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**Agrément Certificate**

**15/5283**

Product Sheet 2

### IKO INSULATIONS

### IKO ENERTHERM ALU INSULATION BOARD FOR PITCHED ROOFS

This Agrément Certificate Product Sheet<sup>(1)</sup> relates to IKO enertherm ALU Insulation Board for Pitched Roofs, comprising a rigid polyisocyanurate (PIR) foam board with composite foil-facings, for use as insulation installed above, between and/or below rafters, in tiled or slated pitched roofs, or between and over ceiling joists, in new or existing domestic and non-domestic buildings, with height restriction in some cases.

(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

#### KEY FACTORS ASSESSED

**Thermal performance** — the product has a declared thermal conductivity value ( $\lambda_D$ ) of  $0.022 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$  (see section 6).

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

**Behaviour in relation to fire** — the Certificate holder has not declared a reaction to fire Classification to BS EN 13501-1 : 2018 and its use is restricted in some cases (see section 9).

**Durability** — the product is durable, rot proof and sufficiently stable to remain effective as an insulation for the life of the building 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 Third issue: 16 August 2022

Originally certificated on 4 March 2016

Hardy Giesler  
Chief Executive Officer

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](http://www.bbacerts.co.uk)

Readers **MUST** check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.

Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

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## Regulations

In the opinion of the BBA, IKO enertherm ALU Insulation Board for Pitched Roofs, 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)

<b>Requirement:</b>	<b>B4(1)</b>	<b>External fire spread</b>
Comment:		Use of the product is restricted by this Requirement in some cases. See sections 9.1 and 9.2 of this Certificate.
<b>Requirement:</b>	<b>C2(c)</b>	<b>Resistance to moisture</b>
Comment:		The product can contribute to satisfying this Requirement. See sections 7.1, 7.2 and 7.10 of this Certificate.
<b>Requirement:</b>	<b>L1(a)(i)</b>	<b>Conservation of fuel and power</b>
Comment:		The product can contribute to satisfying this Requirement. See sections 6.1 and 6.2 of this Certificate.
<b>Regulation:</b>	<b>7(1)</b>	<b>Materials and workmanship</b>
Comment:		The product is acceptable. See section 11 and the <i>Installation</i> part of this Certificate.
<b>Regulation:</b>	<b>7(2)</b>	<b>Materials and workmanship</b>
Comment:		The product is restricted by this Regulation. See sections 9.1 and 9.2 of this Certificate
<b>Regulation:</b>	<b>26</b>	<b>CO<sub>2</sub> emission rates for new buildings</b>
<b>Regulation:</b>	<b>26A</b>	<b>Fabric energy efficiency rates for new dwellings (applicable to England only)</b>
<b>Regulation:</b>	<b>26A</b>	<b>Primary energy consumption rates for new buildings (applicable to Wales only)</b>
<b>Regulation:</b>	<b>26B</b>	<b>Fabric performance values for new dwellings (applicable to Wales only)</b>
<b>Regulation:</b>	<b>26C</b>	<b>Target primary energy rates for new buildings (applicable to England only)</b>
Comment:		The product can contribute to satisfying these Regulations. See sections 6.1 and 6.2 of this Certificate.



### The Building (Scotland) Regulations 2004 (as amended)

<b>Regulation:</b>	<b>8(1)</b>	<b>Durability, workmanship and fitness of materials</b>
Comment:		The product is acceptable. See section 11 and the <i>Installation</i> part of this Certificate.
<b>Regulation:</b>	<b>8(3)</b>	<b>Durability, workmanship and fitness of materials</b>
Comment:		The product is restricted by this Regulation. See sections 9.1 and 9.3 of this Certificate
<b>Regulation:</b>	<b>9</b>	<b>Building standards applicable to construction</b>
Standard:	<b>2.4</b>	Cavities
Comment:		Use of the product is restricted by this Standard in some cases, with reference to clauses 2.4.4 <sup>(1)</sup> and 2.4.6 <sup>(2)</sup> . See sections 9.1 and 9.3 of this Certificate.
Standard:	<b>2.6</b>	Spread to neighbouring buildings
Comment:		The product is restricted by this Standard in some cases, with reference to clauses 2.6.5 <sup>(1)</sup> and 2.6.6 <sup>(2)</sup> . See sections 9.1 and 9.3 of this Certificate.
Standard:	<b>3.15</b>	Condensation
Comment:		The product can contribute to satisfying this Standard, with reference to clauses 3.15.1 <sup>(1)(2)</sup> , 3.15.3 <sup>(1)(2)</sup> , 3.15.4 <sup>(1)</sup> , 3.15.5 <sup>(1)(2)</sup> and 3.15.7 <sup>(1)(2)</sup> . See sections 7.1, 7.2 and 7.11 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 <sup>(1)</sup> , 6.1.6 <sup>(1)</sup> , 6.2.1 <sup>(1)(2)</sup> , 6.2.3 <sup>(1)</sup> , 6.2.4 <sup>(1)(2)</sup> , 6.2.5 <sup>(2)</sup> , 6.2.6 <sup>(1)(2)</sup> , 6.2.7 <sup>(1)</sup> , 6.2.8 <sup>(2)</sup> , 6.2.9 <sup>(1)(2)</sup> , 6.2.10 <sup>(1)</sup> , 6.2.11 <sup>(1)(2)</sup> , 6.2.12 <sup>(2)</sup> and 6.2.13 <sup>(1)(2)</sup> . See sections 6.1 and 6.2 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 <sup>(1)(2)</sup> [Aspects 1 <sup>(1)(2)</sup> and 2 <sup>(1)</sup> ], 7.1.6 <sup>(1)(2)</sup> [Aspects 1 <sup>(1)(2)</sup> and 2 <sup>(1)</sup> ] and 7.1.7 <sup>(1)(2)</sup> [Aspect 1 <sup>(1)(2)</sup> ]. See section 6.1 of this Certificate.
<b>Regulation:</b>	<b>12</b>	<b>Building standards applicable to conversions</b>
Comment:		Comments made in relation to the product under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12.1 <sup>(1)(2)</sup> and Schedule 6 <sup>(1)(2)</sup> .
		(1) Technical Handbook (Domestic) (2) Technical Handbook (Non-Domestic).



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

<b>Regulation:</b>	<b>23(1)</b>	<b>Fitness of materials and workmanship</b>
Comment:		The product is acceptable. See section 11 and the <i>Installation</i> part of this Certificate.
<b>Regulation:</b>	<b>23(2)</b>	<b>Fitness of materials and workmanship</b>
Comment:		The product is restricted by this Regulation. See sections 9.1 and 9.2 of this Certificate.
<b>Regulation:</b>	<b>29</b>	<b>Condensation</b>
Comment:		The product can contribute to satisfying this Regulation. See sections 7.1 and 7.2 of this Certificate.
<b>Regulation:</b>	<b>36(a)</b>	<b>External fire spread</b>
Comment:		Use of the product is restricted by this Regulation in some cases. See sections 9.1 and 9.2 of this Certificate
<b>Regulation:</b>	<b>39(a)(i)</b>	<b>Conservation measures</b>
Comment:		The product can contribute to satisfying this Regulation. See sections 6.1 and 6.2 of this Certificate
<b>Regulation:</b>	<b>40(2)</b>	<b>Target carbon dioxide emission rate</b>
	<b>43B</b>	<b>Nearly zero-energy requirements for new buildings</b>
Comment:		The product can contribute to satisfying these Regulations. See sections 6.1 and 6.2 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 sections: 3 *Delivery and site handling* (3.4) and 12 *General* (12.2 and 12.3) of this Certificate.

## Additional Information

### NHBC Standards 2022

In the opinion of the BBA, IKO enertherm ALU Insulation Board for Pitched Roofs, if installed and used in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Chapter 7.2 *Pitched roofs*.

### CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard BS EN 13165 : 2012.

## Technical Specification

### 1 Description

IKO enertherm ALU Insulation Board for Pitched Roofs comprises a rigid polyisocyanurate (PIR) board with composite foil-facings. The board has the nominal characteristics given in Table 1.

*Table 1 Nominal characteristics*

Characteristic (unit)	Value
Length and width (mm)	1200 x 600
	1200 x 2400
Thickness (mm)	30 to 200 (in 5 mm increments)
Edge profile	Straight edge
Minimum compressive stress at 10% deformation (kPa)	175
Foil-facings	Printed composite foil-facing both sides

### 2 Manufacture

2.1 IKO enertherm ALU Insulation Board for Pitched Roofs is manufactured by blending together polyol and MDI in a continuous foaming process aided by a blowing agent and sandwiched between two composite foil-facings. After formation, the boards are left to cure and are cut to 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 environmental management system of IKO Insulations UK Ltd has been assessed and registered as meeting the requirements of BS EN ISO 14001 : 2015 by Lucideon (Certificate 24884).

### 3 Delivery and site handling

3.1 The product is delivered to site in polythene shrink-wrapped packs, including a label with the Certificate holder's trade name, product description and characteristics, and the BBA logo incorporating the number of this Certificate.

3.2 The product must be protected from prolonged exposure to sunlight and should be stored either under cover or protected with opaque polythene sheeting. Where possible, packs should be stored inside. If outside, the product should be stacked flat, and raised above ground level and not in contact with ground moisture.

3.3 The product is light and easy to handle, and care should be exercised to avoid crushing the edges or corners. If damaged the product should be discarded.

3.4 The product must not be exposed to open 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 IKO enertherm ALU Insulation Board for Pitched Roofs.

## Design Considerations

### 4 Use

4.1 IKO enertherm ALU Insulation Board for Pitched Roofs is suitable for use as thermal insulation within tiled or slated pitched roofs in conjunction with internal lining board, roof tile underlay, timber counter battens and tiling battens, or between and over ceiling joists, in new and existing domestic and non-domestic buildings, with height restriction in some cases (see Section 9 of this Certificate), and may be installed:

- above sloping rafters
- above and between sloping rafters
- between sloping rafters
- between and below sloping rafters
- between and over ceiling joists.

4.2 Roofs should be designed and constructed in accordance with the relevant clauses of BS 5250 : 2021, BS 5534 : 2014, BS 8212 : 1995 and BS EN 1995-1-1 : 2004 and its UK National Annex.

4.3 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.

4.4 The product is for use in constructions where the ceiling follows the pitch of the roof and encloses a habitable space, or where the ceiling is horizontal and encloses a loft space.

4.5 It is essential that detailing and jointing of the boards achieves a convection-free envelope of high vapour resistance. Any gaps should be filled and/or taped. Ridges, abutments and penetrations should also be sealed. Flue pipes passing through the insulation should be suitably sleeved.

4.6 A ventilated air space of minimum 50 mm may be required between the underside of the roof tile underlay and the upper face of the product, depending on the specification of the roof tile underlay used (see section 7.3).

4.7 During installation, care should be exercised to ensure that the product is not subjected to any construction or foot traffic loads. Roof timbers of adequate strength should be used to support such loads.

### 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) of specific roof constructions should be carried out in accordance with BS EN ISO 6946 : 2017 and BRE Report BR 443 : 2019, using the declared thermal conductivity ( $\lambda_D$ ) value of  $0.022 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$  for the insulation, and an aged emissivity ( $\epsilon$ ) (to BS EN 15976 : 2011) of 0.07 for the printed foil-facings.

6.2 The U value of a completed roof will depend on the thickness of the product, number and type of fixings, and the roof structure and its internal finish. Calculated U values for example constructions in accordance with the national Building Regulations are given in Table 2.

**Table 2 Example U values — pitched roof<sup>(1)</sup>**

Target U value (W·m <sup>-2</sup> ·K <sup>-1</sup> )	Insulation thickness (mm)		
	Over rafters <sup>(2)(3)</sup>	Between rafters <sup>(4)</sup>	Between and under rafters <sup>(2)</sup>
0.11	175	—	100 + 115
0.13	150	—	100 + 85
0.15	130	—	100 + 65
0.16	120	—	100 + 60
0.18	105	—	90 + 50
0.20	95	—	90 + 40
0.25	70	130	75 + 30

(1) Plasterboard = 12.5 mm ( $\lambda = 0.25 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ).

(2) Based on a ventilated pitched roof with 50 x 150 mm deep timber rafters at 400 mm centres = 12.5% ( $\lambda = 0.13 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ).

(3) Helical fixings for the insulation over the rafter of 6.7 per m<sup>2</sup> stainless steel ( $\lambda = 17 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ), with a cross-sectional area of 7.45 mm<sup>2</sup>.

(4) Based on a ventilated pitched roof with 50 x 200 mm deep timber rafters at 400 mm centres = 12.5% ( $\lambda = 0.13 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ).

## Junctions

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

### Interstitial condensation



7.1 Roofs will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2021 and the relevant guidance.

7.2 The foil-facings have a water vapour resistance of 1000 MN·s·g<sup>-1</sup> and the insulation core has a water vapour resistivity of 300 MN·s·g<sup>-1</sup>·m<sup>-1</sup>.

7.3 When installed with tightly butted joints, with all gaps/joints filled and sealed, the product will provide a continuous convection-free envelope of high vapour resistance. Therefore, a suitable vapour-permeable (low resistance -LR) roof tile underlay may be laid over the insulation boards without a ventilated air space unless the tiles/slates are tight fitting as defined in BS 5250 : 2021. When using a high-resistance (HR) underlay, the space below it must be ventilated in accordance with BS 5250 : 2021.

7.4 Where the product is installed in a roof with either a horizontal or sloping ceiling (ie room-in-the-roof), a 'warm roof' space is created, and ventilation should be designed in accordance with BS 5250 : 2021. However, any insulation in a horizontal ceiling should be removed.

7.5 Where high humidity may be expected, a vapour control layer (vcl) such as 0.125 mm thickness polyethylene with sealed and lapped joints, should also be used unless a construction-specific condensation risk analysis in accordance with BS 5250 : 2021 indicates otherwise.

### Cold pitched roof (non-habitable loft space) — insulation at horizontal ceiling level only

7.6 It is important to seal existing service penetrations in the ceiling and to provide draught proofing to any loft hatches to reduce inflow of warm air and moisture. Any new loft insulation should be kept sufficiently clear of the eaves so that any adventitious ventilation is not reduced. Further guidance may be obtained from BRE Report BR 262 : 2002.

7.7 Insulation material placed at ceiling level will considerably reduce the temperature of an unheated roof structure and, if moist air passes into the roof space, condensation on cold surfaces is likely to increase. Roof structures incorporating the insulation at ceiling level must have provision for adequate permanent ventilation of the space above the insulation to minimise the formation of condensation in the roof space.

7.8 Permanent ventilation of the roof structure should be provided by continuous openings or regularly spaced vents of equivalent area situated along two opposite sides of the roof at eaves level, and at a high level when required. The

size and position of ventilation openings for pitched roofs should be in accordance with the relevant recommendations of BS 5250 : 2011. Further information and guidance is given in BRE Report BR 262 : 2002.

7.9 Ventilation openings should be arranged to prevent the ingress of rain, snow, birds and small mammals, and the risk of blockage by other building operations

### Surface condensation



7.10 In England and Wales, 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 walls are designed in accordance with section 6.3 of this Certificate.



7.11 In Scotland, roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed  $1.2 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$  at any point. Guidance may be obtained from BS 5250 : 2021. Further guidance may be obtained from BRE Report BR 262 : 2002 and section 6.3 of this Certificate.

## 8 Strength and stability (over rafter application)

8.1 The product, when installed in accordance with the manufacturer's instructions and this Certificate, will resist the loads likely to be met in service. During installation, care should be taken to ensure that the product is not subjected to any construction or foot traffic loads. Roof timbers of adequate strength should be used to support such loads.

8.2 Resistance to wind uplift will depend largely on the building geometry and its geographical location and should be calculated in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex. Snow loadings should be calculated in accordance with BS EN 1991-1-3 : 2003 and its UK National Annex.

8.3 The Certificate holder and fixing manufacturer must advise on the use of the correct proprietary fixings and fixing capacity. When considering and calculating the fixing spacing required to resist the calculated loadings, the requirements of BS EN 1995-1-1 : 2004 and its UK National Annex should be followed.

## 9 Behaviour in relation to fire



9.1 The Certificate holder has not declared a reaction to fire classification for the product to BS EN 13501-1 : 2018.



9.2 In England, Wales and Northern Ireland, the product, when used in roof pitches of greater than  $70^\circ$ , should not be used on buildings that have a storey at least 18 m above ground level.



9.3 In Scotland, the product, when used in roof pitches of greater than  $70^\circ$ , should not be used on buildings with a storey at a height of 11 m or more above the ground or within 1 m of a boundary.

9.4 Elements must incorporate cavity barriers at edges, around openings, at junctions with fire-resisting elements and in cavities, in accordance with the relevant provisions of the national Building Regulations.

9.5 The product must not be carried over junctions between roofs required to provide a minimum period of fire resistance. The continuity of fire resistance must be maintained, as described in the national Building Regulations.

## 10 Maintenance

As the product is confined within the pitched roof by the underlay and has suitable durability (see section 11), maintenance is not required.



## 11 Durability



The product is durable, rot-proof, dimensionally stable and, when installed with the overlays specified in this Certificate, will remain effective as an insulating material for the life of the building in which it is incorporated.

## Installation

## 12 General

12.1 Installation of IKO enertherm ALU Insulation Board for Pitched Roofs must be in accordance with the relevant clauses of BS 5534 : 2014, and the manufacturer's instructions. Installation can be carried out in all conditions normal to roofing work.

12.2 The product is light to handle but some handling difficulties may be experienced in windy conditions.

12.3 Since the product will not support the weight of operatives, appropriate care must be taken during installation and tiling.

12.4 The product can be cut easily using a sharp knife or fine-toothed saw. Care must be taken to prevent damage, particularly to edges. Damaged boards should not be used. Small areas of damaged facing may be repaired with self-adhesive aluminium foil tape.

12.5 It is important to ensure a tight fit between boards, between boards and rafters, and between boards and other detailed elements. At ridges and verges, boards should be cut to achieve tightly butted joints.

12.6 It is important to fill/seal gaps and joints in the insulation envelope, including at all service penetrations (see section 4.5 of this Certificate).

12.7 For installation of roof tiles or slates and internal lining boards, see sections 13.13 and 13.14 of this Certificate.

## 13 Procedure

### Insulation above rafters

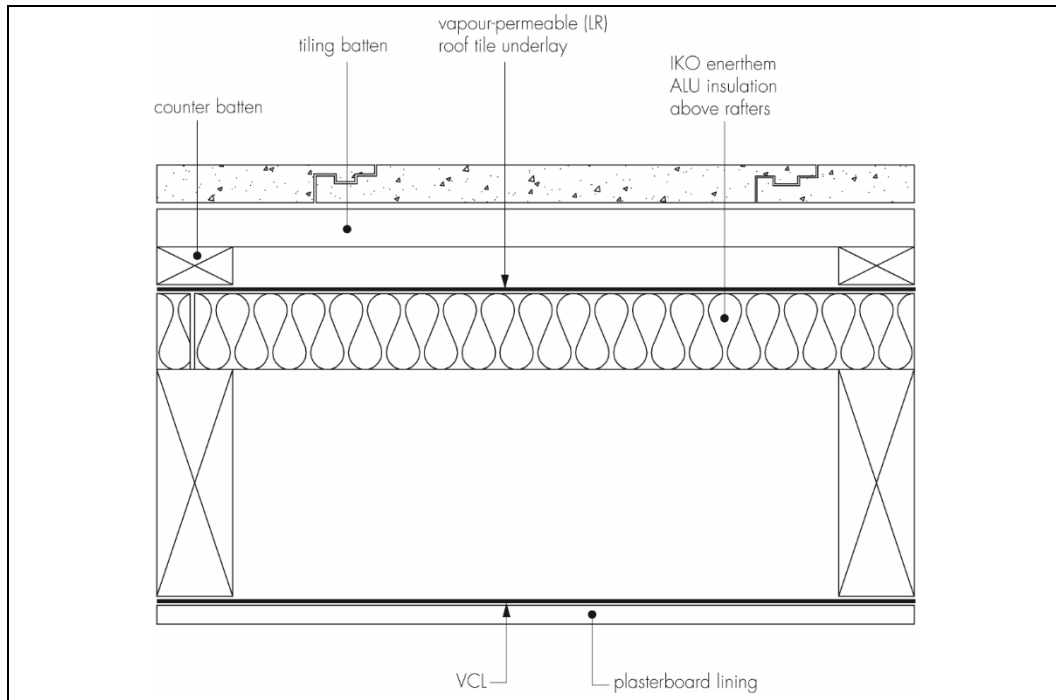
13.1 A treated timber stop batten, the same thickness as the insulation board, is fixed to the rafters close to the eaves to provide a firm fixing point for the counter battens. The product is laid over the rafters, commencing at the stop batten. The product should be tightly butted and positioned in a staggered pattern, with all the joints running from eaves to ridge positioned over the rafters. The procedure is continued until the whole area is covered.

13.2 Any gaps must be sealed with flexible sealant or expanded foam. Large-headed clout nails can be used as a temporary securing measure until the counter battens are secured into place.

13.3 A vapour-permeable (low resistance -LR) roofing underlay should be installed on top of the insulation and secured with counter battens, followed by tiling battens (see Figure 1).



**Figure 1 Insulation above rafters**



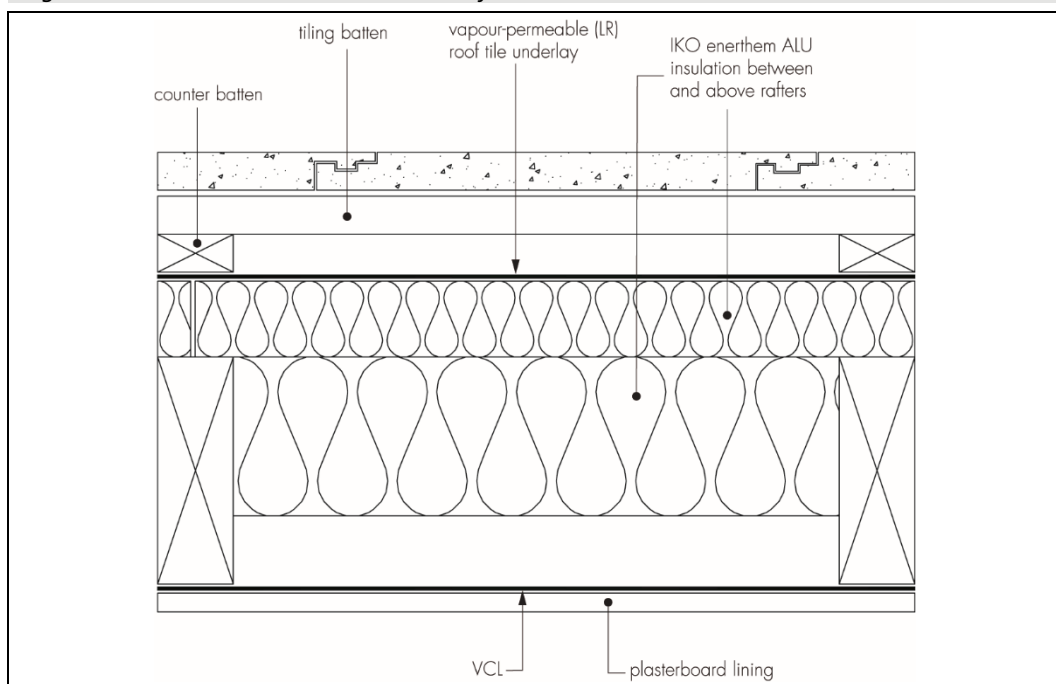
#### **Insulation between and above rafters**

13.4 The product is cut to fit tightly within the space between the rafters and can be restrained using proprietary clips or timber sections.

13.5 The product is installed flush with the top of the rafters.

13.6 A second layer of insulation board is then fixed above the rafters, installed as described in sections 13.1 to 13.3 (see Figure 2).

**Figure 2 Insulation between and above rafters**



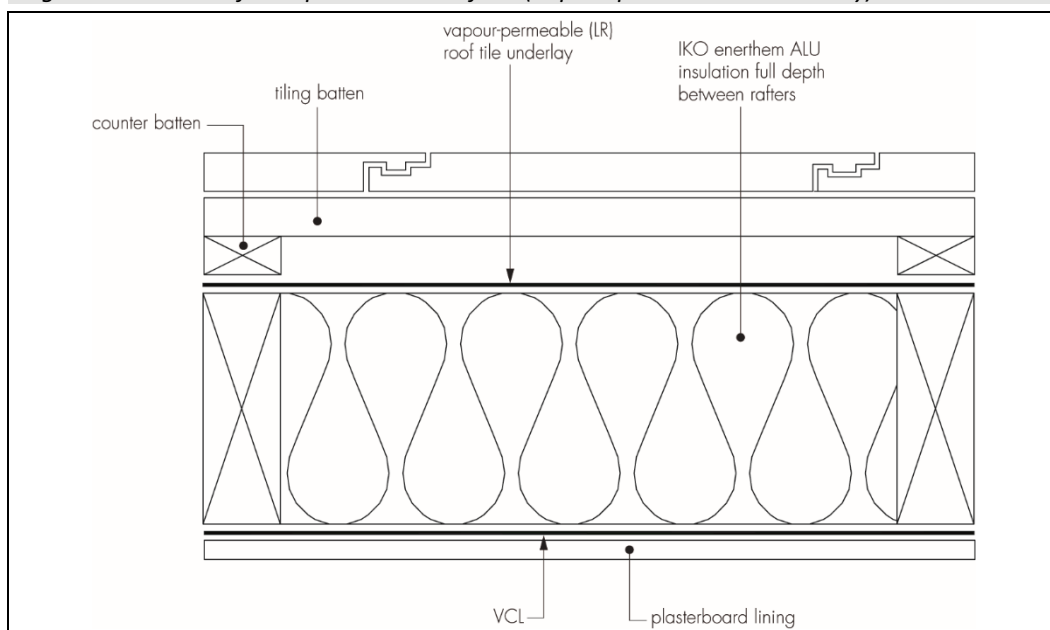
#### **Insulation between rafters**

13.7 The product is cut to fit tightly within the space between the rafters and restrained using proprietary clips or timber battens, allowing sufficient depth for the insulation to sit flush with the underside of the rafters.

13.8 A ventilation gap of 50 mm minimum must be maintained between the top of the insulation and roof tile underlay to minimise the risk of condensation, unless a vapour-permeable (LR) underlay is used.

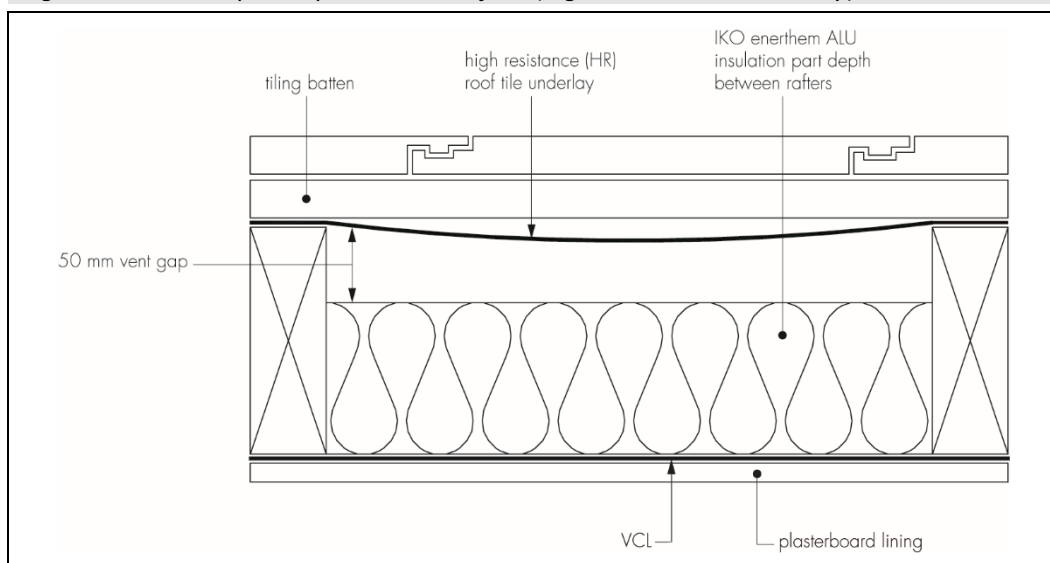
13.9 When using a vapour-permeable (LR) roofing underlay on top of the rafters, the insulation can be installed full depth between the rafters, ie flush with the top and bottom of the rafters. Counter battens are then installed over the underlay, followed by tiling battens (see Figure 3).

**Figure 3 Insulation full depth between rafters (vapour-permeable LR underlay)**



13.10 When using a high-resistance (HR) roofing underlay on the top of the rafters, the insulation should be installed part depth between the rafters, ie flush with the bottom of the rafters and set to create a 50 mm void between the top of the insulation and the top of the rafter for ventilation. Tiling battens are applied over the roofing underlay (see Figure 4).

**Figure 4 Insulation part depth between rafters (high-resistance HR underlay)**

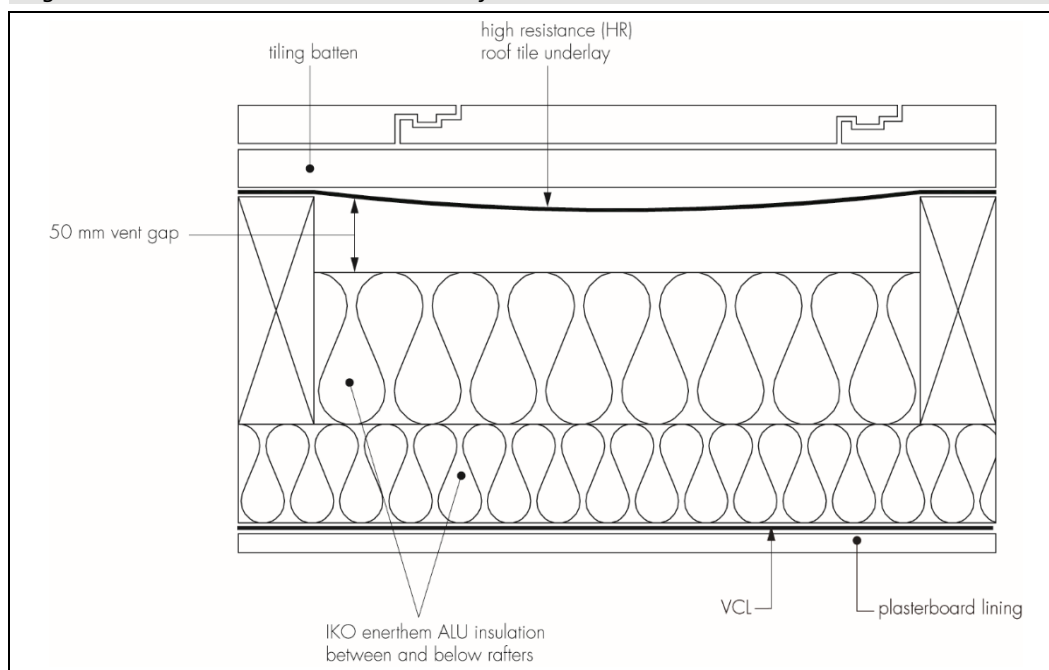


#### **Insulation between and below rafters**

13.11 If required, after installation between rafters as described in sections 13.7 to 13.10, a second layer of the product may be added below the rafters, running at right angles to the rafters and insulation fill, in a staggered pattern, and fixed accordingly (see Figure 5).

13.12 The product should be butted tightly against each other to prevent gaps. Taping the joints with a self-adhesive aluminium foil tape provides an effective air permeability barrier. To achieve an adequate bond, the product should be clean and free from any contamination.

**Figure 5** *Insulation between and below rafters*



## Finishing

13.13 Roof tiles or slates are installed in accordance with the relevant clauses of BS 5534 : 2014. When applying roof tiles or slates to a warm roof construction, the recommendations of the manufacturer should be followed.

13.14 A sealed polythene vcl with a minimum thickness of 0.125 mm with lapped and sealed joints is placed over the internal rafter face before applying the internal finishing plasterboard lining to BS EN 520 : 2004, fixed in accordance with BS 8212 : 1995, to ensure a well-sealed ceiling in accordance with BS 9250 : 2007.

## Technical Investigations

### 14 Tests

Results of tests were assessed to determine:

- thermal conductivity
- compressive stress at 10% deformation
- dimensional accuracy
- water vapour resistance.

### 15 Investigations

15.1 Existing data on durability and properties in relation to fire were evaluated.

15.2 A calculation was undertaken to confirm the declared thermal conductivity ( $\lambda_D$ ).

15.3 A series of U value calculations were carried out.

15.4 A condensation risk analysis was carried out.

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

## Bibliography

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

BRE Report BR 443 : 2019 *Conventions for U-value calculations*

BS 5250 : 2021 *Management of moisture in buildings. Code of practice*

BS 5534 : 2014 + A2 : 2018 *Slating and tiling for pitched roofs and vertical cladding — Code of practice*

BS 8212 : 1995 *Code of practice for dry lining and partitioning using gypsum plasterboard*

BS 9250 : 2007 *Code of practice for the design of the airtightness of ceilings in pitched roofs*

BS EN 520 : 2004 + A1 : 2009 *Gypsum plasterboards — Definitions, requirements and test methods*

BS EN 1991-1-3 : 2003 + A1 : 2015 *Eurocode 1 : Actions on structures — General actions — Snow loads*

NA + A2 : 18 to BS EN 1991-1-3 : 2003 + A1 : 2015 UK National Annex to *Eurocode 1 : Actions on structures — General actions — Snow loads*

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

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

BS EN 1995-1-1 : 2004 + A2 : 2014 *Eurocode 5 : Design of timber structures — General — Common rules and rules for buildings*

NA to BS EN 1995-1-1 : 2004 + A2 : 2014 UK National Annex to *Eurocode 5 : Design of timber structures — General — Common rules and rules for buildings*

BS EN 13165 : 2012 + A2 : 2016 *Thermal insulation products for buildings — Factory made rigid polyurethane foam (PU) products — Specification*

BS EN 13501-1 : 2018 *Fire classification of construction products and building elements — Classification using test data from reaction to fire tests*

BS EN ISO 14001 : 2015 *Environmental Management systems — Requirements with guidance for use*

BS EN 15976 : 2011 *Flexible sheets for waterproofing — Determination of emissivity*

BS EN ISO 6946 : 2017 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

### 16 Conditions

#### 16.1 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.

16.2 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.

16.3 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.

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

16.5 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.

16.6 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.