

Slating & Tiling

TIPS 75

Slate nail hole position

The term 'centre nail slates' is misleading, as the nail fixing is not located in the dead centre of the slate or in the centre of the length of the slate. So where should the nail holes be? There are some fairly simple rules and complicated calculations to ensure that the slates are fixed in the right place.

Head lap

With double lap slates the length of the slate is equal to two gauge lengths plus one headlap length. Each slate must lap over the slate below by one gauge length, plus one headlap length, with the second gauge length extending up under the next slate to the centre of the next batten.

The horizontal line along which the nails can be fitted has to be at the lowest point where the nail will not penetrate the slate below. If it is higher up the slate it will miss the batten, unless the slates are being nailed directly to rigid sarking boards. The higher the nail fixing is up the slate the less effective to wind uplift forces they will be. The best location for the nail fixings is 3-5mm above head of the lower slate, making the nail hole position one gauge + one headlap + 4mm from the leading edge of the slate. But as the head lap and gauge dimensions can vary proportionally the headlap needs to be determined to allow the gauge to be calculated.

Take the length of the slate, deduct the headlap and divide the answer in half for the gauge dimension. For a 500mm long slate with a 100mm headlap the gauge is $500-100=400 \times 0.5=200$ mm. In this case the nail holes should be $200+100+4=304$ mm from the leading edge of the slate.

The maximum headlap dimension is defined as one third of the length of the slate, which for a 500mm long slate will be 167mm. The more critical minimum headlap is defined by the action of water held in the small gap between slates, rising up by capillarity. The minimum headlap will vary with pitch but should never

be less than 54mm. Water can rise up to 75mm by capillarity under the most ideal conditions, which are two smooth parallel surfaces approx 1mm apart.

Gaps between natural slates will vary with the texture of the slate but are likely to be worse with smooth surfaces like glass. Therefore when slates are laid on shallow rafter pitches, water will creep further up between the slates than when laid on steeper rafter pitches. This means longer slates can generally be used on shallower rafter pitches as the headlap will be bigger without exceeding the one third of the length of the slate maximum headlap rule. The calculation to find the exact minimum headlap figure can be found in clause 5.3.4.1 of BS 5534 *The code of practice for slating and tiling: 2003*. Where the driving rain exposure is higher, the capillarity can be assisted by wind-driven rain, so different values within the calculation are used for above and below the 56.51 per m² rainfall rates.

Side lap

Water running down a slate will run into the side lap joint between two slates, and soak in sideways under the adjacent slates. This water will meet the water rising from the headlap and combine in a curve between the two. All nail fixing holes in the slate should be above this curved line of water, otherwise water may run down the nail hole onto the batten or underlay below. The distance that water will seep in sideways is partially determined by the rafter pitch, the gauge, the water flow and the texture of the slate.

Normally the nail holes should be located close to the outer edges of the slate, as far away from the side lap joint of the slates above as possible. But if the side lap gap between the slate increases from the recommended 1-5mm to a maximum of 9 for fibre cement slates, sometimes more with some natural slating, the distance from the edge of the upper slate to the nail hole

reduces, making the nail hole more vulnerable. If the side lap drifts off the centre of the slates below, or if a narrow cut is introduced where two areas of slates are stitched together above a dormer, the normal nail hole position may fall within the wet area of the headlap and sidelap. This must be avoided.

Another common instance where water can reach a nail hole is when salvaged slates are reholed, either for a new headlap size, or where the original nail hole is too large and the nail head pulls through. Generally to maintain some strength in the slate around the nail hole, the new hole is punched 25-30mm away from the previous hole, normally closer to the centre of the slate, reducing the side lap distance. If the slates are very wide relative to their length, the relative performance of the slate improves as the distance to the nail hole increases, but at the expense of cost and weight. Generally the widest slate proportion is a proportion of 2:1.5 compared with the narrowest slates which are 2:1.

Edge distance

The distance a nail hole can be formed in a slate relative to the edges of a slate is determined by the strength and thickness of the slate material, and the method of forming the hole. With some slate material that is very brittle, it may be impossible to punch holes, as this would break the total slate. These slates have to be drilled, or fixed with slate hooks.

Slates that are thinner and capable of being punched cleanly can normally have nail holes formed between 25mm and 30mm from the edge; any closer and the slate will break between the hole and the edge under wind suction loads. The steeper the rafter pitch the greater the distance the nail hole can be placed in from the edge. In BS5534, formula 3 is used to calculate the minimum side lap distance between the edge of the upper



This slate has three sets of nail holes. Only one is the right size, as the slate is soft and flaking, suffering from frost delamination. Note the lines of the side and headlaps of the slate above.

slate and the nail hole position. Whilst this gives you the minimum total slate width, it can also determine the maximum edge distance for the nail hole. For example a 500 x 250mm slate laid on a rafter pitch of 25° in a moderate driving rain exposure area installed with a 100mm headlap, would require the maximum edge to nail hole distance to be 25mm. While at 60° rafter pitch the maximum edge distance rises to 42mm with the same 100mm headlap. But at 60° with a 54mm headlap the edge to nail hole distance falls back to 32mm.

Conclusion

Whilst headlap is frequently mentioned when specifying slates, side lap and nail hole position is rarely specified and so rarely measured or supervised, but in most cases is a much more important dimension, especially when slates are installed on rafter pitches below 30°. Trimming the width of a slate, or re-holing a used slate should be done in the knowledge that it may affect the weathering performance of the slates, unless the rafter pitch is higher than 45° and the headlap increased accordingly.

Tips

- Always try and maintain the half bond side lap when setting out and laying a slate roof.
- Avoid trimming the width of a slate on a shallow rafter pitch.
- Unless you are slating a very steep rafter pitch, avoid re-holing a slate more than 30mm from the edge of the slate.

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