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Agrément Certificate
16/5299
Product Sheet 3

KINGSPAN KOOLTHERM RANGE FOR FLOORS, WALLS AND PITCHED ROOFS

KOOLTHERM K107

This Agrément Certificate Product Sheet⁽¹⁾ relates to Kooltherm K107, a (perforated) foil-composite closed-cell phenolic foam board faced on both sides, for use in domestic buildings of new and existing warm pitched roof constructions where the ceiling follows the pitch of the roof and encloses a habitable space.

(1) Hereinafter referred to as 'Certificate'.

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.

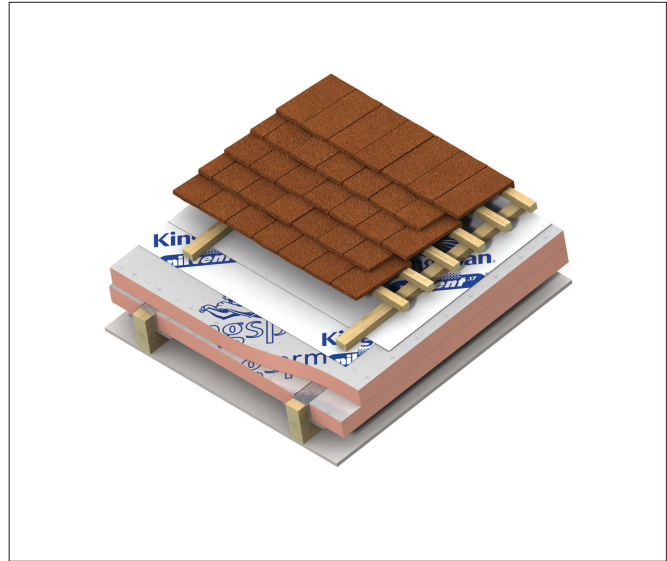
KEY FACTORS ASSESSED

Thermal performance — the product has a declared thermal conductivity (λ_D value) of $0.018 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ and an aged emissivity value of 0.05 for the facer (see section 6).

Condensation risk — the product will contribute to limiting the risk of condensation (see section 7).

Behaviour in relation to fire — the product has an NPD classification (see section 9).

Durability — the product will have a life equivalent to that of the structure in which it is incorporated (see section 11).



The BBA has awarded this Certificate to the company named above for the product described herein. This 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: 1 March 2017

John Albon — Head of Approvals
Construction Products

Claire Curtis-Thomas
Chief Executive

Certificate amended on 20 March 2017 to update section 7.2.

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.

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Regulations

In the opinion of the BBA, Kooltherm K107, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted).



The Building Regulations 2010 (England and Wales) (as amended)

| | | |
|--------------|---------|--|
| Requirement: | C2(c) | Resistance to moisture |
| Comment: | | The product can contribute to satisfying this Requirement. See sections 7.1 and 7.4 of this Certificate. |
| Requirement: | L1 a(i) | Conservation of fuel and power |
| Comment: | | The product can contribute to satisfying this Requirement. See section 6 of this Certificate. |
| Regulation: | 7 | Materials and workmanship |
| Comment: | | The product is an acceptable material. See section 11 and the <i>Installation</i> part of this Certificate. |
| Regulation: | 26 | CO ₂ emission rates for new buildings |
| Regulation: | 26A | Fabric energy efficiency rates for new dwellings (applicable to England only) |
| Regulation: | 26A | Primary energy consumption rates for new buildings (applicable to Wales only) |
| Regulation: | 26B | Fabric performance values for new dwellings (applicable to Wales only) |
| Comment: | | The product can contribute to satisfying these Regulations although compensating fabric and/or services measures may need to be taken. See sections 6.1 and 6.3 of this Certificate. |



The Building (Scotland) Regulations 2004 (as amended)

| | | |
|-------------|-----------|--|
| Regulation: | 8(1) | Durability, workmanship and fitness of materials |
| Comment: | | The product is acceptable. See section 11 and the <i>Installation</i> part of this Certificate. |
| Regulation: | 9 | Building standards applicable to 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⁾ , 3.15.4 ⁽¹⁾ , 3.15.5 ⁽¹⁾ and 3.15.7 ⁽¹⁾ . See sections 7.1 and 7.5 of this Certificate. |
| Standard: | 6.1(b) | Carbon dioxide emissions. |
| Standard: | 6.2 | Building insulation envelope |
| Comment: | | The product can contribute to satisfying these Standards, with reference to clauses, or parts of, 6.1.1 ⁽¹⁾ , 6.1.6 ⁽¹⁾ , 6.2.1 ⁽¹⁾ , 6.2.3 ⁽¹⁾ , 6.2.6 ⁽¹⁾ to 6.2.11 ⁽¹⁾ and 6.2.13 ⁽¹⁾ . See section 6 of this Certificate. |
| Standard: | 7.1(a)(b) | Statement of sustainability |
| Comment: | | The product can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard. In addition, the product can contribute to a construction meeting a higher level of sustainability as defined in this Standard, with reference to clauses 7.1.4 ⁽¹⁾ [Aspects 1 ⁽¹⁾ and 2 ⁽¹⁾], 7.1.6 ⁽¹⁾ [Aspects 1 ⁽¹⁾ and 2 ⁽¹⁾] and 7.1.7 ⁽¹⁾ [Aspect 1 ⁽¹⁾]. See section 6.1 of this Certificate. (1) Technical Handbook (Domestic). |



The Building Regulations (Northern Ireland) 2012 (as amended)

| | | |
|-------------|----------|---|
| Regulation: | 23 | Fitness of materials and workmanship |
| Comment: | | The product is acceptable. See section 11 and the <i>Installation</i> part of this Certificate. |
| Regulation: | 29 | Condensation |
| Comment: | | The product can contribute to satisfying this Regulation. See section 7.1 of this Certificate. |
| Regulation: | 39(a)(i) | Conservation measures |
| Regulation: | 40(2) | Target carbon dioxide emission rate |
| Comment: | | The product can contribute to satisfying these Regulations. See section 6 of this Certificate. |

Construction (Design and Management) Regulations 2015

Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See section: 3 *Delivery and site handling* (3.3) and 12 *General* (12.1) parts of this Certificate.

Additional Information

NHBC Standards 2017

NHBC accepts the use of Kooltherm K107 provided it is installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 7.2 *Pitched roofs*.

Technical Specification

1 Description

1.1 Kooltherm K107 is manufactured from closed-cell phenolic foam, faced with a (perforated) bilaminate aluminium foil, bonded to glass tissue on both sides, with the characteristics shown in Table 1.

Table 1 Nominal characteristics

| Description | Value |
|------------------------------|-----------|
| Length (mm) | 2400 |
| Width (mm) | 1200 |
| Thickness at 5 mm increments | 25 to 180 |
| Compressive behaviour kPa | CS(Y) 120 |

1.2 The product is for use as an insulation above the rafters, and as a thermal insulation board between and/or below rafters, in tiled and slated pitched roofs designed and constructed in accordance with the relevant clauses of BS 5534 : 2014.

1.3 Ancillary items used with the product but outside the scope of this Certificate:

- vapour permeable roof tile underlay installed draped, or fully supported with counter battens (see section 4.4)
- helical fixings
- nailable sarking clips
- aluminium tape
- galvanized slab nails
- nails and treated battens
- Kooltherm K118 (insulated plasterboard — BBA Certificate 16/5299 PS8).

2 Manufacture

2.1 Raw materials are injected onto the lower foil-facer on a conveyor belt. The exothermic reaction expands the foam, which then comes into contact with the upper foil-facer. An automated process cures and cuts the product to the required size.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Kingspan Insulation Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by the Loss Prevention Certification Board (LPCB) (Certificate 388).

3 Delivery and site handling

3.1 The boards are delivered to site shrink-wrapped in polythene packs containing a label with the product description and characteristics, the manufacturer's name, and the BBA logo incorporating the number of this Certificate.

3.2 Ideally, boards should be stored inside. If outside storage cannot be avoided, boards should be stacked clear of the ground and covered with an opaque polythene sheet or weatherproof tarpaulin. They must be protected from rain, snow and prolonged exposure to sunlight. Boards that have been allowed to get wet or that are damaged must not be used. Nothing should be stored on top of boards.

3.3 The boards must not be exposed to a naked flame or other ignition sources, or to solvents or other chemicals.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Kooltherm K107.

4 Use

- 4.1 Kooltherm K107 is for use above, between and/or below roof rafters in conjunction with internal lining board, roof tile underlay, timber counter battens and tiling battens in tiled or slated pitched roofs designed and constructed in accordance with the relevant clauses of BS 5534 : 2003.
- 4.2 The product is for use in warm pitched roof constructions where the ceiling follows the pitch of the roof and encloses a habitable space.
- 4.3 Although the product can contribute to the buckling and racking strength of the roof, normal cross-bracing is required.
- 4.4 Vapour permeable roof tile underlays used in conjunction with the product must have a current BBA Certificate and must be used in accordance with, and within the limitations of, that Certificate.
- 4.5 Detailing and jointing of the product should avoid cold bridging. Gaps should be filled. Flue pipes passing through the insulation should be suitably sleeved.
- 4.6 The product is to be installed flush with the internal face of the rafters, where possible.
- 4.7 A ventilated air space of minimum depth 50 mm may be required between the underside of the roof tile underlay and the upper face of the product, dependent on the specification of the roof tile underlay used (see section 7.2).

5 Practicability of installation

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

6 Thermal performance

6.1 Calculations of the thermal transmittance (U value) should be carried out in accordance with BS EN ISO 6946 : 2007 and BRE Report BR 443 : 2006 using the aged emissivity value of 0.05 for the facer and the declared thermal conductivity (λ_p) of $0.018 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$.

6.2 Example U values are shown in Table 2.

Table 2 Example U values ($\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$) for pitched roofs

| Target U value ($\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$) | Over rafters | Kooltherm K107 thickness requirement (mm) | |
|--|-----------------|---|---|
| | | Over and between ⁽¹⁾ rafters | Under and between ⁽¹⁾ rafters |
| 0.13 | 130 | 65 + 75 | 100 + 55 |
| 0.15 | 110 | 55 + 65 | 100 + 40 |
| 0.16 | 105 | 50 + 60 | 100 + 30 |
| 0.18 | 90 | 45 + 50 | 95 + 25 |
| 0.20 | 80 | 40 + 45 | 80 + 25 |
| 0.25 | 65 | 30 + 35 | 100 |

(1) Based on 150 mm deep rafters with additional 12, 19 or 38 mm deep timber counter battens, to maintain a minimum 50 mm vented cavity.

(2) With additional 38 mm deep timber counter battens added to rafters, to maintain a 50 mm vented cavity.

6.3 Care must be taken in the overall design and construction of junctions with other elements and openings to minimise thermal bridges and air infiltration. Detailed guidance can be found in the documents supporting the national Building Regulations.

7 Condensation risk

Interstitial condensation

7.1 Roofs will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2011, Annex H.

7.2 The insulation core of a 50 mm Kooltherm K107 has a water vapour resistance of $18.5 \text{ MN}\cdot\text{s}\cdot\text{g}^{-1}$, and each foil-facing has a water vapour resistance of $3 \text{ MN}\cdot\text{s}\cdot\text{g}^{-1}$. When a suitable vapour permeable roof tile underlay is used over the insulation it may be installed without a ventilated air space underneath it. When a high resistance (type HR) underlay is used, the space below it, must be ventilated in accordance with BS 5250 : 2011 Annex H.

7.3 The insulation product joints are not sealed, and they should be used in conjunction with a vapour check plasterboard internal lining. A continuous vapour control should be considered unless a site-specific dynamic analysis to BS EN 15026 : 2007 indicates otherwise.

Surface condensation



7.4 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $0.35 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ at any point and the junctions with other elements are designed in accordance with the guidance referred to in section 6.3 of this Certificate.



7.5 Roofs will limit the risk of surface condensation adequately when the thermal transmittance (U value) does not exceed $1.2 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ at any point and the junctions with other elements are designed in accordance with the guidance in BS 5250 : 2011, Annex G. Further guidance may be obtained from BRE Report BR 262 : 2002 and section 6.3 of this Certificate.

8 Strength and stability (with product over the rafters)

8.1 The product, when installed in accordance with the manufacturer's instructions and this Certificate, will resist the loads likely to be met during installation and in service.

8.2 The resistance to wind uplift and likely dead loads depends upon factors specific to each project (eg, roof geometry, geographical location).

8.3 When calculating the fixing spacing required to resist the calculated loadings, the requirements of BS EN 1995-1-1 : 2004 should be followed where possible. The Certificate holder can advise on the use of the correct proprietary fixings, such as helical fixings and nails, in accordance with these requirements.

8.4 Tiling battens of 25 mm by 50 mm or 38 mm by 50 mm dimensions must be installed on rafters at no more than 600 mm centres, depending on the requirement. See also Table 3 from BS 5534 : 2014.

9 Behaviour in relation to fire

9.1 The product has an NPD classification (No Performance Determined).

9.2 The product must not be carried over junctions between roofs and walls that are required to provide a minimum period of fire resistance. The continuity of fire resistance must be maintained, as described in the documents supporting the relevant national Building Regulations.

9.3 When installed between or under the rafters, the insulation will be contained between the roof and internal lining board until one is destroyed. Therefore, the product will not contribute to the development stages of a fire or present a smoke or toxic hazard.

10 Maintenance

The product, once installed, does not require any maintenance.

11 Durability



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

Installation

12 General

12.1 Installation of Kooltherm K107 must be in accordance with the relevant clauses of BS 5534 : 2014 and the manufacturer's instructions, and can be carried out in all conditions normal to roof work. Care should be taken when handling the product in windy conditions.

12.2 The product is light to handle and can be cut easily but care must be taken to prevent damage, particularly edge damage.

12.3 Cutting should be carried out either by using a fine-toothed saw, or by scoring with a sharp knife, snapping the product over a straight edge and then cutting the facing on the other side.

12.4 Accurate trimming should be ensured in order to achieve close-butting joints and continuity of insulation.

12.5 When installing over rafters, the product must not be walked on except over supporting roof timbers. The product has insufficient nail-holding ability to be considered as an alternative to timber sarking.

12.6 When installing between rafters, small gaps between the rafters and the product should be filled with expanding foam.

12.7 Foil-faced or vapour check plasterboard must be provided with supports (noggings) along all edges.

12.8 The roof tile underlay is fixed over the counter battens (Figures 1 and 2) or over rafters (Figures 3 and 4) and tiling battens may then be fixed horizontally, at spacings to suit the tiles or slates specified.

13 Procedure

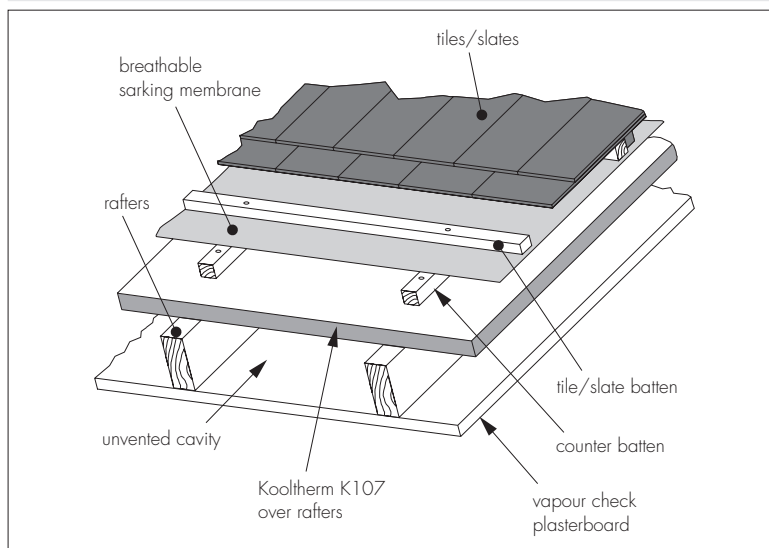
Over rafter insulation (single layer system) (see Figure 1)

13.1 When installing over the rafters, it is not necessary to tape the product joints; a preservative-treated stop rail should be secured to the rafters at the eaves.

13.2 The product is laid on to rafters, starting at the stop rail and working towards the ridge so it covers the whole roof area. The product should be tightly butted and fixed in a staggered pattern. Product joints should be butted over rafters, not mid-span. It is important to ensure a tight fit between the product, product and rafters and other detailed elements. At ridges and verges, the product should be cut to achieve a close-butt joint.

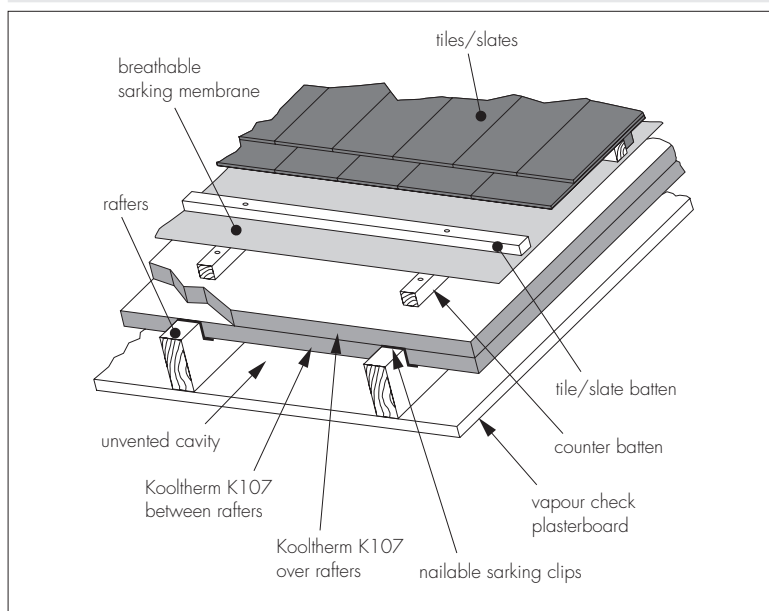
13.3 Treated counter battens are fixed above the insulation boards down the line of each rafter, run from eaves to ridge using the helical fixings at a minimum spacing of 300 mm centres. A minimum 37 mm fixing penetration into the rafter should be maintained. Short lengths of counter batten should be tightly butted.

Figure 1 Over rafter insulation



Over and between rafters (see Figure 2)

Figure 2 Over and between rafter insulation

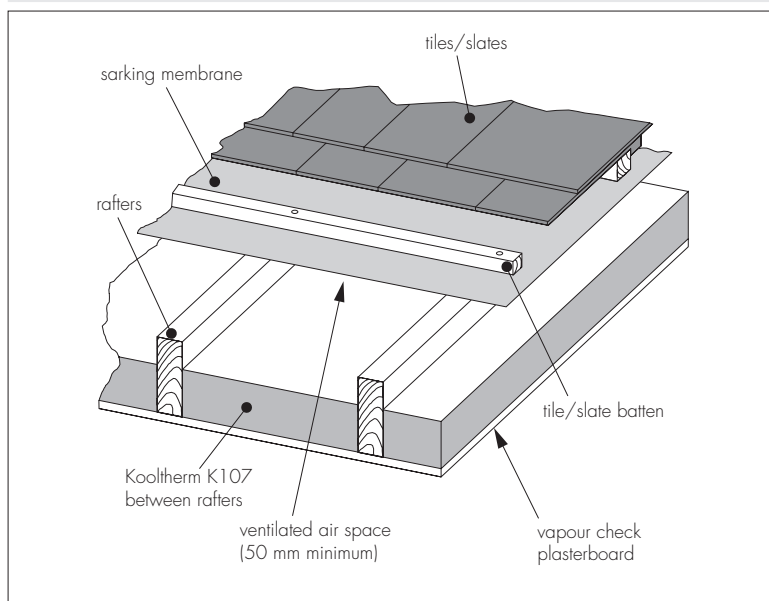


13.4 The product is cut to fit tightly between rafters and is supported on stop battens or galvanized metal angles using nailable sarking clips. Over rafter boards are laid as described in sections 13.1 to 13.3. The product is secured to counter battens running down the length of the rafters, and fixed at a minimum spacing of 300 mm centres through the counter batten and insulation.

Between rafters (see Figure 3)

13.5 The product is cut to fit tightly between the rafters and butted against stop battens or galvanized metal angles, which must maintain a ventilated air space suitable for the underlay ventilation requirements.

Figure 3 Between rafters

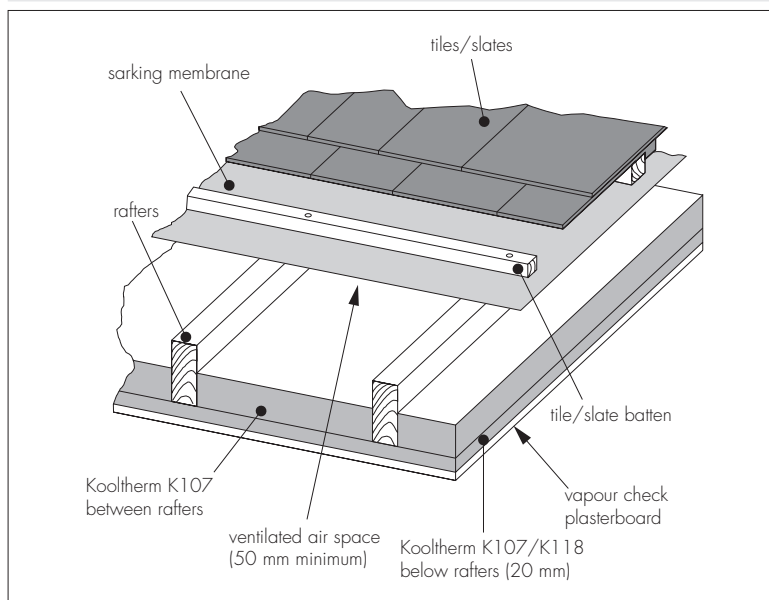


Under and between rafters (see Figure 4)

13.6 The product may be attached to the underside of rafters, either as a single layer or in conjunction with an insulation product between the rafters, as described in 13.5.

13.7 The product is temporarily fixed with clout-head nails and joints butted and taped. Appropriate internal lining panels may then be fixed through the insulation into the underside of the rafters.

Figure 4 Under and between rafters



Finishing

13.8 The vapour permeable roof tile underlay (sarking membrane) should be installed in accordance with the manufacturer's instructions and the appropriate BBA Certificate.

13.9 Roof tiles or slates are installed in accordance with the relevant clauses of BS 5534 : 2014.

13.10 Internal lining panels appropriate to the application and required decoration are installed.

14 Investigations

14.1 An investigation of the following properties was carried out:

- compressive strength
- flexural/bending strength
- proprietary fixings
- dimensional stability with temperature
- density
- closed cell count
- fire performance
- thermal conductivity
- dimensional accuracy
- water absorption.

14.2 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of materials used.

14.3 An assessment of the thermal and hygrothermal properties of the system was made, including condensation risk calculations for typical installations.

Bibliography

BS 5250 : 2011 *Code of practice for control of condensation in buildings*

BS 5534 : 2014 *Code of practice for slating and tiling (including shingles)*

BS EN 1995-1-1 : 2004 *Eurocode 5 : Design of timber structures — General — Common rules and rules for buildings*

BS EN 13166 : 2012 *Thermal insulation products for buildings — Factory made phenolic foam (PF) products — Specification*

BS EN 13501-1 : 2007 *Fire classification of construction products and building elements — Classification using test data from reaction to fire tests*

BS EN 15026 : 2007 *Hygrothermal performance of building components and building elements — Assessment of moisture transfer by numerical simulation*

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

BS EN ISO 9001 : 2008 *Quality management systems — Requirements*

BRE Report (BR 262 : 2002) *Thermal insulation: avoiding risks*

BRE Report (BR 443 : 2006) *Conventions for U-value calculations*

15 Conditions

15.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page — no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- 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.

15.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

15.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and 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.

15.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

15.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- 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
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

15.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal 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, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue 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.