Clay Plain Tiling - Special Features

Prepared by:
The Technical Committee of the
Clay Roof Tile Council 2007

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Front cover photograph courtesy of Marley Eternit

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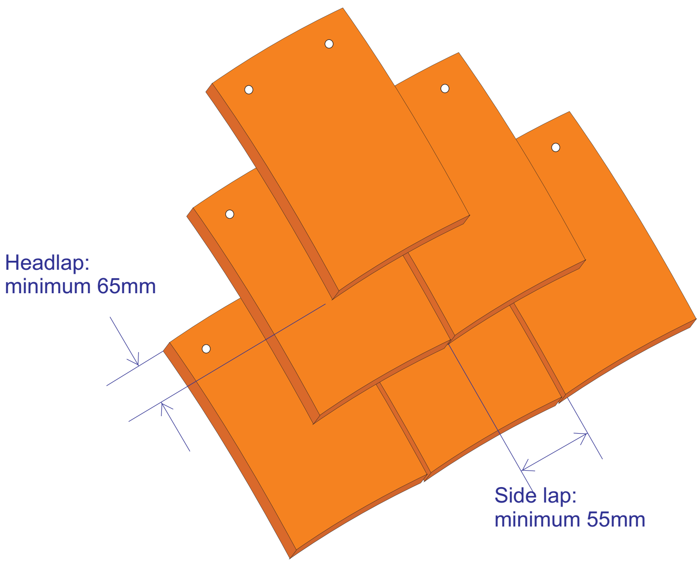
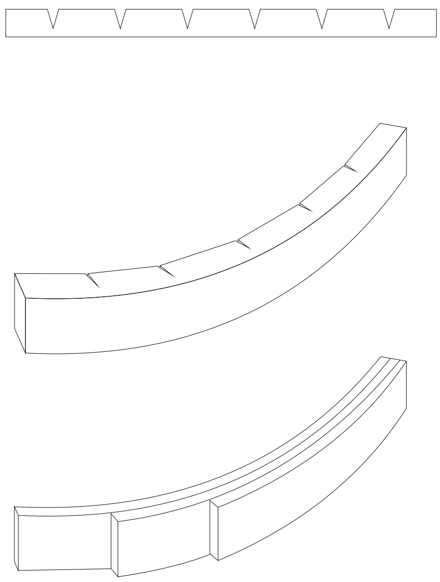
Section 1: Special feature techniques

1.1 Rules for side-lap and headlap



- The side lap between tiles in subsequent courses must not be less than one third of the width of a standard tile; ie for 265 x 165mm tiles the side lap must not be less than 55mm.
- The headlap between tiles in the course below but one must be not less than 65mm.

1.2 Bending and scarfing of battens

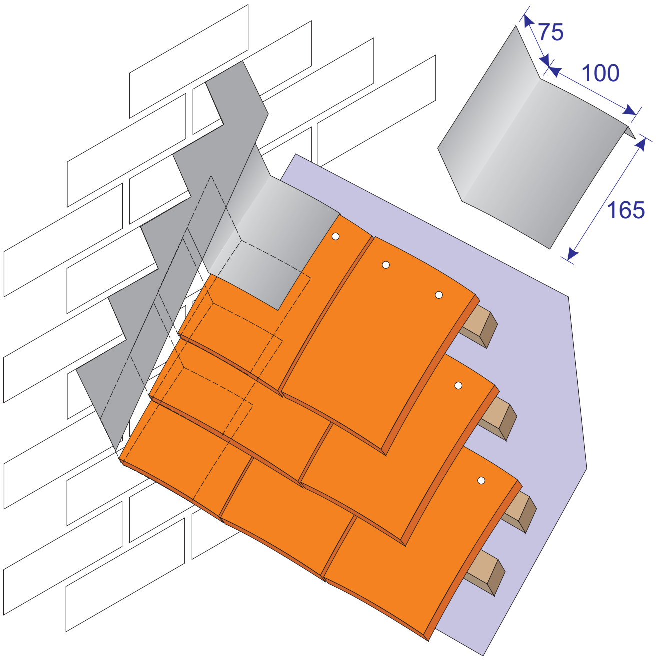


- The battens are 'scarfed' by sawing a series of short cuts into one face of the batten and this allows the batten to bend in the scarfed direction.
- An alternative method is to use layers of thin battens, built up to the required thickness. For example, 4 layers of 6mm battens could be used.
- If practical and there are facilities on site, soaking and/or steaming the battens will greatly aid their ability to bend and conform to the curved roof surface.

- An example of an eye brow window detail

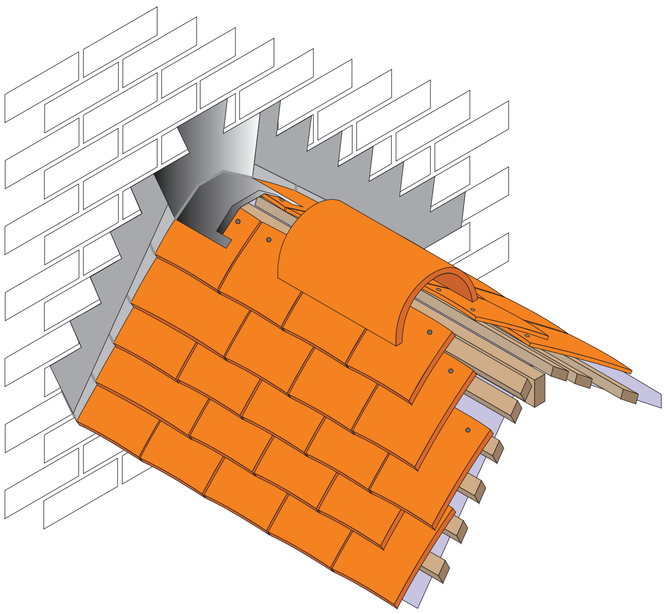
(Photograph courtesy of Sandtoft)

1.3 Soaker detail - side abutment



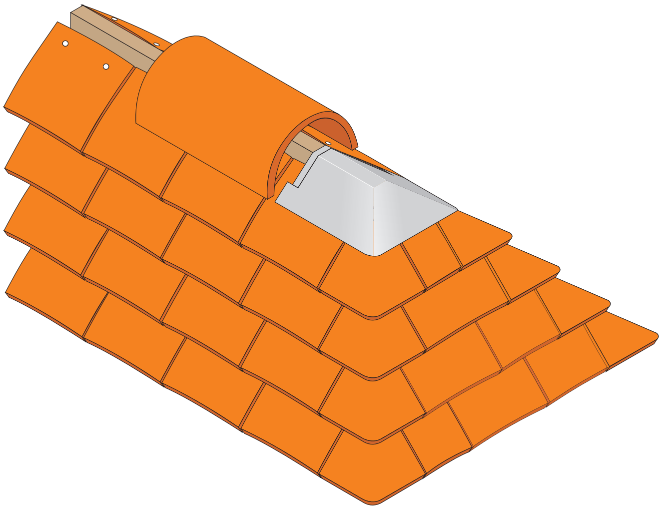
- Soakers can be cut from code 3 lead.
- The length of each soaker should equal the tile gauge + the headlap; ie 100 + 65mm = 165mm.
- When cutting the soakers, allow an extra 25mm length for turning over the top of the tile.
- The step cover flashing must cover the soakers by at least 65mm.

1.4 Soaker detail - junction of ridge with abutment



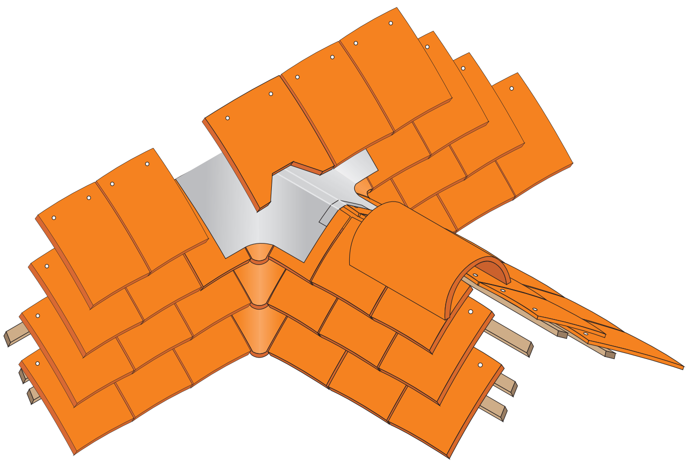
- The lead saddle at an abutment should extend 150mm along the ridge and 150mm down each roof slope.
- The edge of the saddle under the ridge tile should terminate in a welt.
- For steeper roof pitches it may be necessary to form the saddle using lead welding.

1.5 Soaker detail - junction of ridge with hip



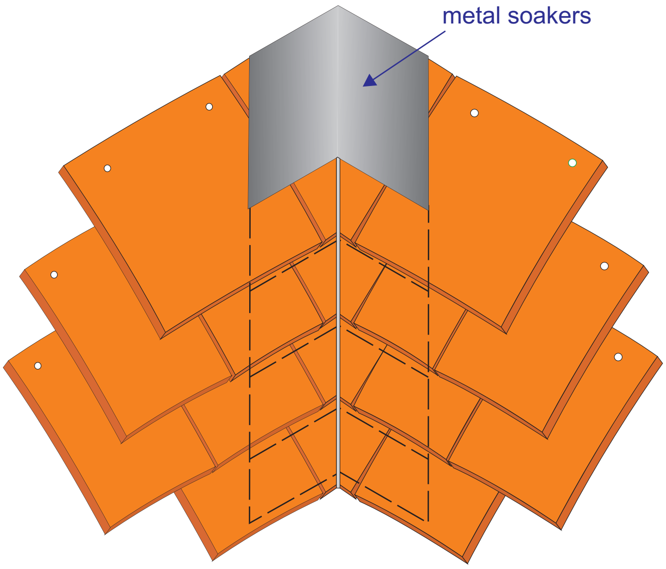
- At a junction of a ridge with a hip a lead saddle should be fitted. This should extend at least 100mm down each roof slope.
- The edge of the saddle under the ridge tile should terminate in a welt.

1.6 Soaker detail - junction of ridge with valley



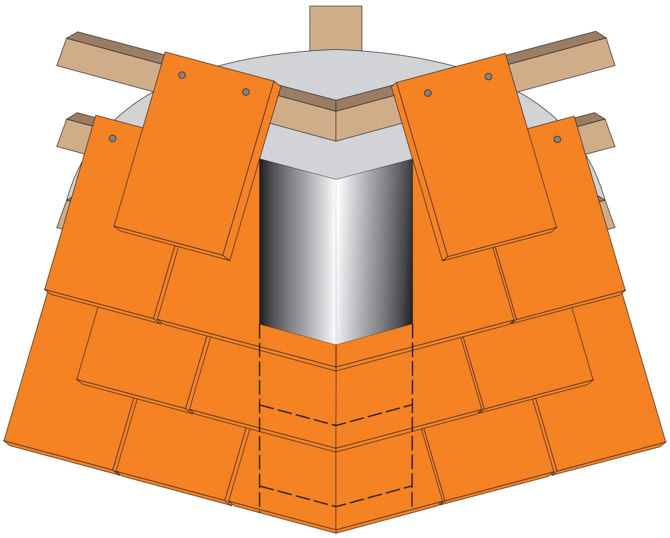
- A lead saddle should be fitted where two tiled valleys meet. This should extend at least 100mm down each roof slope.
- The top edge of the saddle should extend at least one tile head lap and terminate by turning over the head of the tile.
- The edge of the saddle under the ridge tile should terminate in a welt.

1.7 Soaker detail - mitred valley



- Valley soakers should be used on every tile course in a mitred valley detail.
- Each soaker should extend at least 150mm to either side of the valley and is held in position by turning over the heads of the tiles below.
- Valley soakers are not recommended for use on roof pitches below 50 degrees, on valleys longer than 6 metres or where water is discharged into the valley from other roof slopes.

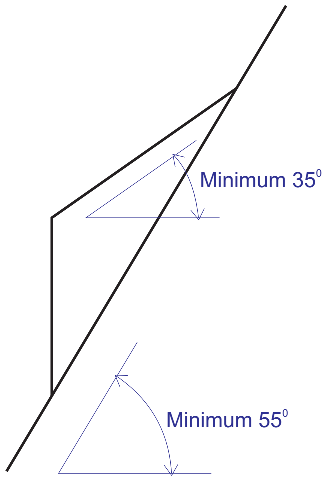
1.8 Soaker detail - mitred hip



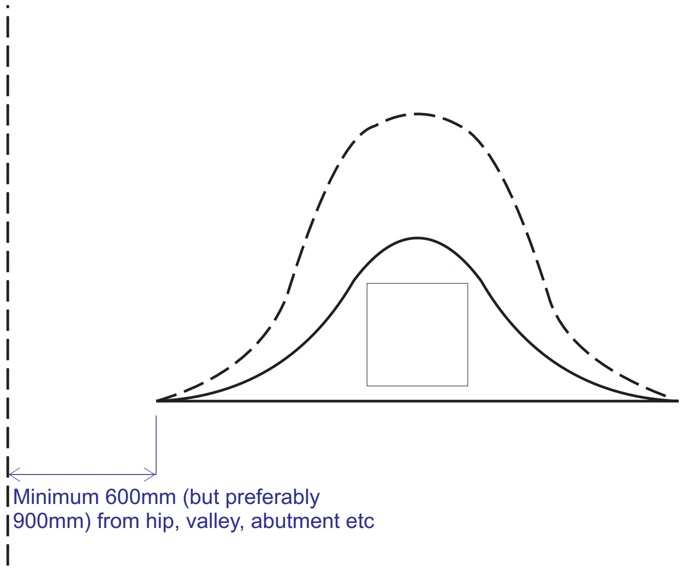
- Hip soakers should be used on every tile course in a mitred hip detail.
- Each soaker should extend at least 100mm to either side of the hip and is held in position by turning over the heads of the tiles below.
- Hip soakers are suitable for all plain tile roof pitches.

Section 2: Eyebrows

2.1 Critical dimensions

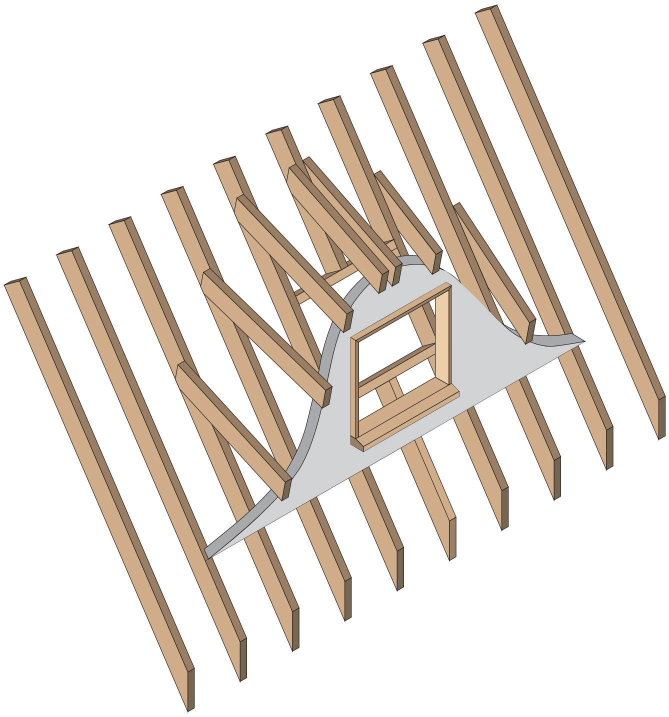


- The minimum general roof pitch should be 55° to ensure that the eyebrow minimum pitch is 35°. Where the roof pitch is less than 55° soakers should be used with the tiles on the eyebrow.
- The slope of the curve should be the minimum possible to avoid the risk of tile 'chatter'. Tile chatter can occur on steep curves where the tiles do not fit closely round the top of the curve.



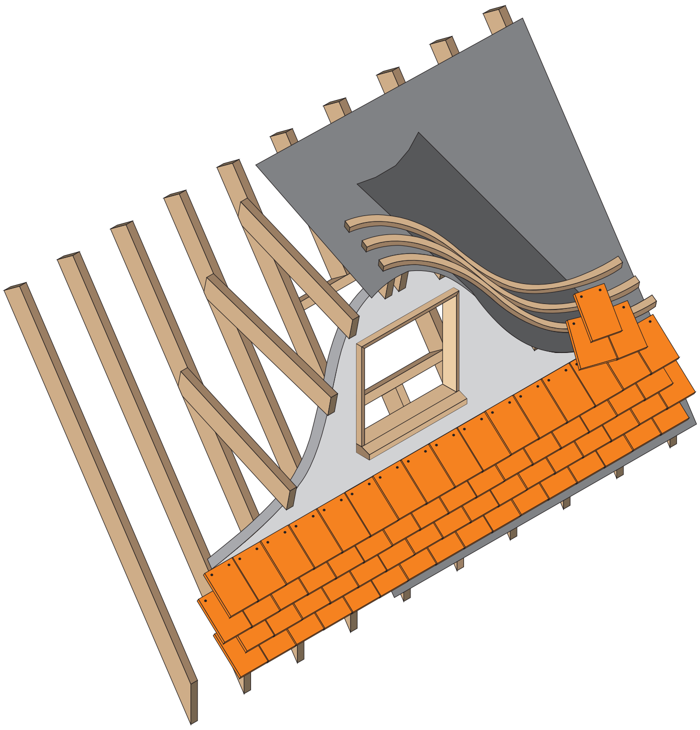
- The transition between eyebrow and general roof should be regarded as a valley and precautions, such as courses of extra underlay, should be taken to eliminate the risk of water ingress.
- To avoid the risk of water ingress the eyebrow should start/terminate no closer than 600mm (but preferably 900mm) from roof edges such as hips, valleys, abutments etc.

2.2 Timber construction



- The apex of the curve of the eyebrow should occur between rafters to ensure a smooth curve to the tile battens.
- Rafter centres should not exceed 400mm.

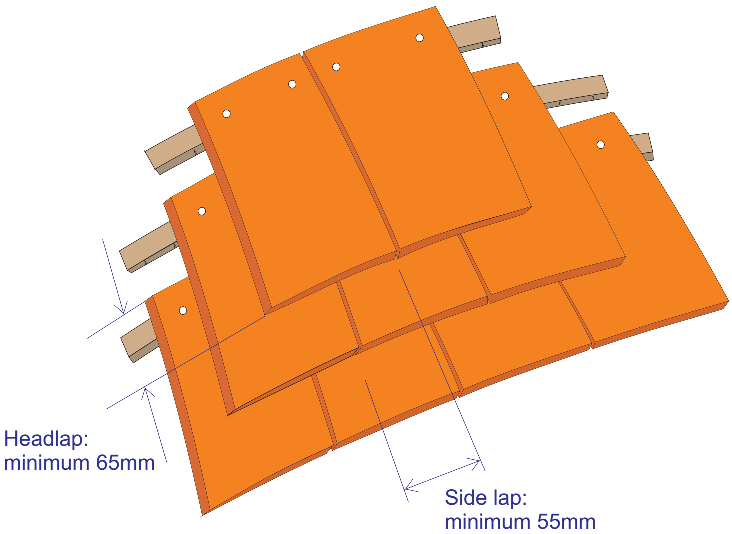
2.3 Part tiled eyebrow dormer



- Battens may be 'scarfed' at the back to enable them to be bent around the curvature of the roof. Refer to *Special features techniques* for more information on shaping of battens .
- Treat the transitions between main roof and dormer as valleys and lay extra courses of underlay.

Section 3: Convex curves

3.1: Tiling a convex curved roof



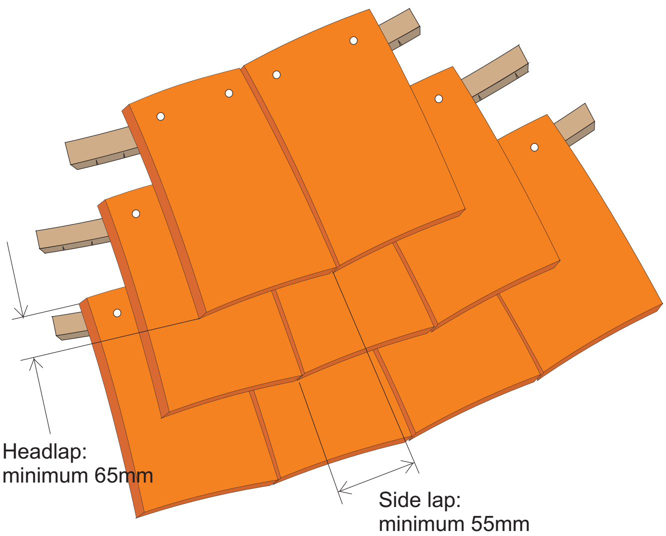
- The underlay must be laid vertically.
- The battens should be 'scarfed' at the back to enable them to be bent around the curvature of the roof. Refer to *Special features techniques* for more information on shaping of battens .
- Each course is a different width and this will require the tiles to be tapered to maintain the bond, or side lap. For example, a typical conical roof of 70 degree pitch may require three sizes of tapered tile - the first of 150mm width at the tail, the second of 125mm and the third of 100mm.
- To maintain an effective bond, or side lap, with the adjacent courses, the minimum possible width of tile is 81mm. It may be necessary to re-drill appropriate nail holes on site for fixing. Depending on the radius of the curve it may not be possible to rely on the nibs for support therefore each tile should be twice nailed.

- This photograph shows an example of a convex curved roof. Note the use of cut tiles and tile-and-a-half tiles to maintain bond.

(Photograph courtesy of Marley Eternit)

Section 4: Concave curves

4.1: Tiling a concave curved roof



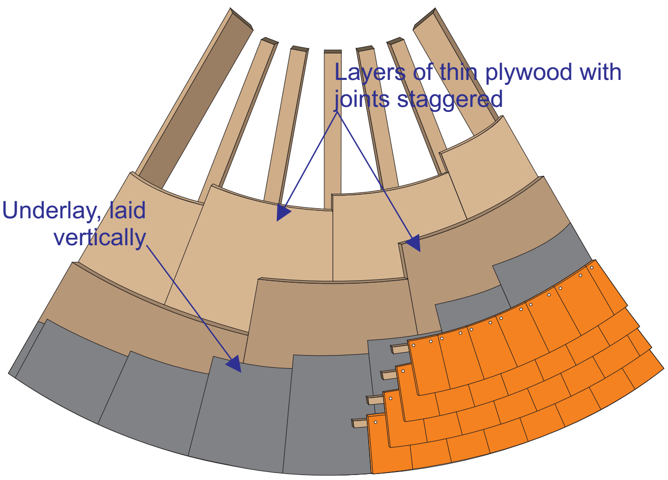
- The underlay must be laid vertically.
- The battens should be 'scarfed' at the back to enable them to be bent around the curvature of the roof. Refer to *Special features techniques* for more information on shaping of battens .
- Each course is a different width and this will require the tiles to be tapered to maintain the bond, or side lap.
- To maintain an effective bond, or side lap, with the adjacent courses, the minimum possible width of tile is 81mm. It may be necessary to re-drill appropriate nail holes on site for fixing. Depending on the radius of the curve it may not be possible to rely on the nibs for support therefore each tile should be twice nailed.

photograph of concave roof

- This photograph shows an example of a concave curved roof. Note the use of cut tiles and tile-and-a-half tiles to maintain bond.

Section 5: Cones

5.1: Conical tower with plywood skin



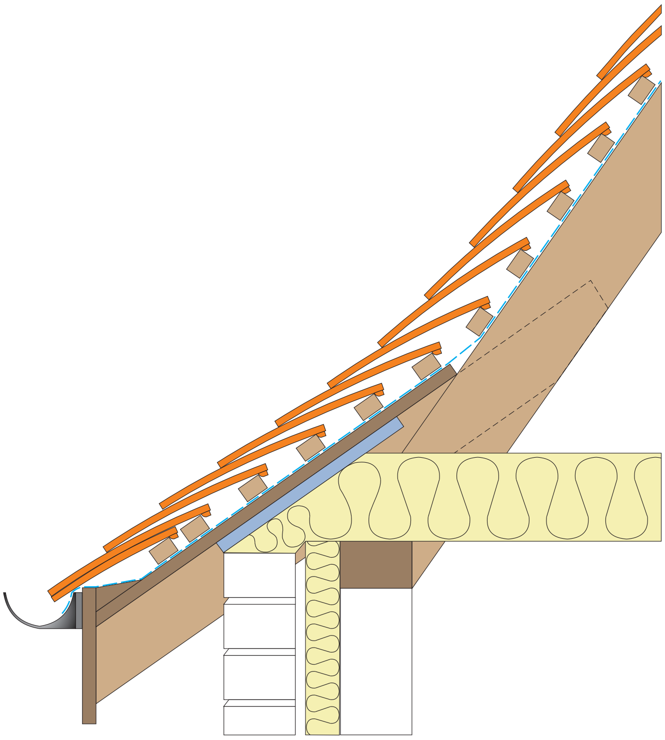
- Conical roofs can be covered with layers of thin plywood to a depth of 25mm to maintain a smooth curve.
- The underlay should be laid vertically, with vertical laps of 150mm and horizontal laps of 100mm.
- To comply with the requirements of BS 5534 tiles should be fixed to timber battens. But for heritage and other traditional work tiles can be fixed directly to the plywood and suitable underlay.
- Battens may be 'scarfed' at the back to enable them to be bent around the curvature of the roof. Refer to *Special features techniques* for more information on shaping of battens . At the apex, where the radius is the smallest, it may be necessary to use 4 thicknesses of 6mm timber battens to achieve the flexibility to fit the curve. In this case the joints of the 6mm battens should be staggered.

- This photograph shows an example of a conical roof. *(Photograph courtesy of Sandtoft)*

- Each course is a different width and this will require the tiles to be tapered to maintain the bond, or side lap. For example, a typical conical roof of 70 pitch may require three sizes of tapered tile - the first of 150mm width at the tail, the second of 125mm and the third of 100mm.
- To maintain an effective bond, or side lap, with the adjacent courses, the minimum possible width of tile is 81mm. It may be necessary to re-drill appropriate nail holes on site for fixing. Depending on the radius of the curve it may not be possible to rely on the nibs for support therefore each tile should be twice nailed.

Section 6: Bellcast/sprocketed eaves

6.1: Section through eaves showing ‘bellcast’ or ‘sprocketed’ eaves



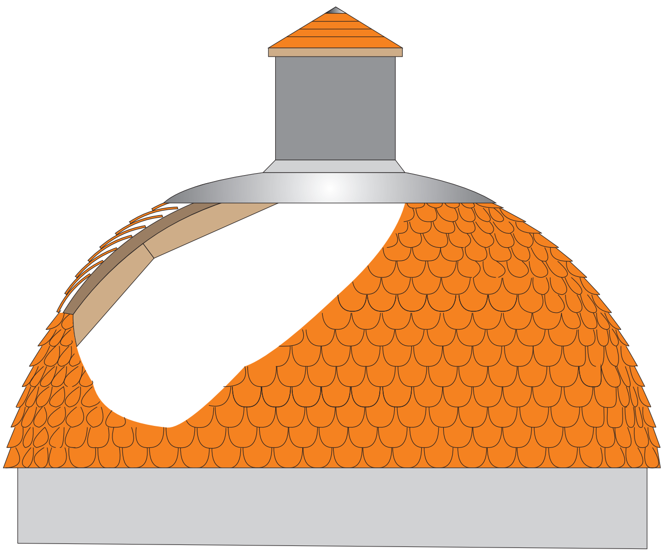
- Because the minimum recommended roof pitch for plain tiles is 35 degrees (40 degrees for handmade plain tiles) the general roof pitch needs to be greater to ensure that the bellcast is at least the minimum pitch.
- Where the minimum headlap cannot be maintained soakers should be used *(see Section 1.2: Use of soakers)*.

- This photograph shows an example of a bellcast eaves.

(Photograph courtesy of Marley Eternit)

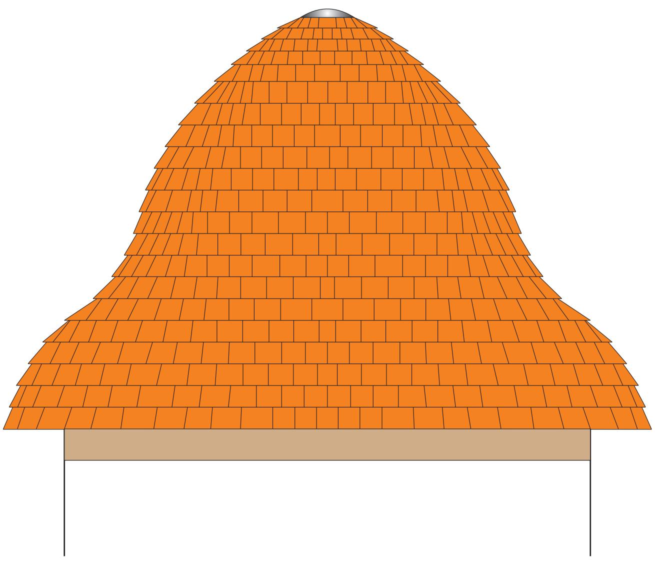
Section 7: Domes

7.1: Part-tiled roof showing substructure of dome



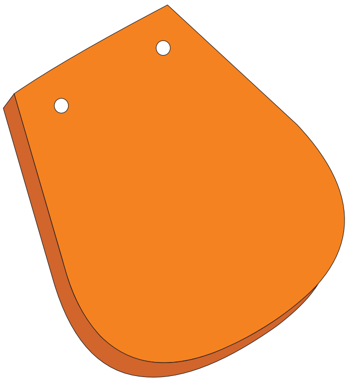
- Dome tiles, or 'fish-scale' tiles should be used. These are semicircular at the tail and square at the top, with the sides tapered to absorb the horizontal curvature. The tiles have little or no camber. The size of the tiles in relation to the size of the dome is small so there should be little risk of tiles 'riding' on each another. The shaping of the tails compromises weather efficiency but the tiles are more flexible in use.
- The pitch of the dome almost flattens out at the top of the roof so tiles here cannot provide any weather protection. Therefore a complete covering of lead or other metal is required to ensure adequate weather protection.
- Such a covering, or cap, can be decorative, or in the form of a window detail to allow light into the dome.

7.2: Example of a Cupola roof



- A Cupola is a small dome but at the critical roof pitch the dome rises to a peak to avoid the very low roof pitch angles.
- The groundwork can be a complex layer of 'plasterers laths' laid obliquely; ie bent over all the curves to allow tile nails to be driven in anywhere on the curve.
- Alternatively, 38 x 25mm battens could be used, amply 'scarfed' or otherwise treated to allow bending to the curves.

7.3: 'Dome' or 'fish-scale' plain tile



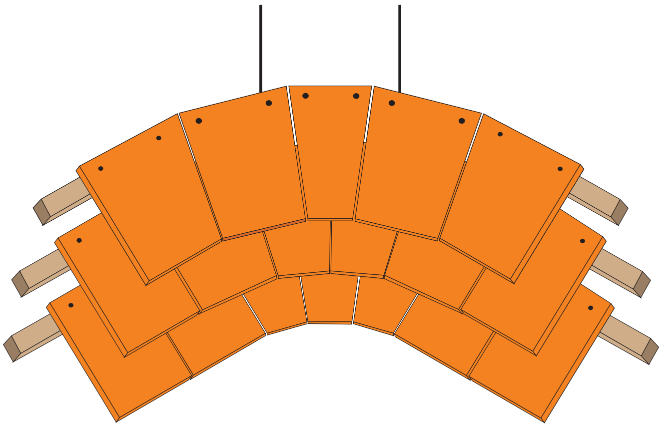
- Dome tiles, or 'fish-scale' tiles are semicircular at the tail and square at the top, with the sides tapered to absorb the horizontal curvature. The tiles have little or no camber. The size of the tiles in relation to the size of the dome is small so there should be little risk of tiles 'riding' on each another. The shaping of the tails compromises weather efficiency but the tiles are more flexible in use.

photograph - show Latimer House near Commonwealth Institute, Kensington Gardens (Keymer)

- This photograph shows an example of a dome.

Section 8: Valleys

8.1: Swept valley



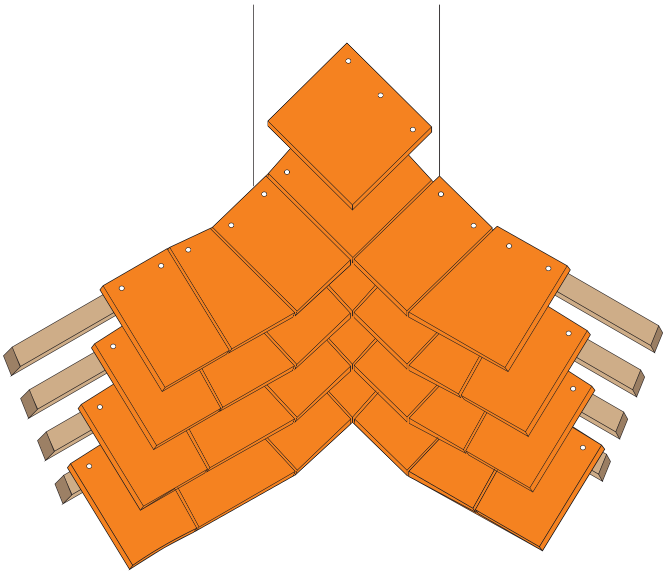
- A swept valley detail should only be used on roof pitches of 45 degrees and above and where roof slopes of equal pitches meet.
- If a swept valley is used on the main roof extra tiles courses will be required at the top of the valley. This will mean that the ridge line must rise towards the valley top. Therefore, there must be a matching swept valley on the opposite side of the roof. Alternatively, a large, unsightly lead soaker would be required to weather the resultant gap at the top of the valley.
- When tiling this type of detail it can be difficult, if not impossible, to always achieve the minimum 55mm side lap between courses. Where this happens, lead soakers must be inserted.
- Alternatives to swept valleys are mitred valleys using metal soakers and purpose-made valley tiles.

8.2: Swept valley top detail

photograph

- The ideal situation for this type of detail is, for example, a dormer, where the swept valley meets a ridge part way up a main roof slope. In this case, the upward curve of the tiling and ridge line can be absorbed in the main tiling courses above.

8.3: Laced valley



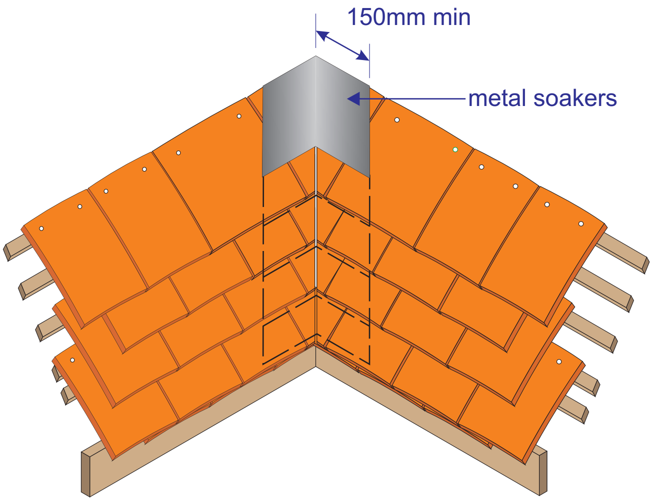
- A laced valley detail should only be used on roof pitches of 45 degrees and above and where roof slopes of equal pitches meet.
- If a laced valley is used on the main roof extra tiles courses will be required at the top of the valley. This will mean that the ridge line must rise towards the valley top. Therefore, there must be a matching laced valley on the opposite side of the roof. Alternatively, a large, unsightly lead soaker would be required to weather the resultant gap at the top of the valley.

8.4: Laced valley top detail

photograph

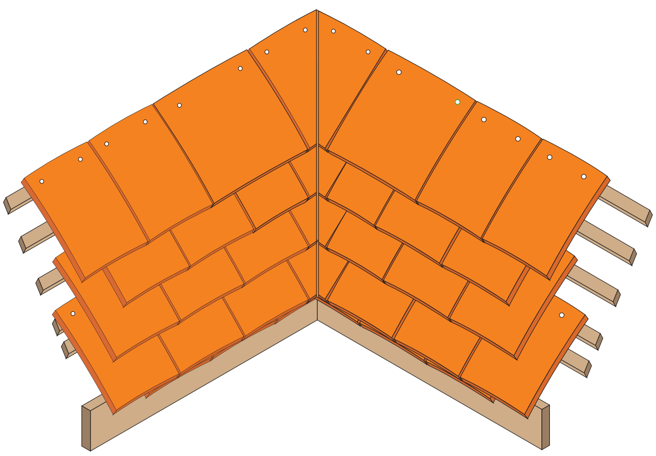
- The ideal situation for this type of detail is, for example, a dormer, where the laced valley meets a ridge part way up a main roof slope. In this case, the upward curve of the tiling and ridge line can be absorbed in the main tiling courses above.
- The head of the valley may continue above the dormer ridge for a maximum of 3 courses before being absorbed into the main tiling.
- The last ridge at the top of the valley must be cut to a taper to maintain a horizontal ridge line.

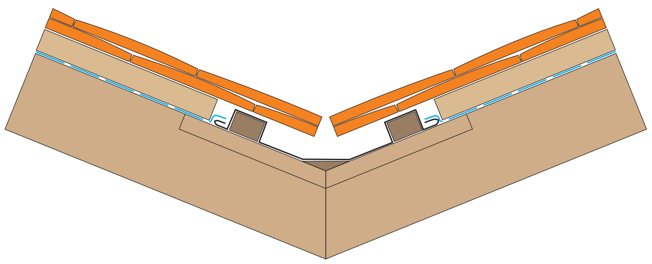
8.5: Mitred valley



- A mitred valley detail should only be used on roof pitches of 50 degrees and above and where roof slopes of equal pitches meet.
- The maximum rafter length should be no more than 6 metres.
- Mitred valleys should not be used where the valley receives additional water from a roof area above.
- The length of each soaker will vary, depending upon the roof pitch. The minium width of each soaker is 150mm at each side of the valley.

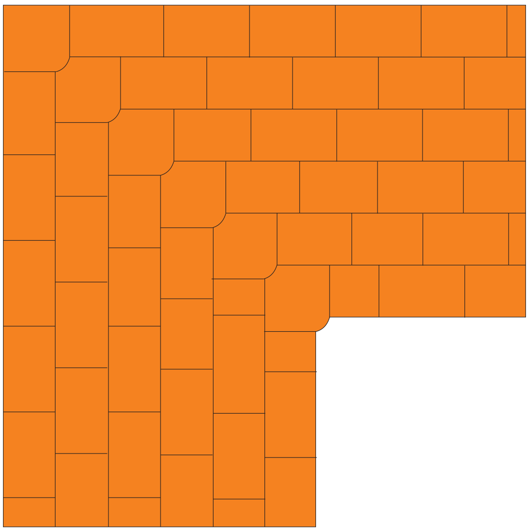
8.6: Mitred valley with secret gutter



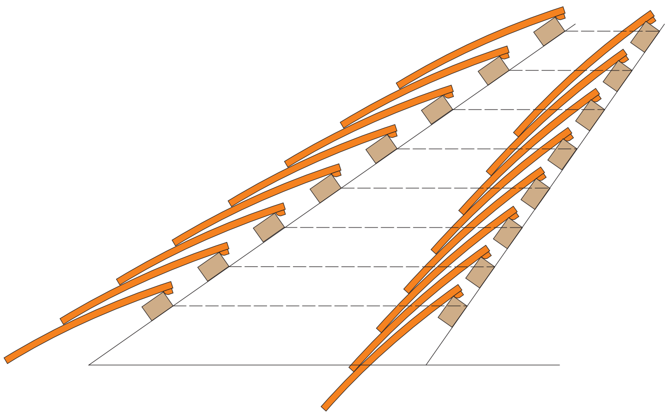


- This detail could be used where unequal roof pitches meet but should only be used on roof pitches over 50 degrees.
- This form of valley has the disadvantage of the risk of becoming clogged by debris - leaves pine needles etc.
- There also exists the difficulty in constructing a sufficiently wide valley gutter for adequate water discharge whilst still being able to secure all cut tiles.
- This type of valley detail has fallen out of favour in recent years and is rarely used.

8.7: Valleys with unequal roof pitches



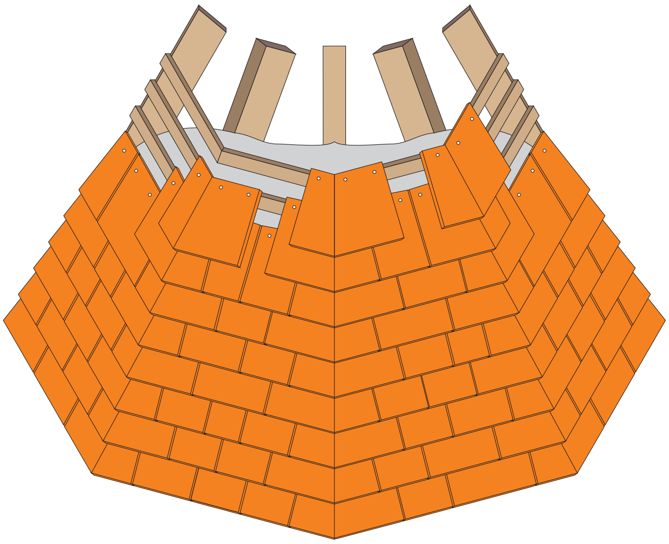
- If it is required to continue the tile courses in line around a valley, and the roof pitches at each face are unequal, it will be necessary to set out the tile batten gauge on the lesser pitch first, at maximum gauge. Then, the battens on the steeper pitch can be fixed in line with the first battens. This will necessitate having a shorter gauge on the steeper side.
- Lining up the tile courses in this way uses more tiles and is only for aesthetic reasons - it is not necessary technically.
- It is only possible to use valley tiles for up to 5 degrees difference in pitch between the two roof faces.



- This sectional detail shows the battens on the steeper pitch set out at a lesser gauge to line up with the battens on the lesser pitch.

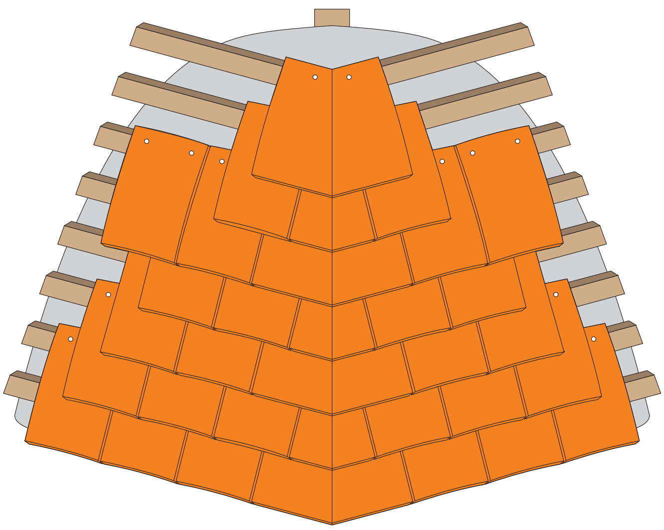
Section 9: Hips

9.1: Hexagonal (120°) tower with handed arris hip tiles



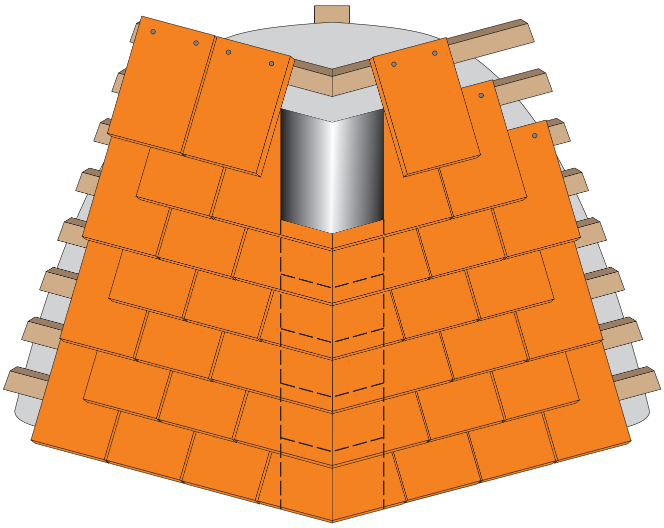
- At each hip left and right-handed arris hip tiles are used in alternate courses to maintain a broken bond to each side of the hip.

9.2: Octagonal (135°) tower with large & small arris hip tiles



- At each hip large and small arris hip tiles are used in alternate courses to maintain a broken bond to each side of the hip..

9.3: Octagonal (135^0) tower with mitred hips

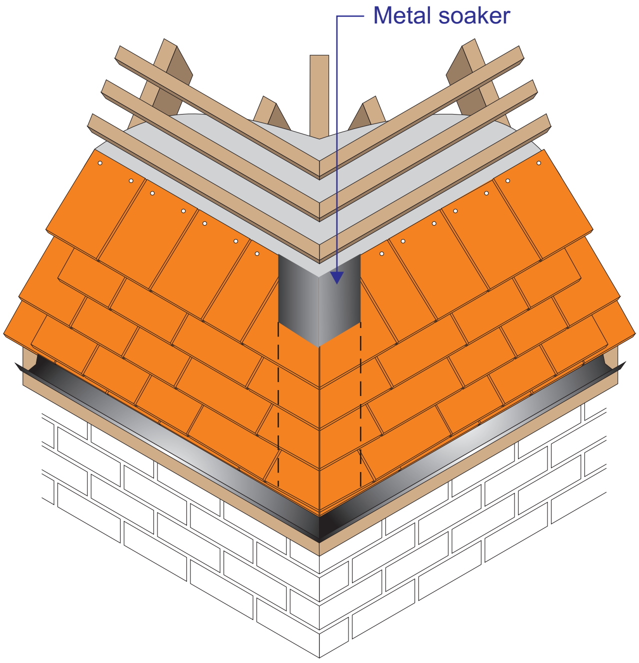


- Tiles and tile-and-a-half tiles are cut and fixed to form a straight, weathertight, close mitred junction at the hip.
- The mitred tiles are interleaved with metal soakers, extending a minimum 100mm to each side of hip. The soakers are secured by turning down over heads of mitred tiles.
- Extreme care is needed to achieve a neat finish at the hip. Where possible it is advisable to use specially made arris hip tiles to suit the particular roof pitch instead.

- Photograph shows an example of an octagonal tower

(Photograph courtesy of Marley Eternit)

9.4: Mitred hips

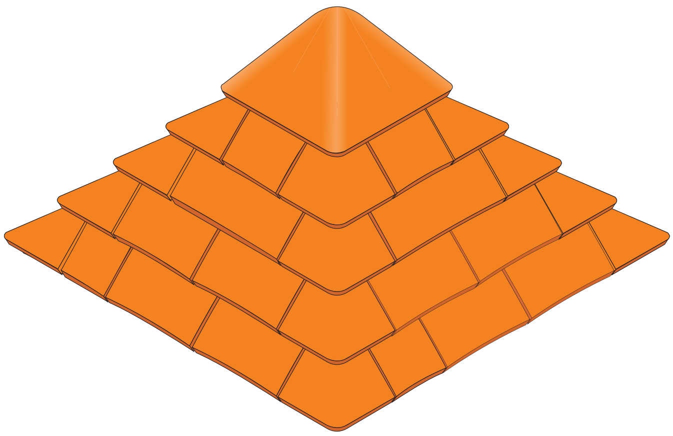


- Lay courses of underlay over hip with overlaps of not less than 150mm.
- Cut tile-and-a-half tiles and fix to form a straight, weathertight, close mitred junction.
- Interleave mitred tiles with metal soakers, extending a minimum 100mm to each side of hip. Fix soakers by turning down over heads of mitred tiles.
- Extreme care is needed to achieve a neat finish at the hip. Where possible it is advisable to use either bonnet hip tiles or specify specially made arris hip tiles to suit the particular roof pitch instead.

- Photograph shows an example of a hexagonal tower

(Photograph courtesy of Sandtoft)

9.5: 4-way hip cap

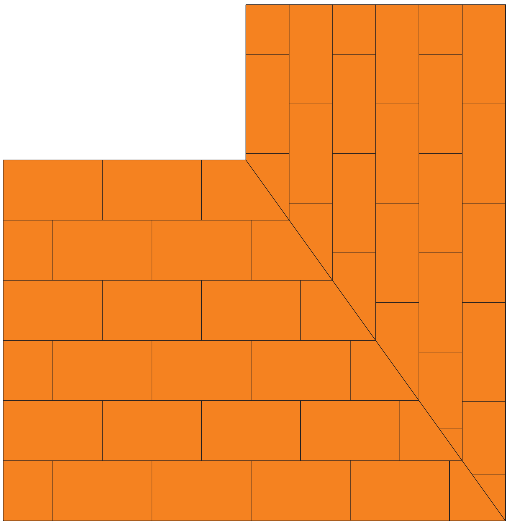


- Where 4 mitred, bonnet or arris hips terminate without a ridge line a purpose-made cap or finial can be used.
- Because hip caps and finials are pitch specific please contact the tile manufacture with roof details.
- Decorative finials can be made to order.

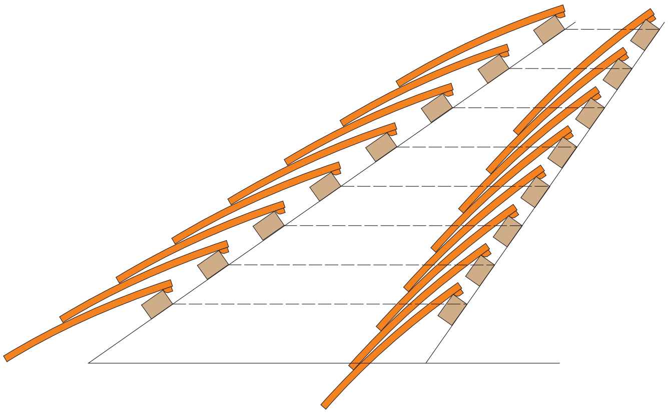
photograph

- Photograph shows an example of a 4-way hip finial

9.6: Hips with unequal roof pitches



- If it is required to continue the tile courses in line around a hip, and the roof pitches at each face are unequal, it will be necessary to set out the tile batten gauge on the lesser pitch first, at maximum gauge. Then, the battens on the steeper pitch can be fixed in line with the first battens. This will necessitate having a shorter gauge on the steeper side.

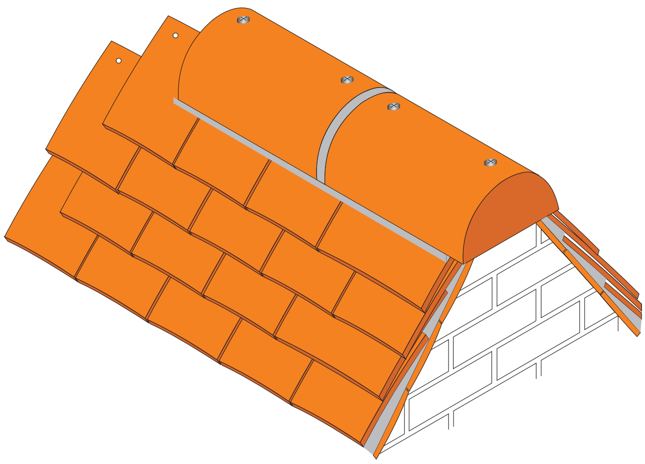


- This sectional detail shows the battens on the steeper pitch set out at a lesser gauge to line up with the battens on the lesser pitch.

Section 10: Ridges and finials

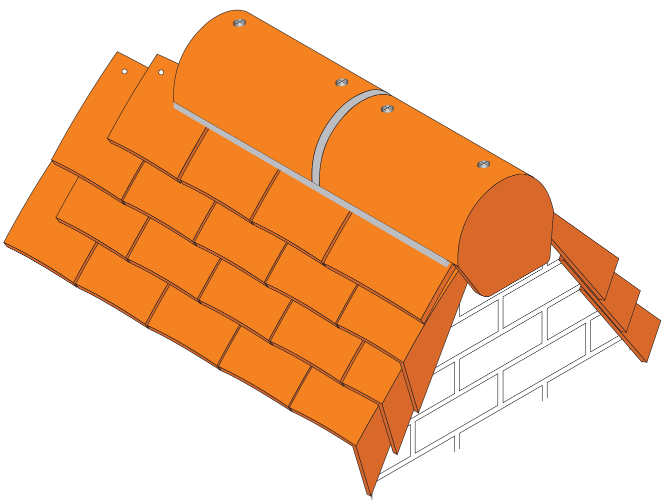
10.1: Some examples of ornamental ridges

10.2: Gable stop end



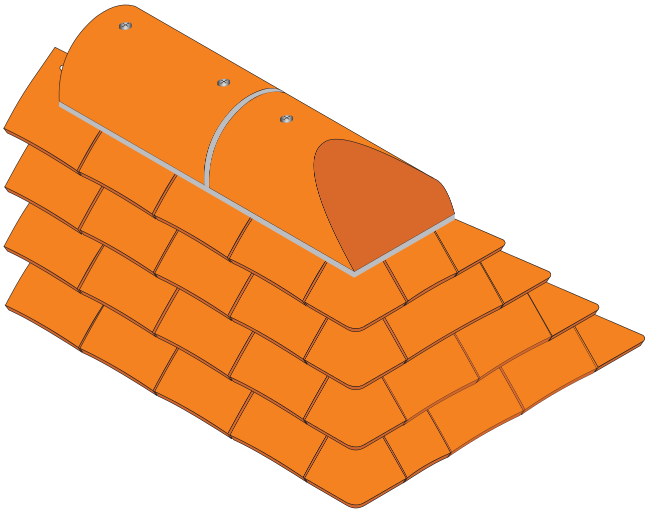
- This drawing shows an example of a gable stop end ridge tile. These are commonly used at the gable in conjunction with bedded verges and avoid the need for a deep bed of mortar underneath the end ridge tile .
- At the gable end the first 900mm of ridges (ie first 3 if they are 300mm long, or first 2 if they are 450mm long) must be mechanically fixed to the roof structure *(see example fixings in section 10.5).*

10.3: Block end



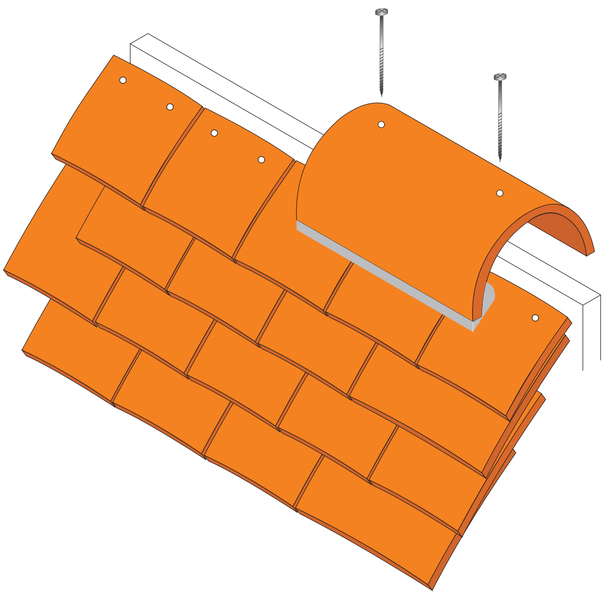
- This drawing shows an example of a gable block end ridge tile. These are commonly used at the gable in conjunction with cloaked verges, although they can also be used with bedded verges to avoid the need for a deep bed of mortar underneath the end ridge tile .
- At the gable end the first 900mm of ridges (ie first 3 if they are 300mm long, or first 2 if they are 450mm long) must be mechanically fixed to the roof structure *(see example fixings in section 10.5).*

10.4: Hip end



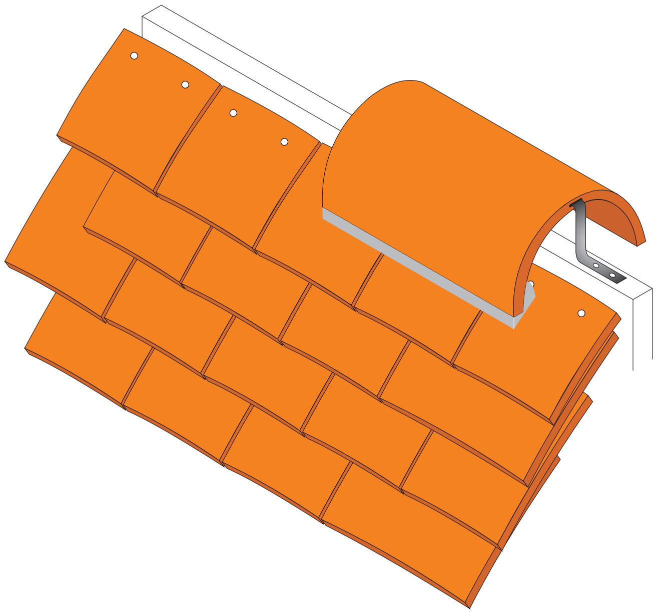
- This drawing shows an example of a hip end. These are commonly used at the junction between a ridge and hips, which bonnets, arris hips or a mitred hip have been used.
- A suitable lead saddle (not shown) should be fixed underneath the end ridge tile to weather the ridge/hip junction.

10.5: Mechanically fixed ridges - use of nails or screws



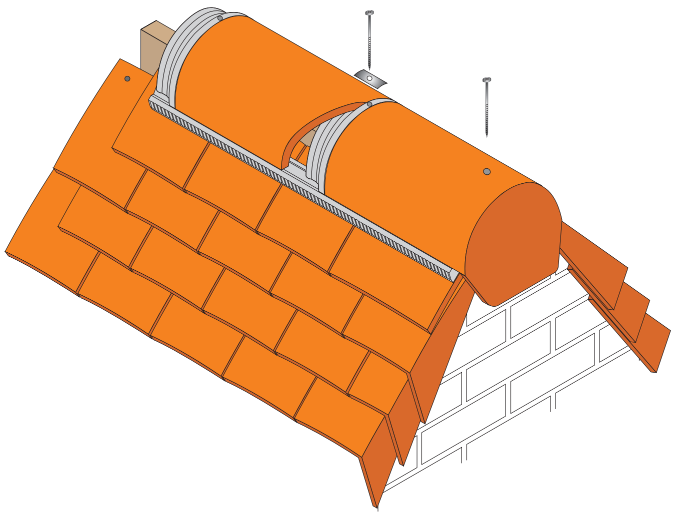
- This drawing shows an example of a mechanically secured ridge tile using nails or screws with sealing washers. The ridge tile must be drilled or specially manufactured with holes.
- Where the ridge tree is absent, or of insufficient height or width to accommodate the fixings, it will be necessary to fit an additional ridge timber.
- Where using this method of mechanically fixing in conjunction with mortar bedding it is better to use screws rather than nails to avoid the risk of dislodging the mortar during fixing.

10.6: Mechanically fixed ridges - use of metal strap

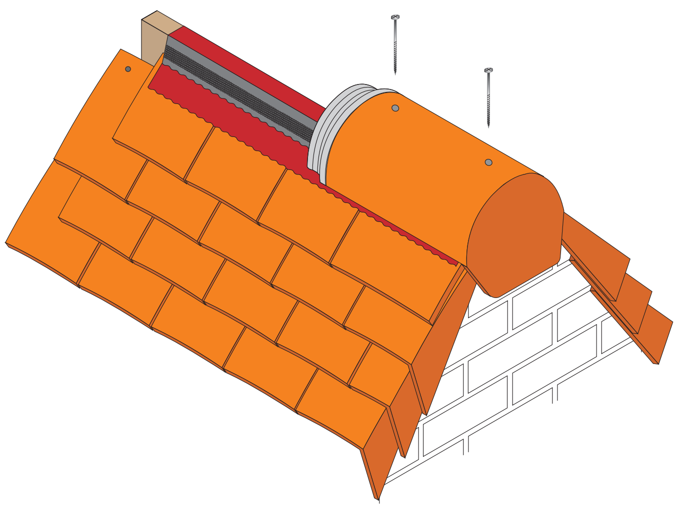


- This drawing shows an example of a mechanically secured ridge tile using a metal strap inserted into a recess at the end of the ridge tile and secured to the ridge timber.
- This method of fixing requires the manufacture of special ridge tiles.
- Where the ridge tree is absent, or of insufficient height or width to accommodate the fixings, it will be necessary to fit an additional ridge timber.

10.7: Examples of ventilated dry ridge systems

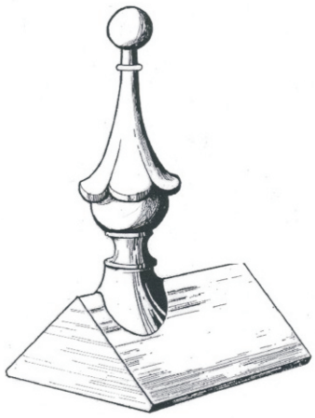
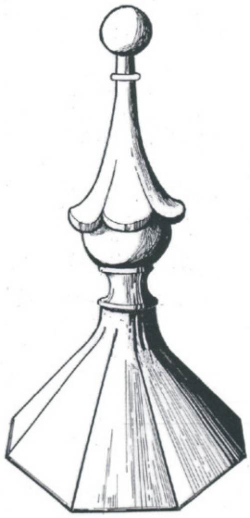
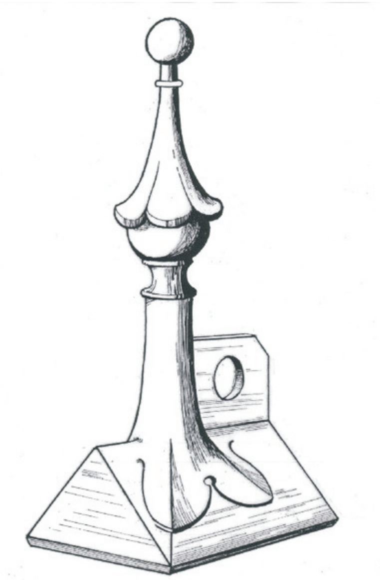
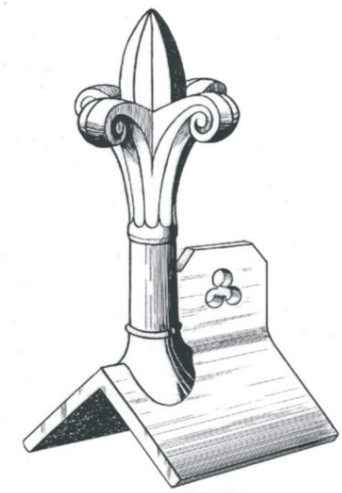
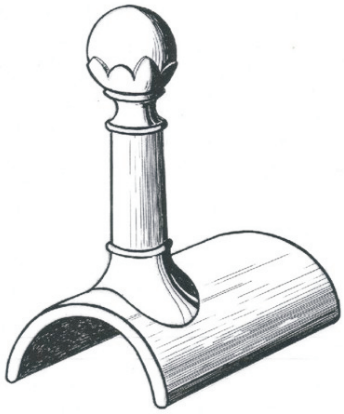
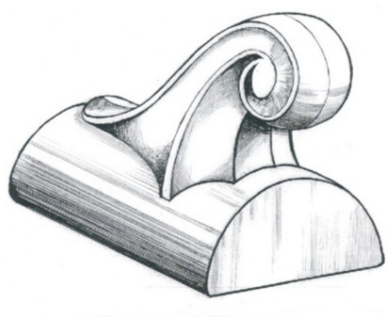


- An example of a proprietary ventilated dry ridge system using ventilated strips on each side of the ridge to maintain a ventilation gap at high level.
- Plastic joints provide a waterproof seal between the ridge tiles, which are secured using screws or nails and small metal plates.

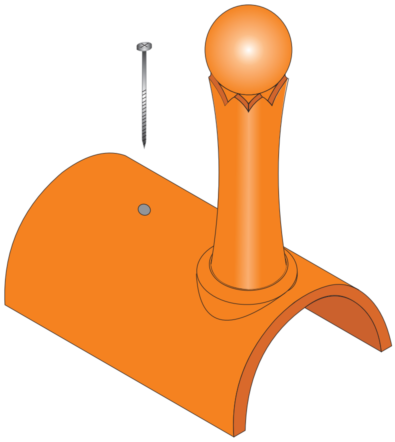


- An example of a ventilated dry ridge system using a universal ridge roll.
- The ridge roll provides high level ventilation as well as a seal at the ridge.
- In this example holed ridge tiles are secured using nails or screws with sealing washers.

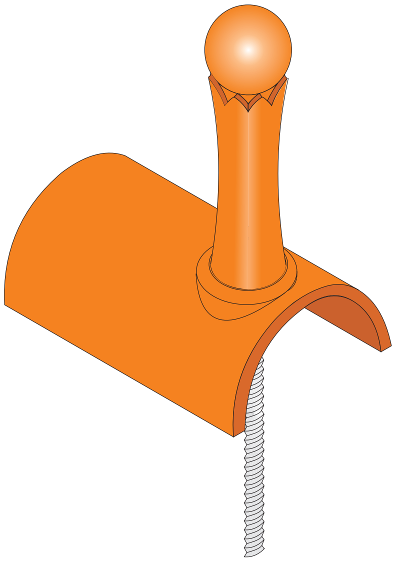
10.8: Examples of decorative finials

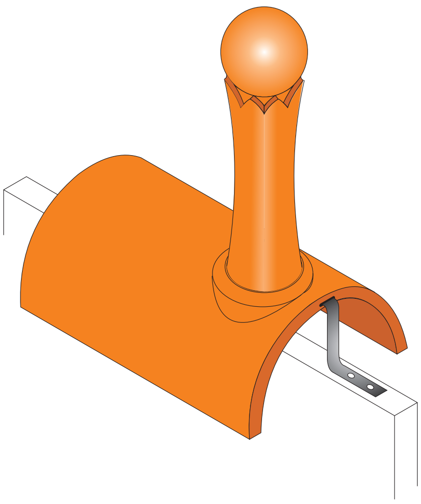

10.9: Mechanical fixing of finials



- In this example the finial has a hole to enable it to be nailed or screwed to the ridge batten.



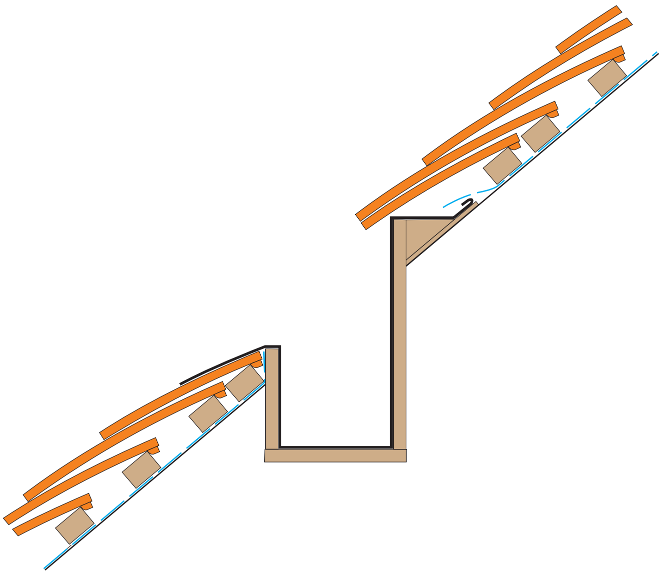
- In this example the finial has a threaded bar embedded in it to enable it to be bolted through a suitable hole in the roof structure; for example, through a hole drilled in the ridge batten.



- In this example the finial has a metal strap inserted into a recess at the end of the finial and secured to the ridge timber.

Section 11: Secret box gutters

11.1: Cross-section of secret box gutter



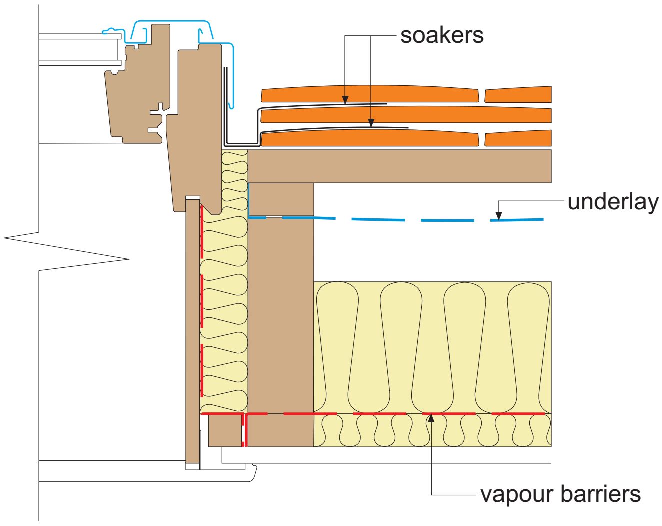
- The secret box gutter runs horizontally across the roof, usually about 300mm above the eaves.
- The gutter may be constructed in timber and usually lined with lead or other suitable material.
- The ridge side of the gutter can be treated as an eaves and is finished with an eaves tile course, projecting 50mm over the gutter. The tails of the eaves course tiles should be in line with the tails of the first course of full tiles above the gutter.
- The lower side of the gutter is treated as a top course and will have a short tile course over the last full tile course. The lead lining of the gutter should overlap the top course tiles by at least 100mm.
- This detail can be used to break up long rafter lengths.

Photograph

- This photograph shows an example of a gutter positioned a short distance up the roof slope from the eaves.

Section 12: Roof windows

12.1: Roof window side edge detail



- A gap 30mm wide should be maintained between the tiling and side edges of the window frame.
- All flashings and other weathering components must be fitted in accordance with the window manufacturers recommendations.
- All seals and gaskets etc have been omitted from this drawing for clarity.

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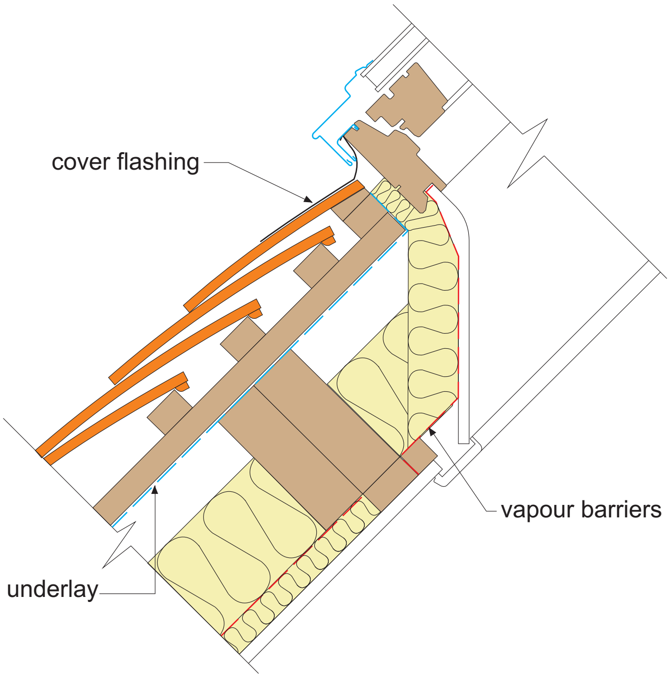
12.2: Roof window bottom edge detail



- The top course of tiles below the window should be cut if necessary to maintain consistent headlap over the tiling course below. A deeper batten should be used if necessary to maintain correct pitch of top course tiles.
- All flashings and other weathering components must be fitted in accordance with the window manufacturers recommendations.
- All seals and gaskets etc have been omitted from this drawing for clarity.

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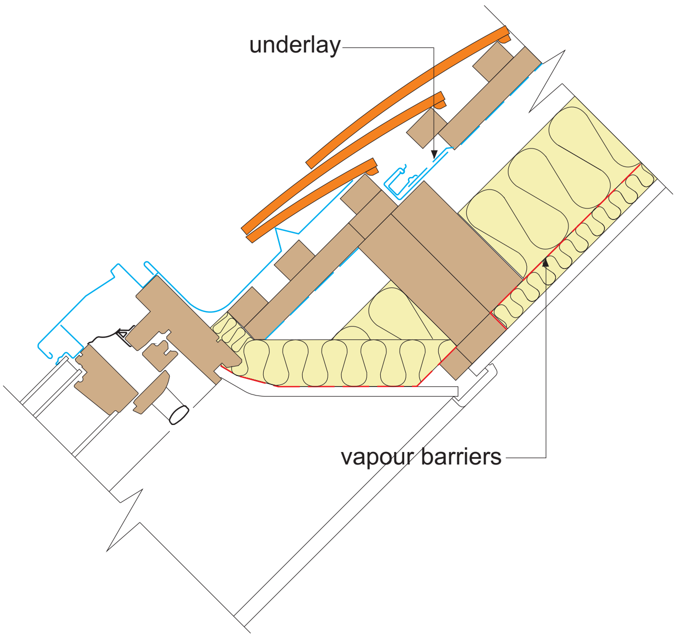
12.3: Roof window top edge detail



- A gap of 60 to 150mm should be maintained between the tiling and the top edge of the window frame. If necessary, the tails of the first two courses of tiles should be cut.
- All flashings and other weathering components must be fitted in accordance with the window manufacturers recommendations.
- All seals and gaskets etc have been omitted from this drawing for clarity.

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