INDEPENDENT SLATE SUPPLIES

ISS Natural Slate Roofing
Technical Guide 2020

Natural Roofing Slate, Flooring and Sills

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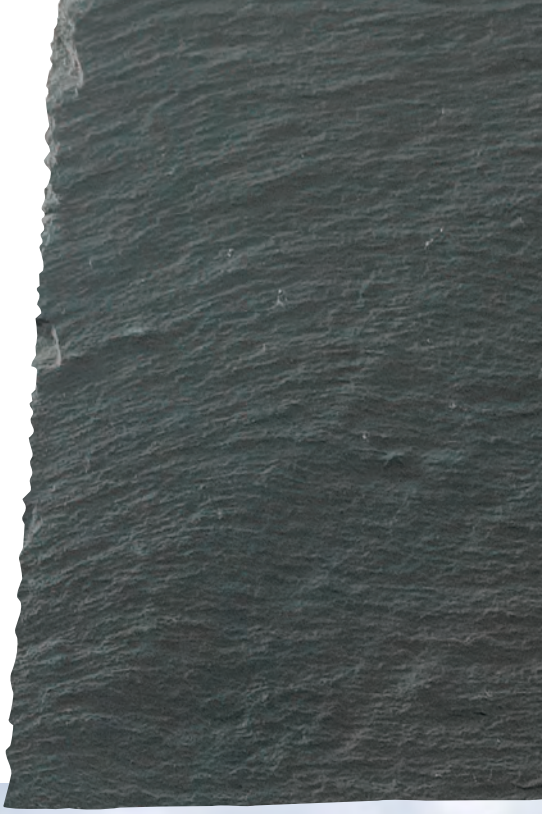
Depots in England, Wales and Scotland.

INDEPENDENT SLATE SUPPLIES

Where quality comes naturally



Company Background

During the 1950s and 1960s Len Phipps grew a successful roofing contracting business serving the south west. In the 1980s, faced with the challenge of erratic supply of indigenous slate, his son Peter discovered new sources in Spain and Brazil. Good contacts, reliability and regular supplies lead a growing number of local roofing merchants to rely on Peter for their natural slates. ISS's ethos of customer service has developed this into today's flourishing business serving the UK roofing merchant.

ISS's commitment to a stockholding in excess of £3.5 million at any one time, means consistent availability of natural slate.

SITE GUARANTEE SPECIFIC

CE

EU Construction Products Regulations, which currently apply in the UK, require any natural slates offered for sale in the UK to display CE Marking. Certification must be made available, if requested, in compliance with the procedures laid down in the relevant UK standard, BS EN 12326-1: 2014 detailing the test results and classifications to be shown on commercial documents.

UK Building Regulations require only CE marked products are used in cases where a directive, such as the CPR exists. Local Authority Building Control Departments enforce these regulations therefore you should be prepared to provide full certificates from your natural slate supplier.

Contents

Slate minimum pitch

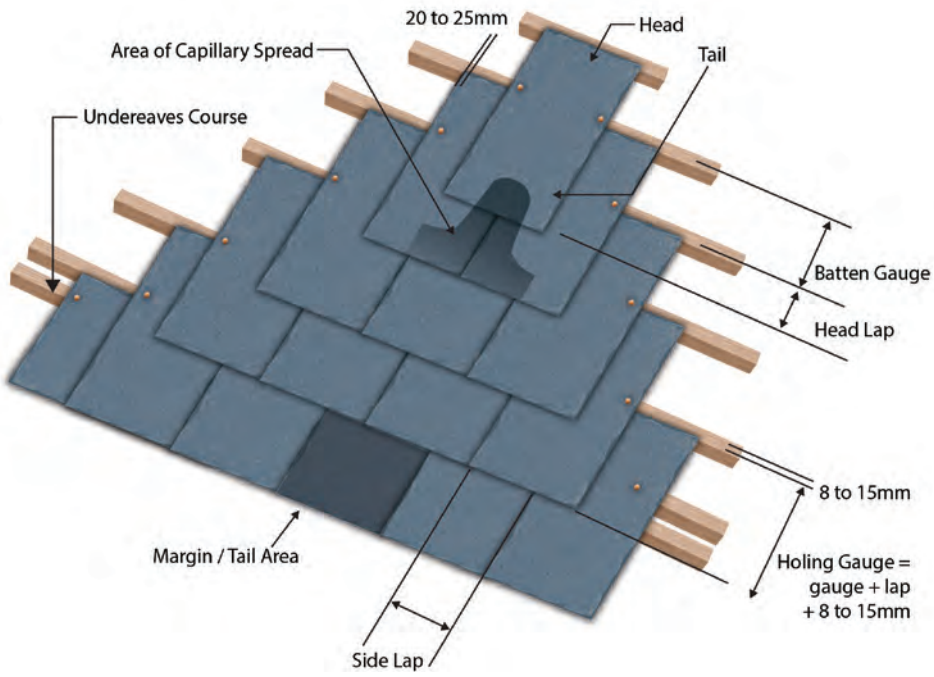
Slate dimension in mm	Minimum pitch degrees, severe exposure location	Minimum pitch degrees moderate exposure location	Number of slates per m2 at 90mm headlap
40x20	30	30	31.5
40x25	30	30	25.3
50x25	27.5	22.5	19.1
50x30	22.5	20	16.0
60x30	30	25	12.9

The principles of double lap slating

Every part of the roof slope is covered by at least two thicknesses of slate. The tails of slates in one course overlap the heads of the slates in the next course but one below. This is the 'lap' or head-lap. The lap provides protection against rain and snow being driven between the joints and passing upwards over the heads of the slates into the roof-space. Water running down the roof and entering the narrow gap between the slates, creeps diagonally down and across the roof as shown. The lower the roof pitch the wider the area of potential water penetration and the greater the danger of water entering the nail holes of the slates in the course below.

The lap is calculated according to the exposure rating of the site and the chosen slate dimension.

Key terminology on a double lapped slate roof slope



The key UK standard for natural slates is, BS EN 12326-1:2014 Slate & Stone for discontinuous roofing and external cladding. Specifications for slates and carbonate slates.

ISS TIP

Tests from other jurisdictions "accreditations" and associated logos should be considered as purely advisory.

The standard does not offer a simple pass or fail criteria, rather it attempts to categorise slate according to various criteria, with the intention that well-informed users can determine what thickness a given slate should be for it to be satisfactory in given climatic conditions. Furthermore, much of the testing and results required by the standard should be undertaken annually or every 25,000 tons of production by the quarry.

Strength -Slate should be strong enough to be used in the UK climate. The best slates commonly available in the UK, between 4-6mm thick exhibit a Characteristic Modulus of Rupture (CMoR) of approximately 70 MPa. Slates with a CMoR of around 35 MPa slate can be used successfully if they are correspondingly thicker, up to around 10mm thick.

Slate - Structure and composition

Test	Measures	Classification	Result/action required
Water absorbtion	Structural weakness. The more absorbent a slate is the faster it will weather, particularly on exposure to frost.	W1. If the slate absorbs (≤ 0.6%) of its mass it reaches the top rating.	Suitable. No further action.
		If the slate absorbs more than 0.6% it achieves W2.	Slate must undergo a freeze-thaw test. Slate can only be used if the result reveals no deterioration in strength.
Thermal cycling	Identifies inclusions which could cause premature failure.	T1. No change in structure, no runs of discolouration.	Suitable. No further action.
		T2. No change in structure, discolouration and runs of discolouration permissible.	T2 slates can be selected if they contain a low carbonate content i.e. less than 5%
		T3. shows the presence of metallic minerals that risk forming holes in the slate.	Not suitable as a weatherproof roof covering.
Exposure to sulphur dioxide *	Ability to resist degradation due to acidic pollution.	S1 slate is not affected by strong exposure to sulphur dioxide.	Acceptable in all conditions.
		S2 exhibits a surface softening in the top 0.7mm of the slate.	Slate should be thicker in proportion to the depth of softening.
		S3 is affected even by exposure to weak sulphur dioxide	Slate must be minimum 8mm thick upwardly adjusted according to strength AND depth of softening.

**The higher the carbonate content the thicker the slate should be. The higher the carbonate the more likely the discolouration. Slates with a carbonate content less than 20% are suitable for use in the UK and are classified S1, 2 or 3.*

Declarations of Performance

These are referred to in the standard as "Accompanying Commercial Documents" and show the annual/every 25,000 tonnes of production test results. These are summarised on labels fixed to every crate.

Exposure

Natural slates from ISS, have been supplied to roofing projects in all regions of the British Isles, providing attractive weatherproof roof coverings whatever the exposure rating or local micro-climate.

Moderate Exposure:

Lowland and inland locations, generally in eastern regions, where lower roof pitches can be specified.

Urban Exposure:

Tend to be sheltered locations, but due to the presence of adjacent buildings of various heights local turbulence may need to be considered when specifying pitch and lap.

Coastal:

Locations within approximately 30 miles of western coastlines are exposed to high winds, severe driving rain and corrosive sea-salt. Steeper pitches, longer headlaps and top quality slates should be specified.

Exposed Rural and mountain:

High winds and driving rain require steeper pitches and longer headlaps. Smaller dimensions which give more fixings per square metre should be considered.

Protection from driving rain

The UK is susceptible to severe driving rain and it is essential that the exposure category of the site is correctly ascertained as this can influence the minimum roof pitch, slate size, head-lap, and rafter length that can be used. Generally, any part of the country within 30 miles of a west facing coast is classed as severe, the shallower the roof pitch the greater the headlap should be. Slates of a width greater than 50% of the length can also be used to mitigate the effects of shallow pitch on the angle of creep.

Roof features such as hips or valleys have a lower pitch than the main area of roof. Such features are generally 5-8° less than the rafter pitch. The minimum pitch of the main roof should therefore be raised to accommodate such features.

Categories of Exposure to Driving Rain

The expected degree of exposure can be determined by reference to the UK map of windspeeds and driving rain annual index which has been derived from BS 8104: 1992 and BRE 262 [27] and can be used when designing buildings up to 12m ridge height. For buildings above 12m in height, the influence of increased windspeed can be determined using BS EN 1991-1-4:2005 +A1:2010. For the Scilly Isles and Channel Islands assume Severe/ very severe

Recommended headlap, Batten Gauge and holing Gauge.

Severe Exposure – more than or equal to 56.5l/m² per spell					
Pitch Degree	Slate Size mmxmm	Minimum Headlap mm	Slates no/m²	Batten Gauge mm	Holing Gauge mm
85°	500 x 250	65	18.00	218	293
	450 x 220	65	23.03	193	268
	400 x 250	65	23.40	168	243
	400 x 200	65	29.10	168	243
	350 x 200	65	34.20	143	218
	300 x 200	65	41.50	118	193
45° - 75°	600 x 300	70	12.40	265	345
	500 x 300	70	15.20	215	295
	500 x 250	70	18.20	215	295
	450 x 220	70	23.90	190	270
	400 x 250	70	23.80	165	245
	400 x 200	70	29.60	165	245
	350 x 200	70	34.80	140	220
	300 x 200	70	42.40	115	195
40°	600 x 300	80	12.60	260	350
	500 x 300	80	15.60	210	300
	500 x 250	80	18.70	210	300
	450 x 220	80	24.02	185	275
	400 x 250	80	24.50	160	250
	400 x 200	80	30.50	160	250
	350 x 200	80	36.10	135	225
	300 x 200	80	44.30	110	200
35°	600 x 300	90	12.90	255	355
	500 x 300	90	16.00	205	305
	500 x 250	90	19.10	205	305
	450 x 220	90	24.69	180	280
	400 x 250	90	25.30	155	255
	400 x 200	90	31.50	155	255
	350 x 200	90	37.50	130	230
	300 x 200	90	46.50	105	205
30°	600 x 300	100	13.10	250	360
	500 x 300	100	16.40	200	310
	500 x 250	100	19.60	200	310
	450 x 220	100	25.40	175	285
	400 x 250	100	26.10	150	260
	400 x 200	100	32.50	150	260
	350 x 200	100	39.00	125	235
	300 x 200	100	48.80	100	210
27.5°	500 x 300	110	16.80	195	315
	500 x 250	110	20.10	195	315
25°	500 x 300	120	17.30	190	320
22.5°	500 x 300	130	17.70	185	325

Moderate Exposure – less than 56.5 l/m² per spell					
Pitch Degree	Slate Size mmxmm	Minimum Headlap mm	Slates no/m²	Batten Gauge mm	Holing Gauge mm
85°	500 x 250	50	17.40	225	285
	450 x 220	50	22.20	200	260
	400 x 250	50	22.40	175	235
	400 x 200	50	27.90	175	235
	350 x 200	50	32.50	150	210
	300 x 200	50	39.00	125	185
45° - 75°	600 x 300	55	12.00	273	338
	500 x 300	55	14.70	223	288
	500 x 250	55	17.60	223	288
	450 x 220	55	22.45	198	263
	400 x 250	55	22.70	173	238
	400 x 200	55	28.30	173	238
	350 x 200	55	33.10	148	213
	300 x 200	55	39.80	123	188
40°	600 x 300	60	12.14	270	340
	500 x 300	60	14.90	220	290
	500 x 250	60	17.83	220	290
	450 x 220	60	23.31	195	265
	400 x 250	60	23.07	170	240
	400 x 200	60	29.69	170	240
	350 x 200	60	33.64	145	215
	300 x 200	60	40.65	120	190
35°	600 x 300	70	12.40	265	345
	500 x 300	70	15.20	215	295
	500 x 250	70	18.20	215	295
	450 x 220	70	23.39	190	270
	400 x 250	70	23.80	165	245
	400 x 200	70	29.60	165	245
	350 x 200	70	34.80	140	220
	300 x 200	70	42.40	115	195
30°	600 x 300	80	12.60	260	350
	500 x 300	80	15.60	210	300
	500 x 250	80	18.70	210	300
	450 x 220	80	24.02	185	275
	400 x 250	80	24.50	160	250
	400 x 200	80	30.50	160	250
	350 x 200	80	36.10	135	225
	300 x 200	80	44.30	110	200
27.5°	600 x 300	85	12.70	258	353
	500 x 300	85	15.80	208	303
	500 x 250	85	18.90	208	303
25°	600 x 300	95	13.00	253	358
	500 x 300	95	16.20	203	308
	500 x 250	95	19.40	203	308
22.5°	500 x 300	105	16.60	198	313
	500 x 250	130	17.70	185	325
20°	500 x 300	115	17.00	193	318

Fixings – Specification for nails and hooks

Any nails, hooks or clips used throughout the roof structure should all comply with the recommendations in the latest version of BS 5534.

Single slates are commonly fixed with two centre nails. Nails should not be driven too tightly into the slate or damage may result: allow light freedom of movement. The head of the nail should fit into the depression around the fixing hole.

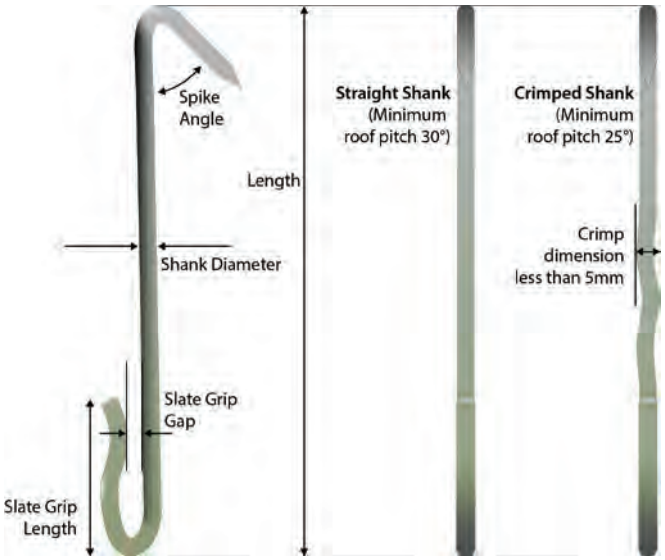
Slate and a halfs are fixed with 3 nails.

Specification for slate nails			
Nail head	**Nail shank diameter**	**Nail length**	**Type**
10mm	3.35mm	Nail length must be 20-25mm plus 2 x slate thickness - longer nails must be used at eaves.	Copper, aluminium

Copper Nails and Aluminium Nails should conform to the latest version of BS 5534.

Specification for slate hooks	
Hook Part	**Dimension**
Hook length	Head-lap plus 5-10mm
Shank diameter	>2.70mm; and less than the thickness of the slate
Slate grip gap	Small enough to hold the slate securely but not so small as to damage the slate
Slate grip length	16.0mm +/- 2.0mm
Spike length	Slate thickness + 20.0mm, or to resist the calculated wind uplift, whichever is larger
Spike angle	70° +/- 5°
Crimp dimension	<5mm

Slate hooks - spiked



Hooks should be formed from stainless steel wire conforming to BS EN 10088-3:2014 and conforming to the values determined by testing shown in Annex J of BS 5534:2014+A2:2018. Hooks should be of 316 grade stainless steel. When hook fixing, additional nail fixings should be used at eaves, ridges, top abutments, verges, hips, valleys and side abutments. Crimped hooks MUST be used at pitches 30° and less. Hooks should NOT be used at pitches less than 25°. Batten hooks are NOT recommended.

Flashings and soakers – Specification for leadwork

Application for roof work	Moderate Exposure - BS EN 12588 code number minimum	Severe Exposure BS EN 12588:2006 code number minimum	Maximum lead length in m
Soakers	3	3	1
Chimney Flashings	4	5	1.5
Pitched Valley Gutters	4	4	1.5
Ridges	4	6	1.5
Hips	4	6	1.5
Parapet, box & tapered gutters	5	6	
Apron and Cover Flashings	4	5	
Dormer Cheeks	4	5	
Dormer Roofs	4	5	
Hip and Ridge Flashings	4	5	

Lead Thickness (mm)	Lead Weight kg/m²	Lead Colour Code BS EN 12588:2006
1.32	14.97	Green 3
2.24	25.40	Red 5
1.80	20.41	Blue 4
2.65	30.05	Black 6

Lead develops a patina of lead carbonate, which can be washed away by rain-water. This can cause staining on slates and other materials. To prevent this, the lead should be treated –on both sides – with patination oil as it is fixed in place.

Installation

Preparation

Before commencing work, check battens, roofing underlays, fixings, fittings and slates are identified by third-party certification markings or other certification of conformity, or by manufacturers' labelling.

NOTE The Construction Products Regulation (EV) No 30512011 (CPR) [3J, requires all construction products manufactured to a harmonized European standard to be CE marked and supported by a current Declaration of Performance, made available by the manufacturer.

Grading and sorting as specified in Code of Practise, BS 8000-6:2014 Workmanship

Even the most consistent natural slates should be graded. Sorting & grading of slates prior to fixing is imperative when slating a roof. Slates should be sorted into three or four groups of equal thickness. Lay slates of equal thickness in any one course with the thicker end at the tail. Slate the roof with the thicker slates in lower course & thinner slates in upper courses. Slates must be graded on the ground, before being lifted to the roof. In order to give an improved aesthetic with regards to thickness & colour variation, furthermore it offers a stronger resistance to wind lift. Slates that are not sorted before fixing, do not lay true, create unsightly and dangerous gaps and result in unattractive uneven roof slopes with, "bird-mouthed," slates.

Slates graded and sorted into batches of equal thickness prior to installation

The result of installing slates without prior grading, slates of varying thickness in the same course, an unsightly, "gappy" roof slope!

Marking – out the roof

For a neat, accurate finish it is recommended to use a chalk line to mark out the correct batten gauge on the underlay. When gauge has been established it's good practice to square the roof before perping the slate bond. To mark the perpends of the slates on the battens (making allowance for the 5mm perpend gap between slates) as well as the half-bond and also the head line of the slates on the battens.

Use of chalk line to mark, perpends, half bond and slate head-line.

Eaves

A double course of slates is used at eaves. The under-eaves slates is laid face down and head-nailed to the eaves batten or an extra batten. The tail of both courses should align and they should overhang the eaves, the edge of the fascia board, tilting fillet or wall face by no less than 50 mm with effective drainage into the gutter;

The first full course of slates overlaps the undereaves course with the joints located over the centre of the under-eaves slates.

Undereaves course laid bed up.

ISS TIP

Undereaves slate length = batten gauge plus headlap plus overhang

ISS TIP

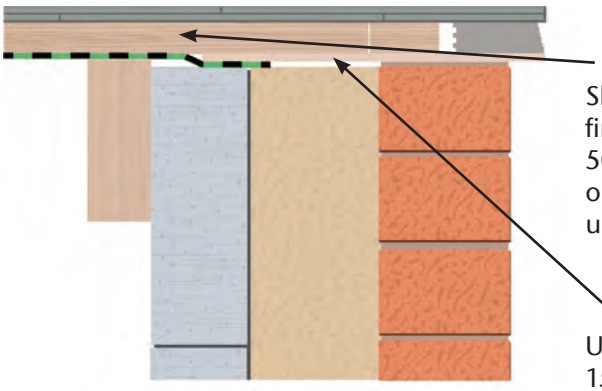
Bedding mortar for verge 1:3 cement to sharp sand. Add a plasticiser to aid adhesion

Verge on brickwork and verge on bargeboard

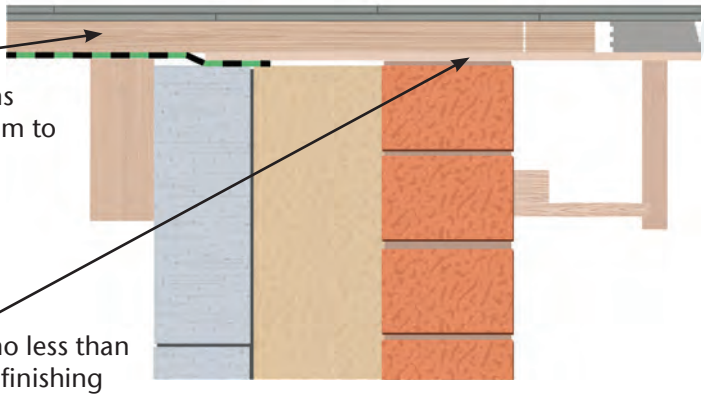
Verges are detailed with a slate and either a slate-and-a-half or a half-slate (not less than 150 mm in width to ensure adequate strength) in alternate courses.

Butt joint flat strips of material (undercloak) up the length of the last rafter, from eaves to ridge to support a bed of mortar. The undercloak is gripped between the slating battens and nailed to the bargeboard or flying rafter.

Verge on brickwork



Verge on bargeboard



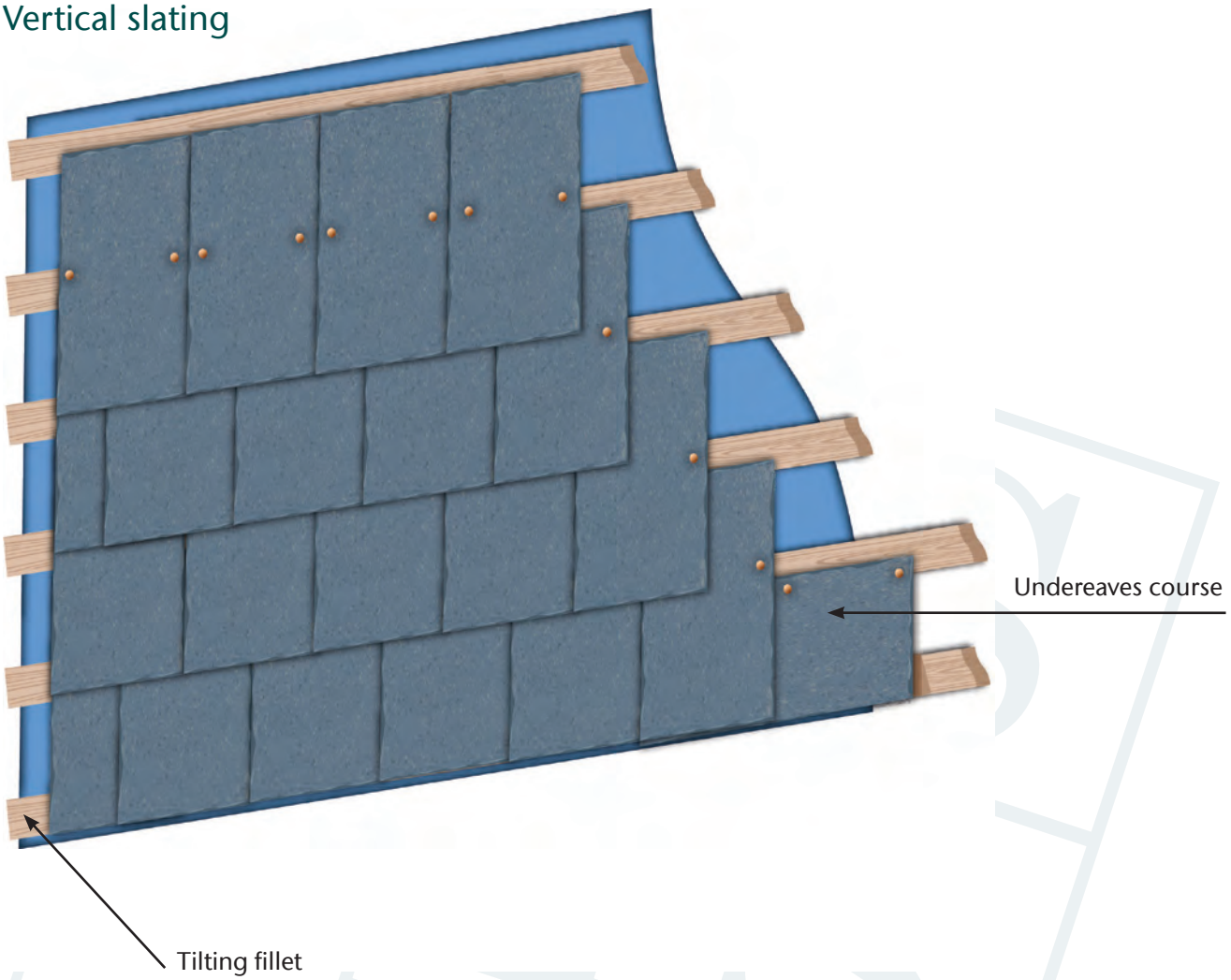
Slating battens finishing 25mm to 50mm from outer edge of undercloak.

Undercloak, no less than 150mm wide finishing 38mm to 50mm over the outer edge of bargeboard/ gable wall. Undercloak should be bedded to the block / brick work.

Vertical slating e.g. on gable end or dormer

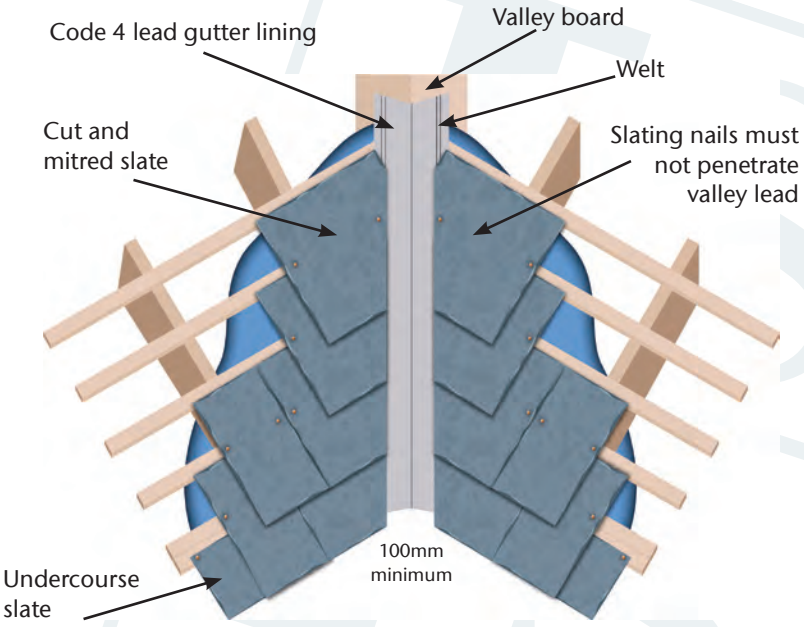
Slating on the vertical follows the basic principles of pitched slopes preventing rain and snow reaching the building fabric. The vertical array commences with an under-eaves course and a tilting fillet. The head-lap should be not less than 44.5mm. A felt or equivalent moisture barrier is installed behind the slating on solid brick or block work walls. If the building is timber framed a 'breather' membrane should be used.

Vertical slating



Lead open Valley and close-mitred valley

(only on roofs above 35 degree pitch in sheltered locations and where the valley is less than 6m in length)



Valley Gutter

Dress underlay over tiling fillets. Cut slates neatly and accurately to form a gap not less than 100mm wide centred on the gutter.

Roof pitch °	Area m² (on plan)	Width of valley gutter in mm 75	150	225
20-22	<25 25-100	100 125	125 150	125 200
22.5-29	<25 25-100	100 100	100 125	100 150
30-34	<25 25-100	100 100	100 100	100 125
35+	<25 25-100	100 100	100 100	100 100

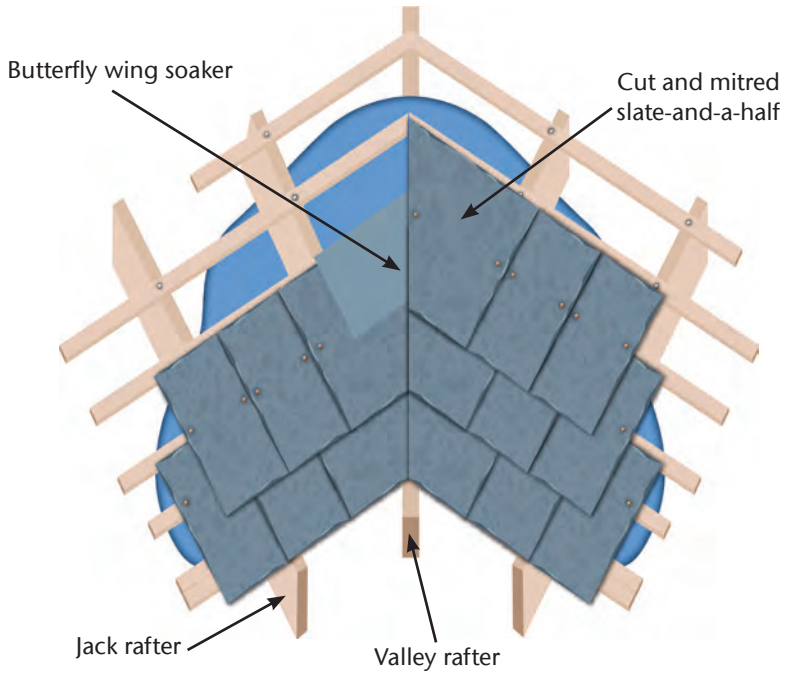
Lead Open Valleys

Timber noggins are installed between rafters so that the surface of the plyboard is flush with the top of the rafter. 19mm exterior grade plywood boards are fixed over the rafter and noggins to provide a smooth support for the lead lining. It's good practice to install a 4mm ply over the valley support boards and rafters. The width of the board is determined by the width of the valley including the tilting fillet and batten ends, as well as the gap between the slopes. The gap will be between 100 and 200mm according to the roof pitch, area to be drained and exposure location as calculated in BS 5534:2014+A2:2018 clause 13.1.2.

ISS TIP

The width of the open valley will be between 100mm and 200mm. The dimension is determined by the roof pitch and the derived exposure rating.

Rafter length maximum = 5m for areas up to 25m²
Rafter length >5m and <10m for areas of up to 25-100m²
No vertical projections drain on to roof
For further information please contact ISS.



Close mitred Valleys

The valley should first be covered with an additional 600mm wide strip of underlay beneath the main underlay.

Lead valley soakers in the shape of a "butterflies wings", are interleaved between courses of slate. The top edge of each wing of the soaker, is fixed over the top edge of the batten on both sides of the line of the valley. The length of the "butterfly wing" soakers should be not less than the sum of the extended gauge at the valley, plus the extended head-lap, plus 25 mm turned over the top of the slates.

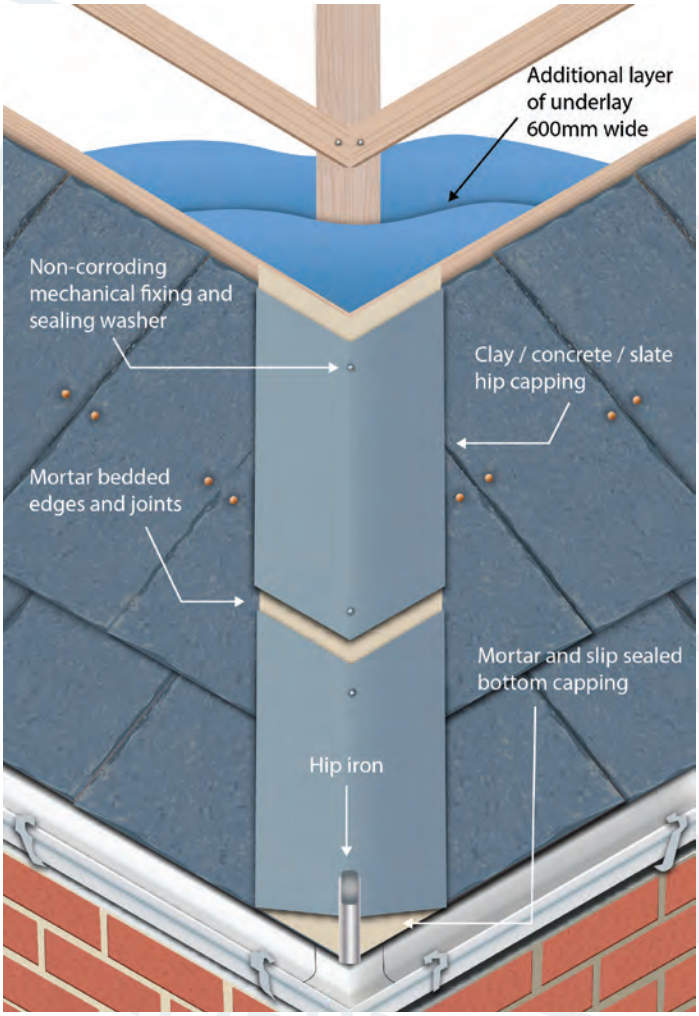
ISS TIP

Only use close mitred valleys on roof pitches above 35 degrees when the valley rafter length is less than 6m and the location is in a moderate/sheltered exposure area.

Hip treatments – Capped, lead rolled, close mitred

Capped hips

The hip should be covered with an additional 600mm width of underlay. Commence with a hip-iron to BS 5534 at the base of the hip rafter to support the run of cappings screwed to the hip rafter. Cut first course of slates to align at eaves. Mitre cut successive courses of slates following the hip rafter line leaving sufficient gap for the mechanical fixing of hip cappings. Bottom capping should be sealed with mortar and slate slips. Bed edges of cappings and joints between cappings in mortar 1:3 sand/cement.

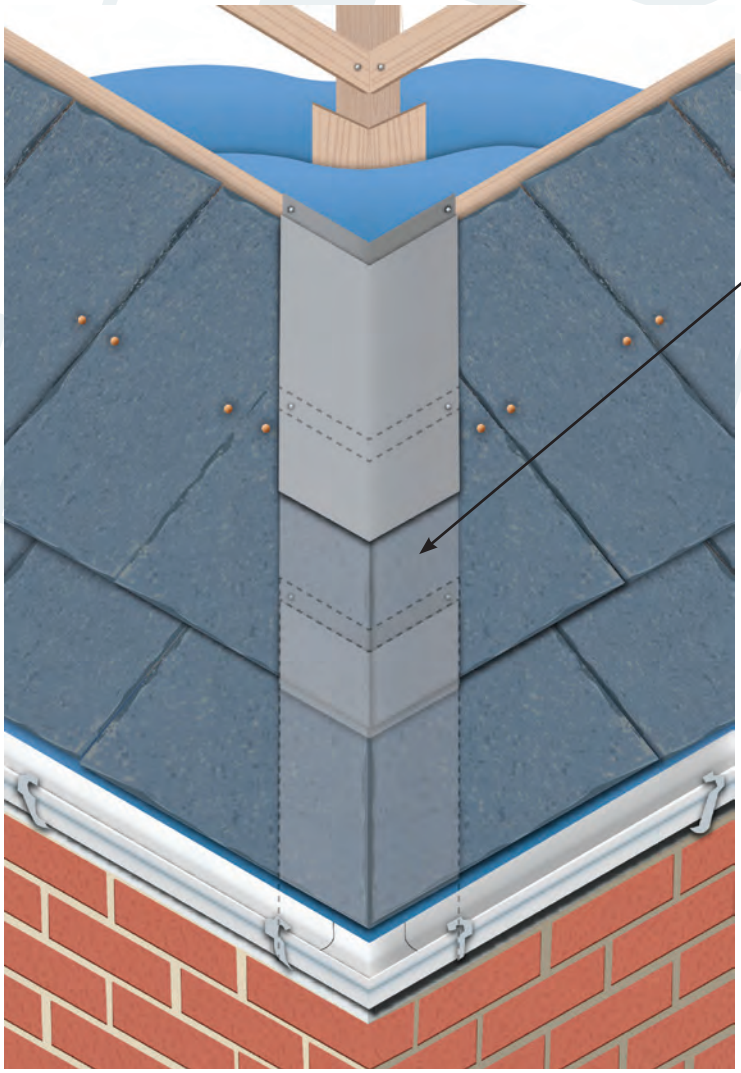


Close mitred hip

Mitred hips at lower pitches without external fixings should only be specified in sheltered locations with a recommended minimum pitch of 30°.

Mitred hips require an additional underlay 600mm wide over the hip and battens adjacent to the hip rafter. Hip slates should be cut from slate-and-a-halfs. One of the nail fixings should be installed on a batten further up the hip. This may require an additional batten laid between adjacent rafters to hold the nail.

Slates should be cut neatly and laid to give a close fit. Hip slates are interleaved with code 3 lead soakers nailed to the top edge of the batten.



Elongated chevron/fish-tail soakers code 3 lead soaker, a minimum of 100mm to each side of the hip (150mm on hips between 30 and 35 degrees pitch). The soaker should be not less than the sum of the gauge at the hip, plus the head-lap, plus 25mm turned over the top of the slates.

ISS TIP

Only use close-mitred hips on pitches above 30 degrees.

Side and top abutments

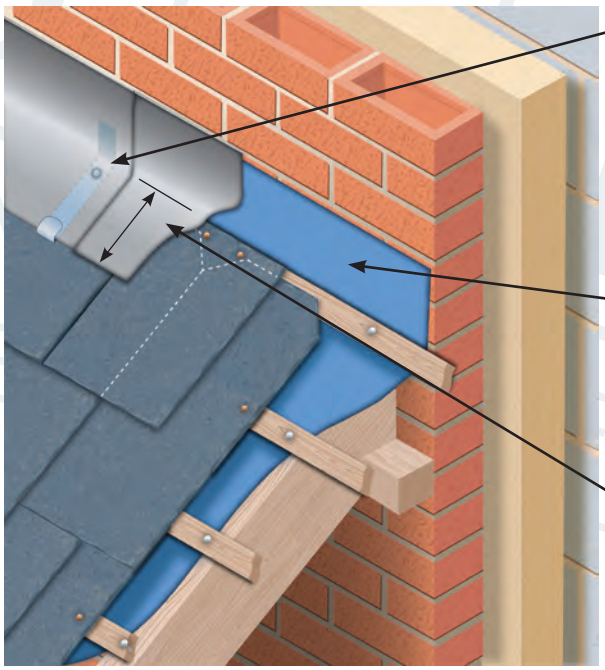
Side abutment

Underlay turned up the abutment by not less than 50mm under the flashings.

Code 4 lead cover flashing. The flashing covers the soakers and is stepped into the joints in the abutment by 25mm. Secure with lead wedges at each step. The joint should be pointed in cement mortar or lead mastic. Flashings should be up to 1.5m long. If longer lengths are required flashings should be lapped 100mm.

Code 3 lead soakers. Length of soakers should be not less than the sum of the length of the gauge, plus lap, plus 25mm. Width should be not less than 100mm cover or half the width of the standard slate under the slate and not less than 75mm turned up the abutment above the face of the slate. The soaker should be turned over the batten.

Top abutment



Code 4 lead flashing 1.5m long, secured with 50mm wide clips. If longer lengths are required flashings should be side lapped 100mm. Flashings extend a minimum of 75mm up the vertical wall, turned 25mm into the joints, wedged every 450mm. The mortar joint should then be pointed.

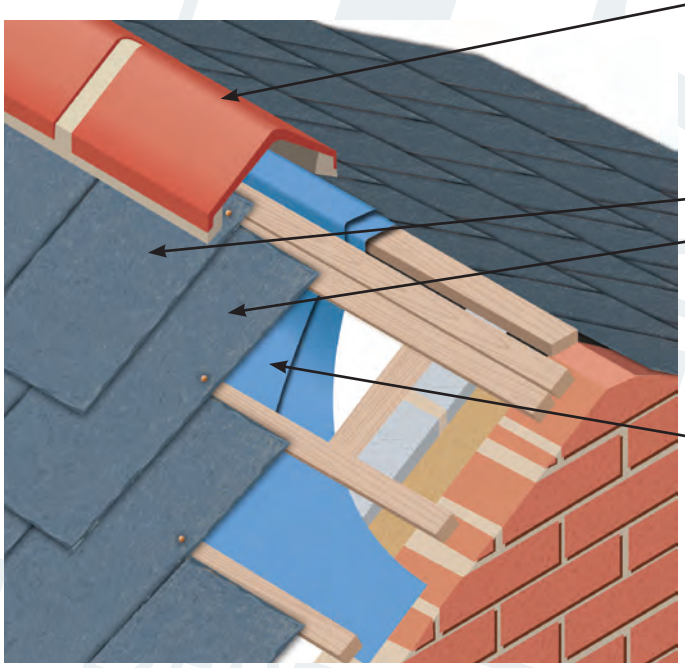
Underlay turned up the abutment by not less than 50mm.

Flashing overlaps the top course of slates by the length to enable the roofslope's headlap to be maintained.

Ridges – Capped ridge and lead-roll ridge

Ideally eaves to ridge ventilation should be incorporated in the roof design. Continuous eaves and ridge ventilation is the most effective solution see page 19. The top edge of the underlay should be laid and fixed down from the apex to provide an air gap to the ridge vent. Where ridge ventilation is impractical high-level roof-slope ventilation should be incorporated.

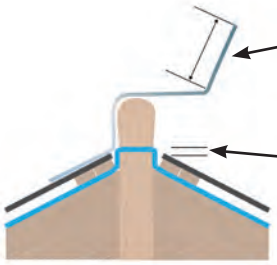
Capped ridge



Ridge tiles mechanically fixed with corrosion resistant screw and sealing washer fixed into ridge board. Edges and joints bedded in 1:3 cement sand mortar. Ridge ends sealed with mortar and slate/tile slips.

The length of the top two courses of slates at the ridge should be such as to ensure that the minimum head-lap is maintained. Either the top course of slates should be bedded with mortar on battens above the nail holes, or the head of the top course should be supported by a thicker batten.

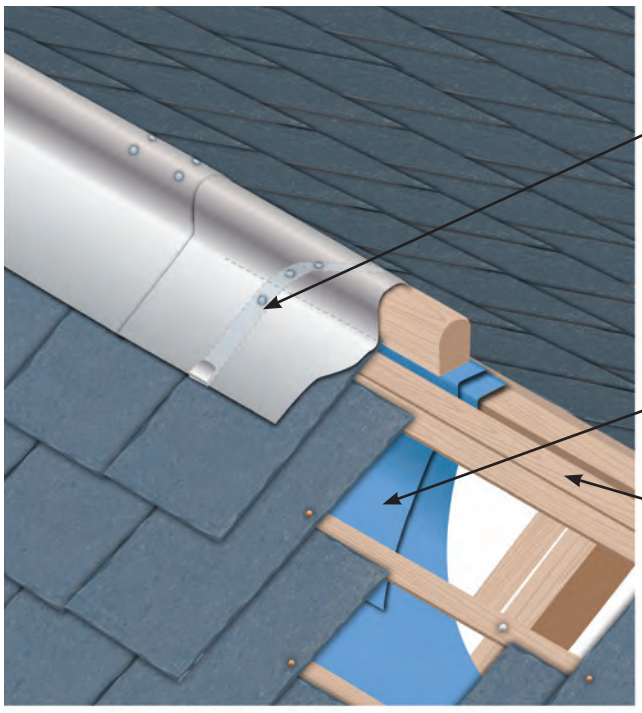
Underlay on one slope should be lapped over the underlay on the opposite slope by a minimum of 150mm.



150mm

A timber roll should be fixed to give a minimum 5 mm clearance above the slating and fixed prior to slating.

Lead Roll ridge



Code 4 or 5 lead laid and fixed to the timber roll, overlapping the top course of slates by 150mm and clipped with a 50mm clip at maximum 150mm centres which is fixed beneath the timber roll. Lead roll should be 1.5m to 1.8m long with 150mm laps.

Underlay on one slope overlapping underlay on opposite slope by minimum 150mm

Thicker top batten to support the heads of top slate course.

Roof ventilation – BS 5250:2011+A1:2016 Code of practise for control of condensation in buildings and Part F of the Building Regulations

Increased standards for energy efficiency and insulation in building construction, combined with modern lifestyles has lead to a greater risk of condensation. Condensation occurs when warm damp air meets a cold surface. The roof space is vulnerable, consequently the regulations require provision to be made to prevent condensation forming in all roof voids.

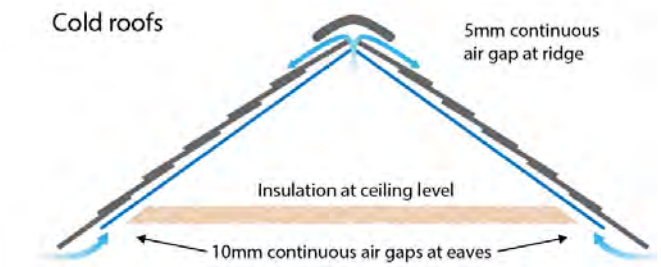
Cross-ventilation of roof voids and/or eaves to ridge ventilation should be provided regardless of the type of underlay used.

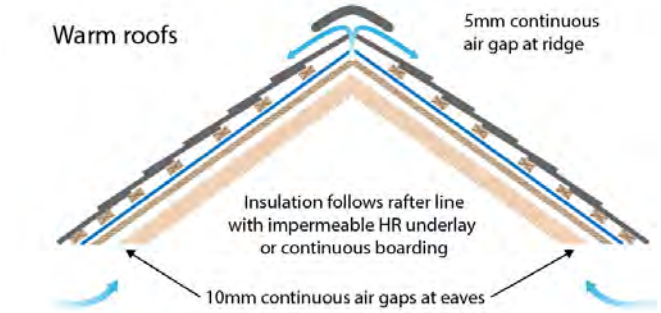
Where impermeable underlay or continuous boarding is used it is mandatory to provide low level ventilation to the equivalent of a continuous 10mm gap.

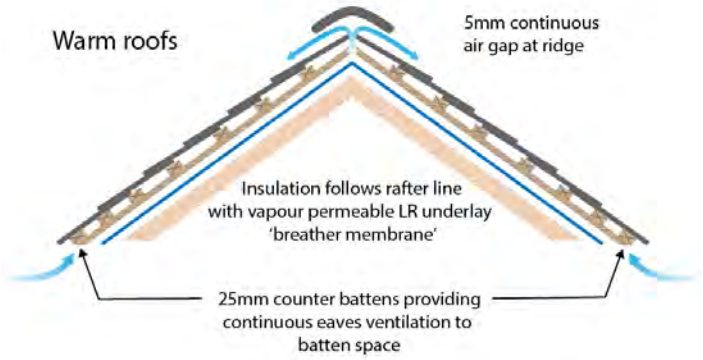
It is also recommended that ventilation be provided at high level to the equivalent of a continuous 5mm gap. At pitches of 35° and over or spans exceeding 10m, this is particularly recommended.

If a vapour permeable underlay, LR, otherwise known as “breather membrane” covered by an appropriate third-party accreditation, is used as an alternative to ventilating the loft space, ventilation should be provided to the counter-batten space above the underlay (between the roof underlay and the roof covering).

In these circumstances a ventilated batten cavity should be provided with the use of a minimum size of 25mm counter-battens and the provision of ventilation at low and high levels. Openings at low level should provide the equivalent of a continuous 25mm gap and at high level a continuous 5mm gap.



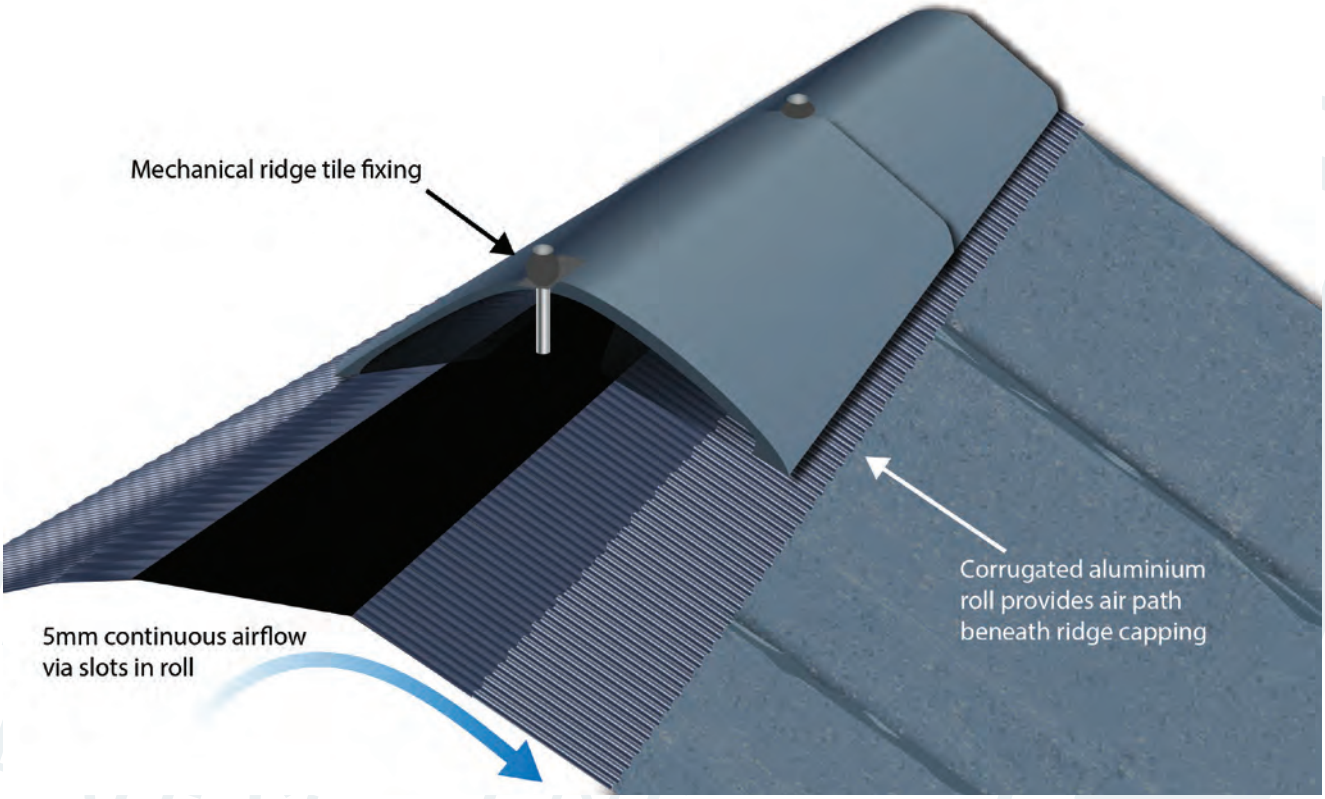




If continuous eaves or ridge ventilation is not possible versatile roof-slope ventilators can be used at low level as inlets and high level as outlets. They can also be adapted to fit soil pipes or gas pipes to be used as outlet terminals.

Vented dry ridge and hip system

ISS's versatile, flexible corrugated aluminium roll provides 5mm continuous ridge and hip ventilation for any combination of slate format and ridge capping. It is mechanically fixed and driving rain resistant, meeting the requirements of BS 5534 and allows ventilation at the ridge in compliance with BS 5250 and Part F of the Building Regulations.



In-line low profile roof slope vents

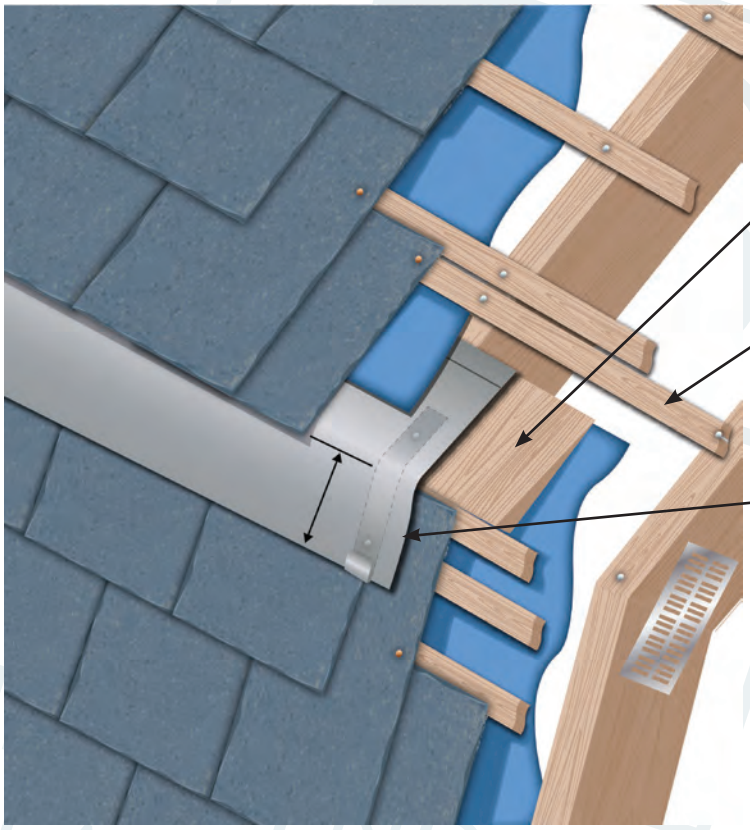
Where continuous eaves and/or ridge ventilation is impractical or undesirable ISS offers a fully rain, wind and UV resistant, low profile roof slope vent that is flush with the roof and can act as a low level inlet, high level outlet or terminal for soil stack vents or mechanical air extraction. ISS's Nature Vent complies with regulations without interrupting the plane of the slope with unsightly protrusions.

Vent name	Appearance	Compatibility	Free air capacity #	Use as terminal?
Nature vent	Incorporates slate cut to fit the lower portion of the unit.	600x300mm 500x250mm	10,000mm2	Yes, c/w 100mm round adaptor.

#Equivalent to 10,000mm2 continuous ventilation when fixed at 1m centres and 5,000mm2 continuous ventilation when fixed at 2m centres.

Mansard Roof and change of pitch

Mansard Roof

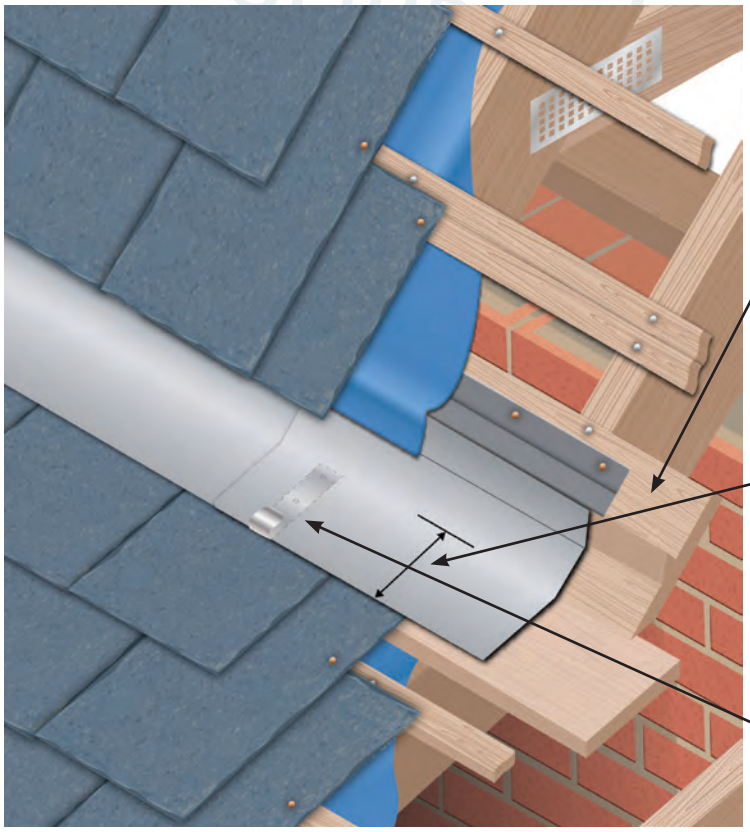


Tilting fillet

Battens on the upper slope are gauged so that the eaves slates overhang the fillet by 50-55mm

Code 4 lead flashing is dressed 150mm over the top course of slates on the lower level and welted on the fillet. Flashing is nailed at 150mm centres. If flashing of more than 1.5m is required side laps should be 150mm. The flashing is clipped at 300-500mm centres, laps and free edges.

Change of pitch



A timber board is fixed to the rafters at the bottom edge of the upper slope to give continuous support to a tilting fillet and Code 4 lead flashing.

The lead flashing is dressed over the tilting fillet and welted. The lead flashing is fixed at 150mm centres and laps a minimum of 150mm over the top course of slates.

The lead flashing is additionaly clipped at 300-500mm centres

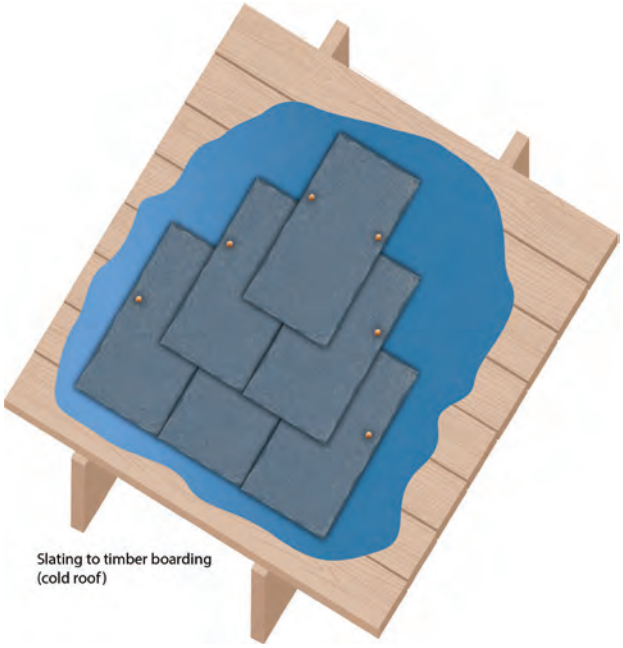
Scottish Practise

The roof rafters are covered with minimum 18mm thick butt jointed square edged boards. The boards are covered with an underlay which is temporarily held in place.

The gauge should then be marked onto the underlay with a chalk line. Slates are graded and sorted, and nailed to the boarding, through the underlay, following the principles of double lap slating shown on Page 4 of this guide. The eaves course follows the same principle as shown on Page 12 of this guide.

Custom and practise have shown that thick, heavy 20x20mm slates can be fixed with 1 head nail (nail hole to be created from the bed of the slate as with any other slate holing) with every 3rd course double nailed.

Scottish Practise - cold roof



The following standards cover the key aspects of design, installation and quality for achieving a compliant, weathertight roof. Due to the limitations of the printing process check on-line to ensure you are referring to the latest version of these standards and of Independent Slate Supplies publications when designing or planning the installation of a roof.

The latest version of BS 5534 Code of Practise
The latest version of BS 8000 Workmanship
The latest version of BS EN 12326 Specifications for slates

Disclaimer; *The contents contained within this guide is purely advisory and should be checked by a qualified professional prior to any installation work. Please consult the British Standards for all relevant and up to date information.*

ISS will accept no responsibility for any loss or damage caused that may arise through reliance being placed on the content of this brochure.

The information in this Guide is based on the company's latest information, best knowledge and belief. The company reserves the right to improve and update guidance at any time without notice.

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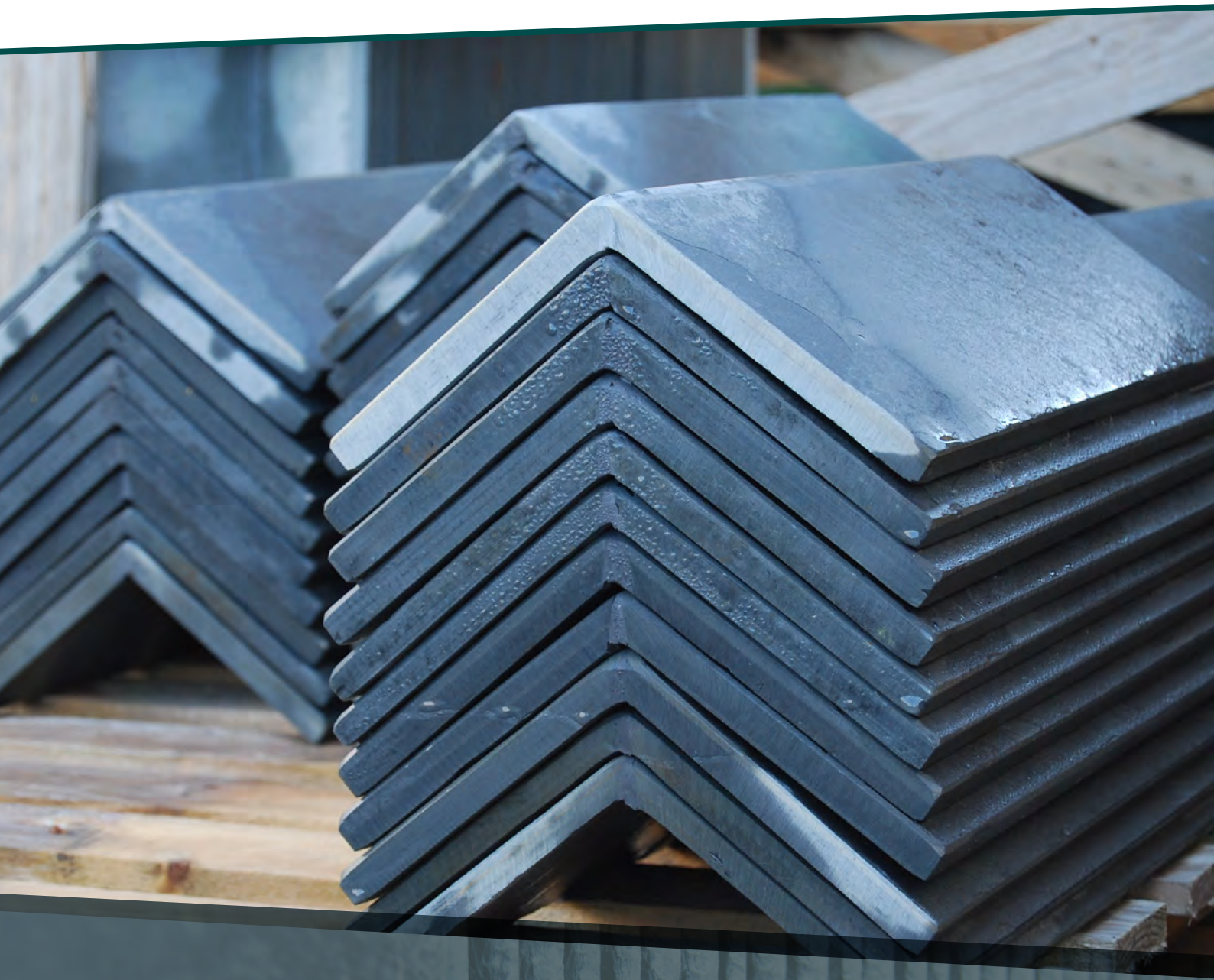

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