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Dry fixed ridge, hip, and verge systems for slating and tiling – Specification

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 January 2018. It was prepared by 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.

Information about this document

This is the first British Standard to address dry-fixed systems and its development may be an iterative process over several revisions, to aid future development.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

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

Requirements in this standard are drafted in accordance with *Rules for the structure and drafting of UK standards*, subclause G.1.1, which states, “Requirements should be expressed using wording such as: ‘When tested as described in Annex A, the product shall ...’”. This means that only those products that are capable of passing the specified test will be deemed to conform to this standard.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. “organization” rather than “organisation”).

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 British Standard specifies the performance requirements and methods of test for dry-fixed ridge and hip systems connected to timber ridge/hip battens, ridge boards or hip rafters, and for dry-fixed verge systems, which are installed with slating or tiling.

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.

BS 1202-2, *Specification for nails — Copper nails*

BS 1202-3, *Specification for nails — Aluminium nails*

BS 5250:2011+A1:2016, *Code of Practice for control of condensation in buildings*

BS 5534:2014+A1:2015, *Slating and tiling for pitched roofs and vertical cladding — Code of practice*

BS EN 485-1, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 1: Technical conditions for inspection and delivery*

BS EN 485-2, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 2: Mechanical properties*

BS EN 485-4, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 4: Tolerances on shape and dimensions for cold-rolled products*

BS EN 490:2011+A1:2017, *Concrete roofing tiles and fittings for roof covering and wall cladding — Product specifications*

BS EN 492, *Fibre-cement slates and fittings — Product specification and test methods*

BS EN 1304, *Clay roofing tiles and fittings — Product definitions and specifications*

BS EN 1991-1-4:2005+A1:2010, *Eurocodes 1 — Part 1-4: Actions on structures — General actions — Wind actions*

National Annex to BS EN 1991-1-4:2005+A1:2010, *Eurocode 1 — Actions on structures — Part 1-4: General actions — Wind actions*

BS EN 10048, *Hot rolled narrow steel strip — Tolerances on dimensions and shape*

BS EN 10051, *Continuously hot-rolled strip and plate/sheet cut from wide strip of non-alloy and alloy steels — Tolerances on dimensions and shape*

BS EN 10088-3:2014, *Stainless steels — Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*

BS EN 10095, *Heat resisting steels and nickel alloys*

BS EN 10230-1, *Steel wire nails — Part 1: Loose nails for general applications*

BS EN 10268, *Cold rolled steel flat products with high yield strength for cold forming — Technical delivery conditions*

BS EN 10346:2015, *Continuously hot-dip coated steel flat products for cold forming — Technical delivery conditions*

BS EN 12326-1, *Slate and stone for discontinuous roofing and external cladding — Part 1: Specifications for slate and carbonate slate*

BS EN 60068-2-52, *Environmental testing — Part 2: Tests — Test Kb: Salt mist, cyclic (sodium, chloride solution)*

BS EN ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics*

BS EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*

BS EN ISO 4892-3:2016, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1.1 dry-fixed

fixing without reliance on mortar

3.1.2 characteristic resistance

adopted resistance value derived from a prescribed statistical analysis of a number of test results

3.1.3 design resistance

characteristic resistance divided by a material safety factor γ_M

3.1.4 characteristic load

maximum load adopted for the design period

3.1.5 design load

characteristic load multiplied by a safety load factor γ_Q and by a structural consequence factor K_{FI}

3.1.6 ultimate limit state

state of a structure at its maximum failure resistance

3.1.7 serviceability limit state

state of a structure at a prescribed limit of deformation, or the residual deformation when the load at the prescribed limit of deformation is released

3.1.8 ventilation

provision for exchange of internal and external air to alleviate condensation

3.2 Symbols

For the purposes of this British Standard, the following symbols apply.

A_h	projected side area of ridge tile, in square metres (m ²)
A_t	area of the verge tile, calculated as the full width of the tile including any sidelock, multiplied by the maximum batten gauge (m ²)
A_{tr}	projected plan area of the ridge tile, in square metres (m ²)
A_v	exposed vertical area of the verge between fasteners, in metres squared (m ²)

B_r	length of ridge tile, in metres (m)
$c_{p,net}$	wind pressure difference coefficient
d_{max}	maximum deflection of a ridge batten, in millimetres (mm)
d	batten depth, in millimetres (mm)
E	modulus of elasticity of a material, in newtons per square millimetre (N/mm ²)
F_h	horizontal wind shear force on a ridge tile or hip tile, in newtons (N)
F_{hv}	worst case horizontal wind load acting on the side surface of a single verge unit, in newtons (N)
$F_{Lmax,i}$	maximum load during test i when measuring tensile strength of ridge-roll product, in newtons (N)
F_{pav}	average maximum load when measuring the peel strength of ridge-roll product per 50 mm width, in newtons (N)
F_{pi}	maximum load in test i when measuring the peel strength of ridge-roll product per 50 mm width, in newtons (N)
$F_{pmax,i}$	maximum load in test i, when measuring the peel strength of ridge-roll product, in newtons (N)
F_T	wind uplift force acting in the centre of the exposed area of the tile or slate, in newtons (N)
F_{Tav}	average maximum load when measuring the tensile strength of ridge-roll product per 50 mm width, in newtons (N)
F_{Ti}	maximum load in test i when measuring the tensile strength of ridge-roll product per 50 mm width, in newtons (N)
F_{tr}	vertical wind uplift force on a ridge tile, in newtons (N) (negative values denote uplift)
F_{TS}	total serviceability wind load on fastener
F_{tv}	worst case wind uplift load acting on a single verge roofing tile or slate, in newtons (N)
$F_{V,max}$	ultimate limit state maximum load in an individual test, in newtons (N)
F_{V0}	measured load without a verge unit attached in newtons (N)
$F_{v,s}$	serviceability limit state failure in an individual test, in newtons (N)
h_r	height of ridge tile, in metres (m)
K_b	depth factor
K_{FI}	structural consequence factor
L_r	width of ridge tile, in metres (m)
I_x	second moment of area about axis xx, in millimetres to the power 4 (mm ⁴)
M_{max}	maximum bending moment, in newton metres (Nm)
MR_x	design ultimate resistance moment, in newton metres (Nm)
M_x	ultimate bending moment in ridge/hip batten in newton metres (Nm)

m	mass of a ridge tile, in kilograms (Kg)
q_p	peak velocity wind pressure, in newtons per square metre (N/m ²) or pascals (Pa)
$R_{kx,max}$	ultimate limit state failure characteristic resistance, in newtons (N)
$R_{kx,s}$	serviceability limit state failure characteristic resistance, in newtons (N)
R_s	serviceability limit state design resistance, in newtons (N)
R_{si}	serviceability limit state resistance due to the verge plus head fixings, in an individual test, in newtons (N)
R_u	ultimate limit state design resistance, in newtons (N)
R_{ui}	ultimate limit state resistance due to the verge plus head fixings, in an individual test, in newtons (N)
S	roof substrate shielding factor
W_i	actual width of specimen for test i, in millimetres (mm)
W_r	load from the self-weight of a ridge tile, in newtons (N)
Z_x	section modulus about axis xx in millimetres cubed (mm ³)
γ_Q	load safety factor
γ_M	material safety factor

4 Material specifications and durability

COMMENTARY ON CLAUSE 4

Thermal shrinkage and expansion have not been included in this standard. However, changes in dimensions can often be accommodated in the design, for example, by using sliding joints or slotted fixing points.

4.1 Concrete, clay, fibre-cement and slate components

The concrete, clay, fibre-cement and slate components of ridge, hip, and verge systems shall conform to BS EN 490, BS EN 1304, BS EN 492, and BS EN 12326-1 respectively.

4.2 Metal components

Metal components, including metal verges, hips, ridges and (where appropriate) the metal parts of ridge-rolls, but excluding fixings, straps, clips and brackets, shall comply with the metal material specifications in BS 5534.

NOTE See [4.5.2](#) for fixings and [4.5.3](#) for clips, straps and brackets.

Metal products made from materials other than those cited above shall be tested according to severity level 4 in BS EN 60068-2-52 and shall, after exposure, enable the ridge, hip or verge system to meet the mechanical strength requirements specified in [Clause 5](#).

4.3 Plastic components

4.3.1 Material identification

For all plastic components, the manufacturer shall declare the type of plastic used, e.g. PVC-u, polypropylene, ABS, etc.

4.3.2 Glass reinforced polyester products

Preformed glass reinforced polyester (GRP) products shall be manufactured from polyester resin and glass fibres with maximum resin to glass ratio of 2.2:1, a minimum glass weight of 450 g/m² and minimum thickness of 1.0 mm. UV surface protection (e.g. polyester film or gel coat) shall be applied to the exposed surface.

4.3.3 Durability

Load-bearing components designed to be exposed to daylight shall have a tensile strength $\geq 40\%$ of the value before ageing. The ageing, for 1 600 h, shall be in accordance with BS EN ISO 4892-3:2016, method A, cycle 1. The tensile strength shall be tested in accordance with BS EN ISO 527-2.

When testing the tensile strength according to BS EN ISO 527-2, prepare the test specimens after ageing and carry out the testing at a cross-head speed of 5 mm/min.

4.4 Ridge-roll products for ridge and hip

4.4.1 Tensile strength

When tested in accordance with [Annex A](#), the average maximum load after ageing shall be ≥ 40 N per 50 mm width or >30 N if the elastic extension is greater than 10%.

4.4.2 Adhesion

When tested in accordance with [Annex B](#), the average maximum load after ageing shall be ≥ 10 N per 50 mm width.

4.5 Accessory and ancillary components

4.5.1 Timber battens

Timber battens for use in ridge, hip and verge systems shall conform to BS 5534.

4.5.2 Mechanical fixings and fasteners (nails and screws)

Mechanical fixings and fasteners made of:

- a) zinc-coated steel shall be coated using any one of the zinc or zinc alloy coating methods specified in BS EN 10230-1;
- b) stainless steel shall conform to BS EN 10088-3:2014, grade 304 or 316;
- c) copper shall conform to BS 1202-2;
- d) aluminium shall conform to BS 1202-3; and
- e) other materials, including phosphor or silicon-bronze, shall be tested according to BS EN 60068-2-52, Severity level 4 and shall, after exposure, meet the mechanical strength requirements specified in [Clause 5](#).

NOTE 1 When selecting the type of screw or nail for each application, account should be taken of the effects on its mechanical and chemical properties when in contact with dissimilar metals or exposure to chemical salts that might be present in its final location.

NOTE 2 Some copper based preservatives can cause corrosion of zinc coated mild steel nails in the presence of moisture.

NOTE 3 Nails for use with battens and counterbattens should be in accordance with BS 5534.

NOTE 4 Minimum end and edge distances for nails or screws driven into the side grain of timber are given in BS 5534:2014+A1:2015, Table 7.

4.5.3 Clips, straps and brackets

Clips, straps and brackets made of:

- a) aluminium alloy shall conform to BS EN 485-1, BS EN 485-2 and BS EN 485-4;
- b) stainless steel shall conform to BS EN 10048, BS EN 10051, BS EN 10095 or BS EN 10088-3:2014, grade 302, 304 or 316;
- c) pre-galvanized steel for non-exposed applications (e.g. ridge batten support brackets) shall conform to BS EN 10346:2015, Z275;
- d) hot-dipped galvanized steel shall conform to BS EN 10268 and shall be hot-dipped in accordance with BS EN ISO 1461 after cutting;
- e) other materials such as different alloy types, non-ferrous metals or polymer-based materials, shall be tested according to BS EN 60068-2-52 and, after exposure, shall meet the mechanical strength requirements specified in [Clause 5](#).

5 Mechanical resistance

Ridge, hip and verge systems shall safely resist the wind and dead loads acting on their surfaces. Their design resistance shall be not less than the design wind and dead loads.

Wind loads shall be determined in accordance with [Annex C](#).

Ridge, hip and verge resistances shall be determined in accordance with [Annex E](#), except for the wind uplift resistance of verge units which shall be determined in accordance with [Annex F](#).

The strength and serviceability limits of timber ridge battens shall be determined either by calculation (see [D.1.3](#)) or by test (see [E.8](#)).

NOTE 1 Particular attention should be given to the eaves connections of verge systems where the connection at the eaves differs from the connections used in the tests. Such connections should have adequate resistance to wind loads and could be assessed by adapting the test method in [Annex E](#).

NOTE 2 The mechanical resistance requirements and the method of test stated in [Annex F](#) do not apply to verges where the uplift resistance of the verge tiles does not rely on the verge units.

The adequacy of the design resistance shall be determined in accordance with [C.5](#).

The withdrawal resistance of nails inserted into the end grain of timber shall not be taken into account.

Ridge systems satisfying the requirements of mechanical resistance shall be deemed to apply to hip systems of identical construction, provided the reduction of dead load of the hip tile on the slope of the hip is taken into account.

NOTE 3 [D.2](#) provides a worked example.

The down-slope dead load from hip tiles shall be safely resisted by the dry-hip system, or by a hip iron conforming to BS 5534.

6 Ventilation for ridge and hip systems (where provided)

The manufacturer shall declare that their product conforms with the ventilation requirements of BS 5250 and shall state how this has been verified.

NOTE The ventilation performance should not compromise the rain tightness of the system.

7 Rain performance

COMMENTARY ON CLAUSE 7

There is no normative requirement for the rain performance of ridges and hips.

Verge systems, when tested in accordance with the test method in [Annex G](#), shall not allow water to discharge in one or more concentrated, continuous or intermittent streams on the wall. Random splashes which do not form intermittent streams are acceptable.

NOTE 1 Concentrated, continuous streams of water running down the wall are known to cause lines of discoloration and mould.

NOTE 2 Water from continuous verges should safely discharge into the gutter.

The test method in [Annex G](#) shall be applied to discontinuous and continuous verge systems. When testing continuous systems, a joint shall be simulated in the lower quarter of the rig.

8 Geometric characteristics

8.1 Dimensions

The manufacturer shall identify and declare the geometric characteristics of the components of the ridge, hip and verge systems which are essential to the assembly and function of the system.

8.2 Ridge-roll systems profile classification

When tested in accordance with the test method given in [Annex H](#), the ridge and hip-roll systems shall be assigned a profile class(es) when the following conditions are met:

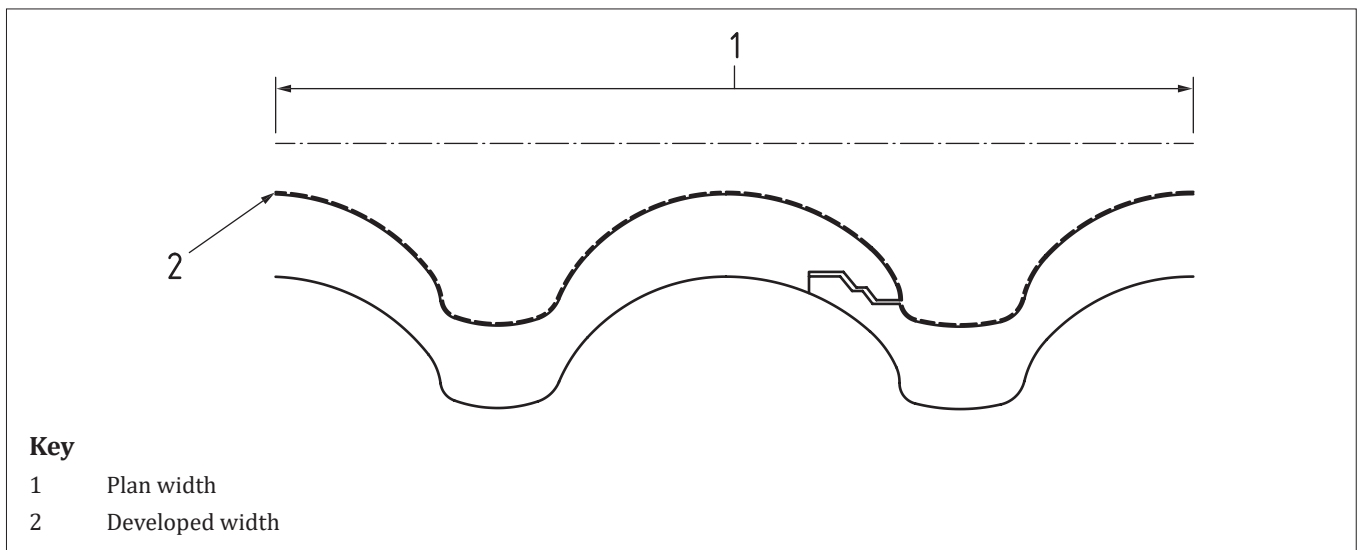
- a) dimension A (see [Figure H.1](#)) ≥ 100 mm;
- b) dimension B (see [Figure H.1](#)) ≥ 80 mm;
- c) dimension C (see [Figure H.1](#)) ≥ 20 mm; and
- d) the probing rod shall not penetrate by more than 20 mm.

The specification for each profile class shall be as follows:

- 1) low profile class: flat tiles, slates and low profiles only (developed width ratio ≥ 1.15); or
- 2) high profile class: high profile tiles (developed width ratio ≥ 1.3);

where the developed width ratio = developed width / plan width (see [Figure 1](#)).

NOTE For flat tiles, a developed width ratio of ≥ 1.15 is necessary for use with hips.

Figure 1 — *Developed width ratio*

9 Marking, labelling and installation instructions

9.1 Marking and labelling

Where applicable, the following information shall be provided, for example on the product, label, accompanying documents, or on a website:

- a) name or trade mark of the manufacturer;
- b) the number of this British Standard¹;
- c) description of the system and its component parts and declaration of plastic materials, in accordance with [4.3.1](#);
- d) verification of conformity with BS 5250; and
- e) the profile class of the ridge-roll product.

Design resistances shall be provided upon request.

9.2 Installation instructions

Detailed instructions shall be made freely available to ensure that the products can be installed correctly. The instructions shall include the identification of any other components that are required to install the product or system.

NOTE 1 The eaves connection of verge units should have sufficient resistance to resist the design wind loads, particularly where the connection details differ from the fixings tested in this standard. Adequate instructions should be provided for the installer.

NOTE 2 Systems should comply with BS 5534 for the prevention of the ingress of insects, birds and rodents.

Ridge-roll products shall be installed with at least 5 mm extending on either side beyond the contact point of the ridge tile.

¹ Marking BS 8612:2018 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.

Annex A (normative)

Tensile strength test for ridge-roll products

A.1 Principle

A width of ridge-roll product is mounted between the jaws of a tensile test machine and the tensile load on the product is increased until failure occurs. The test is carried out after ageing in accordance with the heat/freeze/thaw procedure given in [A.3](#).

A.2 Apparatus

- A.2.1 Non-ventilated oven, capable of maintaining $(70 \pm 5) ^\circ\text{C}$.
- A.2.2 Climatically controlled cabinet, capable of carrying out a freeze/thaw cyclic test of the test specimens at $-20 ^\circ\text{C}$ for 9 h, followed by $+20 ^\circ\text{C}$ for 3 h.
- A.2.3 Shallow plastic tray, for housing the specimens during the freeze/thaw cycles.
- A.2.4 Tensile strength test machine, capable of loading the product under test at a rate of (100 ± 10) mm/min and capable of clamping the test specimen to be tested over its full width (see [Figure A.1](#)).

NOTE Test specimens which are wider than the jaws of the testing machine should be folded to ensure the full width is loaded.

- A.2.5 Measuring device, to measure the width of the test specimen, accurate to ± 0.5 mm.