Construction Notes - No 9 Bedded ridge

In a series of articles on interlocking concrete roof tiles, experts from the **Concrete Tile Manufacturers Association** have pooled their knowledge. This Construction Note discusses mortar bedded ridges.

Duo pitch ridge

A duo pitch ridge occurs where two roof slopes meet at their upper edges. This is generally the highest part of the roof and should be horizontal or parallel with the eaves. If the ridge is not horizontal then technically it is a hip. Where the top one roof slope meets a vertical wall it forms either a mono ridge or a top edge abutment, both of which are dealt with in separate articles.

A duo pitch ridge can be formed with or without high level ventilation to comply with BS 5250 *Code of Practice for the Control of Ventilation in Buildings* and Building Regulation Approved Document F2. The requirement for ventilation will depend upon the location of the insulation and the span and pitch of the roof structure and will be dealt with in a later article.

A duo pitch ridge can also be formed with or without mortar bedding to comply with BS 5534: *Code of Practice for Slating and Tiling* and BS 8000: *Workmanship on Building Sites* Part 6: *Code of Practice for slating and tiling of roofs and cladding.*

Where mortar bedding is not used a proprietary system is required to prevent wind-driven rain and large insects from gaining access to the roof space this will also be dealt with in a later article.

In all instances, so, if not all, of the ridge assembly will need to be mechanically fixed to the roof structure to ensure that the ridge is not displaced during high winds.

Ridge tiles

The junction of the tiles between the two roof slopes needs to be covered with a purpose-made ridge tile (A). This should be approximately 250mm wide to bridge the gap between the tiles and lap over the tiles by a minimum of 75mm. The distance will vary with rafter pitch and the proximity of the top course of tiles to the apex of the roof. The length of the ridge tile is normally approximately 450mm. The design of the ridges may be half round, segmental or angular and may also have a finial or crested ornamentation.

Roof structure

The roof structure, which will normally be pre-formed trussed rafters **(B)**, should meet at the apex. Ideally, the pitch on either side should be the same. If the pitches are not the same the whole roof will sit over towards the steeper slope. With a cut timber roof there will be a ridge board at the apex, which runs at right angles to the rafters and provides the joint between the rafters.

Underlay/battens/tiles

The underlay **(C)** should be laid to finish on the first slope level with the apex of the roof. On the second slope the underlay should extend beyond the apex and lap onto the underlay of the first slope by a minimum of 150mm. The top batten **(D)** should be positioned to allow the top course of tiles **(E)** to finish as close to the apex or ridge batten **(F)** as possible. Cutting tiles in their length to fit the top course of tiles should be avoided wherever possible.

Ridge tile fittings

Mortar bedding **(G)** is, by its very nature, rigid. However, timber and steel roof structures can expand, shrink and deflect depending upon the humidity, temperature and loads experienced during their lifetime. Where the roof comes into contact with a rigid wall or chimney the situation is at its worst. The stresses generated at a rigid wall support onto a less rigid timber or steel support can cause differential movement and the mortar to fail.

It is for this reason that the end 900mm of any ridge, or where it meets or crosses a rigid support such as a gable end wall, party wall/fire break wall or a chimney, the ridge tiles should additionally be mechanically fixed to comply with BS 5534. In some instances, where wind loads dictate, it will be necessary to mechanically fix every ridge tile.

The mechanical fixing of the ridge tiles may be one of the following methods: -

- One screw or nail fixing through the centre of the ridge tile.
- One screw or nail fixing through each end of the ridge tile.
- One screw or nail through a plate at the cross bed joint.
- An embedded wire at one end of the ridge tile.

For each of these options there will need to be a ridge board/batten **(H)** of adequate width and height to allow the fixing screw or nail to penetrate the ridge board/batten by an amount sufficient to resist the wind uplift forces. The nail point penetration into the timber should be calculated in accordance with BS 5258: *Structural use of timber Part 2: Code of practice for permissible stress design, materials and workmanship,* as the penetration will vary with diameter and type of fixing.

A screw or nail length of 100mm is normally used for fixing ridge tiles, as longer than this they become difficult to install without bending them. The height of the ridge batten is determined by how far it is above the apex of the roof and will depend upon the pitch of the roof, the profile shape and thickness of the tiles being used and the length of the fixing

Where a ridge batten is used with trussed rafters the batten will need to be secured screwed or strapped **(J)** to at least two rafters and extend at least 80mm beyond the end fixing screws or nails.

Where the embedded wire method of fixing is used the wires should be nailed to the ridge board/batten at the end of the ridge nearest the gable wall.

Tile fittings

BS 5534 requires all perimeter tiles to be mechanically fixed. At the ridge this requirement ensures that

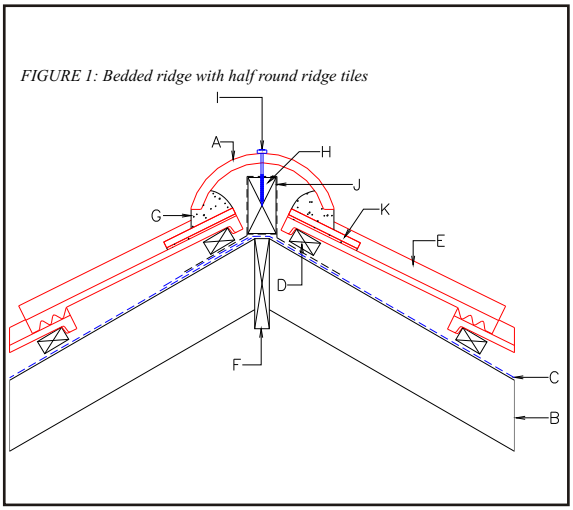

FIGURE 1: Bedded ridge with half round ridge tiles

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where the ridge tiles are bedded onto the top tiles with mortar, the uplift load on the ridges does not allow the top course of tiles to lift off the batten. The top course of tiles should therefore be head nailed and/or tail clipped, wherever is appropriate, having undertaken the wind uplift/fixing calculations within BS 5534.

Mortar bedding

The use of mortar to bed ridge tiles onto the top course of tiles to weather the ridge junction is very traditional. If done correctly the method can be very effective. If not done correctly it will allow rainwater to penetrate the tile covering or allow the ridge tiles to blow off in severe gales. The mortar mix should be either 1:3 cement to sharp sand, where no mechanical fixings are used to hold the ridges to the structure, or 1:4 cement to soft sand, where additional fixings are used to hold down the ridges to the structure.

The higher cement ratio and coarser sands will produce a stronger bond. The lower cement ratio with soft sand provides an effective filler to prevent rain and insects entering the roof covering. To determine the required mortar bond strength with any given sand, mortar mix, admixture and tile surface the test method in BS 5534 should be used.

The mortar should be placed, prior to the ridge being laid, onto a dampened top course roof tile to ensure that the water in the mortar is not sucked into the dry top tile, which otherwise will effect the chemical reaction of the mortar setting. The width of the mortar should be approximately 50mm along the continuous edge bedding and 100mm (50mm either side) at the cross bed joint where a ridge tile abuts the adjacent ridge tile.

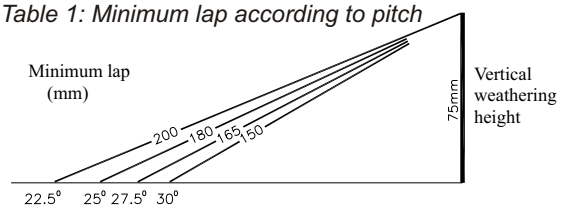
The thickness of the mortar should be sufficient to produce a 50mm surface contact with the underside of the ridge tile, once the ridge tile has been bedded into its final position. Where the roof tiles have a profile with a corrugation depth greater than 25mm, dentil slips **(K)** should be bedded into the corrugation prior to the edge bedding being laid. Dentil slips are narrow widths of plain tile, which are sized to fit within the corrugation. The visible exposed length is at the discretion of the specifier and may be flush with the face of the mortar bed.

At the cross bed joint the mortar may need to be supported and thinned out with pieces of broken tile **(L)** to prevent the mortar from slumping onto the underlay and loosing contact with the underside of the ridge tile.

The ridge tiles should be bedded into position by pressing or tapping the ridge tiles until they are aligned both horizontally and along the centre line of the ridge, showing a 10-15mm mortar joint.

The practice of pointing the cross bed joints of the ridges once the ridge tiles have been bedded is not acceptable as little or no mortar contact will occur under the tile being pointed and in time the mortar joint will crack, allowing rainwater to enter the roof.

Table 1: Minimum lap according to pitch



Ridge junctions

Where a ridge meets another feature such as a hip, top edge abutment or side abutment, a Code 4 lead saddle should be installed. It should be positioned either under the mortar bedding, or over the ridge tile, depending upon the direction of the water run-off. The positioning of the saddle under the mortar is visually more acceptable.

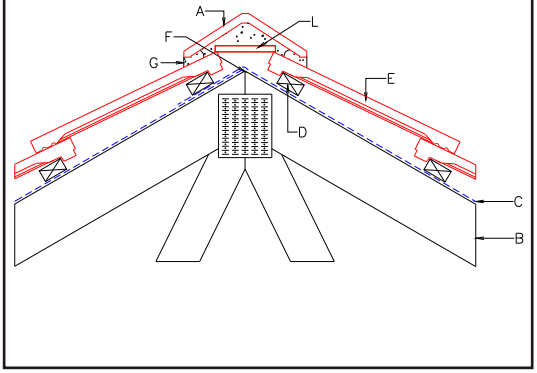
Where the lead saddle is positioned under the mortar, the size of the saddle will depend upon the lap of the lead onto the head of the tiles on each slope (see Table 1). For a rafter pitch of 17.5 degrees, the true tile pitch is likely to be 12.5 degrees. So the lead saddle headlap length will be 350mm for each of the top tiles, plus the distance between the top tiles, which comes to a total length of 800mm.

The width of the saddle will depend upon the proximity of the adjacent roof slope and its relative rafter pitch. The minimum size of lead saddle, ie 450 x 450mm, should therefore not be used on rafter pitches below 35 degrees. The practice of trimming the lead saddle back to the line of the mortar bed is technically incorrect as it will reduce the effective headlap to approximately 75mm.

Where the lead saddle is positioned over a mortar bedded ridge tile the lead should be dressed neatly over the ridge tile and onto the surface of the top tiles by 50mm. Depending upon the size of the ridge the lead sheet width is likely to be between 450 and 550mm, regardless of the rafter pitch. On tall buildings, or where the ridge is very exposed, clipping the edge of the lead saddle should be undertaken to hold it down onto the ridge tile.

Depending upon the complexity of the junction, it may be appropriate to cut in and lead weld gussets to the saddle, rather than boss the lead sheet into shape.

FIGURE 2: Bedded ridge with angle ridge tiles



Summary

- The end two ridges, or the end 900mm of the ridge, must be mechanically fixed.
- Mortar bedding of ridge tiles is effective when done correctly.
- Where the ridge changes direction, or meets a hip or valley etc, a lead saddle should be installed at the junction.
- Dentil slips should be where the tile corrugation height is greater than 25mm.

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Cemex
Forticrete
Lafarge
Marley Eternit
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