Aluthermo SA
Rue Principale 93A-B
B-4790 Burg-Reuland
Belgium
Tel: +3280 429028 Fax: +3280 429029
e-mail: info@aluthermo.be
website: www.aluthermo.com

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
11/4815
Product Sheet 1

VAPREFLEX MULTIFOIL INSULATION

VAPREFLEX MULTILAYER INSULATION FOR PITCHED ROOF APPLICATIONS

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Vapreflex Multilayer Insulation for Pitched Roof Applications, a reflective insulation material for use above and/or below rafters in slated or tiled roofs designed in accordance with BS 5534 : 2003 in domestic applications and existing buildings.

AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Thermal performance — when combined with other types of insulation, the product can contribute to meeting the U value requirement for a roof (see section 5).

Condensation risk — the product has a high water vapour resistance in excess of 1200 $MN \cdot s \cdot g^{-1}$ (see section 6).

Durability — the durability of the product is satisfactory and will have a life equivalent to that of the structure in which it is incorporated (see section 10).

The BBA has awarded this Agrément Certificate to the company named above for the product described herein. The product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 23 February 2011

Simon Wroe
Head of Approvals — Physics

Greg Cooper
Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

Regulations

In the opinion of the BBA, Vapreflex Multilayer Insulation for Pitched Roof Applications, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:

The Building Regulations 2010 (England and Wales)

Requirement:	C2(c)	Condensation
Comment:		The product can contribute to a roof meeting this Requirement. See sections 6.1 and 6.5 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		The product can contribute to meeting this requirement. See sections 5.3 and 5.4 of this Certificate.
Requirement:	7	Materials and workmanship
Comment:		The product is acceptable. See section 10 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The product can contribute to a construction satisfying this Regulation. See section 10 and the *Installation* part of this Certificate.
Regulation:	9	Building Standards — construction
Standard:	3.15	Condensation
Comment:		The product can contribute to satisfying this standard, with reference to clauses 3.15.1[1], 3.15.3[1] to 3.15.5[1] and 3.15.7[1]. See sections 6.1 and 6.6 of this Certificate.
Standard:	6.1(b)	Carbon dioxide emissions
Standard:	6.2	Building insulation envelope
Comment:		The product can contribute to satisfying clauses, or parts of 6.1.1[1], 6.1.3[1], 6.1.6[1], 6.2.1[1], 6.2.3[1], 6.2.4[1], 6.2.6[1], 6.2.7[1], 6.2.9[1], to 6.2.11[1] and 6.2.13[1] of these Standards. See sections 5.3 and 5.4 of this Certificate.
Regulation:	12	Building standards — conversions
Comment:		All comments given for this product under Regulation 9, also apply to this Regulation, with reference to clause 0.12.1[1] and Schedule 6[1].

(1) Technical Handbook (Domestic).

The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The product is acceptable. See section 10 and the *Installation* part of this Certificate.
Regulation:	C5	Condensation
Comment:		The product can contribute to a roof satisfying this Regulation. See section 6.1 of this Certificate.
Regulation:	F2(a)(i)	Conservation measures
Regulation:	F3(2)	Target carbon dioxide Emissions Rate
Comment:		The product can contribute to meeting this requirement. See sections 5.3 and 5.4 of this Certificate.

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

In the opinion of the BBA, there is no information in this Certificate which relates to the obligations of the client, CDM co-ordinator, designer or contractors under these regulations.

Non-regulatory Information

NHBC Standards 2011

NHBC accepts the use of Vapreflex Multilayer Insulation for Pitched Roof Applications, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 7.2 *Pitched roofs*, Design Standard 7.2, Clause D10-D11.

General

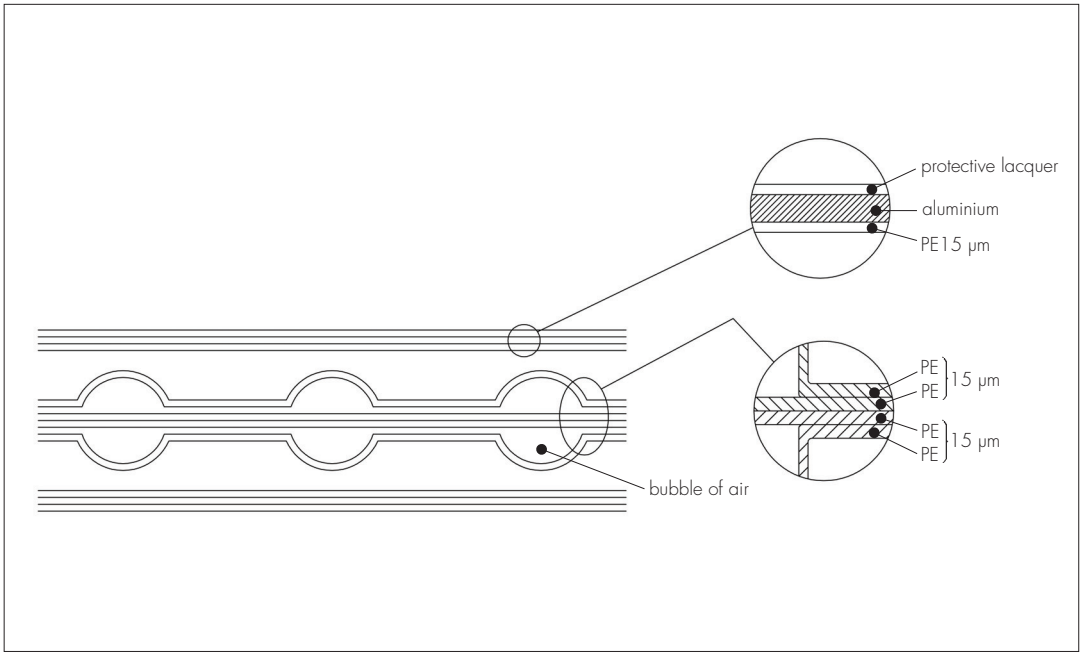
This Certificate is a Confirmation of a French Avis Technique 20/09-160 by CSTB (Centre Scientifique et Technique du Bâtiment), at 4, avenue du Recteur Poincaré, F-75782 Paris Cedex 16 and also based on the ETA 08/0158.

1 Description

1.1 Vapreflex Multilayer Insulation for Pitched Roof Applications comprises a thin reflective insulation composed of two layers of polyethylene/air bubbles sandwiched between two films of lacquered aluminium (see Figure 1). The product is assembled symmetrically in the form of 10 layers as follows:

- 2 layers of polyethylene with air bubbles thickness 3.7 mm thick. Each polyethylene (PE) film is 15 µm (15 g·m^{-2}) thick and is treated with a flame retardant additive
- 2 layers of polyethylene reinforcement between the two layers of polyethylene with air bubbles making a total of 150 µm
- 2 layers of aluminium, 12 µm thick
- 2 layers of polyethylene allowing to reinforce the adhesion of the two layers of aluminium
- 2 layers of a protective nitrocellulose lacquer which prevents the corrosion of the aluminium layer.

Figure 1 Vapreflex (cross section)



1.2 The lacquer does not contain a flame retardant additive.

1.3 The product is available in rolls of 25 m or 6.25 m length, 1.25 m wide and 7 mm thick.

1.4 Ancillary items which are outside the scope of the Certificate but to be used with the products are:

- aluminium tape
- vapour control layer
- staples or nails
- roof tile underlay
- pre-treated counter battens, softwood battens and tiling laths
- roofing slates or tiles
- additional insulation where required.

2 Delivery and site handling

2.1 The product is delivered to site in rolls packed in a protective, branded bag, sealed with an end label.

2.2 Rolls should be stored in clean, dry conditions not exposed to sunlight. The product must be protected from being dropped or crushed by objects. Care must be exercised when storing large quantities on site. The product must not be exposed to open flame or other ignition sources and must be stored away from flammable material such as paint and solvents.

2.3 On site, to ensure maximum performance of the product when installed, precautions must be taken to protect it from mud and dirt.

Assessment and Technical Investigations

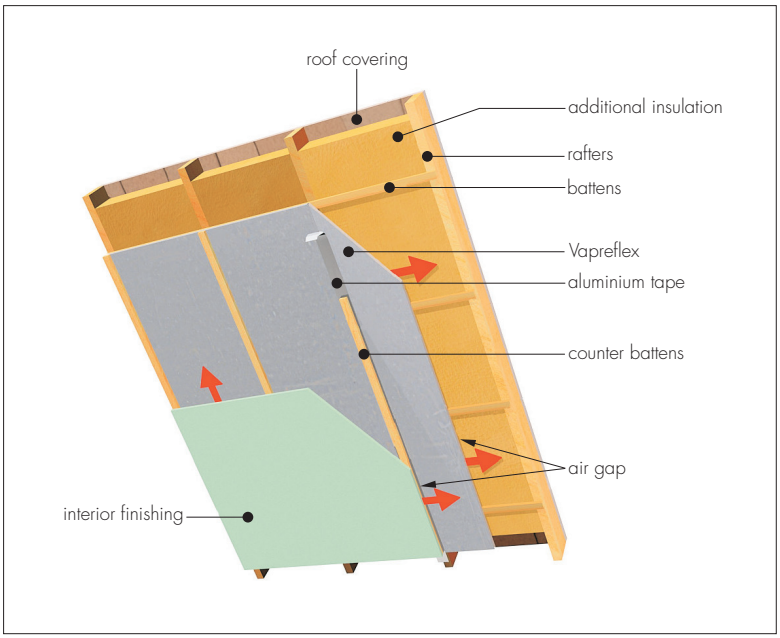
The following is a summary of the assessment and technical investigations carried out on Vapreflex Multilayer Insulation for Pitched Roof Applications.

Design Considerations

3 General

3.1 Vapreflex Multilayer Insulation for Pitched Roof Applications is satisfactory for use as a flexible insulation in conjunction with other insulation materials to reduce the thermal transmittance (U value) in new or existing pitched roofs. It should be installed under the rafters with additional insulation over it (see Figure 2).

Figure 2 Vapreflex installed under the rafters



3.2 The product is for use in constructions where the ceiling follows the pitch of the roof and encloses a habitable space.

3.3 Care must be taken to ensure that the product is covered after installation, as it must not be exposed to rain, showers or wind-driven rain.

3.4 Care must be taken to ensure the product does not come into contact with heat sources with a temperature greater than 80°C.

4 Practicability of installation

The product is designed to be installed by a competent general builder, or a contractor, experienced with this type of product.

5 Thermal performance

5.1 Calculations of thermal transmittance (U value) should be carried out in accordance with BS EN ISO 6946 : 2007 and BRE Report (BR 443 : 2006) *Conventions for U-value calculations* using the following values:

0.20 $m^2 \cdot K \cdot W^{-1}$	*R* value for Vapreflex Multilayer Insulation (7 mm thick)
0.00 $m^2 \cdot K \cdot W^{-1}$	*R* value of product when compressed between battens and rafters, to a nominal 2 mm thickness
0.05	outer surface emissivity
0.46[1] $m^2 \cdot K \cdot W^{-1}$	*R*[2] value of an air cavity adjacent to the product ≥15 mm thick (upwards heat flow)
30%/70%	percentage of Multi-Foil thickness in rafter and plasterboard-batten cavities, respectively, for roof applications.

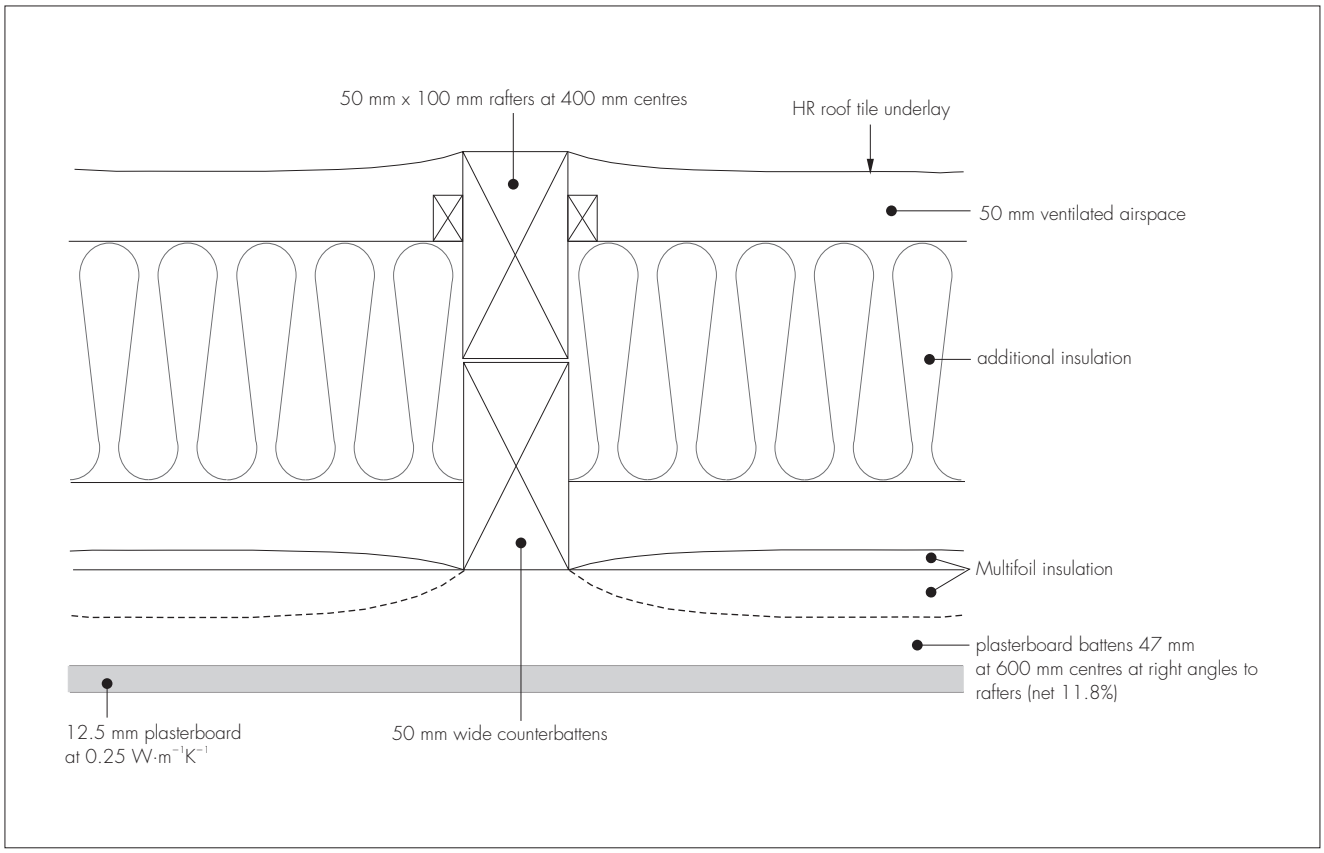
(1) Unventilated cavity with a width and length at least 10 times the thickness and one high emissivity surface.

(2) For guidance on U value calculations refer to the BBA Information Bulletin No 3 *Reflective foil insulation — Conventions for U value calculations.*

5.2 The U value of a completed roof or dormer wall will depend on the thickness and conductivity of the additional insulation used and the extent and arrangement of timber bridging. Example roof constructions are shown in Figure 3 and resulting U values in Table 1.

Figure 3 Example roof construction

a) Existing roof



b) New roof

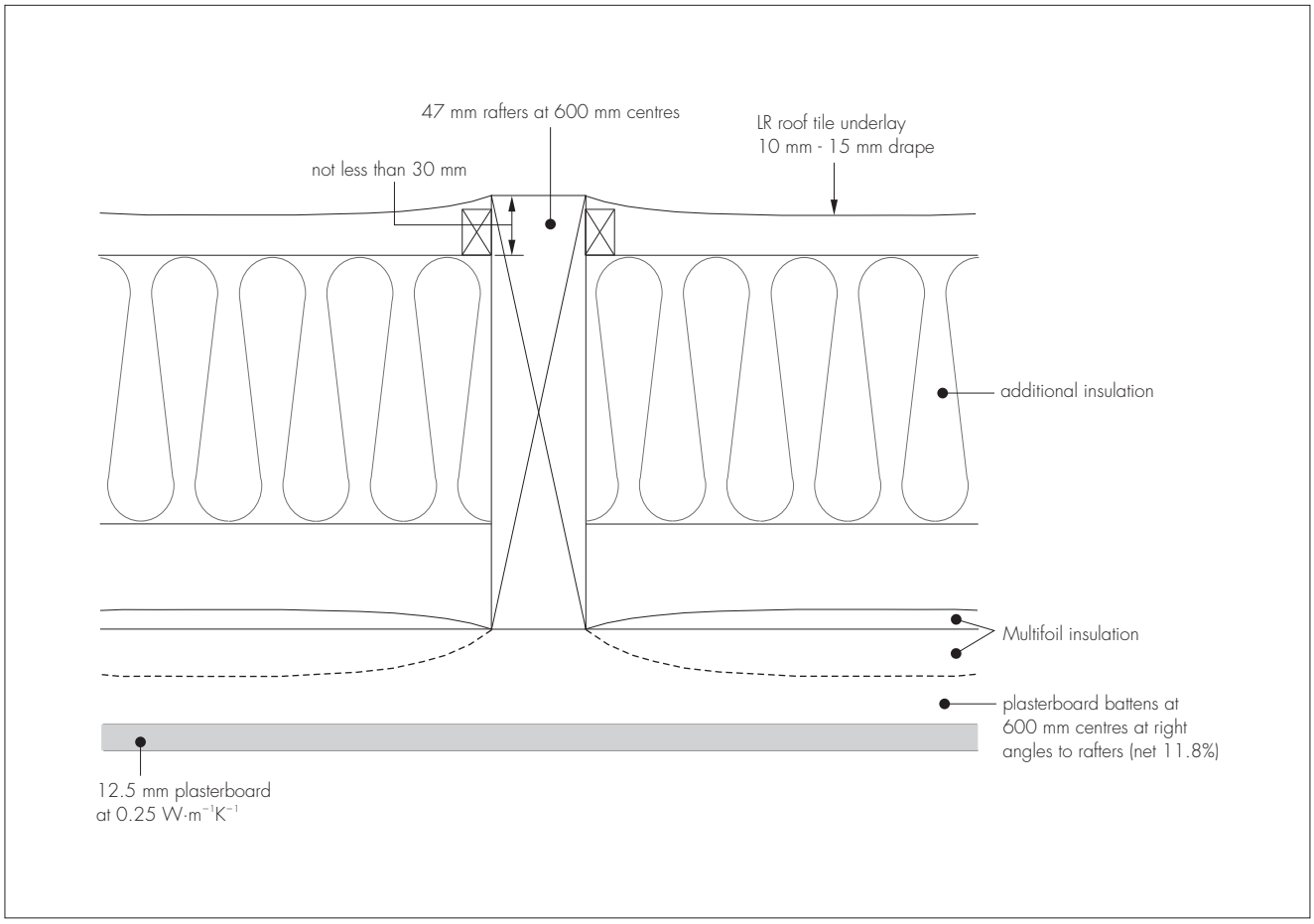


Table 1 U values for specific constructions as detailed

	Rafter depth (mm)	PIR[1] (mm)	Phenolic[1] (mm)	U value ($W \cdot m^{-2} \cdot K^{-1}$)
Old Roof	250	180	170	0.15
[Fig 1 (a)]	225	140	135	0.18
	200	120	115	0.20
New Roof	225	175	165	0.13
[Fig 1(b)]	200	150	135	0.15
	175	115	105	0.18
	150	100	90	0.20

(1) Conductivities 0.022 $W \cdot m^{-1} \cdot K^{-1}$ for PIR and 0.020 $W \cdot m^{-1} \cdot K^{-1}$ for phenolic, both insulations foil faced on both sides.

5.3 Typical design U values are shown in Tables 2, 3 and 4.

Table 2 Typical design U values for pitched roofs — England and Wales[1]

Construction	U value ($W \cdot m^{-2} \cdot K^{-1}$)
Notional dwelling	0.16
Existing building – new, replaced, renovated or retained roof	0.18
Dwelling new-build limit	0.20

(1) Flexible approaches on existing buildings are given in the Approved Documents.

Table 3 Typical design U values for pitched roofs — Scotland[1]

Construction	U value ($W \cdot m^{-2} \cdot K^{-1}$)
Notional dwelling	0.13
New dwelling simplified method	0.13
Conversion unheated building (into dwellings)	0.15
Extension to dwelling	0.15
Alterations and reconstructions to a dwelling	0.18
Stand-alone building < 50 m^2 to a dwelling	0.18
New dwelling limit	0.18
Conversion of heated building	0.25

(1) Flexible approaches on existing buildings are given in the Technical Handbooks.

Table 4 Mean design roof U values — Northern Ireland[1]

Construction	U value ($W \cdot m^{-2} \cdot K^{-1}$)
Notional dwelling	0.16
Existing building – new, replaced, renovated or retained roof	0.20
Building new-build limit	0.25

(1) Flexible approaches on existing buildings are given in the Technical Booklets.

5.4 The product can contribute to maintaining continuity of thermal insulation at junctions between elements and openings. For Accredited Construction Details the corresponding psi values in BRE Information Paper IP1/06 *Assessing the effects of thermal bridging at junctions and around openings*, Table 3 may be used in carbon emission calculations in Scotland and Northern Ireland. Detailed guidance for other junctions and on limiting heat loss by air infiltration can be found in:

England and Wales — Approved Documents to Part L and for new thermal elements to existing buildings, Accredited Construction Details (version 1.0). See also SAP 2009 Appendix K and the iSBEM User Manual for new-build.

Scotland — Accredited Construction Details (Scotland)

Northern Ireland — Accredited Construction Details (version 1.0).

6 Condensation risk

Interstitial condensation

6.1 Roofs incorporating the product will adequately limit the risk of interstitial condensation when designed and constructed in accordance with BS 5250 : 2002, Section 8.4 and Appendix D.

6.2 The product has a vapour resistance in excess of 1200 $MN \cdot s \cdot g^{-1}$.

6.3 The risk of interstitial condensation is greatest when the building is drying out after construction. Guidance on preventing condensation from this and other sources is given in BRE Digest 369 *Interstitial condensation and fabric degradation* and BRE Report (BR 262 : 2002) *Thermal insulation: avoiding risks*.

6.4 In all cases, where high vapour resistance roof tile underlays are used, ventilation to the air space should be in accordance with the recommendations of BS 5250 : 2002 or the relevant BBA Certificate for the roof tile underlay. When installed in conjunction with other insulation materials, the water vapour resistance and installation instructions of the additional insulation should also be taken into consideration.

Surface condensation

6.5 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 0.35 $W \cdot m^{-2} \cdot K^{-1}$ at any point and the junctions with walls are designed in accordance with the relevant requirements of *Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings*, TSO 2002, or BRE Information Paper IP 1/06.

6.6 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 1.2 $W \cdot m^{-2} \cdot K^{-1}$ at any point. Guidance may by obtained from BS 5250 : 2002, Section 8, and BRE Report (BR 262 : 2002).

7 Behaviour in relation to fire

7.1 The insulation must not be carried over junctions between roofs and walls required to provide a minimum period of fire resistance. The continuity of fire resistance must be maintained, for example as described in:

England and Wales — Approved Document B, Volume 1, sections 5.11 and 5.12

Scotland — Mandatory Standard 2.2, clause 2.2.10(1)

(1) Technical Handbook (Domestic).

Northern Ireland — Technical Booklet E, paragraph 3.21.

7.2 When installed with an internal lining board, eg 12.5 mm thick plasterboard, the insulation will be contained between the roof and internal lining board, until one is destroyed. Therefore, the insulation will not contribute to the development staged of a fire or present a smoke or toxic hazard.

7.3 The use of the product will not affect the fire rating obtained by tile or slated roofs when evaluated by assessment.

7.4 When installed with other additional insulation materials, the fire properties of these materials must be taken into consideration.

7.5 The product will melt and shrink away from heat, but will burn in the presence of a naked flame.

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

8 Proximity of flues and appliances

When the product is installed in close proximity to certain flue pipes and/or heat-producing appliances, for buildings subject to national Building Regulations the relevant provisions and guidance given below should be met:

England and Wales — Approved Document J, paragraph 2.15

Scotland — Mandatory Standard 3.19, clauses 3.19.1(1) and 3.19.9(1)

(1) Technical Handbook (Domestic).

Northern Ireland — Technical Booklet L, paragraph 2.9.

9 Maintenance

As the product is confined within a roof structure and has suitable durability (see section 10), maintenance is not required.

10 Durability

The product will have a life equivalent to that of the roof structure in which it is incorporated.

Installation

11 General

11.1 Installation of the product and additional insulation products should be in accordance with the Certificate holder's instructions and current good building practice.

11.2 During construction, care must be taken to ensure the product is not damaged during installation. Should damage occur by tearing, the product should be repaired by covering the holes with tape (see also section 11.4) or replaced.

11.3 The product is securely taped at overlaps and junctions with walls or windows. The product must always be taped together when surfaces are clean and dry.

11.4 The product must have overlap joints of at least 100 mm and be taped along the entire length of the joint with tape.

11.5 When the product is cut to fit around openings, eg the roof perimeter, care should be taken to minimise gaps.

11.6 The product can be cut using a sharp knife or with textile scissors. Where it has been cut and the layers are exposed, the cut edges should be taped together.

11.7 Pieces which have been cut should be stapled and battened as soon as possible, and should not be left only partially secured overnight. Awkward shapes should be taped up, stapled and battened immediately.

12 Procedure

12.1 Installation starts from eaves and the insulation is unrolled parallel to the eaves.

12.2 As the product is unrolled across the rafters they are fixed using nails or staples of at least 14 mm length.

12.3 The next roll must overlap the preceding layer by at least 100 mm, and the overlap should be sealed along the entire length using aluminium tape.

12.4 The product should be permanently fixed in place using wooden battens parallel to the rafters, held in place with nails.

12.5 When the top layer has been battened, any excess material may be cut by running a sharp knife along the edge of the batten.

12.6 A breathable roofing membrane (ie roof tile underlay) should be installed on the counter battens and tiling battens attached perpendicular to the rafters.

12.7 Roof tiles or slates are installed in accordance with BS 5534 : 2003.

12.8 When applying roof tiles or slates to a warm roof construction the recommendations of the tile/slate manufacturer should be followed.

12.9 If the product is applied from the inside, the installation starts from the ridge with the product being unrolled parallel to the eaves.

12.10 As the product is unrolled across the rafters, they are fixed in place using glue, double-sided tape, nails or staples of at least 14 mm depth.

12.11 The next roll must overlap the preceding layer by at least 100 mm, and the overlap should be sealed along the entire length using tape.

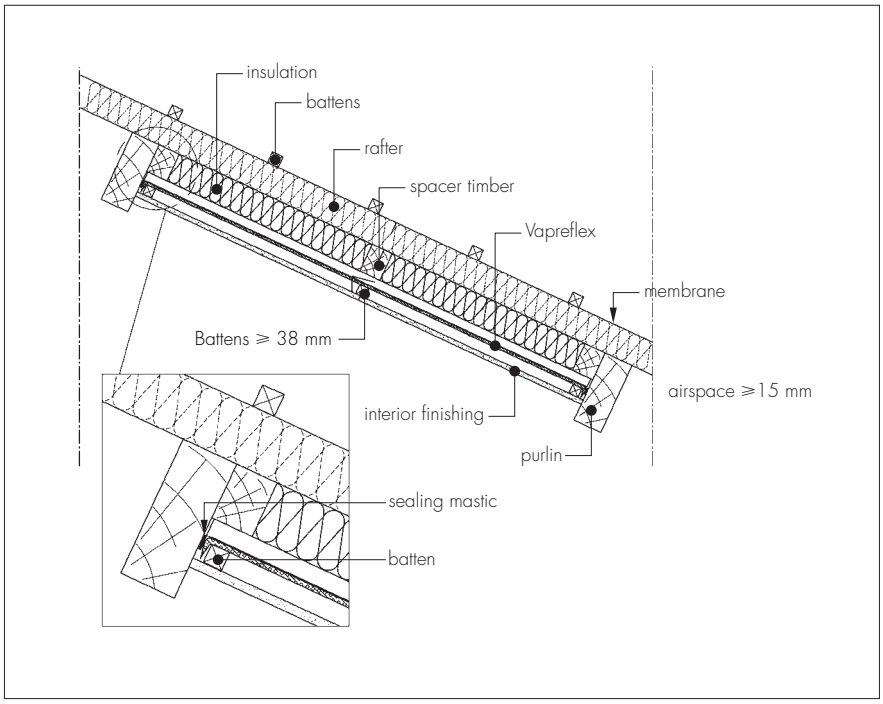
12.12 The product should be permanently held in place using wooden battens fixed with nails. Battens may run either parallel or perpendicular to the rafters.

12.13 When the bottom layer has been battened, any excess material may be cut by running a sharp knife along the edge of the batten.

12.14 Any exposed cut edges of the product should be sealed with a suitable adhesive tape. Any tears or holes in the outer layer should be repaired with heat-reflective tape.

12.15 Plasterboard is fixed to the battens. The batten size should be at least 38 mm by 25 mm, with the fixings at either 150 mm spacing for nails or 230 mm for screws. This batten size should be sufficient to ensure a 15 mm air gap between the product and the plasterboard (see Figure 4).

Figure 4 Detailing of airspace and of Vapreflex around the battens



Additional insulation

12.16 When installed with other additional insulation materials, care should be taken to ensure that all gaps are maintained in accordance with the manufacturer's instructions for their product.

12.17 When the product is installed below the rafters, mineral wool products can be placed directly on top of the products between the rafters without an air space. When the product is installed above the rafters, mineral wool can rest on the vapour control layer and plasterboard without an air space.

12.18 Rigid insulation can be placed with a 20 mm gap above and below the insulation between rafters. Suitable fixings such as wooden battens nailed to the sides of the rafters or clips should be used in accordance with the manufacturer's instructions.

Technical Investigations

13 Investigation

Results of tests and investigations on Vapreflex Multilayer Insulation for Pitched Roof Applications based on CSTB Avis Technique 20/09-160, were assessed including:

- emissivity
- core thermal resistance, resist
- durability of the outer foil
- thickness
- thermal resistance of the core material
- resistance to nail tear
- reaction to fire
- resistance to peel strength
- water vapour transmission
- resistance to tensile strength parallel to faces.

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 EN ISO 6946 : 2007 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

14 Conditions

14.1 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.

14.2 Publications and documents referred to in this Certificate are those that the BBA deems to be relevant at the date of issue or re-issue of this Certificate and include any: Act of Parliament; Statutory Instrument; Directive; Regulation; British, European or International Standard; Code of Practice; manufacturers' instructions; or any other publication or document similar or related to the aforementioned.

14.3 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
- remain covered by a valid French Agrément; and
- are reviewed by the BBA as and when it considers appropriate.

14.4 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/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.

14.5 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; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any 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.

British Board of Agrément
Bucknalls Lane
Garston, Watford
Herts WD25 9BA

tel: 01923 665300
fax: 01923 665301
e-mail: mail@bba.star.co.uk
website: www.bbacerts.co.uk