

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 changes in rafter pitch.

### Change of Rafter Pitch

A change of rafter pitch occurs where the lower section of a pitched roof is at a different rafter pitch to the upper section. The junction where the two sections of roof meet is termed the change of rafter pitch junction.

There are several good reasons why there should be a change of pitch in a roof slope. A steeper rafter pitch can provide more useable space if the roof is to be used as habitable space. A shallower rafter pitch can reduce the ridge height, form a mono pitch dormer, or allow the eaves line to clear a window or door head.

It is not essential that the tiles on the shallower slope are the same as on the steeper slope. This can be a useful technique for where an extension is built onto an existing roof, and the new pitch is below the minimum pitch of the existing roof tiles.

There are two common arrangements at the change of rafter pitch junction: -

**Sprocket;** where the upper rafter pitch is steeper than the lower rafter pitch.

**Mansard;** where the upper rafter pitch is shallower than the lower rafter pitch.

For all intents and purposes they are constructed in the same way.

The amount by which the pitch changes is not important. But the lowest rafter pitch should not drop below that recommended by the

roof tile manufacturer. Remember that the true pitch of an interlocking tile is approx. 5 degrees less than the rafter pitch and it is always rafter pitch that is quoted in manufacturers' literature. The steepest rafter pitch should not normally exceed 69 degrees; above 69 degrees rafter pitch, a roof is considered to be a wall, and therefore should be detailed as such.

The junction of the two rafter pitches should be weathered using a metal flashing. Lapping the tiles without a metal flashing is insufficient to ensure a weather resistant junction. Interlocking tiles that lay in the same plane resist wind driven rain effectively, those that do not lay in the same plane do not, due to the weather bars on the underside of the tile not being in the correct position relative to the head of the lower tile.

### Battens and Underlay

The rafter pitches should be covered with underlay (**A**) in the normal manner, ignoring the position of the change of rafter pitch or the location of the insulation. It is not advisable to lay metal flashing directly onto bituminous underlay and therefore the underlay should pass under the tilting fillet.

The battens on the lower roof section should be gauged to finish with the head of the top tile in line with the change of the rafter pitch. An additional batten (**B**) should be positioned in line with the bottom

edge of the flashing to allow a copper clip to be fixed to prevent the edge of the flashing being lifted by high winds.

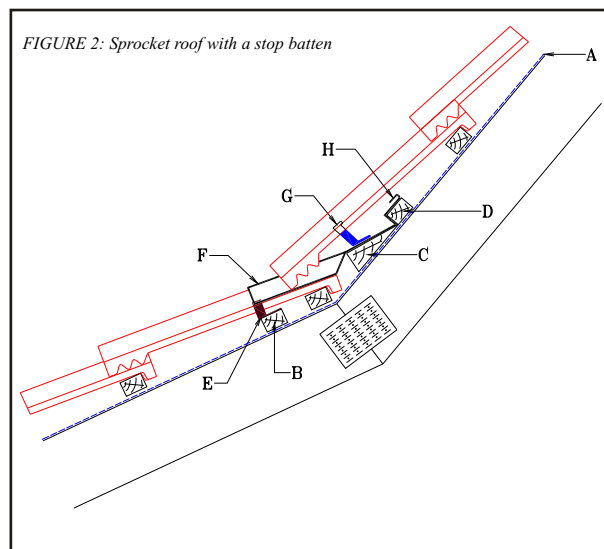
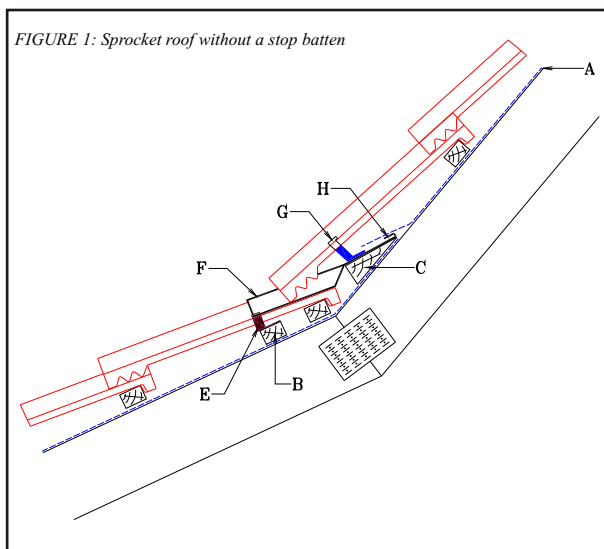
The upper roof slope should start with a correctly sized solid timber-tilting fillet (**C**) to ensure that the first tile lies in the same plane as the rest of the tiles on the upper roof slope. The thickness of the tilting fillet will vary depending upon the tiles used, but with one or two exceptions is equal to the batten thickness plus the tile thickness at the head of the tile.

A tile batten (**D**) should be fixed against the top edge of the tilting fillet where it meets the rafter, to provide an up-stand fixing for the metal flashing.

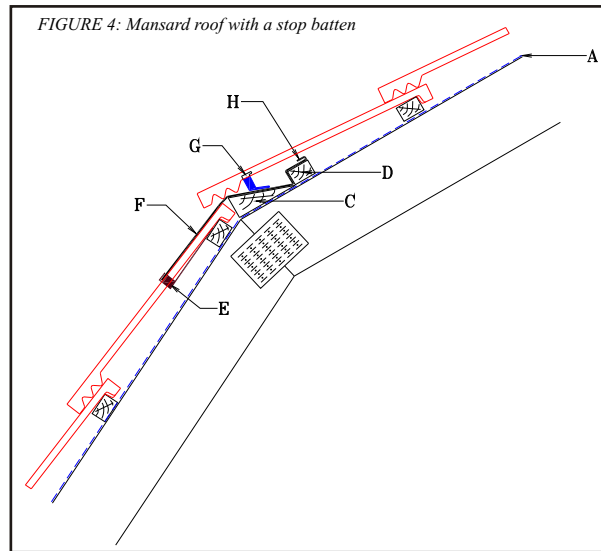
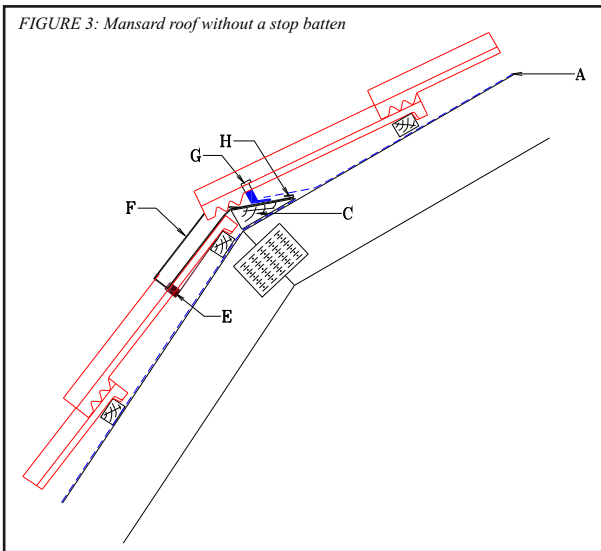
The first batten position on the upper slope should be determined by using two courses of tile on the top of the lower roof slope and one on the upper roof slope. Ensure that the leading edge of the upper roof slope tile does not rest on the head of the tiles on the lower slope, but on the tilting fillet. This is especially important if the tiles on the lower slope are different to the upper slope. If the tiles do not rest on the tilting fillet the first course of tile may not be in the correct plane, also the eaves tile clip may be difficult to position. Gauge the battens for the rest of the roof as normal.

### Tiles

Lay the tiles on the lower roof slope as normal with the top course nailed,



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and/or clipped, to comply with the perimeter fixing requirements of British Standard 5534, The Code of Practice for Slating and Tiling: Design.

The copper clips (**E**) to secure the leading edge of the metal flashing should be nailed to the batten directly below. Dress the clip through the side interlock of the tiles, whilst laying and fixing the top course of tiles.

Install the metal flashing (**F**) before laying and fixing the tiles on the upper roof slope as normal, with the first course nailed and/or clipped to comply with the perimeter requirements of BS5534. Where eaves clips (**G**) are used they may need to be nailed through the metal flashing into the solid timber-tilting fillet. Whilst nailing through a lead flashing is not desirable, in this instance it is unavoidable and better than losing the first course of tiles in high winds. With a mansard roof covered with profiled tiles, the eaves filler unit to prevent birds and small rodents entering the batten cavity should be installed on the first course of the upper slope.

### Flashings

The metal flashing should be fixed to the top of the batten directly above the tilting fillet and the edge finished with a welt (**H**). The flashing should dress down over the tilting fillet onto and down the head of the tile on the lower roof slope. The distance the flashing dresses down the head of

the tile will depend upon the true pitch of the tiles. Remember that the true pitch of interlocking concrete tiles is approx. 5 degrees less than the rafter pitch. To assist you, the following flashing lap table has been adjusted to rafter pitch. The total girth of the metal flashing should be the addition of the lap length + 250mm. The sections of flashing should not be more than 1.5 metres long and must lap the adjacent section horizontally by at least 150mm.

Do not forget to turn the tab of the copper clip up onto the top surface of the flashing to prevent it being lifted by the wind. The spacing of the copper clips will depend upon the exposure of the site.

### SUMMARY

- A metal flashing should always be installed at a change of rafter pitch junction.
- The first course of tiles on the upper roof slope should rest on the timber tilting fillet, rather than the head of the top tile on the lower slope.
- The lap of the metal flashing with the roof tiles of the lower roof slope is dependent upon the true pitch of the top tile.
- The tiles on any roof slope should all lie in the same plane.

### Metal flashing lap table

Rafter pitch (degrees)	17.5-19.5	20-22	22.5-27	27.5-34.5
Flashing lap (mm)	350	300	250	200

CTMA members are:

- Cemex
- Forticrete
- Lafarge
- Marley Eternit
- Sandtoft