

Windloading

Under strong wind gusts the uplift of the roof tiles may be in excess of the dead mass of the tiles, hence requiring them to be securely fixed to prevent them being lifted from the building.

Wind Loadings/Tile Fixing

The principal factors to be considered in deciding on the necessity for additional mechanical fixings are:

- 1.The exposure and location of the site.
- 2.The height of the building.
- 3.The roof pitch.
- 4.The higher wind loadings encountered at eaves and verges.

Where a building is complex in shape, located on steep sloping ground or near to the edge of a cliff, further advice should be obtained.

Recommended Nailing/Clipping as per requirements given in compliance with the Irish Code of Practice for Slating and Tiling I.C.P.2: 2002.

- In the green area of the map every tile should be nailed or mechanically fixed.
- In the blue area each tile in every alternative course should be nailed or mechanically fixed.
- On all sites, every edge or perimeter tile should be nailed or mechanically fixed. In the case of valleys, the first full tile should be nailed or mechanically fixed.
- On exposed sites and in built up areas subject to adverse wind effects such as funnelling, every tile should be nailed or mechanically fixed within the blue area.
- On all roofs at pitches above 45°, each tile should be nailed or mechanically fixed.
- On all roofs at pitches of 55° and over, in addition to nailing each tile, the tail of each tile should be mechanically fixed.

Exposed buildings

For the purposes of selecting appropriate mechanical fixing, buildings in the following circumstances are considered to be exposed:

- (a) any building which stands above its surroundings or has a ridge height in excess of 12 metres above adjoining ground level, or
- (b) any building on a hill slope or hill top, or
- (c) any building in a built up area which is subject to adverse wind effects, such as funnelling, or
- (d) any building which is located in the green area of the map.

Severely exposed buildings

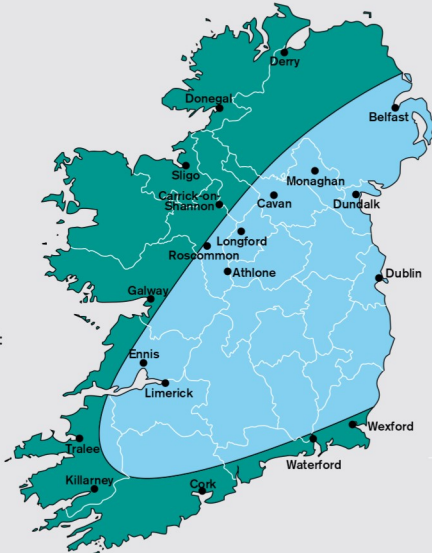
For the purposes of selecting appropriate mechanical fixing, buildings located in the green area of map which are in the following circumstances, are considered to be severely exposed:

- (a) any building which stands above its surroundings or has a ridge height in excess of 12 metres above adjoining ground level, or
- (b) any building on a hill slope or hill top, or
- (c) any building which is subject to adverse wind effects, such as funnelling.

In summary, minimum fixing requirements for single lap tiles:

Pitch	Fixing requirements
Pitch ≥ 55°	All exposure conditions: every tile head nailed and tail clipped
Pitch > 45° and < 55°	a) Normal building: every tile head nailed or tail clipped b) Exposed or severely exposed building: every tile head nailed and tail clipped
Pitch ≤ 45°	a) Perimeter* area, normal building : every tile head nailed or tail clipped b) Roof area excluding perimeter*, normal building : every tile in every alternate course head nailed or tail clipped c) Exposed building: every tile head nailed or tail clipped d) Severely exposed building: every tile head nailed and tail clipped

*All tiles at eaves, verges, ridges, hips and tiles adjacent to valleys, abutments, chimneys, rooflights, etc.



The map shows Ireland divided into two zones on the basis of wind speeds

Introduction

This section is a practical guide to general good practice on site, applicable to all tiled pitched roofs. It is based on the Irish Code of Practice for Slating and Tiling I.C.P. 2: 2002 and Roadstone's long experience in roof tiling. For fixing details see pages 40 to 50. The performance of the finished roof is dependent on quality of workmanship, and Roadstone recommend the use of experienced roof tiling contractors.

UNDERLAYS

Materials

Underlays which are not fully supported, that is draped over rafters, should be either an approved high performance roofing underlay or reinforced underlay type 1F or 5U manufactured in compliance with IS 36.

Laps

Vertical laps should be not less than 100mm and each end of the underlay should be securely fixed over the rafters. The fixings should be not less than 50mm from the edge of the underlay.

Horizontal laps should be:

Rafter pitch	Minimum horizontal lap
Less than 22.5°	225mm
22.5° and under 35°	150mm
35° and above	100mm

The horizontal laps should preferably be under a batten with at least 25mm of underlay projecting beyond each end of the batten. Where a lap occurs between battens, it should be held down by an extra batten to restrain the lap from opening under wind uplift.

Details

Eaves: Underlay at the eaves should be as a minimum of type 5U quality, it should drain any water into the eaves gutter and should extend over the tilting piece and fascia board and well into the gutter. Water traps behind the fascia board must be avoided. Where the Roadstone Eaves Ventilation Tray is used this acts as a tilting fillet and extends into the gutter, in this case lay underlay just short of the Over-Fascia Ventilation Grille.

Hips: a strip not less than 1m wide should be laid over hips, overlapping the underlay of the main roof.

Verges: underlay should be carried across the wall cavity.

Nail Holes

Holes in underlay should be kept to minimum. Where it is necessary to nail underlay, use galvanised clout (large head) nails. It is also recommended that at pitches below 25°, approved high performance roofing underlay should be used.

TILING

Setting Out

Careful setting out makes the actual tiling faster and will contribute to the finished appearance of the roof. It helps to avoid problems such as unequal over-hangs at verges and often makes it possible to avoid a lot of tile cutting at abutments, chimneys and similar obstructions. All Roadstone interlocking tiles have a tolerance of approximately 3mm in the sidelocks, giving considerable adjustment over the full width of a roof. With the use of half tiles where applicable, it is usually possible to avoid cutting. Joints between plain tiles should be slightly open. This also allows flexibility in setting out.

Method

Lay a course of tiles over the full length of the eaves, starting with the correct tile overhang at the right hand verge. When the left-hand verge is reached it will be apparent that by opening or closing all the tile joints, and if necessary substituting a half tile for a whole tile, equal verges can be achieved without cutting.

Perpendiculars

Strike perpendicular chalk lines from eave to ridge at three-tile intervals. Lay tiles with their edges along these lines and all will be truly perpendicular.

Horizontals

Alternative methods are:

1. Use a chalk line to ensure that each horizontal course is true, straight and square with the perpendiculars.
2. Use two timber distance pieces, each the length of the batten gauge minus the width of one batten. This method is particularly suitable for vertical tiling.
3. Mark the batten gauge on a rod by saw cuts, and use the rod as a guide to mark the underlay.

Positioning battens

For single-lap tiles the batten which is to carry the first or eaves course must be positioned so that the bottom edge of the tiles will be over the centre of the gutter. This normally requires an overhang of 50mm to 65mm for a 100mm gutter. Positioning of top and bottom battens must take into account the location of the nibs in relation to the top of the tile. For plain tiles the battens for the eaves undercourse must be positioned so that the tails of the undercourse and the first tile course line up.

Batten Gauges

The distance from the top of the eaves batten to the top of the top batten must be divided into equal amounts, (the batten gauge), which must not exceed the gauge recommended for the tile to be fixed.

Eaves Fascia

The eaves course of tiles must follow the same plane as the rest of the roof. To achieve this the fascia board must project above the top edge of the rafter by the depth of batten section plus the overall thickness of tile at its bottom edge (plus the thickness of the counter batten on a boarded roof).

The design of a bellcast or sprocket at the eaves is not recommended particularly when the pitch of the main roof is less than 30°.

Battening Sizing

Minimum batten sizes (in mm) as shown

Rafter Centres	450mm			600mm		
	width	depth		width	depth	
Single lap tiles	47	x	35	47	x	35
Plain tiles						
Pitched roof	35	x	22	47	x	35
Vertical tiling	35	x	22	47	x	35

Batten Fixing

Battens should be in not less than 1200mm lengths, and should be long enough to be supported at each end and intermediately by at least three rafters, trusses or walls. Battens must not be cantilevered or spliced between supports. Batten ends should be cut square and nails skew driven on each side of joints. Not more than one batten in four should be joined over any one truss or rafter. Battens on boarded roofs must be supported on counter battens to increase ventilation under the tiles and allow free drainage of any water that may reach the underlay. Counter battens must be fixed through to the rafters and not to the boarding alone.

Batten Nails

For duo pitch roofs of not less than 17.5° pitch with ridge height not exceeding 12m and where the basic wind speed does not exceed 48m/s, battens should be nailed with 3.35mm diameter x 80mm long round wire nails. For more severe conditions, annular ring-shank nails of the same diameter should be used.

Tile Fixing

See Windloading (page 50) for tile fixing specifications according to conditions.

Clipping

See Clips (page 48-49) for Roadstone fixing clips.

Mortar Bedding

All mortar used for bedding roof tiles and accessories must be 1:3 cement to sharp sand. Plasticisers may be added in accordance with manufacturer's instructions. Units to be bedded (ridges, hips, verge tiles etc.) should first be soaked in water. Bedding mortar should be squeezed down and struck off to give a clean face, pointing should not be carried out subsequently or with different materials. Pigments complying with BS 1014 may be added in a proportion of not more than 1:15 per cement content. Too much pigment can impair the final setting of the mortar.

Flashings and Soakers

Materials for flashings, soakers and saddles should preferably be lead to IS/EN 12588 of the following minimum thicknesses:

Soakers	Code No. 3,	1.32mm thick.
Flashings and Saddles	Code No. 4,	1.80mm thick.
Valleys	Code No. 5,	2.24mm thick.

To avoid staining of the roof tiles the lead should be pre-treated with patination oil.

Other materials complying with the relevant IS/EN standard may also be used. To avoid the risk of bimetallic corrosion there should be no contact between different metals. Special attention should be given to detailing of flashings and underlay at abutments to chimneys and roof lights.

Roof Details

General good practice for traditional details is given below. Where Roadstone dry roofing systems are used, the manufacturer's instructions should be followed.

Ridge

Bedded Ridge

Edge bed all ridge tiles in mortar and solid bed all ridge joints. Only the end ridge tiles should be solid bedded. Where solid bedding occurs the mortar should be thinned out with pieces of broken tile, to reduce the mass of bedding and thus the risk of cracking due to drying shrinkage. Four-point bedding (a dab of mortar at each corner of the ridge tile) is bad practice and should not be permitted.

Plain Tiles

Fix top tiles using a Roadstone top tile clip. Where Roadstone Dry Ridge System is used this mechanically fixes the top tile and clips are not required.

Eaves

Single Lap Tiles

No mortar or undereaves course is to be used. The eaves course must be in the same plane as the other tiles. See *Setting Out* on previous page. Sprocketed eaves are not recommended with single-lap tiles.

Plain Tiles

Eaves are to have double courses, laid broken bonded throughout, using purpose-made eaves/top tile for the undercourse. Tiles of under-course and first course should line up.

Sprocketed Eaves

Pitch should not be less than 35°. If the pitches of the main roof and the sprocket differ by more than 5° lead soakers should be used.

Verges

Single Lap Tiles

All single lap tiles have their side lock on the left; work must therefore start at the right hand verge and finish at the left.

Undercloak Verge

Nail the undercloak to the end rafter, or bed it on to the brick wall ensuring the underlay is under the undercloak. Bed tiles in mortar on the undercloak, cutting back the mortar to form a sloping face; this will assist drainage and give a thinner appearance to the mortar. This is suitable for a 38mm to 50mm over-hang. The undercloak course must not tilt inwards. A suitable undercloak material is fibre cement strips/slates 6mm thick and 150mm wide, laid rough side up and nailed at not more than 300mm centres. For single lap slates (Roadstone Slate) the right hand verge is formed with half slates and full slates in alternate courses to maintain broken bond. The left hand verge is formed with half slates and purpose made left hand verge slates in alternate courses.

Plain Tiles

Plain Tiles are laid broken bonded using tiles and tile-and-a-half tiles in alternate courses at both verges.

No cut tiles should be used at verges. If cutting is necessary this should be carried out equally on two or three tiles, located some three of four tiles in from the verge.

Abutments

Tile or cement fillers should not be used. Use tiles and half tiles etc. as for verges to minimise cutting and maintain broken bond where appropriate.

Valleys and Hips

Tile Cutting

For raking cuts at valleys and hips, mechanical cutting is preferable to hand cutting since it gives a better appearance and avoids small body cracks. Cutting of tiles should be carried out off the roof slope.

Fixing

All cut tiles must be carefully bedded in mortar. If the nail holes are cut away the side of the piece must be notched and supported with a nail. Small cut tiles at hips can sometimes be supported by driving a long nail into a batten or hip rafter to prevent them slumping when the hip tile is pressed home. Cutting bold-profile tiles often produces a deep mortar bed which may shrink on drying, resulting in cracking or loss of adhesion between mortar and tile. On hips, the use of dentil slips set in the bedding should be considered to thin out the mortar and improve appearance. When forming a valley with interlocking tiles, great care must be taken not to leave any mortar in the sidelocks of the cut tiles, otherwise water will build up in the channels and spill back into the roof. For lead valleys, lengths of the lead sheet should not exceed 1.5m with laps of 150mm.

Provision should be made for a slip layer between the mortar bedding and the lead sheet. The use of secret valleys is not recommended because of the difficulty of keeping the drainage channel clear. Hip tiles should be edge bedded in mortar, with solid bedding at butt joints.

Vertical Tiling

Vertical tiling may be fixed to battens, or to battens on counter battens. Counter battening reduces the amount of fixing direct to a solid wall. When tiling to a timber framed construction a suitable breather membrane or vapour barrier must be provided as appropriate. Two vapour barriers in one cavity are not recommended. Spacing of counter battens should not exceed those given in BS 5534: Part 1 Table 3. The top edge should incorporate an eaves/top tile; where under a window sill or soffit a lead flashing should be dressed down over the top course. The bottom edge should have double coursing throughout using Roadstone Eaves/Top Tiles for the undercourse. For abutments etc. use tiles and tile-and-a-half tiles in alternate courses to maintain broken bond.

SAFETY

These notes are based on the Health and Safety Authority Code of Practice H.S.A.: C.P.: 2005 Safety in Roof Work, which lays down the requirements for the protection of persons who work on sloping roofs and on or near fragile materials. It is the responsibility of employers, employees and the self-employed to ensure that legal requirements are complied with.

Any form of completed roof or vertical work must be treated as fragile. An adequate number of crawling boards, ladders, hooks etc. should be used, properly supported and securely fixed or anchored in such a manner as to prevent slipping or tipping. In some cases it will be necessary to provide parallel sets of crawling boards with a bridge between to form a working platform. In addition where a person is liable to fall more than 1.98m from the lower edge of a sloping roof, a barrier must be provided at that edge to prevent such a fall. Alternatively the work must be done from a securely supported working platform, which is not less than 440mm wide and is fitted with guardrails and toe boards. The regulations also require precautions to be taken when access ladders are used. The requirements to secure ladders should be particularly noted. Ladders should not be rested against verges because of the uneven support and the risk of damage. Similarly, to avoid damage to eaves gutters, ladders should not be rested against gutters but blocked out to clear the gutter and then secured. Great care should be used when fixing eaves gutters immediately below valleys, particularly where valley troughs are used; these are vulnerable to breakage and should not be levered. Packing (e.g. sacking, rubber sheet) should be used under crawling boards, ladders, hooks etc. to protect the tiles from possible breakage. Materials and tools should be carried, not dragged over the roof. Materials stacked on the roof should not overload the battens, boarding or roof structure, and should be evenly distributed to avoid permanent distortion of the roof.