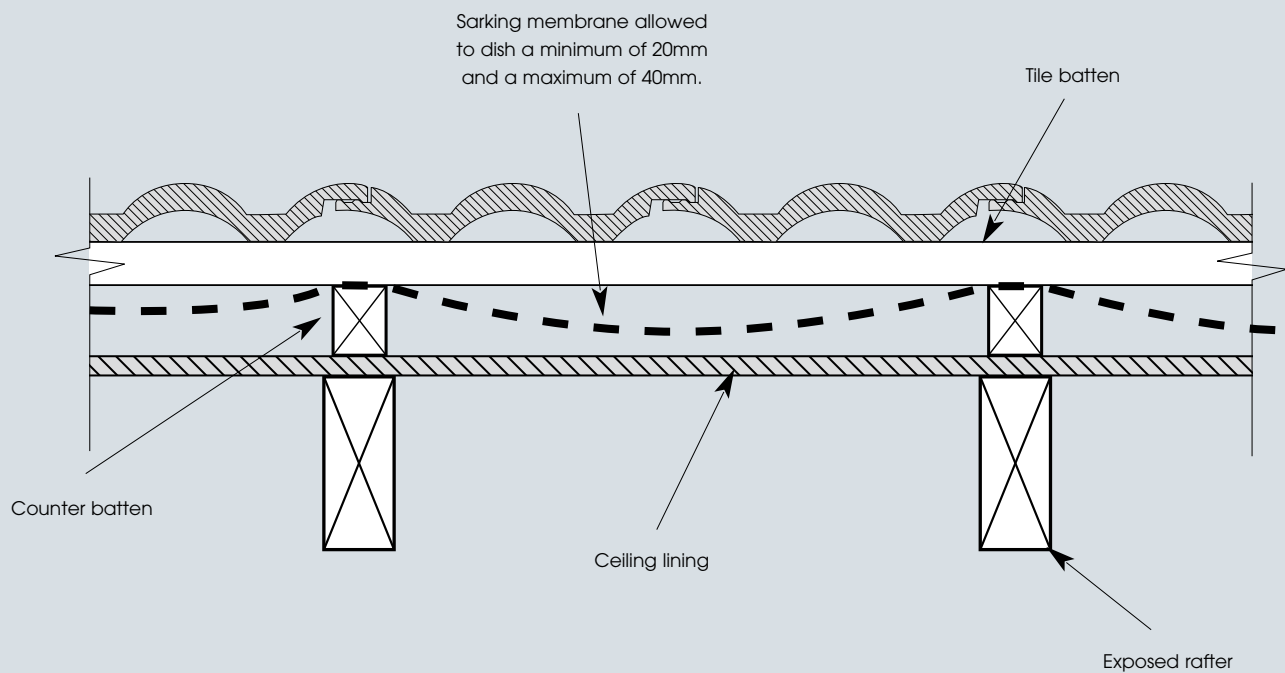
Concealed Gutter Flashing to Abutment



Drawing No. BTR007
Not to scale
Author: Bristle Roofing

Architectural Drawings

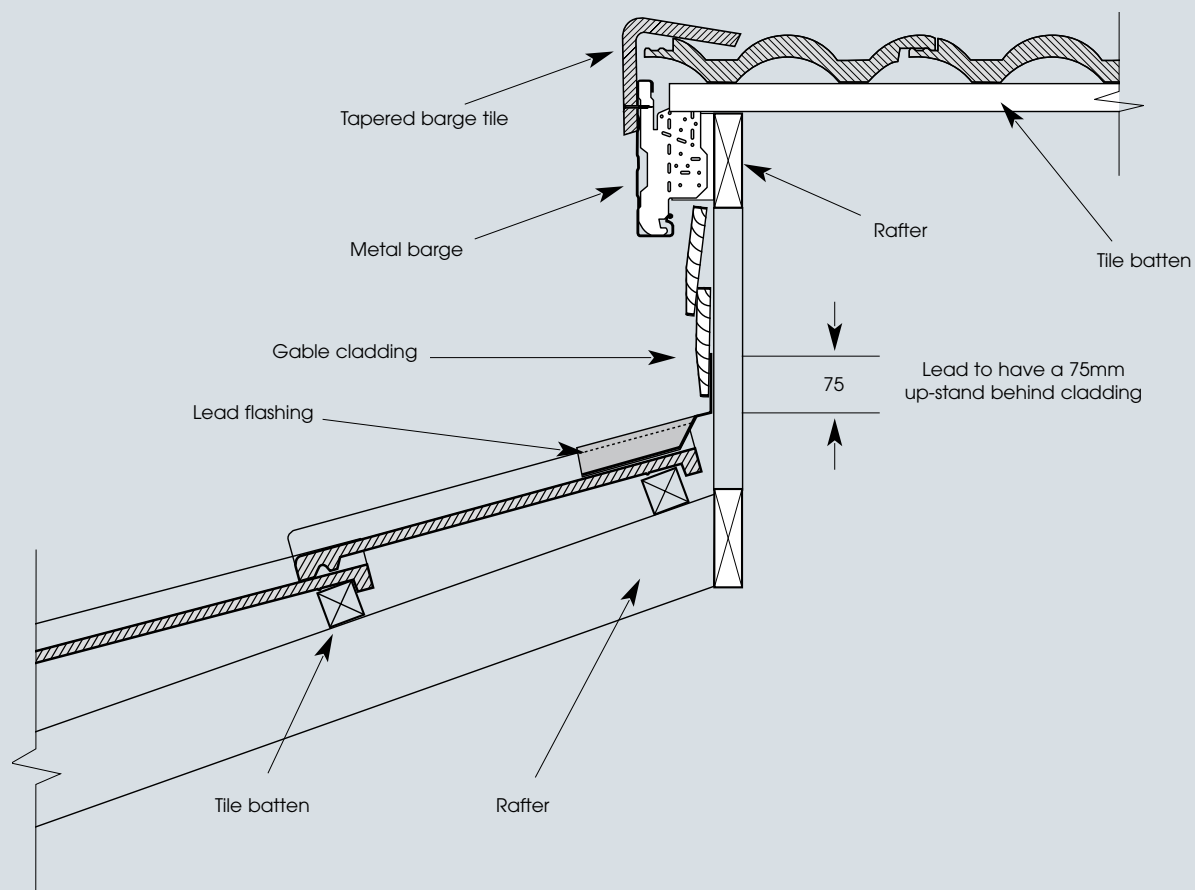
Counter Batten



Drawing No. BTR008
Not to scale
Author: Bristle Roofing

Architectural Drawings

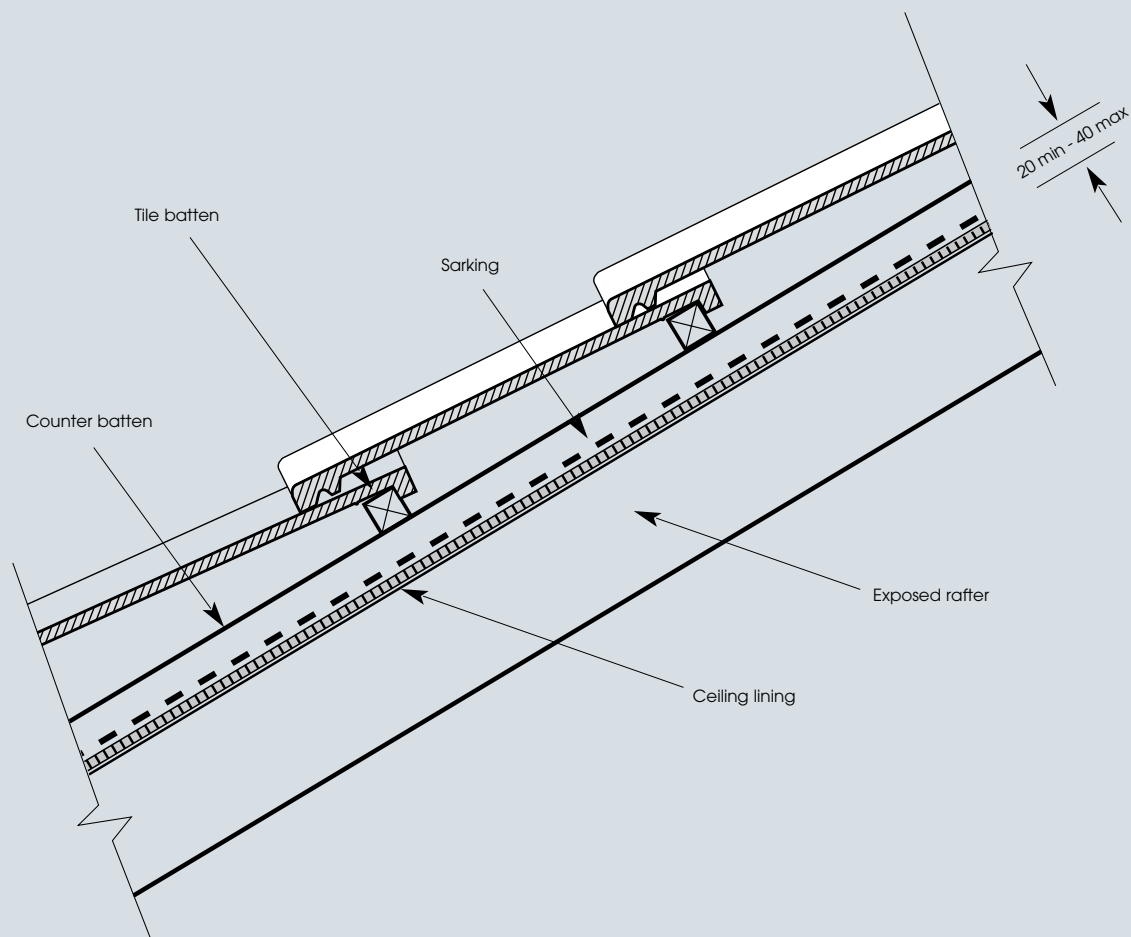
Dutch Gable Detail



Drawing No. BTR009
 Not to scale
 Author: Bristle Roofing

Architectural Drawings

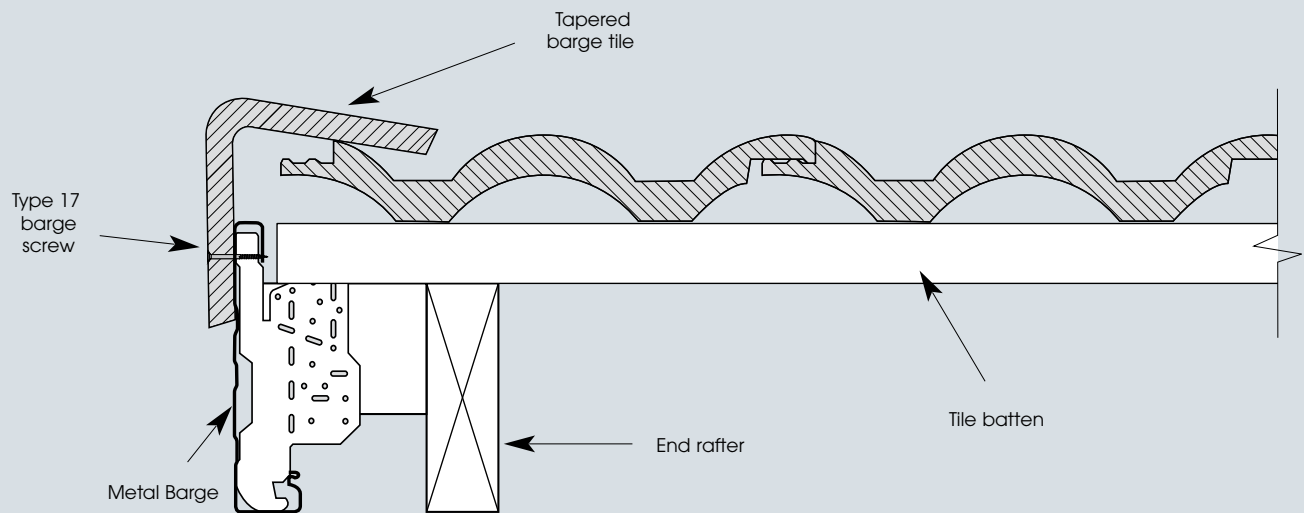
Exposed Rafter



Drawing No. BTR010
Not to scale
Author: Bristile Roofing

Architectural Drawings

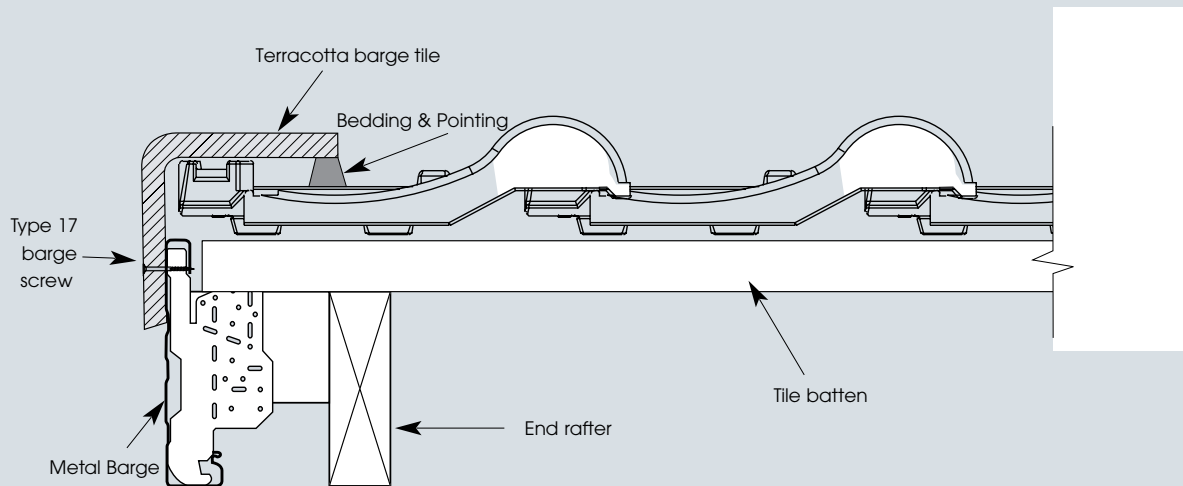
Concrete Barge Tile



Drawing No. BTR011
Not to scale
Author: Bristle Roofing

Architectural Drawings

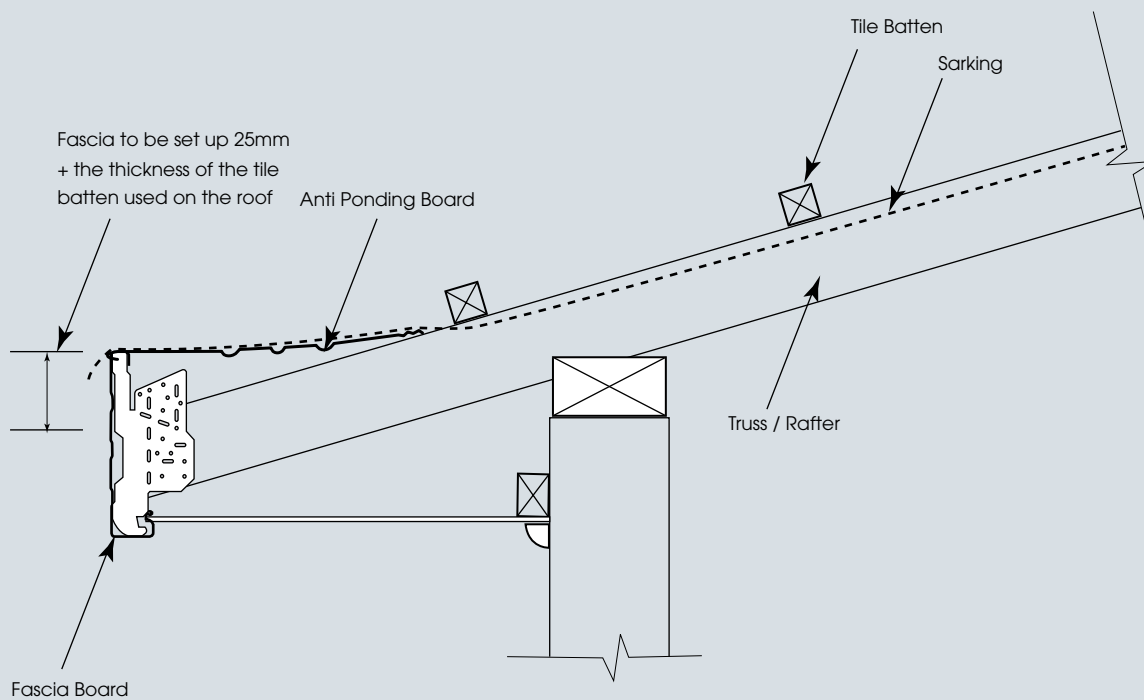
Terracotta Barge Tile



Drawing No. BTR012
 Not to scale
 Author: Bristle Roofing

Architectural Drawings

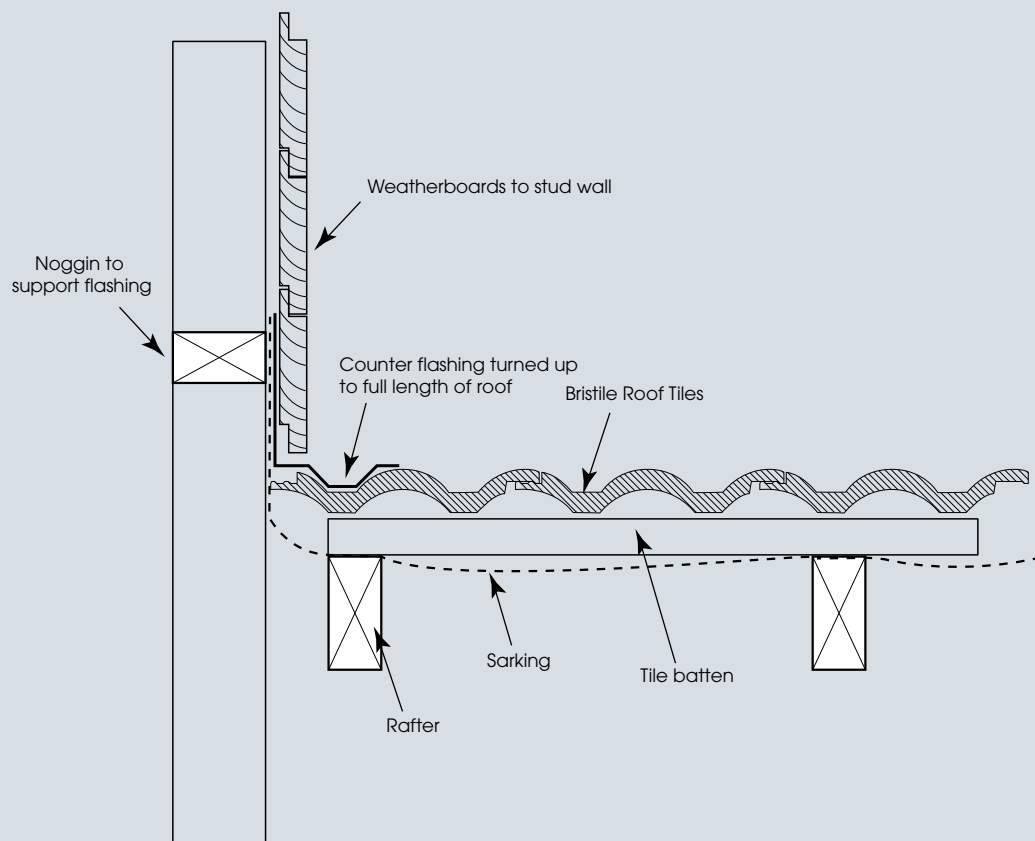
Fascia Set Up



Drawing No. BTR013
 Not to scale
 Author: Bristle Roofing

Architectural Drawings

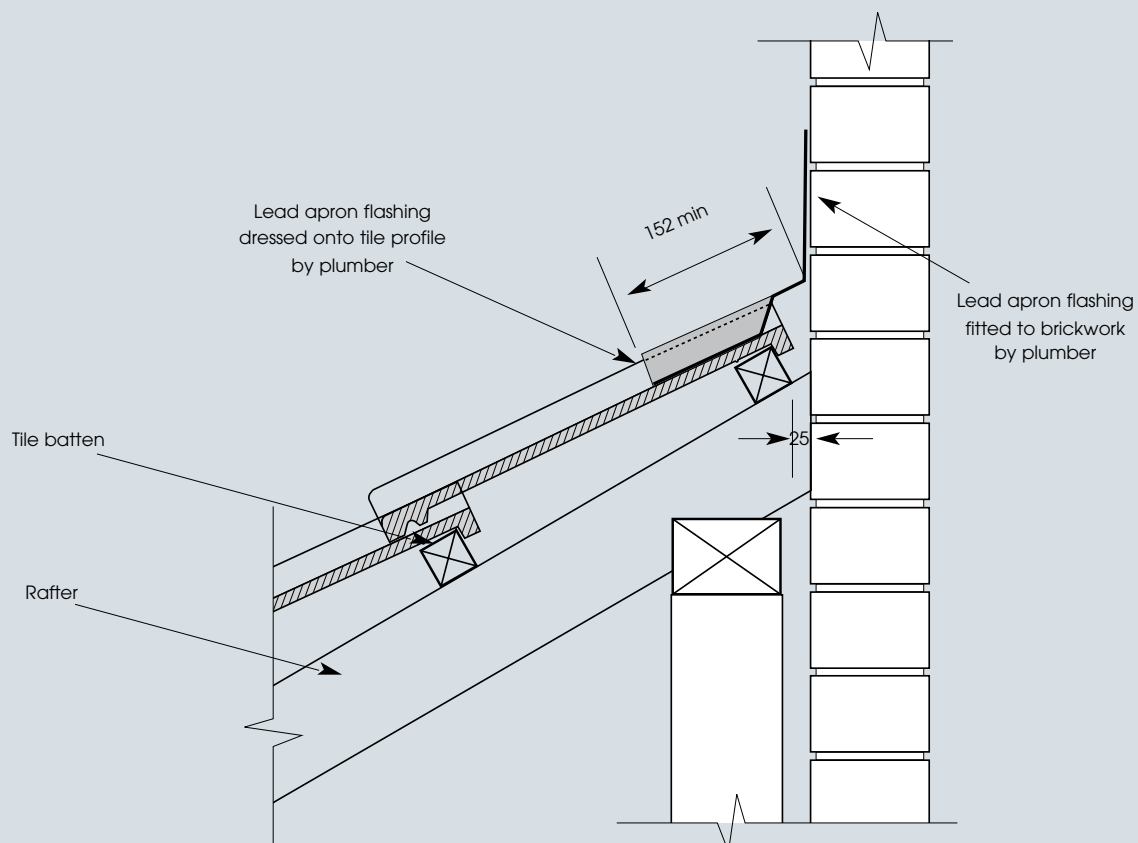
Flashings at Timber Side Abutment



Drawing No. BTR014
Not to scale
Author: Bristle Roofing

Architectural Drawings

Flashings to Brick Abutment



Drawing No. BTR015
Not to scale
Author: Bristle Roofing

Architectural Drawings

Flexible Pointing

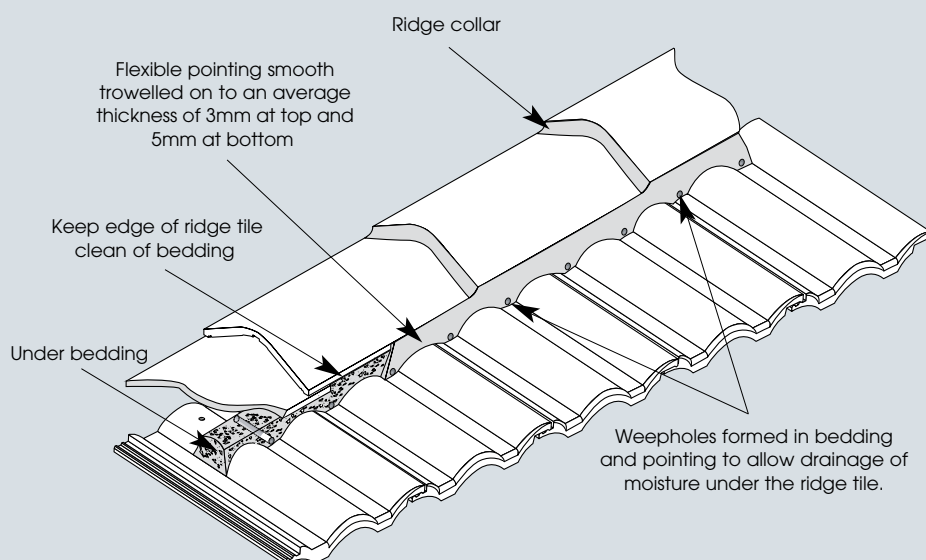
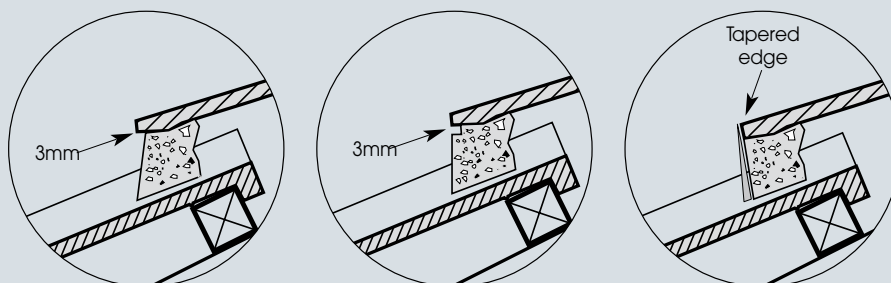


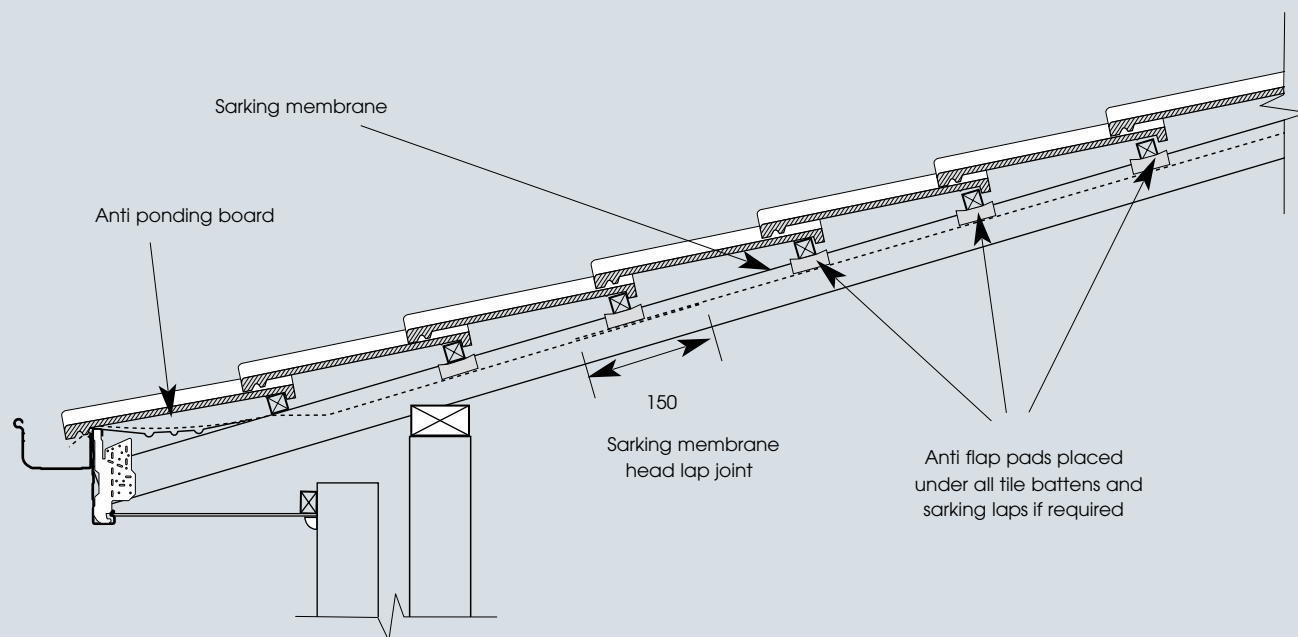
Figure 8.5 (a) Tuck Point Bedding Figure 8.5 (b) Raked Bedding Figure 8.5 (c) Tapered Ridge Tile



Drawing No. BTR016
Not to scale
Author: Bristle Roofing

Architectural Drawings

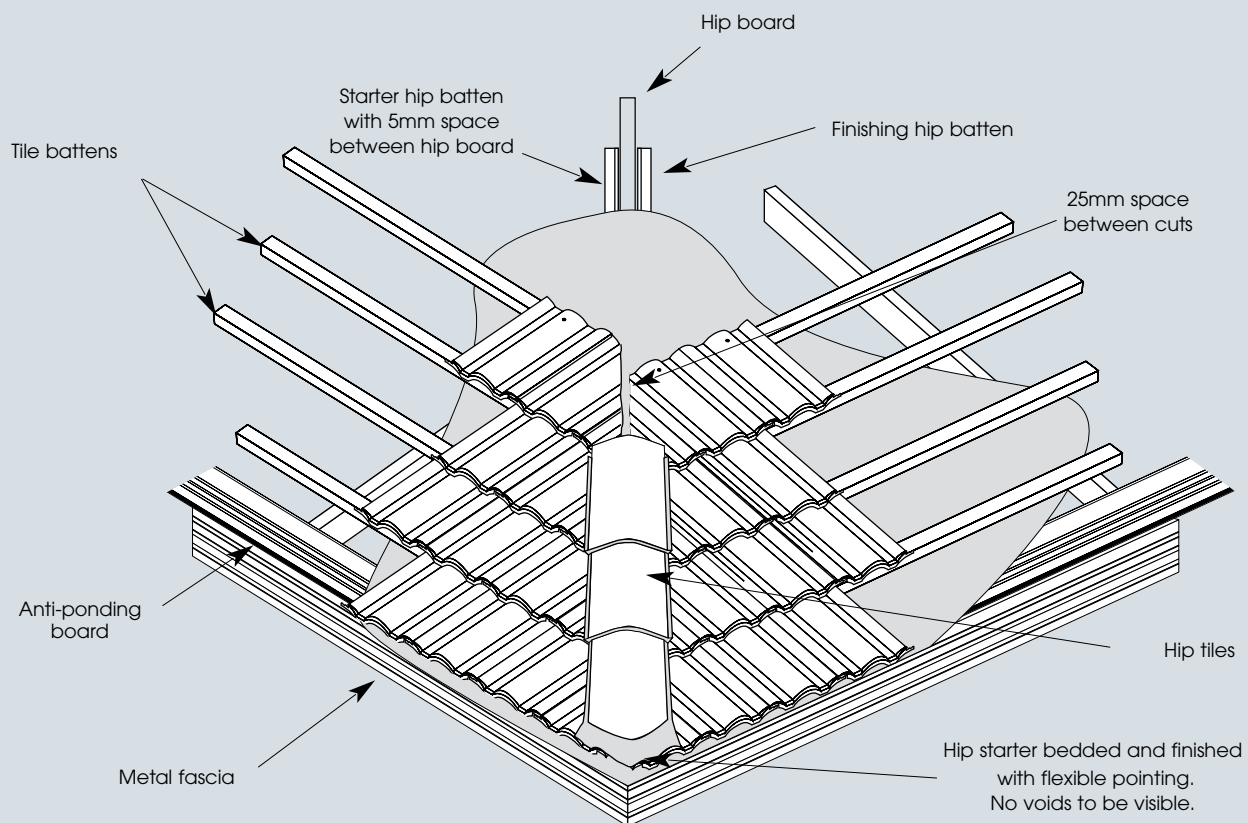
Installed Sarking



Drawing No. BTR017
 Not to scale
 Author: Bristle Roofing

Architectural Drawings

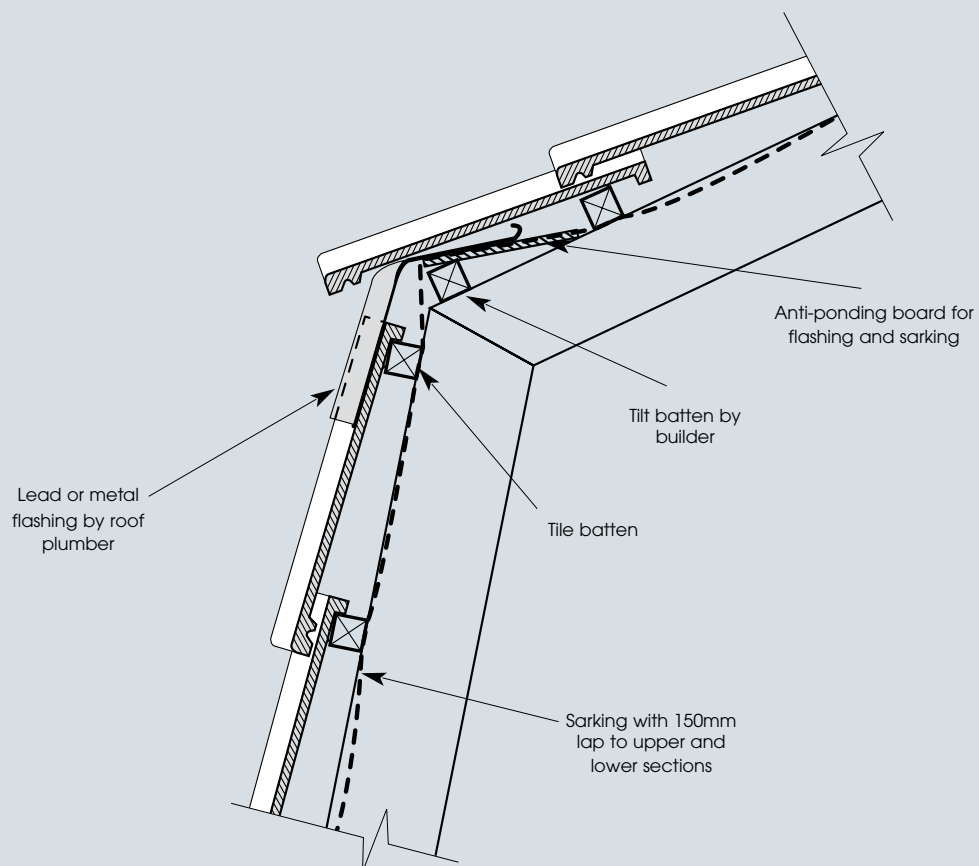
Hip End



Drawing No. BTR018
 Not to scale
 Author: Bristle Roofing

Architectural Drawings

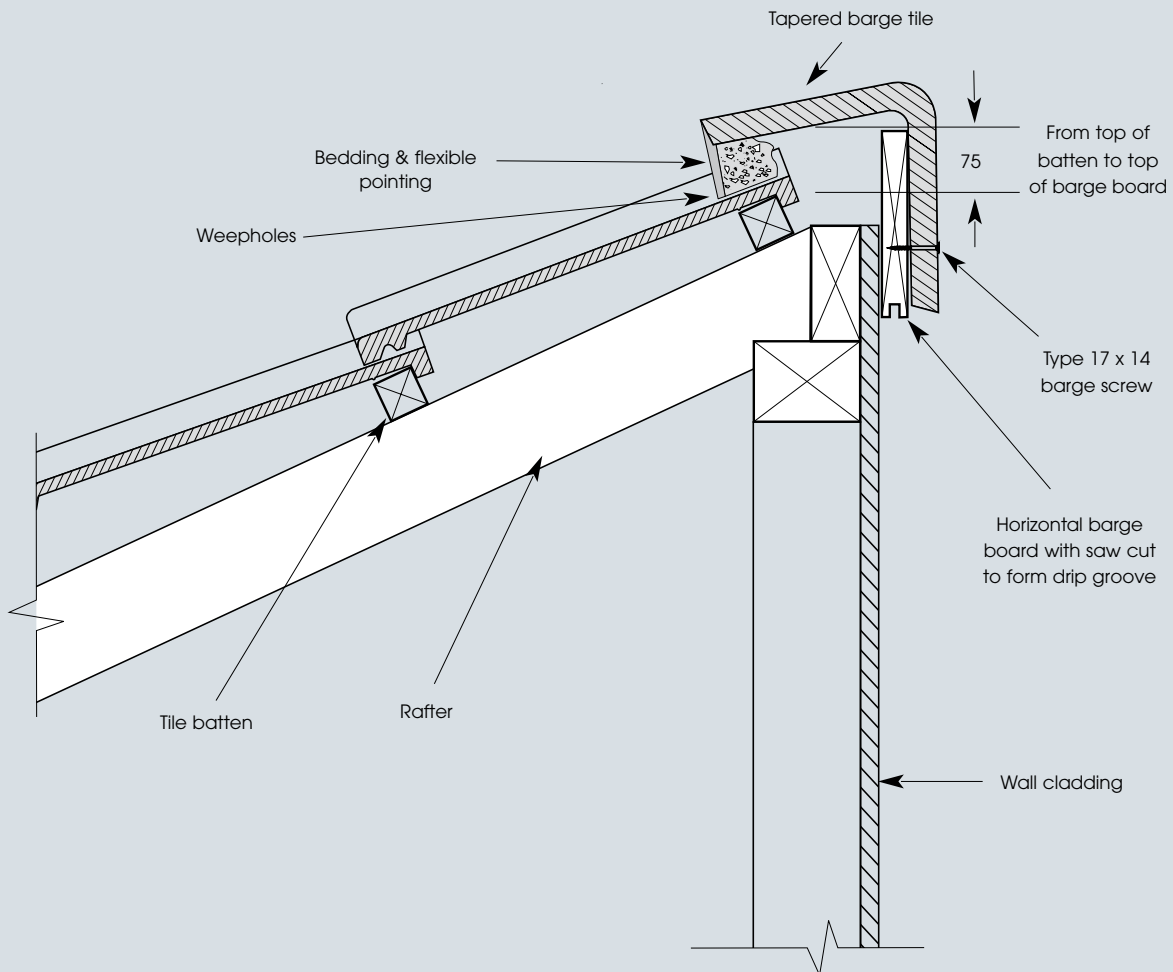
Mansard Detail



Drawing No. BTR019
Not to scale
Author: Bristle Roofing

Architectural Drawings

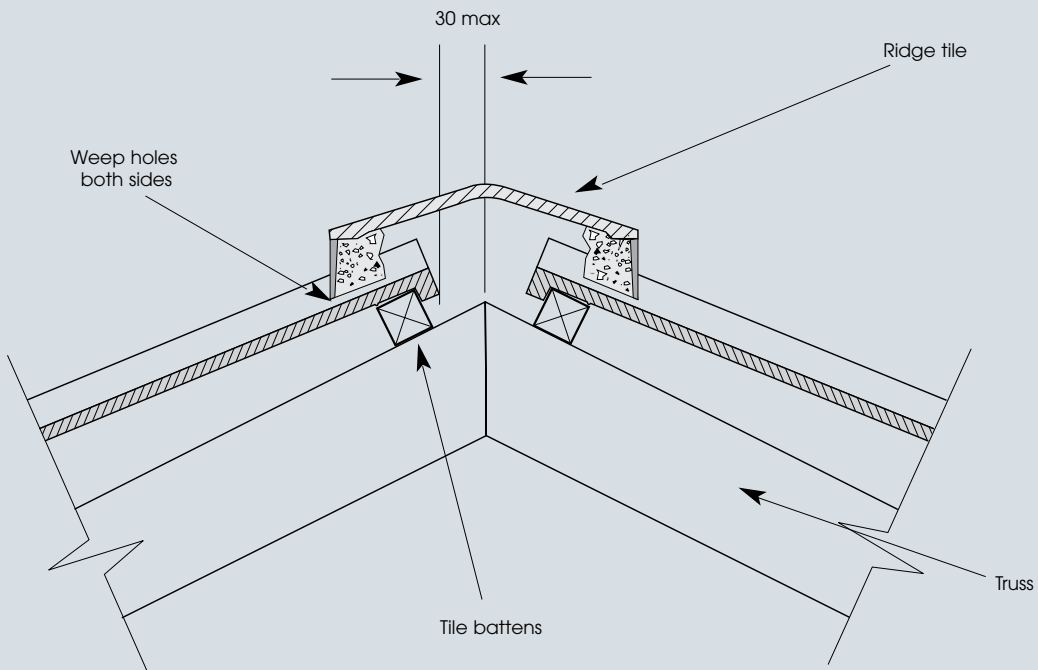
Wing Ridge



Drawing No. BTR020
 Not to scale
 Author: Bristle Roofing

Architectural Drawings

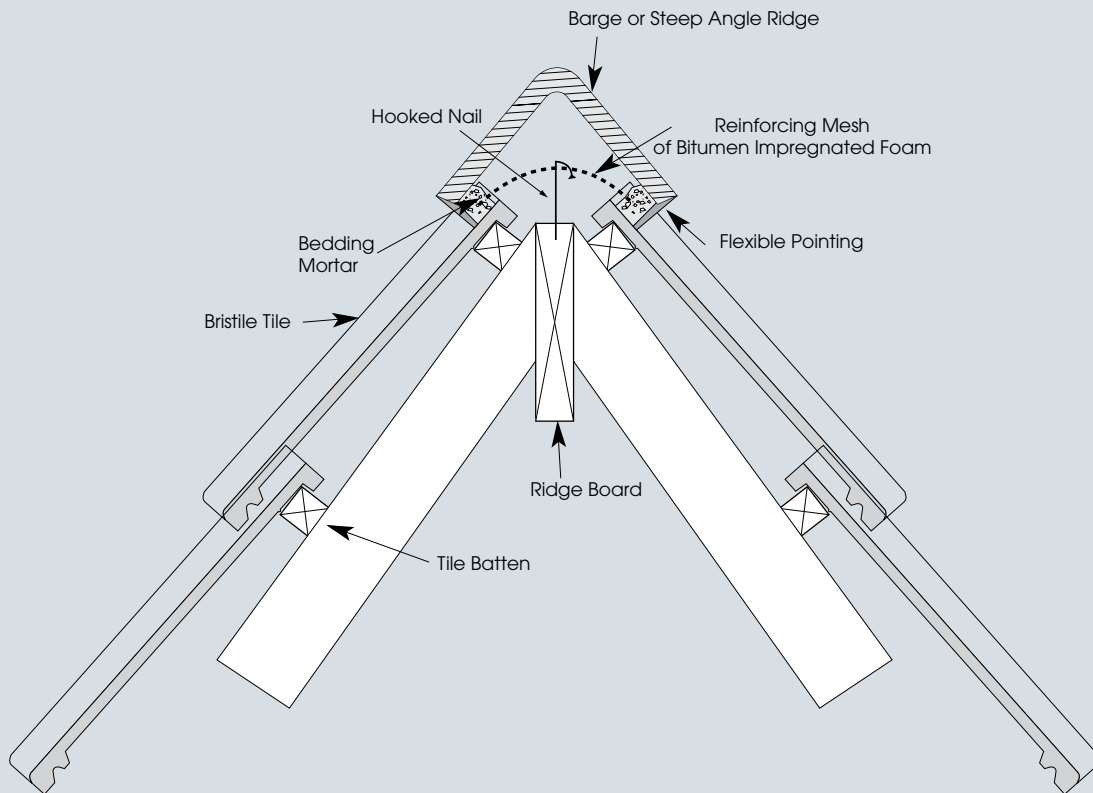
Standard Ridge Cap



Drawing No. BTR021
Not to scale
Author: Bristle Roofing

Architectural Drawings

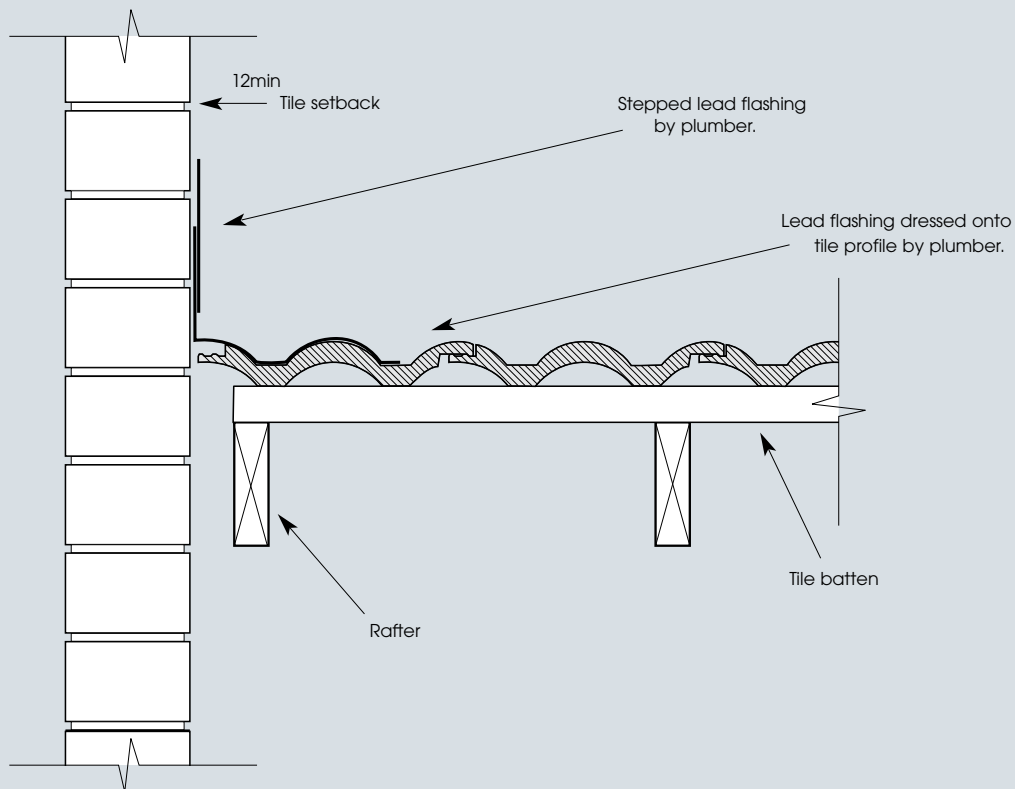
Steep Pitched Ridge



Drawing No. BTR022
Not to scale
Author: Bristile Roofing

Architectural Drawings

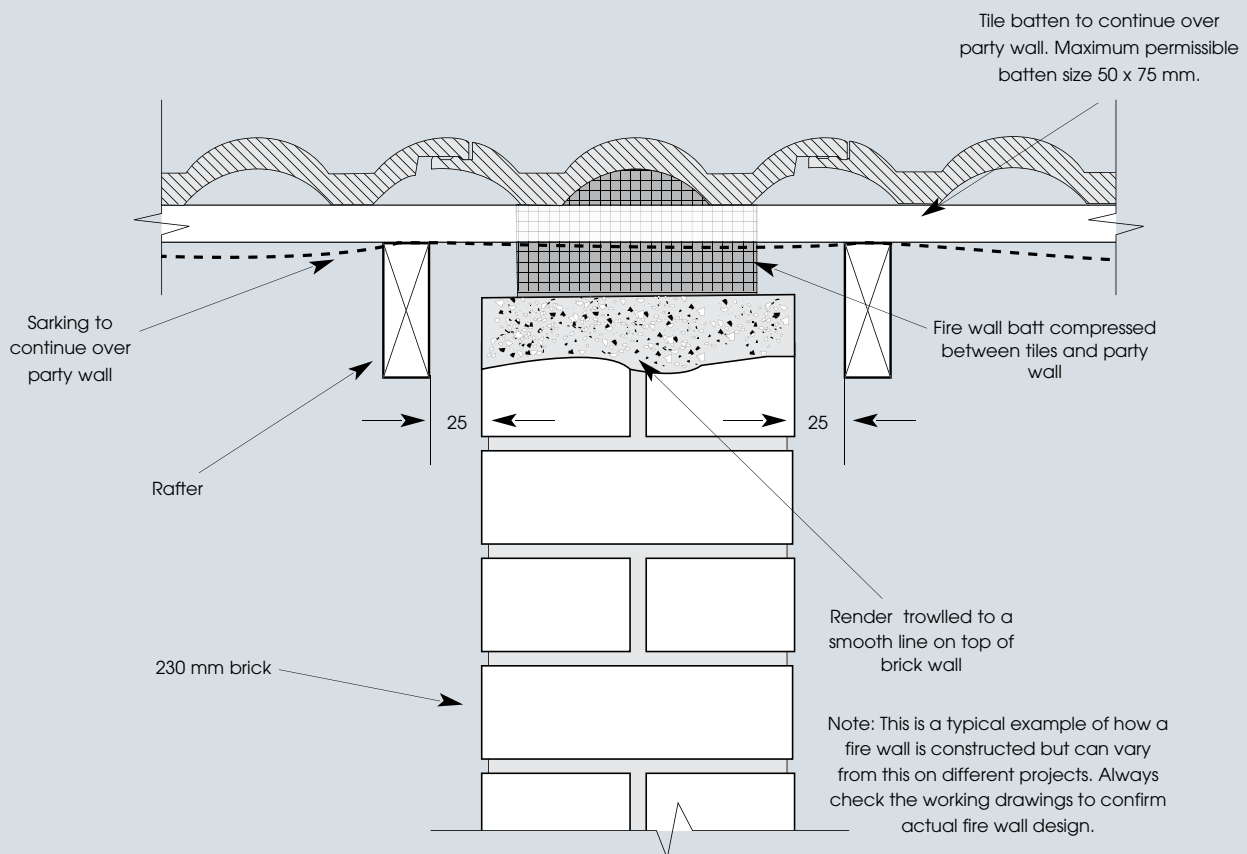
Stepped Cover Flashing



Drawing No. BTR023
Not to scale
Author: Bristle Roofing

Architectural Drawings

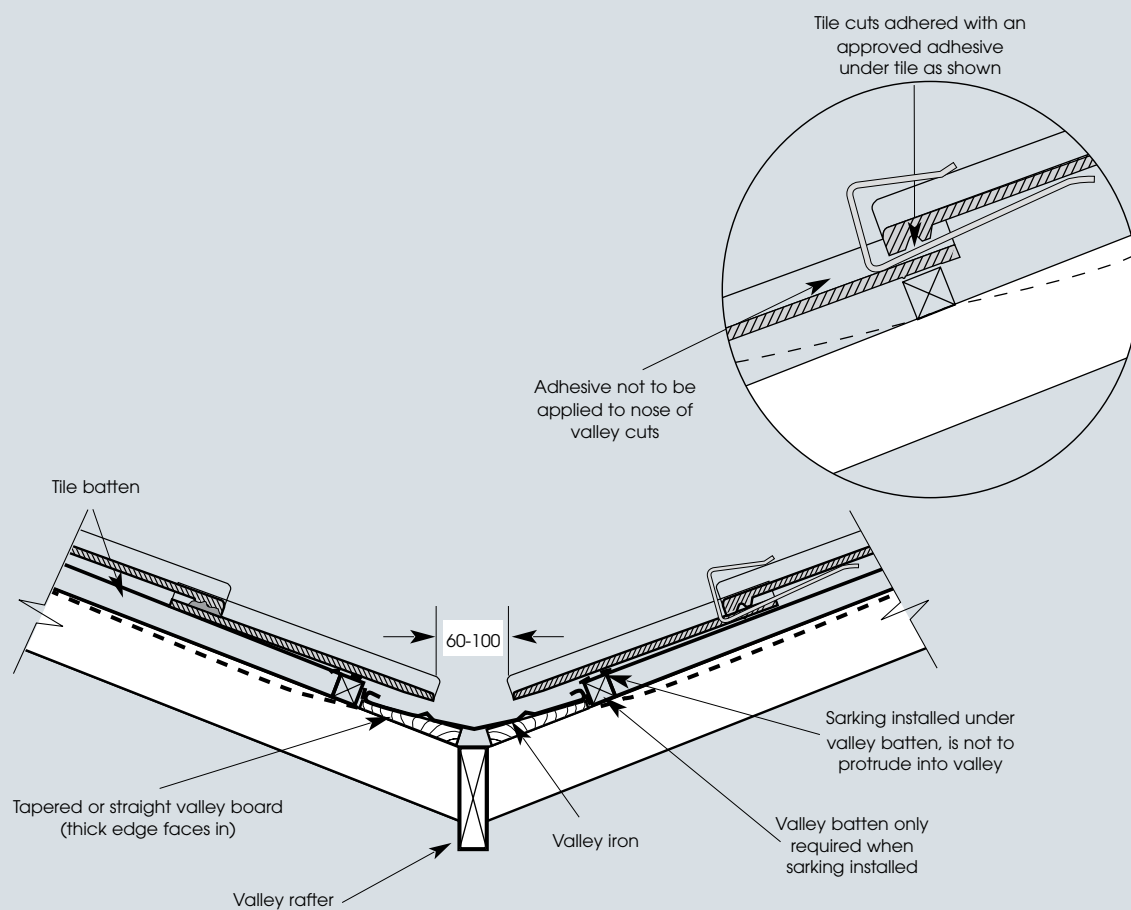
Fire Separation Wall Set Up



Drawing No. BTR024
 Not to scale
 Author: Bristle Roofing

Architectural Drawings

Valley Finish



Drawing No. BTR025
 Not to scale
 Author: Bristle Roofing

■

Brickworks Group Associated Companies



Austral Bricks

Austral Bricks is the largest and most efficient producer of pavers, bricks, building materials, façade systems and landscaping products in Australia.

Austral Bricks continues to set the pace for quality, efficiency and high levels of environmental performance.

The introduction of robotic brick handling equipment at plants around Australia enables us to greatly reduce manufacturing costs and enhance production flexibility.



Austral Masonry

The acquisition of a number of concrete masonry manufacturers, most notably GB Masonry in Queensland, complemented established manufacturing Victorian facilities and led to the formation of Austral Masonry.

Through natural growth and acquisition Austral Masonry has become a significant player in the market for grey block building materials in Queensland and provides further diversification of earnings for the group.



Austral Precast

Austral Precast is Australia's premier supplier of high quality, innovative and customisable precast concrete product solutions, to meet the needs of an evolving building and construction industry.

Operating from five plants located across Australia using state of the art technology, production techniques and systems, Austral Precast produces a diversified range of customised wall, floor, column, and client specific precast solutions.



Bristile Roofing

For almost a century, Bristile Roofing™ has delivered stylish and innovative roofing products for Australian homes. Bristile is now one of Australia's largest manufacturers and installers of quality roof tiles and the exclusive Australian distributor of La Escandella premium-quality terracotta roof tiles from Spain. Product innovation, manufacturing expertise and first-class service guarantee a strong, low maintenance roofing solution that will look great and perform superbly for generations.



Auswest Timbers

Auswest Timbers manufactures a diverse range of timber products including heavy structural timbers, roof tile battens through to floor boards and decking.

The company has manufacturing plants in Western Australia, Victoria and the A.C.T.

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