Construction Notes - No 6 valley (Part 3)

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 concrete valley trough units.

Inclined valley
An inclined valley is the junction between two roof slopes at an internal corner. In most instances the angle of the internal corner will be 90 degrees on plan, but could be any angle up to 179 degrees. The true valley pitch is always slightly less than the rafter pitches. This is important when specifying the lap in the valley sheet material.

Valley width
Regardless of the construction of the valley, the open width of the valley trough, measured between the cut faces of the adjacent roof tiles or slates, is a function of the quantity of rainwater flowing off the roof into the valley trough. This will vary with the area of the roof that will drain into the valley trough, the pitch of the roof and the anticipated rainfall rate. For the worst case, once in 50 years, the rainfall rate should be 225mm per hour.
Depending upon the three design factors, the width of the valley may vary from 100mm to 250mm. Because concrete pre-formed valley units only come in one width, suitable for 100 to 125mm, there will be a restriction on the area of roof and the rafter pitch draining into the inclined valley (see Table 1). Therefore designers should take account of this and may need to specify a metal valley where the open width of the valley needs to be greater than 125mm.

Structure
The valley construction for concrete valley troughs is thicker than for a lead or GRP valley. To allow for this greater thickness the concrete valley trough units need to be supported on timber boards **(A)** that are set between the rafters. The top surface of the support board needs to be flush with the tops of the rafters and supported on noggins **(B)**. The width of the support board needs to be wider than the concrete valley trough unit. The support board should be stiff enough to resist the weight of a tiler standing on the valley and the weight of the valley trough units. Depending upon the rafter spacing, it is normal to use 18 to 20mm plywood or softwood boarding.

At the bottom of the inclined valley the support boards should run through to the back of the fascia board, rather than flatten out and discharge over the fascia board. This will require the fascia board to be cut down by approximately 50mm for the width of the valley. The location of the gutter will need to be adjusted. If the valley 'sprockets' to go over the fascia board the corrugations on the edge of the units will kick up the eaves tiles on each side of the valley.
A 25mm high valley batten **(C)** is needed for each side of the valley to allow the ends of the tile battens to rise and give clearance to the valley trough units. This ensures that the cut edge tiles do not kick up as they pass over the edges of the valley trough. The distance between the valley battens needs to be 10mm greater than the valley trough unit width.

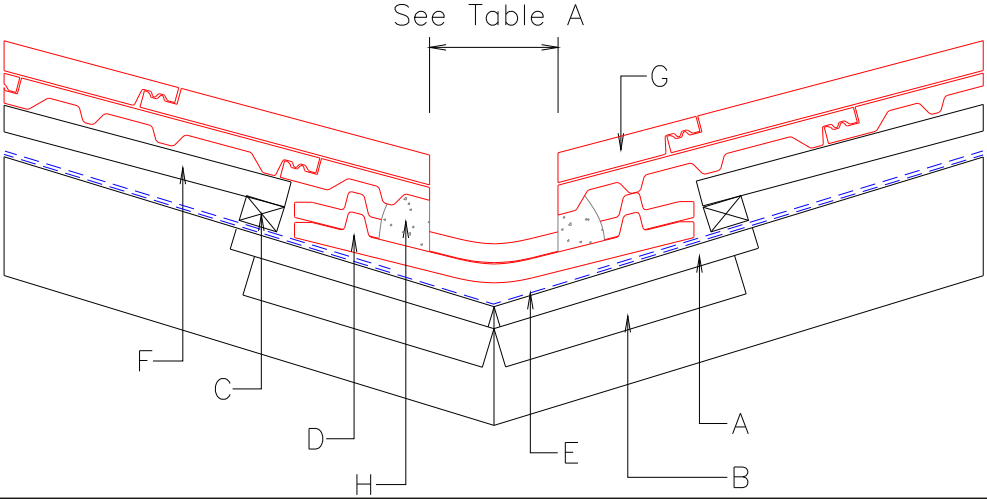
TABLE A

Roof pitch (degrees)	Width of valley gutters (mm) for rainfall rate 225mm/h draining	
	25m² and less on plan	over 25m² up to 100m² on plan
17½–22	125	–
22½–29½	100	–
30–34½	100	125
35+	100	100

See BS 6367: 1983

Valley trough unit
The concrete valley trough units **(D)** have a pre-formed cross section, are heavy in weight and come in a fixed length of 450mm. The shape is ideal for valleys between equal rafter pitches of between 22.5 and 40 degrees. Concrete valley trough units are not designed to work with steeper rafter pitches or unequal rafter pitches on either side of the valley. Each valley unit is laid in position and located against the head of the lower trough unit. The units are not nailed and are held in position by their own weight and the adjacent tiles. The headlap between each unit is set by the length of the trough and should not be reduced to save tile cutting at the head of the valley.

FIGURE 1: Valley with concrete valley troughs



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Valley trough junctions
The top and bottom valley trough units of each valley will need cutting to a 'V' shape to follow the line of the ridge and gutters. At the eaves the valley should over-sail the gutters by 50mm. Where two or more valleys meet at a change of direction in the valley, or where the valley discharges onto a lower roof, a lead saddle is needed to maintain a weather-tight junction. At the junction of two valleys and a ridge, as with a dormer, the ridge tile should stop on the edge of the valley and should not bridge across the valley onto the main roof slope.

Roof underlay
A 1 metre-wide strip of bituminous underlay **(E)** is normally laid down the centre of the valley prior to the valley battens being nailed to the valley support board. This helps to grip the units and is likely to glue itself to the underside of the troughs in hot weather. Because the units are small and the stable nature of concrete means that this will not cause any problems.
The roof underlay should finish on top of the valley battens. The underlay should not dress over the valley trough unit as any water held behind the mortar bedding could track over the edge of the valley trough unit onto the underside of the underlay.

Battens
Each tile batten **(F)** should be cut in line with the valley, finishing on the valley batten. The tile battens should progressively packed up approximately 1 metre away from the valley batten from 1mm to 24mm when they pass over a rafter. This smooth transition from the rafter level to the valley batten level will reduce the amount of gapping between the tiles. Any moisture on the underlay will drain down to the eaves uninterrupted under the raised tile battens.

Tile cutting
When laid on the battens the tiles will need to be cut **(G)** to a rake to form the faces of the open valley width. The cut on each course of tiles will be different and will result in some pieces being very small. The use of half tiles, tile-and-a-half tiles or double tiles, where available, can help to alleviate this problem. It is tempting to rough-cut the tiles into position and cut them in one pass of a disc cutter. However, this practice is not advisable for the following reasons: -

- It will be difficult to hold some of the smaller cuts while you cut them.
- The resulting dust will settle all over the roof and valley and reduce the bond of the mortar.
- Damage to the valley trough could occur if the disc cutter comes into contact with the trough.

Each piece of tile should be cut individually to a chalk line or board secured to indicate the sides of the open valley.

Mortar bedding
When all the tiles have been cut the pieces should be lifted out of the way while the mortar is laid. The mortar **(H)** should be a ratio of 1:3 cement/sand, stiff enough to stand up in a bed 50mm wide without slumping.
Each of the cut pieces of tile should be replaced and bedded onto the mortar. Where the piece of tile hangs on a tile batten it should be nailed and/or clipped. The mortar will hold in place pieces of tile that are too small to hang on a batten.
Pointing up the valley or pushing mortar in under the tiles horizontally will push mortar onto the tilt fillet and render it ineffective as a second line of defence. The mortar should be flushed up to a smooth finish ensuring that the width at the bottom of the open valley is no greater than that at the top of the tiles.

Summary

- Water on the tiles and underlay flows towards a valley. Do not block its path, but channel it towards the eaves.
- The maximum open valley width of 125mm will restrict the roof area and rafter pitch at which the valley trough can be used.
- The two lines of defence against water ingress (mortar and tilt fillet) need to be properly formed and separated from each other. Do not bridge these with mortar.
- The most critical part of any inclined valley is where it discharges into the gutters or back onto the roof.

CTMA members are:

Cemex
Forticrete
Lafarge
Marley Eternit
Sandtoft