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**Agrément
Certificate
No 99/3622**
Third issue*

Designated by Government
to issue
European Technical
Approvals

PERMO ROOF TILE UNDERLAYS

Sous-toiture
Dachunterspannbahn

Product




• THIS CERTIFICATE RELATES TO PERMO ROOF TILE UNDERLAYS, FOR USE IN TILED OR SLATED PITCHED ROOFS.

- The products prevent the ingress of wind-blown rain or snow.
- The product is manufactured in Germany by Klöber GmbH & Co KG.

These Front Sheets must be read in conjunction with the accompanying Detail Sheets, which provide information for specific products.

Regulations — Detail Sheet 1

1 The Building Regulations 2000 (as amended) (England and Wales)

 The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of roof waterproofing with the Building Regulations. In the opinion of the BBA, Permo Roof Tile Underlays, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: C2(b)

Resistance to moisture

Comment:

The products contribute towards a tiled or slated roof meeting the Requirement. See the *Weathertightness* section of these Front Sheets.

Requirement: Regulation 7

Materials and workmanship

Comment:

The products are acceptable materials. See the *Durability* section of these Front Sheets.

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2 The Building (Scotland) Regulations 2004



In the opinion of the BBA, Permo Roof Tile Underlays, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Mandatory Standards as listed below.

Regulation:	8	Fitness and durability of materials and workmanship
Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The products can contribute to a construction satisfying this Regulation. See the <i>Durability</i> section of these Front Sheets and the <i>Installation</i> part of the appropriate Detail Sheet.
Regulation:	9	Building standards — construction
Standard:	3.10	Precipitation
Comment:		The products are acceptable materials under this Standard with reference to clauses 3.10.1 ⁽¹⁾⁽²⁾ and 3.10.7 ⁽¹⁾⁽²⁾ . See the <i>Weathertightness</i> section of these Front Sheets.
Regulation:	12	Building standards — conversions
Comment:		All comments given for these products under Regulation 9, also apply to this Regulation with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ . (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).

3 The Building Regulations (Northern Ireland) 2000



In the opinion of the BBA, Permo Roof Tile Underlays, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The products are acceptable materials. See the <i>Durability</i> section of these Front Sheets.
Regulation:	C4	Resistance to ground moisture and weather
Comment:		Tests for water resistance indicate that the products will contribute towards a roof satisfying the requirement. See the <i>Weathertightness</i> section of these Front Sheets.

4 Construction (Design and Management) Regulations 1994 (as amended) Construction (Design and Management) Regulations (Northern Ireland) 1995 (as amended)

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See section: 1 *Description* (1.2) of the appropriate Detail Sheet.

Design Data

5 General

Permo Roof Tile Underlays provide a satisfactory fully supported or, where stated in the relevant Detail Sheet, unsupported, underlay in tiled and slated pitched roofs constructed in accordance with the relevant clauses of BS 5534 : 2003.

6 Strength

The products will resist the loads associated with the installation of the roof.

7 Wind loading

7.1 Project design wind speeds should be determined, and wind uplift forces calculated, in accordance with BS 6399-2 : 1997.

7.2 When used in unsupported applications, draped, wind loading on the underlay should be calculated in accordance with BS 5534 : 2003, Section 5.5.2.7 (see the *Test* section of the appropriate Detail Sheet for acceptable wind loads with specific batten spacings for the draped product, using a 25 mm tiling batten).

7.3 When fully supported on timber sarking with counter battens, the product has adequate resistance to wind uplift forces.

8 Weathertightness

8.1 Tests indicate that the product will resist the passage of water and wind-blown snow and dust into the interior of a building, under all conditions to be found in a roof constructed in accordance with the relevant clauses of BS 5534 : 2003.

8.2 The products resist penetration of liquid water to a hydrostatic head of 2 m and consequently may be used as temporary waterproofing prior to the installation of slates or tiles. The period of such use should, however, be kept to a minimum.

9 Risk of condensation

9.1 For design purposes, the underlay's resistance to water vapour transmission may be taken as not more than 0.25 MNsg^{-1} . This value can be used in roof designs shown in Section 8.4 of BS 5250 : 2002. For roofs designed in accordance with BS 5534 : 2003, it may be regarded as a type 'LR' membrane.

9.2 In common with all roofs, care must be taken in the overall design and installation to minimise the risk of water vapour coming into contact with cold parts of the construction. Factors to be considered and minimised include; moisture diffusion through the ceiling, infiltration through unsealed openings/penetrations in the ceiling and services evaporating or venting moisture into cold spaces.

Ceiling and insulation horizontal (cold roof)

9.3 Roofs designed and constructed in accordance with BS 5250 : 2002⁽¹⁾ will adequately limit the risk of interstitial condensation.

(1) Non-ventilated cold roof applications are covered by Certificate No 00/3749.

Ceiling and insulation inclined (warm roof)

9.4 For roofs with an insulated inclined ceiling, ventilation above or below the underlay will not be required provided that the passage of moisture by diffusion and by convection is controlled, eg, by a vapour control layer or a continuous envelope of insulation with a high vapour resistance.

Ceiling and insulation partially inclined (warm roof and cold roof)

9.5 Where an insulated ceiling only spans part of the roofline, resulting cold roof spaces if ventilated

should be in accordance with BS 5250 : 2002, Section 8.4.2.5 and 8.4.2.6. Alternatively, the cold roof spaces can be non-ventilated in accordance with Certificate No 00/3749.

10 Properties in relation to fire

10.1 The products have similar properties in relation to those of traditional polyethylene roof tile underlays.

10.2 When the products are for use in a fully supported situation, the reaction to fire will be determined by the support used.

10.3 When used unsupported, there is a risk fire can spread if the material is accidentally ignited during maintenance works (eg roofer's or plumber's torch). As with all types of sarking material, care should be taken during building and maintenance to avoid the material becoming ignited.

11 Maintenance

Damage to the products can be repaired easily, prior to the application of slates or tiles, by the replacement of the damaged sheet.

12 Durability



Permo Roof Tile Underlays will be virtually unaffected by the normal conditions found in a roof space and will have a life comparable to that of traditional roof tile underlays.

Bibliography

BS 5250 : 2002 *Code of practice for control of condensation in buildings*

BS 5534 : 2003 *Code of practice for slating and tiling (including shingles)*

BS 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*

Conditions of Certification

13 Conditions

13.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English law.

13.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

13.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

13.4 In granting this Certificate, the BBA is not responsible for:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual installations of the product or system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

13.5 Any information relating to the manufacture, supply, installation, use and maintenance of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product/system.



In the opinion of the British Board of Agrément, Permo Roof Tile Underlays are fit for their intended use provided they are installed, used and maintained as set out in this Certificate. Certificate No 99/3622 is accordingly awarded to Klober Ltd.

On behalf of the British Board of Agrément

Date of Third issue: 20th July 2006

A handwritten signature in black ink, appearing to read 'G. A. Cooper'.

Chief Executive

**Original Certificate issued 15th May 2000. This amended version includes revised Building Regulations and Standards, inclusion of common text from Detail Sheets and updated Conditions of Certification.*



Klober Ltd

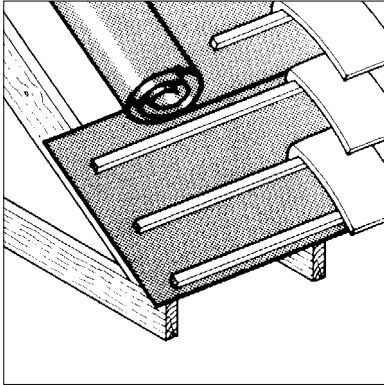
PERMO FORTE

Certificate No 99/3622

DETAIL SHEET 2

Second issue*

Product



• THIS DETAIL SHEET RELATES TO PERMO FORTE, FOR USE AS AN UNSUPPORTED OR FULLY SUPPORTED ROOF TILE UNDERLAY IN COLD VENTILATED AND WARM NON-VENTILATED ROOFS FOR TILED OR SLATED PITCHED ROOFS.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the product's position regarding the Building Regulations, general information relating to the product, and the Conditions of Certification, respectively.

Technical Specification

1 Description

1.1 Permo Forte is manufactured by heat laminating a light grey spunbond polypropylene (80 gm^{-2}), a white spunbond polypropylene (20 gm^{-2}), a reinforcing polypropylene netting and a linear low-density polyethylene film.

1.2 The product has the nominal characteristics given in Table 1.

Table 1 Nominal characteristics

Characteristic (units)	Nominal value
Roll width (m)	1.1, 1.5
Roll length (m)	25, 50
Weight per unit area (gm^{-2})	175
Colour	
upper surface	light grey with dark grey logos
lower surface	white

1.3 Other ancillary items for use with Permo Forte include:

- Klober Underlay Support Tray — a PVC-U detail used to provide a run-off detail into gutters and protect the edge of the underlay from the effect of ultraviolet light ageing
- Klober Eaves Closer — a mesh faced PVC-U unit acting as a barrier against intrusive pests while allowing natural air movements and moisture run-off from the batten space
- Butylon — butyl adhesive tape
- Permo Pro HD — a single-sided adhesive tape.

1.4 Quality control tests on the final product include:

- weight
- head of water
- tensile strength
- nail tear
- dimensional stability.

2 Delivery and site handling

2.1 The membrane is delivered to site in rolls wrapped in polyethylene with a red label bearing the company name and product name. A label bearing the BBA identification mark incorporating the number of this Certificate is applied to the outer polyethylene wrapper.

2.2 Rolls should be stored on their sides, on a smooth, clean surface, under cover and protected from sunlight.

Installation

3 Procedure

3.1 Permo Forte must be installed and fixed in accordance with the manufacturer's instructions and the relevant recommendations of BS 5534 : 2003 and BS 8000-6 : 1990. Installation can be carried out under all conditions normal to roofing work.

3.2 The membrane, when installed as an unsupported system, is fixed in the traditional method for roof tile underlays, ie draped between the rafters.

3.3 For fully supported applications the membrane is secured with counter battens, at least 25 mm thick (for drainage and air movement), with corrosion resistant nails at a maximum of 300 mm centres coinciding with rafter centres. The tiling battens are fastened to the counter battens leaving an air space between the membrane and the tiles/slates for drainage and ventilation. Alternatively, the membrane may be installed draped over counter battens, with sufficient drape to allow drainage of liquid water under the tiling battens.

3.4 Horizontal laps should be at least 150 mm and vertical laps 300 mm. Vertical laps should be staggered a minimum of 300 mm and detailed to occur along rafter lines where they are secured by the counter battens. All horizontal laps can be taped and sealed using a double-sided tape.

3.5 When the membrane is laid directly onto insulation without a ventilation gap, in a convection-tight system, the vapour resistance of the insulation material should be taken into account when deciding if a vapour control layer is required (see the *Risk of condensation* section of the Front Sheets).

Technical Investigations

The following is a summary of the technical investigations carried out on Permo Forte.

4 Tests

4.1 Samples of Permo Forte were obtained from the company for testing. The results of the tests carried out by, or on behalf of the BBA, which show typical results for the material, are summarised in Tables 2 and 3.

4.2 The following properties were tested on Permo Forte (see Detail Sheet 3) and used to assess the performance of Permo Forte:

- resistance to heat ageing
- resistance to ultra-violet ageing
- resistance to water soak
- Mullen burst strength.

4.3 Testing on the following properties was also carried out:

- thickness
- width
- weight per unit surface area.

Table 2 Physical properties — directional

Test (units)	Method ⁽¹⁾	Mean results	
		Long ⁽²⁾	Trans ⁽³⁾
Tensile strength [N/(50 mm) ⁻¹]	BS 2782-3.320A (100 mm min ⁻¹)	386	262
Elongation at maximum load (%)	BS 2782-3.320A (100 mm min ⁻¹)	15	16
Low temperature flexibility (°C) ⁽⁴⁾	MOAT 27 : 5.4.2	≤-25	≤-25
Nail tear (N)	MOAT 27 : 5.4.1 (100 mm min ⁻¹)	190	122

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents

(2) Longitudinal direction.

(3) Transverse direction.

(4) Lowest temperature tested -25°.

Table 3 Service performance

Test (units)	Method ⁽¹⁾	Mean result
Water vapour permeability (gm ⁻² day ⁻¹)	BS 3177 : 1959 (25°C/75% RH)	1034
Vapour resistance (MNsg ⁻¹)		0.20
Hydrostatic pressure (mm) minimum	BS EN 20811	≥2000
Hydrostatic pressure (mm) mean		≥2000
Resistance to water spray	BBA T1/15 ⁽²⁾	pass
Coefficient of friction dry	BBA T1/10 ⁽²⁾	0.91
Coefficient of friction wet		0.71
Wind loading (kPa) ⁽³⁾ batten spacing 350 mm	BBA T1/03 ⁽²⁾	1.0 ⁽⁴⁾
Wind loading (kPa) ⁽³⁾ batten spacing 300 mm		2.0 ⁽⁴⁾
Wind loading (kPa) ⁽³⁾ batten spacing 250 mm		2.5 ⁽⁴⁾

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents

(2) BBA test method.

(3) 25 mm batten used

(4) Maximum pressure achieved.

5 Investigations

5.1 The methods of quality control were examined and details obtained of the quality and composition of the materials used.

5.2 A series of calculations on the condensation risk in warm roof constructions incorporating the membrane was examined.

Bibliography

BS 2782-3.320A to 320F : 1976 *Methods of testing plastics — Mechanical properties — Tensile strength, elongation and elastic modulus*

BS 3177 : 1959 *Method for determining the permeability to water vapour of flexible sheet materials used for packaging*

BS 5534 : 2003 *Code of practice for slating and tiling (including shingles)*

BS 8000-6 : 1990 *Workmanship on building sites — Code of practice for slating and tiling of roofs and claddings*

BS EN 20811 : 1992 *Textiles. Determination of resistance to water penetration. Hydrostatic pressure test*

MOAT No 27 : 1983 *General Directive for the Assessment of Roof Waterproofing Systems*



On behalf of the British Board of Agrément

Date of Second issue: 20th July 2006



Chief Executive

**Original Detail Sheet issued 15th May 2000. This amended version includes revised Detail Sheet format.*

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For technical or additional information,
contact the Certificate holder (see
front page).
For information about the Agrément
Certificate, including validity and
scope, tel: Hotline 01923 665400,
or check the BBA website.



Klober Ltd

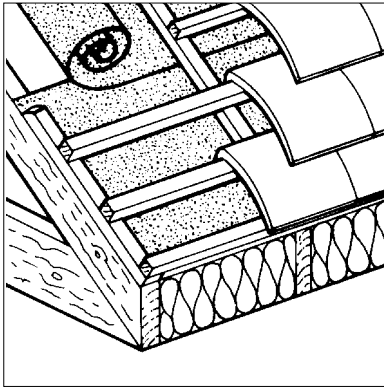
Certificate No 99/3622

DETAIL SHEET 3

Second issue*

PERMO LIGHT

Product



• THIS DETAIL SHEET RELATES TO PERMO LIGHT, FOR USE AS AN UNSUPPORTED OR FULLY SUPPORTED ROOF TILE UNDERLAY IN COLD VENTILATED AND WARM NON-VENTILATED ROOFS FOR TILED OR SLATED PITCHED ROOFS.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the product's position regarding the Building Regulations, general information relating to the product, and the Conditions of Certification, respectively.

Technical Specification

1 Description

1.1 Permo Light is manufactured by heat laminating a grey spunbond polypropylene (80 gm⁻²), a white spunbond polypropylene (20 gm⁻²), and a linear low-density polyethylene film.

1.2 The product has the nominal characteristics given in Table 1.

Table 1 Nominal characteristics

Characteristic (units)	Nominal value
Roll width (m)	1.1, 1.5
Roll length (m)	50
Weight per unit area (gm ⁻²)	140–145
Colour	
upper surface	grey with dark grey logos
lower surface	white

1.3 Other ancillary items for use with Permo Light include:

- Klober Underlay Support Tray — a PVC-U detail used to provide a run-off detail into gutters and protect the edge of the underlay from the effect of ultraviolet light ageing

- Klober Eaves Closer — a mesh-faced PVC-U unit acting as a barrier against intrusive pests while allowing natural air movements and moisture run-off from the batten space

- Butylon — butyl adhesive tape

- Permo Pro HD — a single-sided adhesive tape.

1.4 Quality control tests on the final product include:

- weight
- head of water
- tensile strength
- nail tear
- dimensional stability.

2 Delivery and site handling

2.1 The membrane is delivered to site in rolls wrapped in polyethylene with a blue label bearing the company name and product name. A label bearing the BBA identification mark incorporating the number of this Certificate is applied to the outer polyethylene wrapper.

2.2 Rolls should be stored on their sides, on a smooth, clean surface, under cover and protected from sunlight.

3 Procedure

3.1 Permo Light must be installed and fixed in accordance with the manufacturer's instructions in fully supported systems over insulation and the relevant recommendations of BS 5534 : 2003 and BS 8000-6 : 1990. Installation can be carried out under all conditions normal to roofing work.

3.2 The membrane when installed as an unsupported system, is fixed in the traditional method for roof tile underlays, ie draped between the rafters.

3.3 For fully supported applications the membrane is secured with counter battens, at least 25 mm thick (for drainage and air movement), with corrosion resistant nails at a maximum of 300 mm centres coinciding with rafter centres. The tiling battens are fastened to the counter battens leaving an air space between the membrane and the tiles/slates for drainage and ventilation. Alternatively, the membrane may be installed draped over counter battens, with sufficient drape to allow drainage of liquid water under the tiling battens.

3.4 Horizontal laps should be at least 150 mm and vertical laps 300 mm. Vertical laps should be staggered a minimum of 300 mm and detailed to occur along rafter lines where they are secured by the counter battens. All horizontal laps can be taped and sealed using a double-sided tape.

3.5 When the membrane is laid directly onto insulation without a ventilation gap, in a convection-tight system, the vapour resistance of the insulation material should be taken into account when deciding if a vapour control layer is required (see the *Risk of condensation* section of the Front Sheets).

Technical Investigations

The following is a summary of the technical investigations carried out on Permo Light.

4 Tests

4.1 Samples of Permo Light were obtained from the company for testing. The results of the tests carried out by, or on behalf of the BBA, which show typical results for the material, are summarised in Tables 2 and 3.

4.2 Testing on the following properties was also carried out:

- thickness
- width
- weight per unit surface area.

5 Investigations

5.1 The methods of quality control were examined and details obtained of the quality and composition of the materials used.

5.2 A series of calculations on the condensation risk in warm roof constructions incorporating the membrane was examined.

Table 2 Physical properties — directional

Test (units)	Method ⁽¹⁾	Mean results	
		Long ⁽²⁾	Trans ⁽³⁾
Tensile strength [N(50 mm) ⁻¹]	BS 2782-3.320A (100 mm min ⁻¹)	264	210
Percentage change in tensile (%)	BS 2782-3.320A (100 mm min ⁻¹)		
heat aged ⁽⁴⁾		-11.5	-9.6
UV aged ⁽⁵⁾		-25.0	-19.2
Elongation at maximum load (%)	BS 2782-3.320A (100 mm min ⁻¹)	71	81
Percentage change in elongation (%)	BS 2782-3.320A (100 mm min ⁻¹)		
heat aged ⁽⁴⁾		-22.5	-29.9
UV aged ⁽⁵⁾		-38.0	-43.7
Low temperature flexibility (°C) ⁽⁶⁾	MOAT 27 : 5.4.2	≤-25	≤-25
Nail tear (N)	MOAT 27 : 5.4.1 (100 mm min ⁻¹)	116	96
Percentage change in nail tear (%)			
heat aged ⁽⁴⁾		0	2.4
water soak ⁽⁷⁾			
tested dry		-40.1	-38.1
tested wet		-31.4	-34.5

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.

(2) Longitudinal direction.

(3) Transverse direction.

(4) Heat aged for 56 days at 70°C.

(5) Ultraviolet aged for 500 light hours using UVB 313 lamps with a cycle of four hours UV at 50°C and four hours condensation at 50°C.

(6) Lowest temperature tested -25°.

(7) Water soak for 56 days at 23°C.

Table 3 Service performance

Test (units)	Method ⁽¹⁾	Mean result
Water vapour permeability (gm ⁻² day ⁻¹)	BS 3177 : 1959 (25°C/75% RH)	1.149
Vapour resistance (MNsg ⁻¹)		0.18
Hydrostatic pressure (mm)	BS EN 20811	
minimum		≥2000
mean		≥2000
Resistance to water spray	BBA T1/15 ⁽²⁾	pass
Coefficient of friction	BBA T1/10 ⁽²⁾	
dry		0.91
wet		0.71
Mullen burst strength (kNm ⁻²)	BS 3137	451
Wind loading (kPa) ⁽³⁾	MOAT 69 : 4.2.1	
batten spacing 350 mm		0.5 ⁽⁴⁾
batten spacing 330 mm		1.0 ⁽⁴⁾
batten spacing 300 mm		1.0 ⁽⁴⁾
batten spacing 250 mm		2.5 ⁽⁴⁾

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.

(2) BBA test method.

(3) 25 mm batten used.

(4) Maximum pressure achieved.

Bibliography

BS 2782-3.320A to 320F : 1976 *Methods of testing plastics — Mechanical properties — Tensile strength, elongation and elastic modulus*

BS 3137 : 1972 *Methods for determining the bursting strength of paper and board*

BS 3177 : 1959 *Method for determining the permeability to water vapour of flexible sheet materials used for packaging*

BS 5534 : 2003 *Code of practice for slating and tiling (including shingles)*

BS 8000-6 : 1990 *Workmanship on building sites — Code of practice for slating and tiling of roofs and claddings*

BS EN 20811 : 1992 *Textiles — Determination of resistance to water penetration — Hydrostatic pressure test*

MOAT No 27 : 1983 *General Directive for the Assessment of Roof Waterproofing Systems*

MOAT No 69 : 2004 *UEAtc Technical Report for the Assessment of Discontinuous Roofing Underlay Systems*



On behalf of the British Board of Agrément

Date of Second issue: 20th July 2006

Chief Executive

**Original Detail Sheet issued 15th May 2000. This amended version includes revised Detail Sheet format.*

Electronic Copy

British Board of Agrément

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scope, tel: Hotline 01923 665400,
or check the BBA website.