

Tiling

tips: No 3

Nail fixings for tiles and slates

If you were to ask roofers how they would prefer to fix tiles or slates they would almost always say nails! Nails are cheap, simple to use and well proven. However they are not the most secure fixing for tiles or slates.

A vast range of nails in different materials are available - aluminium, copper, silicon bronze, stainless and galvanized steel - different lengths (15mm to 200mm), different diameters (1mm to 6mm) and different head types and sizes (lost head, French wire, cut clasp, wire clout, wire lath, cut lath, roofing, stack pipe and deck head), different shank types (oval, round, square, brad, ring shank, spiral and screw nails). The choice of nail is often down to what is available from the merchant, but the correct nail to be used should be specified in the contract documents or in accordance with the tile or slate manufacturer's recommendations.

The size of nail used is restricted by the thickness of the tile or slate

that it passes through and the timber thickness into which it is being fixed, such as a batten. BS 5268, *Code of practice for structural timber*, recommends that the distance from the nail to the edge of the timber should not be greater than five times the diameter (D) of the nail. This means that for a nail driven into a 38mm wide batten, the maximum diameter of nail shank is $5D+1D+5D=11D$; 38mm divided by 11 = 3.45mm diameter. This assumes that the nail will be driven precisely into the centre of the timber, which is almost impossible due to the tolerance on the position of the nail hole in the tile or slate and the angle at which it is driven. Therefore the diameter of nail is always slightly smaller than the theoretical maximum.

The greater the nail diameter and penetration depth, the greater the surface area of the nail, and the greater the grip of the timber. To obtain the maximum grip for any given nail diameter, the tile/slate nail needs to penetrate the batten to its full depth of 25mm, allowing for the point to remain in the timber. If the nail is too short or not driven fully home, less grip will be achieved. Too long and the nail point may puncture the underlay, yet achieve no extra grip. A smooth, round 2.65mm diameter nail with a 15mm penetration depth into a batten will provide about half the pull out load (grip) of a 3mm diameter nail with a full 25mm of penetration into the same batten.

Head size

The head of the nail needs to be bigger than the nail hole in the tile or slate. Most holes are slightly tapered to allow the punch that forms the hole during manufacture to retract cleanly. For most wire nails, the head diameter is twice the diameter of the shank. For clout head nails used for tiles and slates the head diameter should be four times the diameter of the shank.

The way the nail head is formed results in clout headed nails having a thinner head than a round wire nail of the same shank diameter. This may not be an issue for steel nails, but for aluminium nails it can be a problem. Hammering a nail into a batten will cause the metal in the nail head to become thinner and spread slightly. The



• The heads of 40 by 2.65mm aluminium clout head nails are very thin. Under high wind suction the left hand nail head has pulled off, the middle nail head has started to fold up and the right hand nail is new, but just as thin.

thinner the head, the weaker it becomes. There comes a point when the force needed to fold the head is less than the pull out grip of the nail shank into the batten, leaving the nail shank in the timber when the wind sucks the tile off the roof. This is often seen on plain tile roofs when they are being stripped and retilled.

Plain tiles traditionally use 2.65mm aluminium clout head nails originally used with 32mm wide battens. Now that all battens used for plain tiles should be 38mm wide and 25mm deep a 3 or 3.35 mm diameter clout head nail should be used. Better still would be a harder non-ferrous metal, but until they are available at a reasonable price this is unlikely to be recommended by tile/slate manufacturers.

Nails for fixing concrete, clay or slate should never be made of steel, regardless of whether it is galvanized or not. Stainless steel is very good, but the range of nail sizes available is limited.

The reason for not using galvanized steel nails is because of the risk of rusting. The hardness of the tiles and the softness of the zinc coating of the nail often results in the coating being scratched, exposing a small area of steel which can then rust. Steel, when it rusts, can expand to seven times its original size and break a tile or slate with the force. This can be a big problem with natural slates (nail sick) when the resulting expansion causes the lower half of the slate to break off. Similarly, timber shingles should always be fixed with silicon bronze or stainless steel nails to resist the natural chemicals in the timber.

Wind uplift

Having determined the right nail for the tiles or slates being used, its pull out strength should be compared with the anticipated wind uplift/ leverage exerted on the nails likely to occur once in 50 years. This ensures that the nails will hold the tiles or slates on the roof in windy conditions. While nailing the tiles to the battens will stop them falling off the battens, wind will still be able to lift a nailed tile until the slack in the nail has been taken up.

Roofers rarely drive nails hard down onto the face of the tile or slate for fear of breaking them - they tend to leave about 0.5mm slack. If the anticipated wind uplift is found to be higher than that with which the nails can cope, an alternative is needed. Ring shank or spiral nails will provide more pull-out grip than a smooth round nail for the same diameter and penetration depth. Alternatively clips may be used, but each will have a different value that will also need to be calculated and compared. It's easier to get a fixing specification from the tile or slate manufacturer and stick to it.

Next month: Flashing laps



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