

# Slating & Tiling

## TIPS 41

### nail holes in slates & tiles

Nail-holes in roofing slates and tiles are taken for granted. We expect them to be there, but their size, shape, and location are critical to fit the slates and tiles correctly on a roof. If they are not formed correctly they can become a big problem.

#### Why have nail-holes?

There are interlocking tiles that do not have nail-holes in them. Provided there is a means of locating and fixing the tiles against wind uplift, they are not always needed. Often they are provided if they are needed. With interlocking tiles at 45° and above, it is essential that every tile is fully nailed to prevent the tiles sliding off the battens. This means that if the tile has two nail-holes, then two nails must be used to fix it.

At below 45°, if the wind uplift forces are greater than the dead-weight resistance, and below the combined resistance of the dead weight and the nail pull-out resistance, then nailing tiles is appropriate. If the tiles in the main body of the roof do not require nailing, the perimeter tiles must be nailed to comply with BS5534, the code of practice for slating and tiling. There may also be instances in very exposed locations where tiles will need to be nailed and clipped.

Slates do not have nibs to locate them on a batten, so every slate must be nailed, or they could be hooked.

#### Location

The position of the nail-hole is critical. With interlocking tiles the nail-hole is generally located in the headlap area and should coincide with the centreline of the tile batten. If the nail-hole is outside the middle third of the batten, there is a high risk of splitting the batten. If the nail-hole is too close to the top edge of the tile, the ability of the nail to stop the tail of the tile lifting in the wind is reduced; the further the nailhole is down the tile the better. If the nail-hole is too far from the top of the tile the greater the risk of water seeping up the face of the tile by capillarity. When water reaches the nail-hole, it will drain down it, especially on shallow rafter pitches. This is often why at shallow rafter pitches

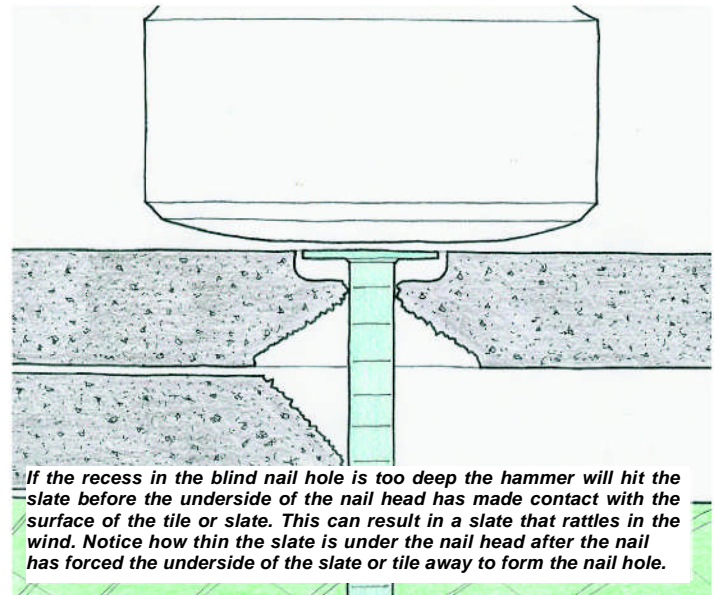
the head-lap is increased, or tiles with no nail-holes are used. The distance in from the edge of the tile is not always critical, but is best kept away from the trough of a corrugated tile or the side lap of the tiles above, especially if there is a recessed interlock.

Sometimes this is unavoidable as with a single pantile, where often the nail-hole position will restrict the minimum pitch parameter. Some tiles will have the nail-hole located in the nib where the nail is driven into the narrow edge of the batten. This location protects the nail-hole from water seeping in but has a very low wind uplift resistance and the nail can often split the thin section of the batten. Nibs are also vulnerable to being broken in transit rendering the nail fixing ineffective.

With slates, being double lap, their location is dictated by the recommended batten gauge for a given size, exposure, and rafter pitch. The nail-hole location, about half-way down the slate length, makes the ability of the nail to resist wind uplift forces that much better than if located close to the head. However, being close to the centre makes it vulnerable to water seeping sideways from the side lap of the slates above. To compensate for this the nail-holes need to be as far away from the side lap as possible, but not too close to the outer edge as the nail-hole will be weak. With some materials you can get as close as 20mm from the edge, while with others it can be as high as 40mm.

The distance the nail-hole is up, and in, from the edges of the slate above will determine its pitch performance. This is why shorter wider slates perform better than longer narrower slates at low pitches. With salvaged slates it is common practice to punch new nail-holes in the slate either closer to the centre of the slates, and/or above the original damaged nail-hole.

This practice can present problems – unless the rafter pitch is very steep water may reach a nail-hole and leak in. Also additional nail-holes will further weaken the slate at the point of maximum stress in the slate, causing the slate to fail between the nail-holes.



#### Size

The size of the nail-hole should be just a little bit larger than the diameter of the nail that is being used to fix the tile or slate. With concrete, slate and resin slate materials, the nail-hole punch has to be tapered to allow the punch to return without damaging or tearing the sides of the hole that it has just formed, so the hole will be slack under the nail head, but tight where it penetrates the batten. The nail-hole should never be smaller than the nail diameter, to prevent the correct fixing nail being used. Forcing a nail into a smaller nail-hole could damage the nail or the tile.

The underside of the nail-head should always make contact with the surface of the tile to ensure there is the minimum of tile lift before the nail starts to do its work of resisting the wind uplift forces. The bigger the gap between the underside of the nail-head and the tile, the greater the risk of tiles rattling in the wind. Some tiles have a small recess around the nail-hole to accommodate the thickness of the nail head. This design feature can prevent the underside of the nail head from making contact with the surface of the tile, especially if the nail head is very thin or the recess is too deep. It also results in the tiler's hammer coming directly into contact with the slate. The practice of leaving the tile nail clear of the surface of the tile is very common as over-driving the nail can result in the tile breaking. Skill and care can be used to ensure the underside of the nail head is as close as possible to the surface of the tile. For every 1mm the nail head is above the tile, there is 1mm less penetration of the nail into the batten, and, therefore, less grip on the nail.

With slates the nail-holes are often pre-punched for a given gauge/head-lap. Provided they are done correctly with a correctly

adjusted sharp punch the spall around the hole on the upper surface of the slate will allow the nail head to sit flush or slightly above the top surface of the slate. With a blunt punch the spall will be larger and will affect the depth of the recess and the remaining thickness of the slate around the nail-hole. With some man-made double lap slates, recessed blind nail-holes are provided to allow the slater to punch through with the fixing nail. As with interlocking tiles, the depth of the recess is critical to stop the slates rattling. Sometimes the thickness of the blind nail-hole is more than half the thickness of the slate, resulting in a large section of spall on the underside of the slate, weakening the slate around the nail-hole position. Tiles or slates with missing or poorly formed nail-holes should be rejected before or during construction as defective. It may be that the nail-hole defect can be corrected. But often it can not be and renders the tile or slate as unusable.

#### Tips

- Using a correctly adjusted nail-hole punch for slates will produce a clean nail-hole without weakening the slate.
- Drive the nail-head down to almost touch the surface of the slate or tile to give the best wind uplift performance of the nail.
- It is cheaper to install extra nail fixings during construction than to replace one broken or slipped tile or slate after the scaffolding has been dismantled.

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