BS 8000-6:2013

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Workmanship on building sites –

Part 6: Code of practice for slating and tiling of roofs and walls

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Contents

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 42, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 8000 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 September 2013. It was prepared by Subcommittee B/542/1, *Slating and tiling*, under the authority of Technical Committee B/542, *Roofing and cladding products for discontinuous laying*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 8000 supersedes BS 8000-6:1990, which is withdrawn.

Relationship with other publications

BS 8000 is published in the following parts:

- *Part 1: Code of practice for excavation and filling;*
- *Part 2: Code of practice for concrete work;*
- *Part 3: Code of practice for masonry;*
- *Part 4: Code of practice for waterproofing;*
- *Part 5: Code of practice for carpentry, joinery and general fixings;*
- *Part 6: Code of practice for slating and tiling of roofs and claddings;*
- *Part 7: Code of practice for glazing;*
- *Part 8: Code of practice for plasterboard partitions and dry linings;*
- *Part 9: Cementitious levelling screeds and wearing screeds – Code of practice;*
- *Part 11: Internal and external wall and floor tiling – Ceramic and agglomerated stone tiles, natural stone and terrazzo tiles and slabs, and mosaics – Code of practice;*
- *Part 12: Code of practice for decorative wallcoverings and painting;*
- *Part 13: Code of practice for above ground drainage and sanitary appliances;*
- *Part 14: Code of practice for below ground drainage;*
- *Part 15: Code of practice for hot and cold water services (domestic scale);*
- *Part 16: Code of practice for sealing joints in buildings using sealants.*

Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- new clauses to take into account revisions to BS 5534;
- updated clauses to reflect product innovations, e.g. dry fix systems;
- updated sitework practices to reflect new health and safety legislation;
- the addition of guidance on the installation of solar roof panels.

Where reference is made to proprietary products and to manufacturers' recommendations, the user is advised to obtain evidence that these products and recommendations have been proven by relevant experience or relevant test method data, based on the conditions and methods of use in the UK climate, to be fit for purpose.

It is advisable that all parties seek assurances at the outset of a project that such recommendations are appropriate for the product in its intended use and location.

Use of this document

The purpose of this code of practice is to encourage good workmanship by providing:

a) the most frequently required recommendations on workmanship for building work in a readily available and convenient form to those working on site;

b) recommendations on how designers' requirements for workmanship can be satisfactorily realized;

c) guidance on good practice for supervision and for training purposes;

NOTE This guidance is not intended to supplant the normal training in craft skills.

d) a reference for quality of workmanship;

e) recognition that design, procurement and project information are likely to be conducive to good workmanship.

This code of practice has generally been arranged in accordance with the *Common Arrangement of Work Sections (CAWS) for Building Works* [1] so that it can be used easily with project specifications and bills of quantities using CAWS.

As a code of practice, this part of BS 8000 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this part of BS 8000 is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This part of BS 8000 gives recommendations on basic workmanship on building sites, both commercial and domestic, and covers those tasks which are frequently carried out in relation to the slating and tiling of roofs and walls of newly constructed buildings or buildings being refurbished and re-roofed. It makes recommendations and gives guidance on basic workmanship for conventional types of building work. The recommendations given are not necessarily comprehensive; particular project documents, e.g. project specifications, might be needed to cover recommendations not dealt with by this code of practice.

Some of the recommendations might not apply to historic building conservation or heritage roofing.

The recommendations given in this British Standard apply to the laying and fixing of clay and concrete tiles, natural slates and fibre cement slates and their associated fittings and accessories.

NOTE 1 The manufacture of concrete roofing tiles and fittings, fibre cement slates, clay roofing tiles and fittings and natural slates for use in the UK is covered in BS EN 490, BS EN 492, BS EN 1304 and BS EN 12326-1, respectively.

NOTE 2 Design aspects of slating and tiling are covered in BS 5534.

NOTE 3 The installation of timber shingles and shakes are described in NFRC Technical Bulletin 34 [2]. Manufacturers' instructions will apply to the installation of asphalt shingles and sheet metal or proprietary discontinuously laid roofing products.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

BS 5534, *Code of practice for slating and tiling (including shingles)*

BS 6100-6, *Building and civil engineering – Vocabulary – Part 6: Construction parts*

BS 8000-3, *Workmanship on building sites – Part 3: Code of practice for masonry*

Other publications

[N1] NATIONAL FEDERATION OF ROOFING CONTRACTORS. *Standard roofing mortar.* Technical Bulletin 27. London: National Federation of Roofing Contractors, 2012.

[N2] NATIONAL FEDERATION OF ROOFING CONTRACTORS. *Pitched roof underlay.* Technical Bulletin 06. London: National Federation of Roofing Contractors, 2012.

3 Terms and definitions

For the purposes of this part of BS 8000, the definitions given in BS 6100-6 apply.

4 Handling and preparation of materials

4.1 Checking, handling and site storage of materials

4.1.1 Checking

Materials and products should be checked to ensure that they conform to the project specification.

Battens, roofing underlays, clay and concrete roof tiles, natural and fibre cement slates and fittings should be checked to identify them, either by their third-party certification mark or other certification of conformity, or by manufacturers' labelling.

NOTE Attention is drawn to The Construction Products Regulation (EU) No 305/2011 (CPR) [3], which requires all construction products manufactured to a harmonized European standard to be CE marked and supported by a Declaration of Performance, made available by the manufacturer.

4.1.2 Handling

Tiles, slates and fittings should be unloaded and handled with care to avoid damage, soiling from ground conditions or mortar preparation, breakage in stacking or damage from passing traffic.

4.1.3 Storage (on ground)

Concrete tiles, clay tiles, fibre cement slates, natural slates and fittings with wrappings and banding should be stored in place on a firm, even base free from soiling.

When fibre cement slates are stored outside, the sides of the plastic wrappings should be split open to allow free air movement between the slate stacks. The slates should then be covered with a tarpaulin or similar cover.

Concrete, clay, natural slate, fibre cement slates and fittings should be stored as close as possible to the roof to avoid excessive handling, and in compact, stable stacks. Loose product should not be stacked flat.

Roofing underlays should be stored on end on a firm, clean base protected from direct sunlight.

Battens and counterbattens should be stored on bearers sufficient to prevent sagging or twisting. They should be protected from water saturation when stored in bales or bundles horizontally.

Accessories should be stored in a safe weatherproof store.

Provision should be made for the storage and protection of all materials on site. If a hard standing area is not available, a firm flat area should be selected, which is clear of rubbish and vegetation and free from soiling and risk of damage from access traffic.

4.1.4 Storage (on roof)

Clay, concrete, natural and fibre cement slates should be stacked out safely on the roof to avoid slippage and should be distributed to prevent unbalancing or overloading of the roof structure.

4.2 Preparation for work

4.2.1 General

The recommendations contained in this British Standard should be carried out in accordance with BS 5534 or the Zonal Fixing Method and the manufacturers' instructions. Where contract specifications deviate from these recommendations, clarification should be obtained prior to commencing work as to which takes priority.

Manufacturers' sitework instructions should be in accordance with BS 5534. If the sitework instructions do not comply with these, the designer or specifier should seek assurances at the preparation stage of the project that such recommendations are appropriate.

NOTE 1 Recommendations for mechanical fixing in this British Standard generally refer to nailing and/or clipping but might also refer to screws or proprietary products.

The responsibility for carrying out sheet metal work should be decided prior to the start of work.

NOTE 2 The detailing for flashings included in this British Standard is designated sheet metal work.

NOTE 3 This British Standard has been written on the basis that its use will be supported by documentation on the fixings for roofing underlays, battens, slates and tiles and other materials for the works of a generic nature. It also makes reference to appropriate manufacturers' instructions.

4.2.2 Working instructions

The building designer responsible for the specifications should ensure that British or harmonized European Standards are fully employed where required by the building contract; in the case of this standard, BS 5534.

The specifications should be translated into "working instructions" which the craftsman assembling the roof covering should follow in carrying out the work. These working instructions may be in the form of written instructions, manufacturers' recommendations or specific detail from the designer and technician. They may be supplied by the designer but should be passed to the craftsman by the person responsible for carrying out the roofing part of the main contract.

4.2.3 Liaison

Other contractors should be liaised with and agreement should be reached on the timing and sequence of work with other trades, e.g. sheet metal workers for flashings.

Agreement should be reached on the requirements for and provision of sufficient working space, e.g. for sorting and grading natural slates; plant hoisting facilities; mortaring materials; mechanical cutting; access; safety; services and security.

Necessary work by other contractors should be sufficiently complete and should not delay the continuity of work or leave uncompleted work vulnerable to damage by inclement weather.

NOTE It is good practice to treat lead work, where the rainwater discharges on to slates or tiles, with a patination oil to avoid staining (see Rolled lead sheet – the complete manual *[4] for guidance).*

4.2.4 Acceptability of the roof structure

Before commencing work, the following should be checked:

a) roof trusses and rafters are structurally sound and to a true line and adequately secured and braced as specified; timber noggings and lay boards are installed where required at hips, valleys and other details to support the ends of tiling battens;

b) the roof structure is to the specified pitch, to an acceptable squareness tolerance and curved roofs are without abrupt curve changes;

c) the level of stepped cavity trays and flashings at abutments suit the line of the roof covering, and that flashings and secret gutters, which will be covered by the slating or tiling, are positioned and secured to specification;

d) fascia boards and gutters are positioned and secured to specification;

e) gable brick work has been parged to be below the rafter or truss level;

f) fascia boards or tilting fillets are positioned to provide a base datum for setting out the correct tilt (taking into account any over fascia accessory). Also that they allow the eaves course of tiles or slates to be in the same plane as the main roof, i.e. not drooped or elevated unless sprocketed eaves have been specified;

g) pitches of roof slopes to ensure suitability of specification and detailing of the slates and tiles and coordinating fittings.

4.2.5 Fire-break walls

The space between the top of the wall and the slates or tiles should be completely filled with mortar or non-combustible packing above and below the underlay to fill all gaps. Packing should be compressed by the slates or tiles.

There should be no path for smoke or flame to penetrate from one side of the wall to the other. The battens should be encapsulated tightly with the non-combustible material, where they are carried over the party wall. In all cases the lifting of the tiles or slates at the party wall should be avoided.

4.2.6 Insulation

Where slabs of over-rafter insulation are used, adequate stop-battens should be fixed to the rafters to prevent the roof assembly from sliding.

Fixings securing counterbattens through slab insulation should have adequate withdrawal resistance from the rafters and be used in sufficient quantity to ensure security.

All air passages should be kept clear of debris to avoid impedance of air flow.

Support trays at eaves should be fixed to give adequate air-flow.

NOTE BS 5534 provides design guidance for the fixing of counterbattens and stop battens where over-rafter insulation slabs are used.

4.3 Mortar preparation

Mortar for use with slating and tiling should be in accordance with BS 5534 and NFRC Technical Bulletin 27 [N1].

NOTE Lime mortar mixes suitable for roofing are given in NFRC Technical Bulletin 42 [5].

Mortar should be prepared in accordance with BS 8000-3.

Mortar should be mixed to obtain a uniform consistency and colour.

4.4 Application of mortar

*COMMENTARY ON **4.4***

*The following refers to the general application of mortar on roofs. More specific information is provided in Clause **6**.*

Wherever possible, the same mix and colour (where applicable) of mortar should be used for pointing as for the bedding. However, where this is not possible, pointing should take place as soon as possible to ensure that the bedding and pointing mortar set as one piece.

NOTE 1 It might be necessary to dampen the mortar bed prior to pointing.

The mortar bed should be of sufficient depth to compress when the slate or tile is fixed and firm enough to withstand the vibrations of nailing tiles or the pressure applied as a result of mechanical fixings.

Mortar should be used within two hours of mixing and should be protected from extremes of heat or cold and rain.

Water should not be added to mortar which has become too dry to use. All unused mortar should be discarded.

Staining due to rainwater run off from fresh mortar should be avoided by covering where necessary.

NOTE 2 It is good practice to wet the underside of all concrete products prior to bedding with mortar and ensure that all bedding surfaces are clean and free from release agents used in the manufacturing process. Whilst release agents are not used on clay products, the practice of wetting is particularly important when bedding in hot weather to prevent premature drying out of the mortar.

5 Preparation, laying and fixing

5.1 Roofing underlays

5.1.1 General

The documentation for all products should be checked to ensure that it conforms to the specification and working instructions.

The roofing underlay should be laid parallel to the eaves or ridge with the horizontal overlaps as specified for the rafter pitch and roof construction (see BS 5534). On tightly curved roofs the underlay should be laid up the slope.

The underlay should be laid and fixed in accordance with BS 5534 and NFRC Technical Bulletin 06 [N2]. The gap at the laps resulting from different tautness between underlay courses should be minimized.

The underlay should be fixed with clout nails or other fixings as recommended by the manufacturer. The overlap should be nailed to each rafter or counterbatten, 25 mm in from the top edge of the lower sheet and 25 mm from the exposed edge of the upper sheet.

The underlay should be handled and fixed with care to ensure no tears or punctures occur. Any tears or punctures should be repaired prior to tiling or slating.

The underlay should not obstruct the flow of air through ventilators.

Where proprietary underlays are to be used, the manufacturers' instructions should be followed as directed by the specification.

Contact should be avoided between the underlay and the underside of the slates or tiles to prevent the wind uplift load being transmitted to the slates or tiles. There should be a nominal 10 mm drape in the underlay between supports to provide a drainage path for any moisture and to prevent excessive deflection under wind load.

NOTE Some underlay types might have specific conditions of use or limitation. The underlay provides a barrier to minimize the wind load generated under wind gusts acting on the slates or tiles and also provides a barrier to prevent wind driven snow and rain or dust from entering the roof space (see BS 5534).

Underlay laps should be covered by a batten and, where necessary, the lap of the underlay adjusted to coincide with the nearest slating or tiling batten (see **5.2.3**). Laps may also be sealed using proprietary means in accordance with manufacturers' instructions.

5.1.2 Boarding and sarking

The fully supporting boards or sarking should be dry.

The underlay may be laid and fixed either over or under the counterbattens (depending on the specification).

Where boarding is required for curved roofs, swept valleys or curved dormers the underlay should be laid onto the rafters under the boarding to eliminate the need for counterbattens and battens, the slates or tiles being fixed direct to the boards.

NOTE In traditional Scottish slating, practice slates are laid over the underlay and nailed directly into sarking boards.

5.1.3 Eaves

If the underlay types are suitable for external exposure they should be laid directly into the gutter. If they are not suitable for external exposure, then a strip of external grade (UV resistant) underlay or proprietary underlay support trays should be used at the eaves. Where this is the case, the first course of underlay should be laid to maintain the necessary laps and leave the lower edge set back from exposure above the gutter.

No trough should be formed behind the fascia board and a support should be provided for the underlay to prevent any collection of water. The underlay should allow any water reaching it to freely drain into the eaves gutter.

NOTE Where a proprietary eaves fascia ventilator is specified, special detailing of the underlay might be recommended by the manufacturer.

5.1.4 Verge

The underlay should be laid or cut neatly onto the outer skin of the wall, or onto the flying rafter in the case of an overhanging verge.

NOTE Where proprietary verge tiles or dry verge systems are specified, special detailing of the underlay might be recommended by the manufacturer.

5.1.5 Ridge

5.1.5.1 Duopitch ridge

The top courses of underlay should be overlapped.

5.1.5.2 Monopitch ridge

The top course of underlay should be laid or cut and fixed about 100 mm over the top fascia board.

5.1.5.3 Vented ridge

Where specified, the top edge of the underlay should be laid and fixed down from the apex by the required distance.

NOTE Where proprietary ventilating ridge tiles or dry ridge systems are specified, special detailing of the underlay might be recommended by the manufacturer.

5.1.6 Hip

The underlay should be overlapped across the hip by the specified amount.

Excessive thickness of underlay at hips should be avoided. Roof structures should include a continuous member at hips to which the underlay can be fixed.

5.1.7 Valley

Lay boards to support valley linings should be fixed beneath the underlay between the rafters or counterbattens to finish flush with the tops of the rafters.

Other than for sheet metal valleys, a continuous strip of underlay should be laid down the valley and should overlap the underlay at the sides by no less than 300 mm.

On continuously supported valley linings, such as lead and other metals, the underlay should be cut to rake and lap onto the valley lining by no less than 50 mm but not beyond the tilt fillet.

In the case of mitred valleys or purpose made plain tile valley tiles, the adjacent underlays should be brought into the centre of the valley to create a double layer.

Punctures should be avoided in the valley underlay and any fixings within 100 mm of the centre line.

Continuously supported metal valleys, e.g. lead, should not be laid directly on to bituminous underlays, as melting, which results in sticking, might lead to a deterioration of the metal valley lining. Lay boards should not interrupt the roof covering alignment.

5.1.8 Abutments

5.1.8.1 Side/front abutment

The underlay should be turned up the abutment so that the top edges are covered by the flashings by no less than 50 mm.

5.1.8.2 Back abutment

The underlay should be dressed or cut neatly to provide not less than a 100 mm overhang into the back gutter (see **5.1.3** for exposure recommendations).

5.1.9 Underlay penetrations

Any penetrations through the underlay should be protected from water ingress, where specified, using tapes or proprietary seals in accordance with manufacturers' instructions.

Where proprietary ventilation units and similar products are specified, the manufacturer's sitework instructions should be followed.

5.2 Battens and counterbattens

5.2.1 General

The battens and counterbattens should conform to BS 5534 and should be of specified size and marked with the supplier's name, size, grade, species and "BS 5534".

If a preservative treatment is used, it should be checked that it is of the correct type or has environmental accreditation, e.g. FSC or PEFC.

NOTE Unmarked battens or battens not marked with the full information given above will not conform to BS 5534. They could pose a health and safety risk and might be inadequate for fixing requirements.

5.2.2 Setting out

The roof should be set out carefully using the eaves tilt datum to ensure that minimum cutting of slates and tiles is necessary and the horizontal lines of the courses are regular and true.

The eaves or bottom course batten should be set to provide the required overhang into the gutter or over the tilting fillet.

The top course batten should be set to allow the required overlap by ridge tiles or flashing.

For variable gauge tiling, the distance between the top of the eaves batten to the top of the top batten should be divided to give an equal batten gauge not greater than that specified for the product used.

It might be necessary to retain the gauge calculated for the main roof slopes onto projecting roof slopes. Where two roof slopes of varying pitch intersect, the batten gauge should be set out to the lower roof pitch.

For fixed gauge tiling, the shunt available should be assessed prior to setting out the battens.

For single sized slating, battens should be fixed to provide a headlap not less than that specified.

For random (diminishing courses) slating, the batten gauges should be adjusted where necessary to ensure that the margins do not show an increase upwards at any part of the roof slope and that the specified head lap is achieved.

5.2.3 Fixing

Where the roof width allows, battens not less than 1.2 m long should be fixed to each rafter or support in straight lines to the calculated gauge parallel with the ridge or top course or at right angles to the line of drainage.

All joints should be square-cut and butted centrally on the supports. Each batten end should be splay nailed.

Battens should be fixed to each rafter, using the specified type and size of fixings.

For trussed rafter roofs where the batten gauge is greater than 200 mm, batten joints should be staggered at a ratio of no more than one in four courses on the same support.

For trussed rafter roofs where the batten gauge is less than 200 mm, batten joints should be staggered at a ratio of no more than three joints in twelve courses on the same support.

On rafter and purlin roofs occasional batten joint staggers should be used.

NOTE When there are other roof or vertical details such as chimneys or windows, etc. it might be necessary to gauge out the battens to suit each of the fixed points. Equal batten gauges are important with high profiled tiles to avoid distorted diagonal lines.

Underlay laps should be covered by a batten and, where necessary, the lap of the underlay adjusted to coincide with the nearest slating or tiling batten. Additional battens between courses should be avoided, as these can cause trip hazards and loading issues. Underlay laps may also be sealed using proprietary means in accordance with manufacturers' instructions.

5.2.4 Counterbattens

5.2.4.1 Roof

The specified counterbattens should be fixed up the roof slope directly over the rafters or alternative structural member.

5.2.4.2 Wall

The specified counterbattens should be fixed to the boarding/sheathing/sarking in line with vertical supports or to the masonry wall as specified.

The counterbattens should be secured to masonry walls using timber pads built into the mortar joints, or directly into the masonry with plugs and screws or other appropriate fixings.

Battens should be fixed to counterbattens secured to the wall using appropriate fixings and not directly fixed to brick or blockwork. Fixings used to secure counterbattens and battens to proprietary roof decks or panels should be able to provide adequate resistance to wind uplift and shear loads (see BS 5534).

5.3 Verge undercloak

The edge of the battens should be finished 25 mm to 50 mm from the outer edge of the undercloak with the pretreated ends at the verge or, if cut, treated with a suitable preservative.

The undercloak should be installed under the battens, and above or below the underlay as specified.

On masonry walls, the undercloak should be bedded on mortar or mastic.

On timber rafters/bargeboards, the undercloak should be fixed securely to the rafters with clout nails.

The undercloak should be no less than 150 mm wide and should be formed from plain tiles, fibre-cement or natural slate.

Where plain tiles are used as an undercloak they should be laid face down.

The undercloak should overhang the verge 38 mm to 50 mm for slate and plain tile roofs.

For single lap tiles on a verge to verge roof, the undercloak should overhang the verge 30 mm to 60 mm to aid setting out and reduce cutting.

Plain tiles should not be used on timber bargeboard construction. The undercloak should be positioned not to tilt inwards towards the roof.

6 Laying and fixing of clay and concrete roof tiles, fittings and accessories

6.1 General

The documentation for all products should be checked to ensure they conform to the specification and any specified certification schemes or assessments.

NOTE These documents might include third-party certificates or manufacturers' product certificates of conformity to British, European or international standards.

Any limitations on the use of products should be established by manufacturers' instructions or product standards or third-party certificates, etc.

All sides of the roof should be stacked out uniformly for weight distribution and ease of laying.

Manufacturers' recommendations for mixing tiles or slates should be checked before laying in order to blend colours.

6.2 Single-lap tiles

6.2.1 Single-lap tiles (variable gauge)

Precautions should be taken to protect the safety of roofing operatives when working above slates/tiles in accordance with **11.2**.

Where possible, the roof should be set out to minimize cutting, to ensure tiling is straight, and that verge overhangs and other critical positions are identified before tiling commences. Where a proprietary dry fix verge system or cloak verge tile is used, reference should be made to the manufacturer's instructions.

Tiles should be laid broken or straight bond, as given in the manufacturer's sitework instructions, and in regular horizontal courses.

The maximum or minimum gauges should not be exceeded.

Tiles should be mechanically fixed in accordance with BS 5534 or the Zonal Fixing Method or the manufacturer's specifications for the tile, roof detail and site location.

NOTE 1 Information on the Zonal Fixing Method can be found in The Zonal Method user's guide *[6]).*

Any fixed points required for fittings and accessories should be placed in the ridge, roof slope or wall.

Interlocking tiles should possess side shunt, which allows them to be opened and closed (within acceptable limits), to assist with setting out issues such as verge overhangs and out of square roofs.

NOTE 2 On very wide roofs and/or where the side shunt is very generous, it might also be possible to open or close the tiles to avoid or minimize cutting.

6.2.2 Single-lap tiles (fixed gauge)

Eaves detail should be laid and fixed as specified for the type of tile using eaves fillers/clips, proprietary eaves tile or tile undercloak as required.

Average linear coverage should be established using an assessment of 10 tiles at both closed and open shunt. Tiles should be laid commencing from the right-hand verge where possible, and the eaves course should be set out to provide required verge overhangs without cutting where possible. A proprietary dry fix verge system or cloak verge tile should be used in accordance with the manufacturer's instructions.

Tiles should be laid in broken or straight bond as specified, in regular horizontal courses.

Average tile gauge should be established using an assessment of 10 tiles at both closed and open head locks.

Tiles should be mechanically fixed in accordance with BS 5534 or the Zonal Fixing Method or the manufacturers' specifications for the tile, roof detail and site location.

Any fixed points required for accessories should be placed in the ridge or roof plane.

Single-lap tiles that have mitred laps or headlocks and are of fixed gauge normally have some shunt in both directions. Setting out of battens and tiles should be within the maximum recommended gauge and the minimum shunt dimensions. The shunt in the side locks should be taken into account in setting out perpendicular lines. Special fittings (including half width and half length tiles) might be available from some manufacturers to assist with setting out. A proprietary dry fix verge or ridge system should be used in accordance with the manufacturer's instructions.

6.2.3 Eaves and bottom edges

6.2.3.1 Eaves and bottom edges (variable gauge tiles)

The eaves batten should be set to ensure the tail of the roof tile extends over the edge of the fascia board by no less than 50 mm measured on the rake, and that there is effective drainage into the gutter.

The height of the fascia board or tilt fillet should be correct for the eaves course to be in the same plane as the main roof.

Allowance should be made for the height of strip ventilators where they are located on the eaves support or fascia board.

Eaves filler units should be laid and fixed to the top of the fascia board, tilt fillet or strip ventilator, where profiled tiles which give a gap at the eaves of greater than 16 mm are specified.

Eaves tiles should be mechanically fixed to manufacturers' sitework instructions.

NOTE Interlocking tiles are not normally recommended for sprocketed eaves details unless an appropriate flashing or other weathering detail is used. Interlocking tiles are not suitable for curved roofs.

6.2.3.2 Eaves and bottom edges (fixed gauge tiles)

The eaves batten should be set to ensure the tail of the roof tile extends over the edge of the fascia board by no less than 50 mm measured on the rake, and that there is effective drainage into the gutter.

The height of the fascia board or tilt fillet should be correct for the eaves course to be in the same plane as the main roof.

Allowance should be made for the height of strip ventilators where they are located on the eaves support or fascia board.

Where proprietary tile designs are used, eaves should be fixed in accordance with manufacturers' sitework instructions.

NOTE Where traditional tiles such as some pantiles are used, an alternative to eaves fillers is to form the eaves by fixing one or more courses of plain tiles, stone/concrete slates, etc. with the first full course of single-lap tiles bedded, nailed and pointed, leaving side-laps clear of mortar.

6.2.4 Verges

Where the verges are to be bedded in mortar, the specified undercloak should be fixed beneath the battens to provide the correct verge overhang.

Where specified, verge clips should be fixed to the end of each tile batten with their outer edges aligned with the edge of the undercloak and remaining in point contact with the top surface on the tiles once laid. Tiles should be bedded solidly and edges finished neatly.

A 100 mm wide bed of fully compressed mortar width should be laid onto the undercloak. Tiles should be bedded solidly and edges finished neatly.

The mortar bed should be firm enough to withstand the vibrations of nailing tiles or the pressure applied as a result of mechanical fixings.

NOTE It is good practice to wet the underside of all concrete products prior to bedding and ensure that all bedding surfaces are clean and free from release agents used in the manufacturing process. Whilst release agents are not used on clay products, the practice of wetting is particularly important when bedding in hot weather to prevent premature drying out of the mortar.

Where vibration or compression does disturb the bedding, it might be necessary to repack the bedding mortar or apply additional filling prior to pointing.

Special left- or right-hand verge tiles should be used where recommended by the manufacturer.

All verge tiles should be mechanically fixed according to manufacturers' recommendations for single-lap tiles.

Alternate courses should be finished with half tiles/three quarter tiles/tile-and-a-half tiles to break the bond/joints where flat single-lap interlocking tiles are used.

Where proprietary verge tiles or dry verge systems are specified, any special verge details recommended by the manufacturer should be followed. Inward tilt of tiling at verges should be avoided at roof pitches below 30°.

6.2.5 Ridges

6.2.5.1 Top edges

The top course of tiles should be located to ensure that the required 75 mm minimum ridge cover is given.

All tiles at the top edge should be mechanically fixed in accordance with BS 5534.

Proprietary top edge flashing units are available to suit single-lap tiles and should be installed in accordance with manufacturers' recommentations.

6.2.5.2 Ridge tiles

Butt jointed ridge and hip tiles should be edge bedded with a contact area of no less than 25 mm each side and solid bedded at the joints.

End ridge tiles should be solid bedded with dentil or tile slips.

Capped ridge should be edge bedded with the caps back bedded without pointing.

All ridge tiles bedded to roof tiles should be neatly pointed.

Ridge tiles should be kept to a true line.

All bedded ridge tiles should be mechanically fixed in accordance with BS 5534 and NFRC Technical Bulletin 27 [N1], except where mortar bedding alone is specified (see Note 1).

On historic roofs no attempt should be made to level uneven ridge and hip lines by bedding up the ridge tile.

NOTE 1 For historic or traditional roofing, ridge and hip mortar bedding without mechanical fixing might be specified.

NOTE 2 It is good practice to wet the underside of all concrete products prior to bedding and ensure that all bedding surfaces are clean and free from release agents used in the manufacturing process. Whilst release agents are not used on clay products, the practice of wetting is particularly important when bedding in hot weather to prevent premature drying out of the mortar.

Where vibration or compression does disturb the bedding, it might be necessary to repack the bedding mortar or apply additional filling prior to pointing.

Where the gaps in the troughs of profiled tiles are greater than 25 mm, dentil slips should be fully bedded in mortar.

The mechanical fixing of all ridge tiles should meet the requirements of BS 5534.

Dry fix ridge systems and special ridge tiles, gas flue terminals or ventilating ridge terminals should be fixed in accordance with manufacturers' recommendations.

6.2.6 Hips

6.2.6.1 Ridged hip tiles

Where required, a suitable hip iron should be fixed to the base of the hip rafter.

Roof tiles should be cut into the hip and rake cut to the hip line on both sides.

All small pieces of cut tile should be mechanically fixed or bonded. Special tile-and-a-half or double width tiles should be used where available to avoid small cut pieces.

Where dentil slips are specified for profiled tiles, they should be bedded into each pan of the tiles on both sides of the hip line.

The bottom hip tile should be cut to align with the eaves course. The bottom hip tile should be solid bedded and filled with dentil or tile slips.

All hip tiles should be edge bedded in mortar and all hip ridge joints should be solid bedded, ensuring 75 mm minimum lap over the main roof tiles. Bedding and pointing should be finished neatly with side pointing vertical.

Butt jointed hip tiles should be edge bedded with a contact area of no less than 25 mm each side and solid bedded at the joints.

End hip tiles should be solid bedded with dentil or tile slips.

Capped hip tiles should be edge bedded with the caps back bedded without pointing.

All hip tiles bedded to roof tiles should be neatly pointed.

Hip tiles should be kept to a true line.

All bedded hip tiles should be mechanically fixed in accordance with BS 5534 and NFRC Technical Bulletin 27 [N1], except where mortar bedding alone is specified (see Note 1).

On historic roofs no attempt should be made to level uneven hip lines by bedding up the ridge/hip tile.

NOTE 1 For historic or traditional roofing, ridge and hip mortar bedding without mechanical fixing might be specified.

NOTE 2 It is good practice to wet the underside of all concrete products prior to bedding and ensure that all bedding surfaces are clean and free from release agents used in the manufacturing process. Whilst release agents are not used on clay products, the practice of wetting is particularly important when bedding in hot weather to prevent premature drying out of the mortar.

Where vibration or compression does disturb the bedding, it might be necessary to repack the bedding mortar or apply additional filling prior to pointing

Hip tiles should be mechanically fixed according to manufacturers' sitework instructions where specified.

To achieve a neater hip/ridge junction a slightly flatter shaped ridge tile should be used on hips than on a main ridge, e.g. segmental or third round hip, if available. Where the gaps in the troughs of profiled tiles are greater than 25 mm, dentil slips should be fully bedded in mortar. Because of variations in the sizes of cut tiles the ends of the dentil slips should not be exposed beyond the mortar.

Dry fix hip ridge systems and special hip ridges, such as hip starter tiles, should be fixed in accordance with manufacturers' recommendations.

6.2.6.2 Ridge/hip junctions

Ridge and hip lines should intersect at the correct point.

NOTE The use of hip ridges lower in profile than the ridges is likely to assist in this.

All ridge and hip tiles at junctions should be cut to suit with other roof intersections and weathered with a saddle of the specified material, located and fixed in accordance with manufacturers' instructions.

Ridge and hip tiles should be laid, bedded, mechanically fixed and pointed as required and mortar should be finished neatly.

Purpose-made junction tiles should be fixed according to manufacturers' sitework instructions.

6.2.7 Valleys

6.2.7.1 Sheet metal valleys

The roof tiles should be laid into the valley and cut to rake to allow the required open channel.

NOTE 1 Most double-lap materials and some thinner single-lap slate tiles can be fixed dry without mortar.

Single-lap tiles should be bedded onto a suitable undercloak, such as a tile slip, slate or fibre cement board, laid either side of the channel and finished neatly.

Mortar (if used) should not block the tile sidelocks.

A clear channel should be kept between the bedding mortar and tilting fillet.

Edges of tiles should not be tilted up at open valleys.

All tiles and pieces of tile should be mechanically fixed where possible at the valley in accordance with BS 5534.

The width of open valleys using sheet metal should be in accordance with the design criteria in BS 5534. Close mitred valleys with single-lap tiles should not be used.

NOTE 2 Further guidance on pitched roof valleys can be found in NFRC Technical Bulletin 08 [7] and NFRC Technical Bulletin 38 [8].

6.2.7.2 Preformed valley units

Proprietary pre-formed valley units including dry valley systems should be laid in accordance with the manufacturer's sitework instructions.

NOTE Further guidance on the application of preformed plastic or GRP (glass-reinforced plastic) valley units can be found in NFRC Technical Bulletin 28 [9].

6.2.8 Valley/tile/ridge junctions

Flashings and saddles should be secured and tiles should be cut and bedded neatly to provide a weathertight detail.

A saddle of the specified material should be located and fixed at the top of a valley prior to completing ridges or flashings.

6.2.9 Abutments

6.2.9.1 Top edges

The top course of tiles should be located close to the abutment.

All tiles should be mechnically fixed in accordance with BS 5534.

The flashing should be dressed down closely over the surface and profiles.

NOTE It might be necessary to clip the edge of flashings in exposed locations. (Sheet metal work.)

The length of the top course of tiles should ensure that the minimum lap is maintained in combination with the length of the apron flashing. Slate or tile fillets should not be used unless precautions are taken to avoid the mortar from cracking at the abutment face as a result of roof settlement or movement. On no account should cement mortar fillets be used.

Proprietary top edge flashing units are available to suit single-lap tiles and should be installed in accordance with the manufacturer's recommendations.

6.2.9.2 Side abutment: cover flashing

Tiles should be cut close to the abutment.

All tiles should be mechanically fixed where possible in accordance with BS 5534.

A cover flashing should be dressed down closely over the tile profile. (Sheet metal work.)

With profiled tiles the abutment apron flashing should be a minimum of 150 mm wide but may be wider to dress over the first full roll or profile and into a trough. For flat tiles a secret gutter should be installed and the tiling finished at a maximum of 15 mm from the wall.

NOTE Where there is a risk of blockage from debris a combination of the cover flashing and secret gutter might be necessary.

Alternatively, proprietary pre-formed soakers or external flashing units are available to suit single-lap tiles and should be installed in accordance with the manufacturer's recommendations. Soakers should be weathered with an apron flashing.

6.2.9.3 Open secret gutters

*COMMENTARY ON **6.2.9.3***

Open secret gutters are more common in Scotland.

Tiles should be cut and fixed to give the required gap from the abutment.

All tiles should be mechanically fixed in accordance with BS 5534.

The gap underneath the edge tiles into the batten cavity should be closed using a comb filler or other appropriate material.

NOTE Where there is a risk of blockage from debris a combination of the cover flashing and secret gutter might be necessary.

6.2.9.4 Back gutters

The first course of tiles should be laid to discharge rainwater into the back gutter.

The tile course should not be kicked up and should be in the same plane as adjacent courses.

All tiles should be mechanically fixed in accordance with BS 5534.

6.2.9.5 Plastic, GRP and metal faced flashings and soakers

Proprietary plastic, GRP and metal faced flashing strips, units and soakers should be installed in accordance with manufacturers' recommendations.

6.2.10 Roofing accessories

The recommendations given in Clause **9** should be followed.

6.2.11 Lightning conductors

Lightning conductors, where installed, should not adversely affect the performance of the tiles as laid.

6.3 Double-lap (plain tiles)

6.3.1 Roof and wall general

Precautions should be taken to protect the safety of roofing operatives when working above slates/tiles in accordance with **11.2**.

Where possible, the roof should be set out to minimize cutting, ensure tiling is straight and that verge overhangs and other critical positions are identified before tiling commences.

A dry fix verge system or cloak verge tiles should be installed in accordance with manufacturers' instructions.

Tiles should be laid broken bond and in regular horizontal courses with joints not more than 3 mm apart and with each joint located generally over the centre of the tile below, ensuring side lap is not less than 55 mm.

The maximum or minimum gauges should not be exceeded.

Tiles should be mechanically fixed in accordance with BS 5534, the Zonal Fixing Method or the manufacturers' specifications for the tile, roof detail and site location.

Any fixed points required for fittings and accessories should be placed in the ridge, roof slope or wall. The manufacturer's roof pitch and gauge recommendations should not be exceeded.

6.3.2 Eaves and bottom edges

The two undereaves courses should be laid with special short eaves/top tiles to give the required overhang to the gutter or tilting fillet.

The main eaves course should be laid to give a broken bond/joint and the same overhang as the undereaves courses.

Both courses should be mechanically fixed in accordance with BS 5534.

The tilting fillet at the bottom edge should provide the required lay and fit of the eaves courses.

NOTE 1 Special eaves tiles might vary in length between manufacturers.

The short course and the first full course should have each tile twice nailed to battens. The roof pitch at sprockets should, as a minimum, be as given in BS 5534.

NOTE 2 Where a roof is re-tiled with products of different effective thickness, it might be necessary to adjust the height of the eaves.

Allowance should be made for the height of strip ventilators where they are located on the eaves support or fascia board.

6.3.3 Verges

Where the verges are to be bedded in mortar, the specified undercloak should be fixed beneath the battens to provide the correct verge overhang.

A 75 mm wide bed of mortar width should be laid onto the undercloak to leave an approximate finished bed width of 100 mm on compression. Tiles should be bedded solidly and the edge finished neatly.

The mortar bed should be of sufficient depth to compress when the slate or tile is fixed and firm enough to withstand the vibrations of nailing tiles or the pressure applied as a result of mechanical fixings.

NOTE It is good practice to wet the underside of all concrete products prior to bedding and ensure that all bedding surfaces are clean and free from release agents used in the manufacturing process. Whilst release agents are not used on clay products, the practice of wetting is particularly important when bedding in hot weather to prevent premature drying out of the mortar.

Where vibration or compression does disturb the bedding, it might be necessary to repack the bedding mortar or apply additional filling prior to pointing.

All verge tiles should be mechanically fixed in accordance with BS 5534.

Alternate courses should be finished with tile-and-a-half/gable tiles to break the bond.

6.3.4 Ridges

6.3.4.1 Top edges

The top course of tiles should be located to ensure that the required 65 mm ridge cover is given.

Special short double-lap top tiles should be laid to give a broken bond/joint at the top edge.

Both courses of tiles should be mechanically fixed at the top edge in accordance with BS 5534.

NOTE Some manufacturers produce shorter top course tiles which are fitted on top of a standard length tile and are mechanically fixed using special fixings.

Proprietary top edge flashing units are available to suit double-lap tiles and should be installed in accordance with the manufacturer's recommendations.

6.3.4.2 Ridge tiles

All ridges should be edge bedded in mortar and all ridge tile joints should be solid bedded. Bedding and pointing should be finished neatly.

End ridge tiles should be solid bedded and filled with tile slips.

The ridge tiles should be kept to a true line.

Ridges should be bedded onto top courses of tiles which have been mechanically fixed.

Ridge tiles should be mechanically fixed to manufacturers' sitework instructions where specified.

Butt jointed ridge tiles should be edge bedded with a contact area of no less than 25 mm each side and solid bedded at the joints.

Capped ridge should be edge bedded with the caps back bedded without pointing.

All ridge tiles bedded to roof tiles should be neatly pointed.

All bedded ridge tiles should be mechanically fixed in accordance with BS 5534 and NFRC Technical Bulletin 27 [N1], except where mortar bedding alone is specified (see Note 1).

On historic roofs no attempt should be made to level uneven ridge and hip lines by bedding up the ridge tile.

NOTE 1 For historic or traditional roofing, ridge mortar bedding without mechanical fixing might be specified.

NOTE 2 It is good practice to wet the underside of all concrete products prior to bedding and ensure that all bedding surfaces are clean and free from release agents used in the manufacturing process. Whilst release agents are not used on clay products, the practice of wetting is particularly important when bedding in hot weather to prevent premature drying out of the mortar.

Where vibration or compression does disturb the bedding, it might be necessary to repack the bedding mortar or apply additional filling prior to pointing.

Dry fix ridge systems and special ridge tiles, gas flue terminals or ventilating ridge terminals should be fixed in accordance with manufacturers' recommendations.

6.3.5 Hips

6.3.5.1 Ridged hip tiles

Where required a suitable hip iron should be fixed to the base of the hip rafter.

Roof tiles should be cut into the hip and rake cut to the hip line on both sides.

All small pieces of tile should be bedded and fixed.

The bottom hip tile should be cut to align with the eaves.

All hip tiles should be edge bedded in mortar and all hip tile joints should be solid bedded. Bedding and pointing should be finished neatly with the sides finished vertical.

Hip tiles should be mechanically fixed to conform to manufacturers' sitework instructions where specified.

Butt jointed hip tiles should be edge bedded with a contact area of no less than 25 mm each side and solid bedded at the joints.

End hip tiles should be solid bedded with dentil or tile slips.

Capped hip tiles should be edge bedded with the caps back bedded without pointing.

All hip tiles bedded to roof tiles should be neatly pointed.

Hip tiles should be kept to a true line.

All bedded hip tiles should be mechanically fixed in accordance with BS 5534 and NFRC Technical Bulletin 27 [N1], except where mortar bedding alone is specified (see Note 1).

On historic roofs no attempt should be made to level uneven hip lines by bedding up the ridge/hip tile.

NOTE 1 For historic or traditional roofing, hip mortar bedding without mechanical fixing might be specified.

NOTE 2 It is good practice to wet the underside of all concrete products prior to bedding and ensure that all bedding surfaces are clean and free from release agents used in the manufacturing process. Whilst release agents are not used on clay products, the practice of wetting is particularly important when bedding in hot weather to prevent premature drying out of the mortar.

Where vibration or compression does disturb the bedding, it might be necessary to repack the bedding mortar or apply additional filling prior to pointing.

Dry fix hip ridge systems and special hip ridges, such as block end tiles, should be fixed in accordance with manufacturers' recommendations.

NOTE 3 To achieve a neater hip/ridge junction it is better to use a slightly flatter shaped ridge tile on hips than on a main ridge, e.g. segmental or third round hip, if available.

6.3.5.2 Purpose-made hip tiles

*COMMENTARY ON **6.3.5.2***

Purpose-made hip tiles are available to suit particular roof pitches or a combination of roof pitches and can be ordered from the manufacturer. Where roof pitches to either side of the hip vary slightly, made to order hip tiles might also be available. If the roof pitches to either side of the hip vary by more than 5° it might not be possible to use purpose-made hip tiles.

The hip tile should be designed so that a minimum amount of cutting to a rake of the adjacent plain tiles is needed. Hip tiles should not be cut. In order to maintain the perpendicular joints to a straight bond in the general tiling straight cutting should be carried out to the plain tiles at either side of a hip. This cutting should be accommodated within the first four tiles to either side. Tile-and-a-half/gable tiles should be used where necessary to avoid small cut pieces.

Adjacent roof tiles to the hip tiles should be twice nailed, except where they have been cut to width and only one machine-made hole is available.

Where the roof pitches on either side of a hip vary, the steeper pitch should be battened to a closer gauge in order to maintain the same number of courses to either side.

Each hip tile should be bedded and fixed to an adequate hip timber. If necessary, a suitable additional timber should be securely fixed over the hip timber. With angular and round pattern hip tiles, each hip tile should be spot bedded but no mortar or pointing should be visible on the finished roof except at hip ends.

Special short eaves tiles should be laid cut to a mitre at the eaves end of the hip, ensuring that the minimum sidelap is maintained to the hip tile. The bottom hip tile should be laid and fixed in line with the eaves course.

Bonnet hip tiles should be nailed and bedded to give an even alignment to the outside edge of each hip tile.

The mortar should be struck away from the front edge of each bonnet hip tile and pointed neatly to leave a clean leading edge.

The bottom bonnet hip tile should be solid bedded and filled with dentil or tile slips.

6.3.5.3 Mitred hips

Tiles or tile-and-a-half tiles should be cut to form a neat, close rake to the hip line.

Soakers of required material should be cut to extend a minimum of 100 mm either side of the hip line and fixed as required.

All tiles should be mechanically fixed at the hip in accordance with BS 5534.

Tile-and-a-half/gable tiles should be used as appropriate to avoid small cut pieces.

6.3.5.4 Metal roll hips

Tiles or tile-and-a-half/gable tiles should be cut and fixed to a close rake to the hip rafter.

Timber roll should be fixed to give a minimum clearance of 5 mm above the finished level of tiling prior to tiling.

The sheet metal worker and the tiler should work closely to avoid damage to finished roof tiling.

6.3.5.5 Ridge/hip junctions

Ridge and hip lines should intersect at the correct point. The use of hip ridges lower in profile than the ridges will assist in this.

All ridge and hip tiles at junctions should be cut to suit with other roof intersections and weathered with a saddle of the specified material, located and fixed in accordance with manufacturers' instructions.

Ridge and hip tiles should be laid, bedded and pointed as required and mortar should be finished neatly.

Purpose-made junction tiles should be fixed to manufacturers' sitework instructions.

6.3.6 Valleys

6.3.6.1 Valley tiles

*COMMENTARY ON **6.3.6.1***

Valley tiles might be either universal to suit a range of roof pitches or purpose-made for a particular roof pitch or combinations of roof pitches. Where the roof pitches to either side of the valley vary slightly, specially made valley tiles might need to be manufactured to order. Where the roof pitches to either side of the valley vary significantly, it might not be possible to use purpose-made valley tiles.

The design of the valley tile should be such that a minimum amount of cutting to a rake of the adjacent plain tiles is necessary. The cutting of valley tiles should be avoided. In order to maintain perpendicular joints in the general tiling, straight cutting should be carried out to the plain tiles at either side of a valley. This cutting should be accommodated within the first four tiles to either side. Tile-and-a-half/gable tiles should be used as appropriate to avoid small cut pieces.

Adjacent roof tiles to the valley tiles should be twice nailed except where they have been cut to width and only one machine made hole is available.

Where the roof pitches on either side of a valley vary, the steeper pitch should be battened to a closer gauge in order to maintain the same number of courses to either side.

The bottom valley tile should be laid ensuring that the eaves tiles are positioned to maintain minimum sidelap.

The nailing of valley tiles should be avoided.

The second course and subsequent valley tiles should be laid to a true line with the main tiles.

6.3.6.2 Mitred valleys

Tiles or tile-and-a-half/gable tiles should be cut to a close rake to the valley line.

Soakers of the required material and specification should be cut extending a minimum of 150 mm either side of the valley line and fixed as required.

All tiles at the valley should be mechanically fixed to manufacturers' sitework instructions.

Mitred valleys should not be used where the roof pitches intersect at right angles or less on plans where the roof pitch is below 50°. The maximum rafter length should be no greater than 6 m. Mitred valleys should not be used where the valleys receive additional water from a roof area above.

6.3.6.3 Sheet metal valleys

*COMMENTARY ON **6.3.6.3***

Traditionally, plain tiles are not bedded in open valleys. However, in modern practice raking cut tiles to a sheet metal valley are sometimes bedded in mortar.

The tiles should be bedded only and not pointed between the tiles to allow the flow of water between tiles and into the valley. Tile-and-a-half/gable tiles should be used where possible to minimize the use of small tile sections at the valley.

The tile or tile-and-a-half/gable tile should be laid into the valley and cut to rake to allow the required open channel.

Edges of tiles should not be tilted up at the open valley.

All tiles and pieces of tile should be mechanically fixed at the valley in accordance with BS 5534.

NOTE Further guidance on pitched roof valleys can be found in NFRC Technical Bulletin 08 [7] and NFRC Technical Bulletin 38 [8].

6.3.6.4 Laced and swept valleys

The tiling battens should be fixed as for normal valley tiles. A 250 mm min. board (plus feather-edged boards to the sides no less than 100 mm wide) should be fixed and supported centrally to the valley to finish in the line of the first full course of tiles.

The plain tiles should be fixed directly to the boarding at the swept or laced valley, which might require the tiles to be de-nibbed, shouldered, packed and weathered using durable soakers. A specialist roofing contractor should be employed for this detailed work.

Where special valley details are required reference should be made at the design stage to a roofing contractor to advise on the method to be used. Generally, swept and laced valleys in plain tiles should not be used at roof pitches below 45°.

NOTE Further guidance can be obtained from The Clay Roof Tile Council. [1)]

Groundwork should be constructed in accordance with BS 5534.

The recommended minimum head-lap and side-lap should be maintained wherever possible. Adequate soaker strips should be used between courses where it is not possible to achieve the required head and side lap.

[1)] Available from <http://www.clayroof.co.uk> [last viewed 23 August 2013].

6.3.6.5 Preformed valley units

Proprietary pre-formed valley units including dry valley systems should be laid in accordance with the manufacturers' sitework instructions.

NOTE Further guidance on the application of preformed plastic or GRP valley units can be found in NFRC Technical Bulletin 28 [9].

6.3.7 Valley/tile/ridge junctions

Flashings and saddles should be secured and tiles should be cut and bedded neatly to provide a weathertight detail.

A saddle of the specified material should be located and fixed at the top of a valley prior to completing ridges or flashings.

6.3.8 Abutments

6.3.8.1 Top edges

A special short course of tiles should be laid close to the abutment and fixed to the batten.

All tiles should be mechanically fixed in accordance with BS 5534.

Flashings should be dressed down closely over the tile surface.

The length of the top course of tiles should ensure that the minimum lap is maintained in combination with the length of the apron flashing. Slate or tile fillets should not be used unless precautions are taken to avoid the mortar from cracking at the abutment face as a result of roof settlement or movement. On no account should cement mortar fillets be used.

Proprietary top edge flashing units are available to suit double-lap tiles and should be installed in accordance with the manufacturer's recommendations.

6.3.8.2 Side abutment: cover flashing/soakers

Tiling should be finished close to the abutment.

A soaker of the specified design and material should be placed on each course when laying, and fixed as required.

All tiles should be mechanically fixed in accordance with BS 5534.

A cover flashing should be dressed down closely over the soakers. (Sheet metal work.)

6.3.9 Vertical tiling

6.3.9.1 Top edge

The recommendations of **6.3.8.1** should be followed.

6.3.9.2 Bottom edge

The recommendations of **6.3.2** should be followed.

6.3.9.3 Abutments

The recommendations of **6.3.8.2** should be followed.

6.3.9.4 External and internal angles

Purpose-made angle tiles should be located at the angle to maintain the coursing. They should be mechanically fixed in accordance with BS 5534.

Adjacent tiles should be cut and/or laid to abut to the angle tiles.

NOTE Purpose-made angle tiles are available for left-hand and right-hand corners to maintain the bond. Close mitred tiles and soakers can also be used, especially where the corners are non-standard.

6.3.9.5 Junctions with verges: Winchester cutting

Tile-and-a-half tiles should be cut to the angle of the raking verge.

The cut tile should be placed in position and an adjacent plain tile cut to fit.

At least one nail hole should be retained on all cut tiles.

At the apex of the tiling, a tile-and-a-half tile should be purpose cut at an angle to fit.

Where appropriate, the tiling should be set out from the centre-line of the gable to ensure a uniform appearance at either hand. Depending on the pitch of the roof, raking battens or boards might be required to provide secure fixing points for the raking cuts. Where tile nibs need to be removed to assist laying this should be done before the tiles are cut.

Winchester cutting should not be used where the roof pitch or angle of the rake is below 40°.

NOTE 1 The objective of a Winchester cut is to allow tiles which are otherwise decorative to be nailed at the head to a restricted area of batten.

Where the cuts are sheltered from wind and driving rain by the overhanging gable soffit no flashing should be used.

NOTE 2 See the Vertical Tiling Guide *available from The Clay Roof Tile Council [10] for further information and guidance.*

6.3.9.6 Junction with verges: soldier course

The course of tiles should be located and securely fixed on the raking batten.

Where a double course is specified, a special short tile should be used to break the bond/joint on top of the main soldier course.

NOTE Soldier courses can be used at all roof pitches but in a single course the nail holes might be exposed. Ornamental or feature plain tiles could be used as total or part replacements for plain tiles.

6.3.10 Roofing accessories

The recommendations given in Clause **9** should be followed.

6.3.11 Lightning conductors

Lightning conductors, where installed, should not adversely affect the performance of the tiles as laid.

7 Laying and fixing of fibre cement slates, fittings and accessories

7.1 General

The documentation for all products should be checked to ensure they conform to specification and any specified certification schemes or assessments.

NOTE These documents might include third-party certificates, or manufacturers' product certificates of conformity to British, European or international standards.

Any limitations on the use of products should be established by manufacturers' instructions, product standards or third-party certificates, etc.

Precautions should be taken to protect the safety of roofing operatives when working above slates/tiles in accordance with **11.2**.

The roof should be set out to minimize cutting, where possible, and should ensure slating is straight and that verge overhangs and other critical positions are identified before slanting commences.

The eaves course should be set out to provide the required verge overhangs without cutting where possible. It should not be cut less than 125 mm wide.

Slates should be cut and holed to manufacturers' sitework instructions.

Slates should not be cut with an angle grinder (see **11.3**).

Slates should be laid half bond as recommended in the manufacturers' sitework instructions in regular horizontal courses with tails aligned.

Joints should be open but with not more than a 5 mm gap.

All slates and cut slates should be mechanically fixed in accordance with working instructions, for the size of slate, roof detail and site location.

Any fixed points required for accessories should be placed in the ridge or roof plane.

Slates fixed with nails and disc rivets should be fixed in accordance with BS 5534. Where disc rivets are used they should grip the slates together and resist any tendency for the tail to lift or curl. The nails should not be tightly driven but should allow some latitude for movement. Where mortar is to be used with the slates, it should be recognized that this does not provide any tensile bond strength and is used only as a gap filler where the ridge, hip or verge detail determines. All ridge and hip components should, in addition, be mechanically fixed in accordance with the manufacturers' recommendations.

The recommendations of BS 5534 with respect to minimum pitch and laps should not be exceeded. Manufacturers might provide other recommendations, the suitability of which should be verified by reference to third-party accreditation or the manufacturer's evidence of performance to recognized test methods and/or prolonged use in the specified application.

7.2 Hook fixing

Drive hooks should be used in accordance with BS 5534 (see also NFRC Technical Bulletin 03 [11]).

Hooks below 25° pitch should not be used. At pitches less than 30°, hooks with a crimped shank should be used.

Slates should be nailed (or nailed and hooked) at ends of courses, including abutments, hips and valleys, to prevent lateral drift.

Slates should not be forced into the hook or otherwise strained, as this will result in cracking.

7.3 Eaves and bottom edges

The two under eaves courses should be laid with two shortened cut eaves slates to a broken bond to give the required overhang to the gutter or tilting fillet.

The main full size eaves course slates should be laid to give a half bond/joint and the same overhang as the undereaves courses with all tails aligned.

All three eaves courses should be mechanically fixed in accordance with the working instructions.

The tilting fillet at the bottom edge should provide the required lay and fit of the eaves courses.

Allowance should be made for the height of strip ventilators where they are located on the eaves support or fascia board.

The eaves should not be sprocketed as this will affect the fitting of the disc rivet at the tail of the eaves course. This also applies to a raking eaves, where the disc rivet should be re-positioned with full support provided by the under eaves slate.

7.4 Verges

Where the verge is wet bedded, the fibre cement undercloak should be laid and fixed (rough side up) to give the required verge overhang.

All verge slates should be mechanically fixed in accordance with working instructions.

Alternate courses should be finished with slate and half widths to break the bond/joints.

The slate verge should be positioned to give a slight inward tilt but the undercloak should not be allowed to tilt inwards towards the roof.

A 100 mm wide bed of fully compressed mortar width should be laid onto the undercloak. Slates should be bedded solidly and edges finished neatly.

The mortar bed should be firm enough to withstand the vibrations of nailing slates or the pressure applied as a result of mechanical fixings.

NOTE It is good practice to wet the underside of all concrete products prior to bedding and ensure that all bedding surfaces are clean and free from release agents used in the manufacturing process. Whilst release agents are not used on clay products, the practice of wetting is particularly important when bedding in hot weather to prevent premature drying out of the mortar.

Where vibration or compression does disturb the bedding, it might be necessary to repack the bedding mortar or apply additional filling prior to pointing.

The edge of the slates should not be covered with mortar.

Where proprietary verge closers or dry verge systems are specified, any special verge details recommended by the manufacturer should be used.

Where a hook fixing system is used, the verge should be formed with slate and slate-and-a-half slates in alternate courses and each slate should be hooked and fixed with two centre-nails and one head-nail.

Where a bargeboard forms a close fitting to the underside of the verge slates (including any tilt at eaves), an undercloak and mortar should not be used.

7.5 Ridges and hips

7.5.1 Top edges

A top course of special short slates should be located to ensure that the required ridge cover is given.

Special short slate-and-a-half slates should be laid to give a broken bond/joint at the top edge.

All slates should be mechanically fixed at the top edge in accordance with manufacturers' sitework instructions.

The vertical top edge detail should be weathered with a flashing to give the required overlap. (Sheet metal work.)

The length of the top course of slates should ensure that the minimum lap is maintained in combination with the length of the apron flashing. Slate or tile fillets should not be used unless precautions are taken to avoid the mortar from cracking at the abutment face as a result of roof settlement or movement. On no account should cement mortar fillets be used.

Proprietary top edge flashing units are available to suit double-lap slates and should be installed in accordance with the manufacturer's recommendations.

7.5.2 Ridge and hip cappings

All proprietary, socketed or angular ridges and hip cappings should be laid and fixed to manufacturers' sitework instructions. Recommended mastic sealant should be applied to joints in accordance with manufacturers' sitework instructions.

All duopitch ridges, monopitch ridges and all hip cappings should be mechanically fixed to conform to manufacturers' sitework instructions.

NOTE Mortar bedding of ridge and hip cappings is not recommended.

End duopitch ridge and/or monopitch ridges or hip cappings should be laid to a true line and securely fixed to conform to manufacturers' recommendations.

Dry fix ridge systems including special ridge tiles, gas flue terminals or ventilating ridge terminals might be considered as an alternative and should be fixed in accordance with manufacturers' recommendations.

7.6 Hips

7.6.1 Mitred hips

Slates or wide slates should be cut to a close mitre to the hip line.

Soakers of the required material and specifications should be fixed extending at least 100 mm each side of the hip line for pitches 35° and above and at least 150 mm for pitches below 35°.

All slates should be mechanically fixed at the hip to conform to manufacturers' sitework instructions.

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

NOTE Mitred hips are normally secure at vertical and steep pitches. At lower pitches an increasing proportion of each cut slate is exposed.

Where mitred hips are specified in exposed locations supplementary tail fixings, such as screws, washers and caps, might be necessary and reference should be made to the manufacturer for specific guidance in relation to the product being used. Consideration of the visual impact of such fixings should be considered at the design stage.

7.6.2 Ridge/hip junctions

Ridge and hip tiles should be cut neatly at junctions with other roof intersections and weathered with an appropriate saddle of the specified material, located and fixed in accordance with manufacturers' instructions.

Ridge and hip tiles should be laid and fixed as required and finished neatly to a true line.

7.7 Valleys

7.7.1 Sheet metal valleys

The slate or wide slate should be laid into the valley and cut to rake to give the required open channel and overhang to the tilting fillet.

Slates should not be bedded.

Edges of slates should not be tilted up at the open valley.

All slates should be mechanically fixed at the valley to conform to manufacturers' sitework instructions.

NOTE Further guidance on pitched roof valleys can be found in NFRC Technical Bulletin 08 [7] and NFRC Technical Bulletin 38 [8].

7.7.2 Mitred valleys

Slates or wide slates should be cut to a close rake to the valley line.

Soakers of the required material and specifications should be fixed extending to the required dimensions each side of the valley line.

All slates should be mechanically fixed at the valley to conform to manufacturers' sitework instructions.

Mitred valleys should not be used where the roof pitches intersect at right angles or less on plans where the roof pitch is below 50°. At lower pitches down to 27.5°, special attention should be given to the design of the soakers so that adequate head and side-laps are maintained. An open valley should be used below 27.5° pitch. Where special valley details are required, the manufacturer's recommendations should be obtained at the design stage.

7.8 Valley/slate/ridge junctions

Flashings and saddles should be secured and slates should be cut and fixed neatly to provide a weathertight detail.

A saddle of the specified material should be located and fixed at the top of a valley prior to completing ridges or flashings.

7.9 Abutments

7.9.1 Top edges

A course of cut slates should be laid close to the abutment.

All slates should be mechanically fixed to conform to manufacturers' sitework instructions.

Flashings should be dressed down closely over the slate surface. (Sheet metal work.)

The length of the top course of slates should ensure that the minimum lap is maintained in combination with the length of the apron flashing. Slate or tile fillets should not be used unless precautions are taken to avoid the mortar from cracking at the abutment face as a result of roof settlement or movement. On no account should cement mortar fillets be used.

Proprietary top edge flashing units are available to suit double-lap slates and should be installed in accordance with the manufacturer's recommendations.

7.9.2 Side abutment: cover flashing/soakers

Slating should be finished close to the abutment.

A soaker of the specified design and material should be placed on each course when laying and fixed as required.

All slates should be mechanically fixed to conform to manufacturers' sitework instructions.

Cover flashing should be dressed down closely over the soakers. (Sheet metal work.)

7.9.3 Open secret gutters

Slates should be cut and laid to give the required gap from the abutment.

All slates should be mechanically fixed to conform to manufacturers' sitework instructions.

NOTE Where there is a risk of high water flow or blockage from debris a combination of the cover flashing and secret gutter might be necessary.

7.9.4 Back gutters

A gutter course of slates should be laid to discharge rainwater into the back gutter.

The slate course should not be kicked up and should be in the same plane as adjacent courses.

All slates should be mechanically fixed to conform to manufacturers' sitework instructions.

7.10 Vertical slating

7.10.1 Top edge

The recommendations of **6.3.8.1** should be followed.

7.10.2 Bottom edge

The recommendations of **6.3.2** should be followed.

7.10.3 Abutments

The recommendations of **6.3.8.2** should be followed.

7.10.4 External and internal angles

Mitre slates or wide slates should be closed to the line of the corner.

A soaker of the specified design and material should be placed on each course when laying and fixed as required.

7.10.5 Junctions with verges

Slates or wide slates should be splay cut to the angle of the raking verge.

All slates should be mechanically fixed at the junction to conform to manufacturers' sitework instructions.

7.11 Roofing accessories

The recommendations given in Clause **9** should be followed.

7.12 Lightning conductors

Lightning conductors, where installed, should not adversely affect the performance of the slates as laid.

8 Laying and fixing of natural slates, fittings and accessories

8.1 General

Precautions should be taken to protect the safety of roofing operatives when working above slates/tiles in accordance with **11.2**.

NOTE 1 The NFRC Technical Bulletin 04a [12] gives advice on the performance of natural slates suitable for use in the UK.

NOTE 2 The NFRC Technical Bulletin 43 [13] gives advice on the Scottish practice of nailing natural slates directly to board sarking.

8.1.1 Single size (tally) slating

8.1.1.1 Slates should be sorted into at least three groups of equal thickness. Slates which are badly shaped or otherwise unsuitable for laying should be rejected or reserved for special situations.

8.1.1.2 Slates in which the thickness is wedged across their width should be given considerable time and skill to be laid successfully and without causing gaps in the slating. Badly wedged slates cannot be successfully laid and should be rejected.

NOTE Damaged slates could be dressed down for use at eaves, tops and abutments.

8.1.1.3 For centre nailing, slates should be holed to the specified gauge and distance from the side edges. For top or shoulder nailing, slates should be holed to the specified distance from the top edge.

8.1.1.4 The size of slate, the head lap and hence the holing gauge should be selected to conform to BS 5534. These should be checked to ensure they provide adequate side lap.

NOTE The distance of the hole from the side edge might be 18 mm to 30 mm, depending on the slate's properties.

8.1.1.5 Slates should be head nailed where their dead load will exceed the wind load or where the head nailing and head bedding is sufficient to resist the wind load. The adequacy of the uplift resistance and the nailing should be checked using BS 5534.

8.1.1.6 When head nailing slates that are small and heavy a proportion of slates should be side nailed.

8.1.1.7 The holes should be formed using a slate holing machine. Machines which use two holes punches should do so sequentially, as punching two holes simultaneously risks cracking the slates.

8.1.1.8 When holing with a slater's pick hammer the accuracy of the holes should be ensured to avoid undue spalling.

8.1.1.9 Slates should be holed with the thicker end as the tail and from the underside to the topside as laid (from the bed to the back) to provide a small counter sink in the face of the slate. The diameter of the hole and the countersink should be suitable for the specified slate nail diameter.

NOTE The countersink will take the head of the nail when the slate is nail fixed.

8.1.1.10 Slates of equal thickness should be laid in any one course, with the thicker slates in the lower courses grading down to the thinner slates in the upper course.

8.1.1.11 The slating should be set out to provide the required verge overhang without cutting where possible.

8.1.1.12 Slates should be laid with the perpendicular joints in straight lines to nominal half bond in horizontal courses with tails aligned.

8.1.1.13 Slates vary in width. The width should be checked and the slating set out for the average slate width and variation.

8.1.1.14 The gauge should not be exceeded.

8.1.1.15 Slates should be laid with the dressed edge face up. Slates with a grain should be laid with the grain in the vertical direction.

8.1.1.16 Slates should be laid and fixed with gaps no greater than 5 mm at joints to accommodate variations in the slate width. These gaps should not exceed the limitations of side lap calculated in accordance with BS 5534.

8.1.1.17 All slates should be mechanically fixed in accordance with BS 5534.

8.1.1.18 Any fixed points required for accessories should be placed in the ridge or roof plane.

8.1.1.19 Vent slates should be positioned exactly where they replace a slate. If this is not possible and it is necessary to cut adjacent slates, the specified head and side laps should be achieved.

8.1.1.20 Any damaged slates should be replaced with a mechanical fixing. Adhesives should not be used.

8.1.2 Random (diminishing courses) slating

Where random slating is specified the size and laps in relation to the driving rain exposure of the roof should be considered in detail at the design stage.

The recommendations of **8.1.1.3** to **8.1.1.9**, **8.1.1.11** and **8.1.1.14** to **8.1.1.19** should be followed.

Slates of closely similar thickness should be selected and laid to the adjacent slates in the same course to avoid gaps and kicking slates.

Slates should be selected with a width to provide at least the minimum side lap and laid to achieve that lap over the slates in the course below.

In centre nailing the holing and batten gauges should be adjusted for the change courses.

The minimum specified head lap should be achieved at change courses.

The perpendicular joints should be positioned centrally over the slate below and should provide at least the minimum side lap over the slates below.

8.1.3 Hook fixing

Drive hooks should be used in accordance with BS 5534 (see also NFRC Technical Bulletin 03 [11]).

Hooks below 25° pitch should not be used.

At pitches less than 30°, hooks with a crimped shank should be used.

Slates should be nailed (or nailed and hooked) at ends of courses, including abutments, hips and valleys, to prevent lateral drift.

Slates should not be forced into the hook or otherwise strained which will result in cracking. If they do not fit easily into position the slating should be re-laid to remove any twisted or uneven surfaced slates.

8.2 Eaves and bottom edges

The tilting fillet at the bottom edge should provide the required lay and fit of the slates in subsequent courses.

The undereaves course should be laid to give the required overhang to the gutter or tilting fillet and with the dressed edges face down.

The main full size eaves course slates should be laid to give a nominal half bond for single size slating or broken bond with adequate side lap for random slating and the same overhang as the undereaves course with all tails aligned.

Eaves courses should be mechanically fixed in accordance with BS 5534.

The eaves might be sprocketed but the minimum pitch should not be below the pitch and laps recommended in BS 5534. Longer nails should be used for the lower courses where the slates are held away from the battens by the tilt.

Allowance should be made for the height of strip ventilators where they are located on the eaves support or fascia board.

8.3 Verges

A 100 mm wide bed of fully compressed mortar width should be laid onto the undercloak. Slates should be bedded solidly and edges finished neatly.

The mortar bed should be firm enough to withstand the vibrations of nailing slates or the pressure applied as a result of mechanical fixings.

NOTE 1 Where vibration or compression does disturb the bedding, it might be necessary to repack the bedding mortar or apply additional filling prior to pointing.

All verge slates should be mechanically fixed in accordance with BS 5534.

Slates should be laid nominal half bond for single size slating using extra-wide slates where necessary.

For random slating, slates should be laid which provide the minimum required side lap and broken bond in alternate courses.

Dry verge systems should be installed to conform to the manufacturer's sitework instructions.

A combination of slate widths should be used at verges to enable the bond to be achieved. Slate-and-a-half slates may be used where available. To avoid the risk of thin narrow slates breaking or becoming detached, the combination of slate sizes should not include slates less than 150 mm wide.

NOTE 2 In using extra-wide slates, extra fixings might be needed in exposed locations.

Where proprietary dry verge systems are specified, any special verge details recommended by the manufacturer should be used.

Where a hook fixing system is used, the verge slates should be nailed or hooked and nailed.

Where a bargeboard forms a close fitting to the underside of the verge slates (including any tilt at eaves), an undercloak and mortar should not be used.

8.4 Ridges

8.4.1 Top edges

The top course of short slates should be located to ensure that the required ridge cover is given.

To resist wind uplift, a thicker batten should be installed to support the heads of top edge slates. Alternatively, the heads should be bedded in mortar or secured with slate hooks.

All slates at the top edge should be mechanically fixed in accordance with BS 5534.

If the wind load resistance needs to be increased, two courses of short slates should be provided on double battens at the top edges to reduce the length of the top course.

The length of the top course of slates should ensure that the minimum lap is maintained in combination with the length of the apron flashing. Slate or tile fillets should not be used unless precautions are taken to avoid the mortar from cracking at the abutment face as a result of roof settlement or movement. On no account should cement mortar fillets be used.

Proprietary top edge flashing units are available to suit double-lap slates and should be installed in accordance with the manufacturer's recommendations.

8.4.2 Metal roll ridge

The top course of short slates should be located to ensure that the required ridge cover is given.

To resist wind uplift, a thicker batten should be installed to support the heads of top edge slates or they should be secured with slate hooks.

All slates at the top edge should be mechanically fixed in accordance with BS 5534.

A timber roll should be fixed to give a minimum 5 mm clearance above the slating and fix prior to slating. (Sheet metal work.)

The specified metal sheet should be laid and fixed to the timber roll. (Sheet metal work.)

8.4.3 Ridge tiles and stone ridges

All tile or stone ridges should be bedded in mortar and struck off neatly as work proceeds. All joints should be solid bedded but tile sockets should not be pointed up.

Butt jointed ridge and hip tiles should be edge bedded with a contact area of no less than 25 mm each side and solid bedded at the joints.

End hip and ridge tiles should be solid bedded with dentil or tile slips.

All bedded hip and ridge tiles should be mechanically fixed in accordance with BS 5534 and NFRC Technical Bulletin 27 [N1], except where mortar bedding alone is specified (see Note 1).

On historic roofs no attempt should be made to level uneven ridge and hip lines by bedding up the ridge/hip tile.

NOTE 1 For historic or traditional roofing, ridge and hip mortar bedding without mechanical fixing might be specified.

NOTE 2 It is good practice to wet the underside of all concrete products prior to bedding and ensure that all bedding surfaces are clean and free from release agents used in the manufacturing process. Whilst release agents are not used on clay products, the practice of wetting is particularly important when bedding in hot weather to prevent premature drying out of the mortar.

Where vibration or compression does disturb the bedding, it might be necessary to repack the bedding mortar or apply additional filling prior to pointing.

The end of the end tile should be solid bedded.

The ridge tiles should be kept to a true line.

Duopitch ridges and/or monopitch ridges should be mechanically fixed in accordance with BS 5534.

Where special ridge tiles, gas flue terminals or ventilation ridge or dry ridge systems are specified, the manufacturers' laying and fixing recommendations should be used.

Dry fix ridge systems and special ridge tiles, gas flue terminals or ventilating ridge terminals should be fixed in accordance with manufacturers' recommendations.

8.4.4 Dry ridge systems

Dry ridge systems should be installed to conform to the manufacturers' sitework instructions.

8.5 Hips

8.5.1 Hip tiles

A suitable hip iron should be fixed to the base of the hip rafter.

Slates should be rake cut to the hip line.

All slates (including hook fixed slates) should be nailed at the hip in accordance with BS 5534.

The bottom hip tile should be cut to align with the eaves slating.

All hip tiles should be back bedded in mortar and struck off as work proceeds. The edges of the hip tiles or stones should not be pointed up. All hip tile joints should be solid bedded but the tile sockets should not be pointed up.

Butt jointed hip tiles should be edge bedded with a contact area of no less than 25 mm each side and solid bedded at the joints.

End hip tiles should be solid bedded with dentil or tile slips.

Capped hip tiles should be edge bedded with the caps back bedded without pointing.

All bedded hip tiles to roof tiles should be neatly pointed.

Hip tiles should be kept to a true line.

All bedded hip tiles should be mechanically fixed in accordance with BS 5534 and NFRC Technical Bulletin 27 [N1], except where mortar bedding alone is specified (see Note 1).

On historic roofs no attempt should be made to level uneven hip lines by bedding up the ridge/hip tile.

NOTE 1 For historic or traditional roofing, ridge and hip mortar bedding without mechanical fixing might be specified.

NOTE 2 It is good practice to wet the underside of all concrete products prior to bedding and ensure that all bedding surfaces are clean and free from release agents used in the manufacturing process. Whilst release agents are not used on clay products, the practice of wetting is particularly important when bedding in hot weather to prevent premature drying out of the mortar.

Where vibration or compression does disturb the bedding, it might be necessary to repack the bedding mortar or apply additional filling prior to pointing.

Hip tiles should be mechanically fixed in accordance with BS 5534.

8.5.2 Mitred hips

Slates or extra-wide slates should be cut to a close mitre to the hip line to maintain the required side lap given in BS 5534.

All slates (including hook fixed slates) should be nailed at the hip in accordance with BS 5534.

Soakers, one for each course of slates (sheet metal work), should be cut to a template provided by the slater to the required shape; the width should be a minimum of 100 mm for pitches 35° and above and a minimum of 150 mm for pitches below 35° either side of the hip mitre.

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

NOTE Mitred hips are normally secured at vertical and steep pitches. At lower pitches an increasing proportion of each cut slate is exposed, increasing the uplift force acting on the fixings.

Where mitred hips are specified in exposed locations, supplementary tail fixings, such as screws, washers and caps, might be necessary and reference should be made to the manufacturer for specific guidance in relation to the product being used. The visual impact of such fixings should be considered and taken into account at the design stage.

8.5.3 Dry hip systems

Dry hip systems should be installed in accordance with the manufacturers' sitework instructions.

8.5.4 Metal roll hips

The timber roll should be fixed to give a minimum clearance of 5 mm above the slating and fixed prior to slating. (Sheet metal work.)

All slates (including hook fixed slates) should be nailed at the hip in accordance with BS 5534. Specified metal sheet should be laid and fixed to timber roll. (Sheet metal work.)

8.5.5 Ridge/hip junctions

All ridge and hip tiles at junctions should be cut to suit with other roof intersections and weathered with a saddle of the specified material, located and fixed in accordance with manufacturers' instructions.

Ridge and hip tiles should be laid and fixed as required and finished neatly to a true line.

8.6 Valleys

8.6.1 Sheet metal valleys

The slates should be laid into the valley and cut to rake to give the required open channel and overhang to the tilting fillet.

The side laps slates cut to the rake in valleys should not be pointed or bedded. Slates should freely drain into the valley.

Edges of slates at the open valley should not tilt up.

All slates should be mechanically fixed at the valley in accordance with BS 5534.

NOTE Further guidance on pitched roof valleys can be found in NFRC Technical Bulletin 08 [7] and NFRC Technical Bulletin 38 [8].

8.6.2 Mitred valleys

Slates should be cut to a close rake to the valley line.

Soakers of the required material and specifications should be cut extending at least 150 mm each side of the valley line and fixed as required.

All slates (including hook fixed slates) should be nailed at the valley in accordance with BS 5534.

Mitred valleys are not generally recommended for slating where the roof pitches intersect at right angles or less on plan where the roof pitch is less than 50°. At lower pitches, special attention should be given to the design of the soakers. Where special valley details are required, a slating contractor should be consulted at the design stage.

A variety of slate valley types are used on historic roofs; specialist advice should be obtained for their design and construction.

NOTE They are not generally suitable for centre nailed, single sized slating.

8.7 Valley/slate/ridge junctions

Flashings and saddles should be secured and slates should be cut and fixed neatly to provide a weathertight detail.

A saddle of the specified material should be located and fixed at the top of a valley prior to completing ridges or flashings.

8.8 Abutments

8.8.1 Top edges

A course of cut slates should be laid close to the abutment.

All slates should be mechanically fixed in accordance with BS 5534.

A thicker batten should be used to support the heads of top edge slates or they should be head bedded in mortar. Alternatively nails and hooks should be used.

The vertical top edge detail should be weathered with a flashing to give the required overlap. (Sheet metal work.)

Flashings should be dressed down closely over the slate surface. (Sheet metal work.)

If the wind load resistance needs to be increased, two courses of short slates should be provided on double battens at the top edge to reduce the length of the top course. If nails and hooks are used, the slate should not be placed under strain by over nailing.

The length of the top course of slates should ensure that the minimum lap is maintained in combination with the length of the apron flashing. Slate or tile fillets should not be used unless precautions are taken to avoid the mortar from cracking at the abutment face as a result of roof settlement or movement. On no account should cement mortar fillets be used.

Proprietary top edge flashing units are available to suit double-lap slates and should be installed in accordance with the manufacturer's recommendations.

8.8.2 Side abutments: cover flashing/soakers

Slating should be finished close to the abutment.

A soaker of the specified design and material should be placed on each course when laying and fixed as required.

All slates (including hook fixed slates) should be nailed in accordance with BS 5534.

Cover flashing should be dressed down closely over the soakers.

NOTE Splash laps are not recommended.

8.8.3 Open secret gutters

Slates should be cut or laid to give the required gap from the abutment.

All slates (including hook fixed slates) should be nailed in accordance with BS 5534.

NOTE Where there is a risk of blockage from debris, a combination of the cover flashing and secret gutter might be necessary.

8.8.4 Back gutters

A gutter course of slates should be laid to discharge rainwater into the back gutter a minimum of 50 mm below the tilting fillet.

The slate course should not be not kicked up and should be in the same plane as adjacent courses by using a tilting fillet.

All slates should be mechanically fixed in accordance with BS 5534.

8.9 Vertical slating

8.9.1 Top edges

The recommendations of **7.5.1** should be followed.

8.9.2 Bottom edges

The recommendations of **7.3** should be followed.

8.9.3 Abutments

The recommendations of **7.9** should be followed.

8.9.4 External and internal angles

Mitre slates or extra-wide slates should be closed to the line of the corner.

A soaker of the specified design and material should be placed on each course when laying and fixed as required.

8.9.5 Junctions with verges

The slates should be rake cut to the verge soffit, at roof pitches of 40° and above. At roof pitches less than 40° an apron should be provided to cover the exposed nail fixings.

All slates (including hook fixed slates) should be nailed at the junction in accordance with BS 5534.

8.10 Roofing accessories

The recommendations given in Clause **9** should be followed.

8.11 Lightning conductors

Lightning conductors, where installed, should not adversely affect the performance of the slates as laid.

9 Roofing accessories

Accessories should be located, laid and mechanically fixed to maintain the courses and lines of the roof to manufacturers' sitework instructions.

A wide range of proprietary purpose-designed roofing accessories is available to allow other roof and building functions to be satisfactorily performed; where these products are located in the external roofing envelope, manufacturers' laying and fixing recommendations should be used.

10 Solar roof panels

Solar roof panels should be located and mechanically fixed in accordance with the manufacturer's sitework instructions.

Particular attention should be paid to the weatherproofing of the penetrations, which might affect the roof covering, the underlay and any insulation materials. The fitting of solar equipment should be achieved using purpose-designed mounting and waterproofing systems. The use of mastic to seal penetrations in the waterproof medium, such as tiles or slates, should be avoided.

NOTE 1 The handling and method of fixing solar panels to roofs varies considerably for different roof types and panel designs.

NOTE 2 For guidance on solar panels, refer to the following NFRC publications: Technical Bulletin 41 [14], Technical Document 01 [15] and ACR Information Sheet No 2 [16].

NOTE 3 When installing solar panels on listed buildings or buildings in conservation areas, attention is drawn to the need to check what rules exist concerning their installation with the local Planning Authority.

11 Safety and general precautions

11.1 Precautions

*COMMENTARY ON **11.1***

*Attention is drawn to the statutory regulations listed in the commentary on **11.2**.*

11.1.1 General

All gutters should be cleaned out after completion and pipes kept free of debris.

NOTE The recommendations given for basic workmanship apply also to repairs and re-covering.

11.1.2 Repair

Where broken or defective slates or tiles are to be replaced:

a) any broken or defective slate or tile should be replaced with a sound matching unit;

b) for tiles, the tile should be eased upwards and the nibs lifted clear of the batten then pulled downwards. For nailed tiles, its neighbour above should be removed to expose the nail, the nail should be extracted carefully and then work should proceed. If all courses are nailed, a slate ripper should be used to remove tiles as required;

c) for slates, a slate ripper should be used to ensure minimum damage to neighbouring slates. Isolated single replacements or the last slate in a new patch of slating should be secured by a strap, tingle, hook or proprietory fixing under the slate. Tail pinning or adhesives should not be used.

Fixing manufacturers' instructions should be followed for proprietary fixings.

11.1.3 Re-covering

It should be established whether the roof substructure and timbers are sound, secure and free from insect attack, dry or wet rot, and have appropriate strength, stiffness and dimensional accuracy suitable for the weight and application of the re-covering material to be used.

All second-hand slates or tiles to be re-used should be checked. They should be inspected for defects to ensure that the quality, sizes, position and condition of nail holes and nibs conform to the appropriate requirements for lap, pitch and fixing. Where re-holing is necessary, it should conform to the recommendations given in BS 5534 with respect to laps and spread of water through capillarity.

A coating material or compound should not be applied to the top or bottom surface of existing tiling or slating, as this might be detrimental to its functional performance.

NOTE Re-covering with heavier materials might result in distortion or collapse of the roof. Re-covering with lighter materials might result in lower resistance to wind loads. Attention is drawn to the Building Regulations [17] with regard to the structural integrity of the modified roof. Planning consent might be required when re-covering with different materials for buildings in conservation areas or those listed as being of architectural or historic importance.

Where practicable, the exposed structure and ceilings should be provided with weather protection by the use of rigid translucent sheets or tarpaulins.

11.2 Health and safety

*COMMENTARY ON **11.2***

Attention is drawn to The Construction Regulations, made under the Factories Act 1961, comprising the Health and Safety at Work etc. Act 1974 [18], the Construction (Design and Management) Regulations 2007 [19], the Management of Health and Safety at Work Regulations 1999 [20], the Control of Substances Hazardous to Health (COSHH) Regulations 2002 [21], the Work at Height Regulations 2005 [22], HSG 33 Health and Safety in Roof work *[23] and the Lifting Operations and Lifting Equipment Regulations (LOLER) 1998 [24]. Particular attention is drawn to the Construction (Design and Management) Regulations 2007 [19] which lays down requirements for the protection of persons who work on sloping roofs and on or near fragile materials.*

Attention is also drawn to the following regulations, which are applicable to roof work: the Manual Handling Operations Regulations 1992 [25], the Provision and Use of Work Equipment Regulations (PUWER) 1998 [26], the Control of Lead at Work Regulations 2002 [27], the Personal Protective Equipment at Work Regulations 1992 [28], the Health and Safety (Safety Signs and Signals) Regulations 1996 [29], the Noise at Work Regulations 1989 [30] and the Electricity at Work Regulations 1989 [31].

11.2.1 Roofing work should be planned so that battens are used as footholds (albeit not at mid-span) so as to avoid walking directly on tiles and slates. However, when completing hips, valleys and ridges, battens might no longer be available as a foothold, and a degree of working directly above the slates and tiles might be unavoidable. In such circumstances, work should be completed from a kneeling position or from a roof or access ladder, suitably packed with foam or other compressible material so as to spread the load and avoid point contact on the tiles or slates. Any cracked or damaged tiles and slates should be replaced and secured in accordance with the specification, using a fixing system recommended by the slate or tile manufacturer.

11.2.2 Any roof or vertical work in slating or tiling should be considered as fragile in terms of the potential risks associated with handling materials, accessing roofs and trafficking completed areas of work.

11.2.3 An adequate number of crawling boards, ladders, hooks, etc. should be used, supported and anchored to prevent slipping or tipping. Packing should be used between boards and tiles or slates to avoid damage.

11.2.4 A ladder should not be placed against a verge owing to the uneven line of support. Any ladder used to gain access to a roof gable should rest below the verge to assure proper support and should be blocked out to clear any verge overhangs.

11.2.5 Valley products should be checked to ensure they are not damaged if they are to be used for temporary access to the roof.

11.2.6 Materials or tools should not be dragged over the roof or be dropped onto the roof.

11.2.7 Ladders used for access at eaves should not be allowed to rest against the gutter. They should be blocked out to clear the gutter and made secure.

NOTE Guidance on the erection and use of scaffolding for slating and tiling is given in HSG 33 Health and safety in roof work *[23] and NFRC Guidance Sheet A [32].*

11.3 Material cutting

11.3.1 General

When cutting slates, tiles and fittings using a mechanical disc cutter, precautions should be taken to reduce the risk of dust by applying water during cutting (see NFRC Guidance Sheet S [33]).

The modes of cutting slates and tiles described in **11.3.2** and **11.3.3** should be followed.

NOTE The actual method might vary according to the section of work and type of roof covering materials.

11.3.2 Roof details which are covered (hips/tiles/flashings)

The slate or tile should be rough cut to the rake or line of the roof detail.

The following methods should be used:

a) single-lap tiles: hammer or pincer cutting;

b) plain tiles: hammer or pincer cutting;

c) fibre cement slates: scribe and break, guillotine or sawn;

d) natural slates: picked perforated break.

11.3.3 Roof details which are not covered (valleys/mitred hips/external angles/perpendicular joints)

The slate or tile should be cut straight or to the rake or to the mitre in the line of the roof detail.

The following methods should be used;

a) single-lap tiles: mechanical disc cutter or scribe and hammer/pincer cutting;

b) plain tiles: mechanical disc cutter, scribe, hammer/pincer cutting or guillotine cropper. (With plain tiles, mitres formed at right angles on plan are not practical.);

c) fibre cement slates: scribe and break, guillotine or sawn;

d) natural slates: slate knife riven edge. (For mitred hips and external angles, reverse riven edge to form chamfer. With thick slates a rasp might be used to improve the mitre.)

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