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Agrément Certificate  
**10/4771**  
Product Sheet 1

## DURATHERM OS

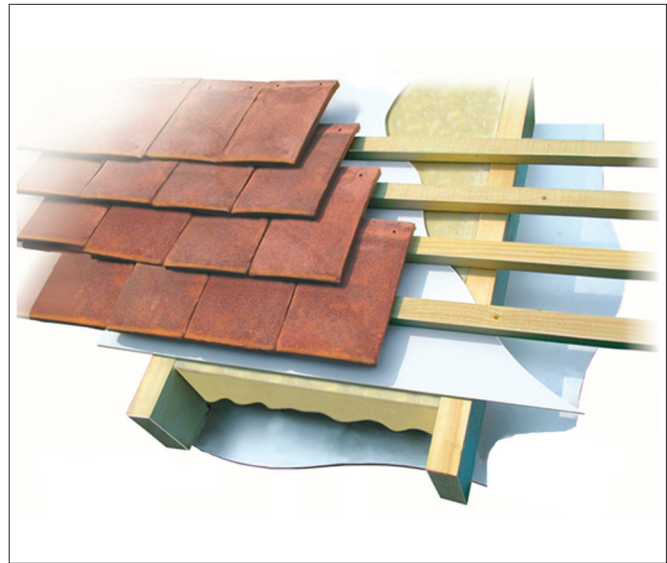
### DURATHERM OS ROOF INSULATION

This Agrément Certificate Product Sheet<sup>(1)</sup> relates to Duratherm OS Roof Insulation, spray-applied in-situ expanding polyurethane (PUR) foam insulation, for use in pitched roofs, including hybrid roofs, or flat timber roof constructions, in new or existing domestic buildings.

(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 declared thermal conductivities ( $\lambda_D$ )\* of  $0.027 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$  to  $0.025 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ , depending upon the thickness of application (see section 6).

**Condensation risk** — the product can contribute to limiting the risk of condensation. The risk of interstitial condensation will depend on the roof construction and should, therefore, be assessed for each project. A pre-installation survey must be carried out to ensure that the construction is suitable for the application of the product. A vapour control layer (VCL) must be used where required (see section 7).

**Durability** — the product will have a life equivalent to that of the structure in which it is incorporated (see section 12).

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

A handwritten signature in black ink, appearing to read 'John Albon'.

Date of Second issue: 8 July 2016

John Albon — Head of Approvals

A handwritten signature in black ink, appearing to read 'Claire Curtis-Thomas'.

Originally certificated on 20 August 2010

Construction Products

Claire Curtis-Thomas

Chief Executive

*The BBA is a UKAS accredited certification body — Number 1113. 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 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, Duratherm OS Roof Insulation, 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 7.6 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		The product can contribute to satisfying this Requirement. See sections 6.1 to 6.3 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The product is acceptable. See section 12 and the <i>Installation</i> part of this Certificate.
Regulation:	26	CO <sub>2</sub> 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; however, compensating fabric/services measures may be required. See sections 6.1 to 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 12 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 <sup>(1)(2)</sup> , 3.15.3 <sup>(1)(2)</sup> , 3.15.4 <sup>(1)(2)</sup> , 3.15.5 <sup>(1)(2)</sup> and 3.15.7 <sup>(1)(2)</sup> . See sections 7.1 and 7.7 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 to 6.3 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 system 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 sections 6.1 to 6.3 of this Certificate.
Regulation:	12	Building standards applicable to conversions
Comment:		All comments given for these systems 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)

Regulation:	23	Fitness of materials and workmanship
Comment:		The product is acceptable. See section 12 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 sections 6.1 to 6.3 of this Certificate.

## Construction (Design and Management) Regulations 2015

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

Information in this Certificate may assist the client, Principal Designer/CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: 3 *Delivery and site handling* (3.1 to 3.3) and 14 *Precautions* (14.1 to 14.6) of this Certificate.

## Additional Information

### NHBC Standards 2016

NHBC accepts the use of Duratherm OS Roof Insulation, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapters 7.1 *Flat Roofs and Balconies* and 7.2 *Pitched Roofs*. To satisfy the requirements of the NHBC, a VCL of a type specified in their standards must be applied behind a plasterboard lining, and the product must only be applied to a roof construction incorporating a breathable roof tile underlay.

### CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard BS EN 14315-1 : 2013. An asterisk (\*) appearing in this Certificate indicates that data shown is given in the manufacturer's Declaration of Performance.

## Technical Specification

### 1 Description

1.1 Duratherm OS Roof Insulation is a cream-coloured closed-cell rigid polyurethane (PUR) foam insulation. It is suitable for application in pitched roofs (either to the underside of a roof tile underlay or directly to the underside of roof tiles or slates), to the underside of flat timber roofs, and in hybrid roofs. It is spray applied (HFC blown) and built up in layers, each not exceeding 20 mm in thickness.

1.2 The product is prepared from two liquid components, one part by volume of isocyanate to one part by volume of resin mixed within the nozzle of the spray gun during the spraying process. The foam cures within two hours.

1.3 The product has an installed density in the range of 30 kg·m<sup>-3</sup> to 42 kg·m<sup>-3</sup>. Quality control arrangements on site include checks on density and appearance.

1.4 Ancillary items used with these products, but outside the scope of this Certificate, include:

- non-breathable and breathable roof underlays
- vapour control layer (VCL)
- gypsum plasterboard.

### 2 Manufacture

2.1 The product is formed in-situ by mixing together isocyanate and resin components within the nozzle of a spray gun. The foam mix produced is soft and fluid but quickly expands and hardens to a rigid foam mass.

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 Isothane Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 and/or BS EN ISO 14001 : 2004 by British Standards Institute (Certificates FM/21549 and EMS/68443).

### 3 Delivery and site handling

3.1 The two components of the product are delivered to site in separate drums (up to 250 kg capacity), bearing the product name, batch number and the BBA logo incorporating the number of this Certificate.

3.2 Drums should be stored in a well-ventilated area, ideally above 10°C and away from possible ignition sources. The drums must be protected from frost.

3.3 The isocyanate component is classified under the *Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulation) 2009*, and the packaging bears the appropriate hazard warning label(s).

## Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Duratherm OS Roof Insulation.

## 4 Use

4.1 Duratherm OS Roof Insulation is effective in reducing the thermal transmittance (U value) of roofs in new and existing domestic buildings.

4.2 The product can be installed:

- between, or between and under, timber rafters in a habitable warm pitched roof (room in the roof). Insulation at rafter level only
- as a combination between and under timber rafters and between ceiling joists in a non-habitable pitched roof (hybrid roof, which contains both sloping and horizontal insulation)
- between, and between and under, timber rafters directly to tiles or slates
- between timber joists to the underside of a roof deck in flat timber roofs.

4.3 The product must be covered by a plasterboard lining except when used in a non-habitable loft space (see section 8.2 and the Installation section of this Certificate); this use is restricted under the national Building Regulations.

4.4 Constructions must be designed in accordance with the relevant recommendations of:

- BS 5250 : 2011
- BS 5534 : 2014
- BS 6229 : 2003
- BS 8103-3 : 2009
- BS EN 351-1 : 2007
- BS EN 1995-1-1 : 2004 and its UK National Annex.

4.5 A pre-installation survey must be carried out to ensure that the construction is suitable for the application of the product.

4.6 It is essential that construction elements are designed and constructed to incorporate normal precautions against moisture ingress before the application of the product.

4.7 Existing constructions must be in a good state of repair with no evidence of rain penetration or damp. Defects must be made good prior to installation. Installation must not be carried out until the moisture content of any roof timber framing is less than 20%.

4.8 The product must not come into direct contact with flue pipes, chimneys or other heat-producing appliances (see section 9).

4.9 The product forms a strong bond with clean, dry substrates. This should be taken into account when specifying the product or anticipating future alterations.

4.10 The product contributes to the airtightness of the building envelope.

### Pitched roofs (including hybrid roofs) tiled or slated to BS 5534 : 2014

4.11 Pitched roofs are defined for the purpose of this Certificate as those roofs having a pitch in excess of 15°.

4.12 The product can be spray-applied directly to the underside of reinforced bitumen membranes, breathable roof tile underlays, timber sarking boards or on top of a plasterboard ceiling lining.

4.13 Care must be taken to ensure the integrity of the roof tile underlay drape when spraying the product. See section 15.7.

### Flat timber roof constructions to BS 6229 : 2003

4.14 The product can be applied to the underside of the flat roof decking between flat roof joists.

## 5 Practicability of installation

The product should only be installed by contractors trained and approved by the Certificate holder in accordance with the Certificate holder's Installation Manual (see section 13).

## 6 Thermal performance


 6.1 Calculations of the thermal transmittance (U value) of a roof should be carried out in accordance with BS EN ISO 6946 : 2007 and BRE Report BR 443 : 2006 using the declared thermal conductivity ( $\lambda_D$ )\* values given in Table 1 of this Certificate.

Table 1 Declared thermal conductivity ( $\lambda_D$ )\*

Insulation thickness (mm)	Declared thermal conductivity ( $\lambda_D$ )* (W·m <sup>-1</sup> ·K <sup>-1</sup> )
<80	0.027
80 to 119	0.026
≥120	0.025

6.2 The U Value of a completed roof will depend on the insulation thickness, the roof structure and its internal finish. Example U values for particular constructions are given in Tables 2 to 4.

*Table 2 U Values — Pitched roof (insulation only between timber rafter)<sup>(1)(2)(3)</sup>*

Design U Values (W·m <sup>-2</sup> ·K <sup>-1</sup> )	Duratherm OS Insulation thickness (mm)
0.13	— <sup>(4)</sup>
0.15	— <sup>(4)</sup>
0.16	— <sup>(4)</sup>
0.18	190 <sup>(5)</sup>
0.20	165 <sup>(5)</sup>
0.25	130 <sup>(6)</sup>

- (1) Thickness range of 30 mm to 200 mm with 5 mm increments.
- (2) Roof construction inclusive of 15 mm concrete tiles, ventilated tile batten cavity ( $R = 0 \text{ m}^2 \cdot \text{kW}^{-1}$ ), 1F roof felt, variable thickness of timber rafters (bridged at 12.5%) containing a variable thickness of insulation (remaining thickness is air cavity), a high performance VCL and 12.5 mm plasterboard ( $\lambda = 0.25 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ).
- (3) It is assumed there is no air gap correction ( $\Delta U_g = 0.00$ ).
- (4) For improved thermal/carbon emissions performance, additional batten/insulation thicknesses may be considered.
- (5) U Value achieved using 200 mm rafters.
- (6) U Value achieved using 150 mm rafters.

*Table 3 U Values — Hybrid pitched roof<sup>(1)(2)(3)</sup>*

Design U Values (W·m <sup>-2</sup> ·K <sup>-1</sup> )	Duratherm OS Insulation thickness (mm)				
	Roof pitch angle: 20°	Roof pitch angle: 30°	Roof pitch angle: 40°	Roof pitch angle: 50°	Roof pitch angle: 60°
0.13	— <sup>(4)</sup>	— <sup>(4)</sup>	— <sup>(4)</sup>	— <sup>(4)</sup>	— <sup>(4)</sup>
0.15	— <sup>(4)</sup>	— <sup>(4)</sup>	— <sup>(4)</sup>	— <sup>(4)</sup>	— <sup>(4)</sup>
0.16	145	— <sup>(4)</sup>	— <sup>(4)</sup>	— <sup>(4)</sup>	— <sup>(4)</sup>
0.18	115	130	— <sup>(4)</sup>	— <sup>(4)</sup>	— <sup>(4)</sup>
0.20	85	100	120	— <sup>(4)</sup>	— <sup>(4)</sup>
0.25	40	45	60	85	140

- (1) Maximum insulation thickness restricted to 150 mm (sprayed between the pitched rafters).
- (2) 15 mm concrete tiles, 20 mm cavity created by the tile battens, 1F felt, variable insulation thickness between 150 mm deep rafters (12.5% bridge,  $\lambda = 0.13 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ), loft space ( $R = 0.20 \text{ m}^2 \cdot \text{kW}^{-1}$ ), 100 mm ceiling joists (12.5% bridge,  $\lambda = 0.13 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ) containing mineral wool ( $\lambda = 0.044 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ) a high performance VCL and 12.5 mm plasterboard ( $\lambda = 0.25 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ).
- (3) It is assumed there is an air gap correction of  $\Delta U_g = 0.04$ .
- (4) For improved thermal/carbon emissions performance, additional batten/insulation thicknesses may be considered.

*Table 4 U Values — Flat roof<sup>(1)(2)(3)</sup>*

Design U Values (W·m <sup>-2</sup> ·K <sup>-1</sup> )	Duratherm OS Insulation thickness (mm)
0.13	— <sup>(4)</sup>
0.15	— <sup>(4)</sup>
0.16	— <sup>(4)</sup>
0.18	190 <sup>(5)</sup>
0.20	165 <sup>(5)</sup>
0.25	130 <sup>(6)</sup>

- (1) Thickness range of 30 mm to 200 mm with 5 mm increments.
- (2) Roof construction inclusive of bitumen, 18 mm plywood deck ( $\lambda = 0.24 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ), variable thickness of timber joists (bridged at 12.5%) containing a variable thickness of insulation (remaining thickness is air cavity), a high performance VCL and 12.5 mm plasterboard ( $\lambda = 0.25 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$ ).
- (3) It is assumed there is no air gap correction ( $\Delta U_g = 0.00$ ).
- (4) For improved thermal/carbon emissions performance, additional batten/insulation thicknesses may be considered.
- (5) U Value achieved using 200 mm joists.
- (6) U Value achieved using 150 mm joists.

## Junctions



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

6.4 This Certificate holder has at least one staff member who has been deemed competent by the BBA under the BBA/TIMSA Scheme for Calculation Competency (U value and Condensation Risk Analysis). Competent persons should be contacted for accurate, quality-assured U value and condensation risk analysis. The Certificate of Competency can be found on the BBA website (<http://www.bbacerts.co.uk>) as Certificate number CS/1011.

## 7 Condensation risk

### Interstitial condensation



7.1 Roofs should be designed and constructed in accordance with the relevant parts of BS 5250 : 2011 and Annexes D and H, including having a well-sealed ceiling, and for the purposes of assessing the risk of interstitial condensation, a water vapour resistivity of  $190 \text{ MN}\cdot\text{s}\cdot\text{g}^{-1}\cdot\text{m}^{-1}$  may be used for the product.

7.2 Dynamic simulations to EN 15026 : 2007 indicate that the VCL properties (with sealed laps) detailed in Table 5 are acceptable in roofs with no penetrations. The suitability of other constructions may be assessed by using an appropriate dynamic modelling package (see section 17.1). Further advice should be obtained from the Certificate holder in relation to suitability of the product for application in specific constructions, including carrying out a condensation risk analysis if required, on a case by case basis.

Table 5 Vapour control layer properties

Roof Type	VCL equivalent air layer thickness $s_a$ (m)	VCL water vapour resistance ( $\text{MN}\cdot\text{s}\cdot\text{g}^{-1}$ )
Flat roof	10	50
Hybrid pitched roof	10	50
Pitched roof	50	250

7.3 It is essential that roof design, construction and maintenance not only limit opportunities for vapour migration by diffusion but also by convection through gaps, cracks and laps in air barriers and/or VCL's and through penetrations. A VCL must be used where indicated by a dynamic simulation (described in 7.2 above).

7.4 Care should be taken to provide adequate ventilation, particularly in rooms expected to experience high humidity, and to ensure the integrity of VCL's (where installed) and linings against vapour ingress.

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

### Surface condensation



7.6 Roofs and loft spaces will limit the risk of surface condensation adequately where 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.



7.7 For buildings in Scotland, constructions will be acceptable where the thermal transmittance (U value) of the roof does not exceed  $1.2 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$  at any point, and when designed and constructed in accordance with the relevant parts of BS 5250 : 2011, annexes D and H. Further guidance may be obtained from BRE Report BR 262 : 2002 and section 6.3 of this Certificate.

## 8 Behaviour in relation to fire

8.1 The product has a reaction to fire classification\* of Class E to BS EN 13501-1 : 2007. The product is not classified as 'non-combustible' and must be protected from naked flames and other ignition sources during and after installation.

8.2 Once installed, except for a non-habitable loft application (which is restricted under the national Building Regulations), the product should be contained by a suitable lining board, eg 12.5 mm plasterboard, with all joints fully sealed and supported by rafters, noggins or battens. Therefore it will not contribute to the development stages of a fire (see also sections 10.2, 10.3 and 14.5).

8.3 Elements must incorporate cavity barriers at edges, around openings and at junctions with fire resisting elements, and the maximum dimensions of any cavity in any direction must meet the requirements of the national Building Regulations and relevant purpose group. The design and installation of cavity barriers must take into account any anticipated differential movement.

8.4 The product must not be applied over junctions between roofs and on walls required to provide a minimum period of fire resistance. Care must be taken to ensure continuity of fire resistance at junctions with fire-resisting elements, in accordance with the national Building Regulations.

## 9 Proximity of flues and appliances

9.1 When installing the product in close proximity to certain flue pipes and/or heat-producing appliances, the relevant provisions of the national Building Regulations are applicable:

*England and Wales* — Approved Document J, sections 1 to 4.

*Scotland* — Mandatory Standard 3.19<sup>(1)(2)</sup>

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

9.2 The product must not be installed within 50 mm of heat-emitting devices, where the temperature is in excess of 93°C.

*Northern Ireland* — Technical Booklet L, sections 1 to 4.

## 10 Materials in contact — wiring installations

10.1 The product is compatible with PVC materials in contact.

10.2 De-rating of electric cables should be considered in areas where the product restricts the flow of air. The use of suitable conduit or trunking is recommended.

10.3 Where recessed lighting is used, provision should be made to prevent the fitting overheating, or ventilated fittings must be used.

## 11 Maintenance

The product, once installed, does not require any regular maintenance and has suitable durability (see section 12), provided the waterproof layers are maintained in a weather-tight condition.

## 12 Durability



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

# Installation

## 13 Approved Installers

The Certificate holder operates an Approved Installer Scheme for this product, under which the installers are approved, registered and regularly reviewed by the Certificate holder to demonstrate that they are competent to carry out installation of the product in accordance with their instructions and this Certificate. Details of approved installers are available from the Certificate holder.

## 14 Precautions

14.1 To comply with the requirements of Section 4 of the *Health and Safety at Work Act 1974*, it is essential that there is an exchange of information between the client and the installer before spray operations commence on any site. Existing health hazards and those brought into the premises by the installer should be discussed and measures agreed to deal with them effectively.

14.2 The process for the installation of the product may produce a build-up of harmful vapours. Installers must wear full personal protection equipment (PPE) when working with the product, including full-face fresh-air-supplied respirators, protective clothing and chemical-resistant gloves. Other trades and personnel must be kept at least four metres away from the applicator while spraying is taking place. The Certificate holder's instructions must be followed at all times.

14.3 Vapours given off by certain components are generally heavier than air and will tend to move to lower parts of the building. These parts should be suitably ventilated.

14.4 If vapour levels need to be measured, methods should be those recommended by the Health and Safety Executive. Certain applications, eg confined roofs, require the use of extractor fans as recommended by the Certificate holder.

14.5 Once installed, except for non-habitable pitched or hybrid roof applications where it is not necessary, the product must be contained by a suitable lining board, eg 12.5 mm plasterboard, with all joints fully sealed and supported by rafters, noggins or battens. Alternatively after installation in loft voids where the foam is left exposed, fire warning labels are placed in prominent positions. The foam is a combustible material and adequate precautions should be taken at all times to avoid ignition.

14.6 To prevent the product from entering an occupied space, the loft hatch/cover must be kept closed during the spraying process. Protective covers must be placed over water tanks to prevent contamination during application, and should not be removed until sufficient time has elapsed for potentially harmful vapours to be ventilated from the roof space.

## 15 Procedure

### General

15.1 Roofs to be insulated must be assessed for suitability and any necessary repairs carried out to ensure the roof is weather-tight before the application of the product. The positioning and access to services should also be considered.

15.2 Access boards and lighting should be positioned in the roof void. Water tanks are covered to prevent contamination and blockage due to overspray.

15.3 Where there is no provision made for ventilation of the space, care should be taken to ensure that ingress of moisture vapour from the dwelling space below is restricted.

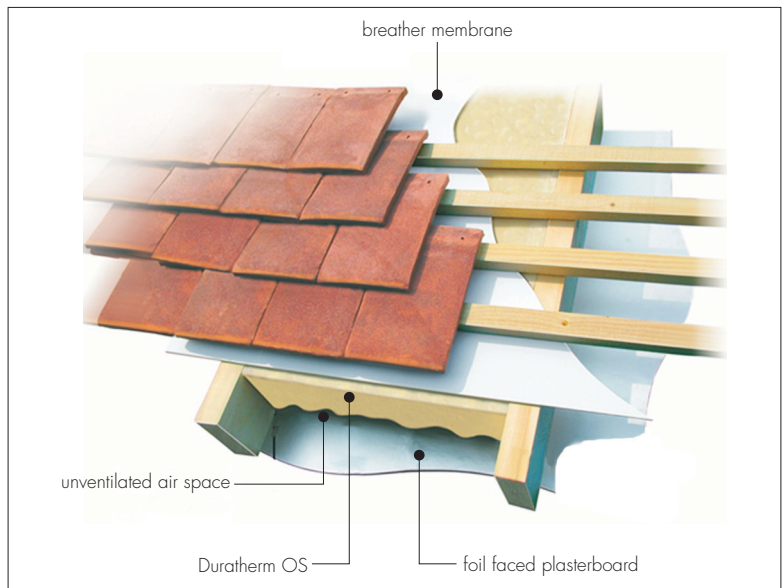
15.4 Where additional insulation is required between the horizontal ceiling joists, various forms of insulation, including Duratherm OS Roof Insulation, can be used, after conducting a condensation risk analysis in accordance with section 7 (also see sections 15.5 and 15.6).

15.5 Care must be taken not to apply the product to flue pipes or electrical cables.

15.6 After completion, a survey should be performed to check that electrical cables and flues are not obstructed. Corrective measures must be taken to clear any such obstruction.

**Warm pitched roof (habitable room in the roof, or non-habitable hybrid roof including insulation at horizontal ceiling level) — Insulation between rafters only (see Figure 1)**

Figure 1 Typical warm pitched roof application



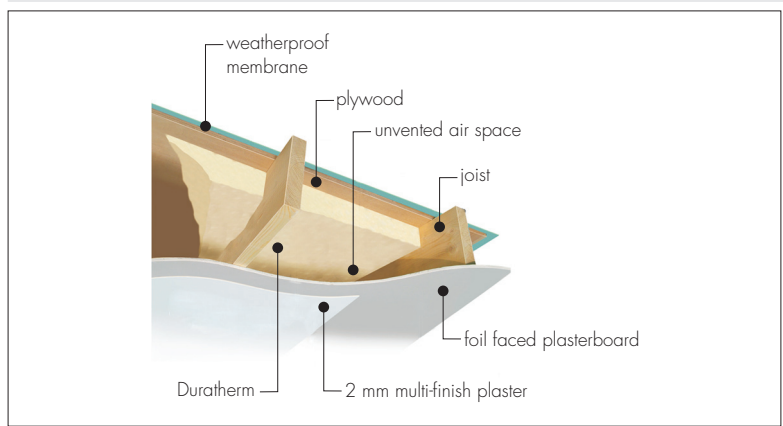
15.7 The product should be spray applied to clean and dry substrates in a flash coat <10 mm thick and, when sprayed to a roof tile underlay, care must be taken to ensure the integrity of the roof tile underlay drape. Subsequent coats not exceeding 20 mm thick are applied once the foam reaction has occurred, and within 10 minutes of the previous coat, until the required total thickness is achieved.

**Warm pitched roof (habitable room in the roof, or non-habitable hybrid roof including insulation at horizontal ceiling level) — Insulation between and under rafters**

15.8 The product is spray applied to the depth of the rafters as in section 15.7. Cross-battens are then mechanically fixed to the rafters. The battens must be of sufficient width and spacing (up to 600 mm) to provide adequate support to which the plasterboard can be mechanically fixed and then filling resumes in 20 mm layers.

**Flat roof application (see Figure 2)**

Figure 2 Typical flat roof application





15.9 The product is spray-applied to clean and dry substrates in a flash coat < 10 mm thick, directly to the underside of the roof deck. Subsequent coats not exceeding 20 mm thick are applied once the foam reaction has occurred, and within 10 minutes of the previous coat, until the required total thickness is achieved.

#### **Tiles and slates application – insulation between rafters only**

15.10 The product is spray-applied to the underside of clean and dry roof slates/tiles between rafters in a flash coat < 10 mm thick, starting at the eaves and working upwards towards the ridge, ensuring the void between the slates/tiles and the upper face of the rafters is completely filled. Subsequent coats not exceeding 20 mm thick are applied once the foam reaction has occurred, and within 10 minutes of the previous coat, until the total required thickness is achieved.

15.11 If the roof to be treated is cold and/or if there is a risk of tiles or slates lifting due to the pressure created by the foaming process, it is recommended that the first coat should not exceed a thickness of 5 mm.

#### **Tile and slates application – insulation between and under rafters**

15.12 The product is spray-applied to the depth of the rafters as in sections 15.10 and 15.11. Cross-battens are then mechanically fixed to the rafters. The battens must be of sufficient width and spacing (up to 600 mm) to provide adequate support to which the plasterboard can be mechanically fixed, and then filling resumes in 20 mm layers.

## Technical Investigations

### **16 Tests**

Results of tests were assessed to determine:

- thermal conductivity
- water vapour permeability.

### **17 Investigations**

17.1 A series of dynamic computer simulations to BS EN 15026 : 2007 were carried out on a range of roof constructions/parameters to assess the risk of interstitial condensation. The simulations included building humidity Class 3, meteorological data including solar irradiation (direct and indirect) and hygrothermal properties for all the materials.

17.2 A series of U value calculations were carried out.

17.3 A calculation was undertaken to confirm the declared thermal conductivity.

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

## Bibliography

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

BS 5534 : 2014 *Slating and tiling for pitched roofs and vertical cladding – Code of practice*

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

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

BS EN 14315-1 : 2013 *Thermal insulating products for buildings – In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products – Specification for the rigid foam spray system before installation*

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*

BS EN ISO 14001 : 2004 *Environmental management systems – Requirements with guidance for use*

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

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

## 18 Conditions

18.1 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
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18.2 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.

18.3 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.

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

18.5 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:

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- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
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- any claims by the manufacturer relating to CE marking.

18.6 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.