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Agrément Certificate  
**10/4777**  
Product Sheet 1

## FOAMSEAL

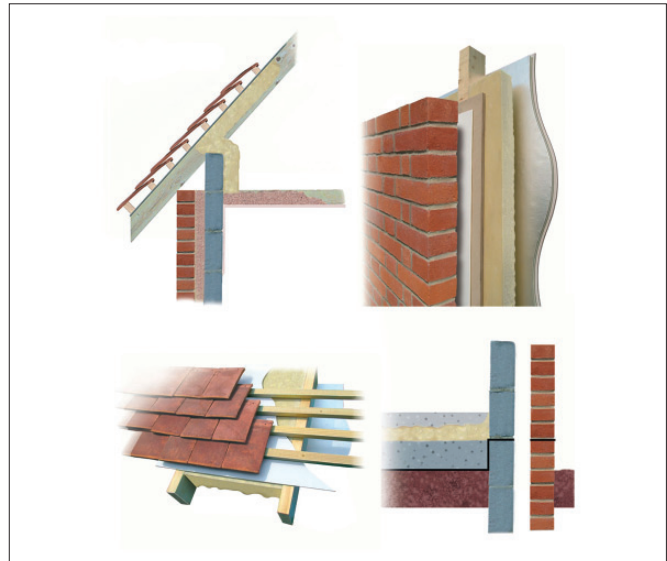
## FOAMSEAL RANGE OF INSULATION

### PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to the Foamseal Range of Insulation, a group of spray applied expanding polyurethane foams, for use in timber-frame stud walling, in pitched roofs, including hybrid roofs, flat timber roof constructions and timber and concrete ground-floor constructions, in new or existing domestic or similar buildings.

#### AGRÉMENT CERTIFICATION INCLUDES:

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



#### KEY FACTORS ASSESSED

**Practicability of installation** — the products should only be installed by contractors trained and approved by the Certificate holder (see section 4).

**Thermal performance** — the products can improve the thermal performance of walls, floors and roofs (see section 5).

**Condensation risk** — the products have high water vapour resistivities ranging from  $479 \text{ MN}\cdot\text{s}\cdot\text{g}^{-1}\cdot\text{m}^{-1}$  to  $305 \text{ MN}\cdot\text{s}\cdot\text{g}^{-1}\cdot\text{m}^{-1}$  but the risk of interstitial condensation will depend on the wall, floor or roof construction and should be assessed for each project (see section 6).

**Behaviour in relation to fire** — wall, floor and roof systems using these products can be designed to meet the UK requirements (see section 7).

**Durability** — the durability of the products is satisfactory and will have a life equivalent to that of the structure in which it is incorporated (see section 13).

The BBA has awarded this Agrément Certificate to the company named above for the products described herein. These products have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Chris Hunt  
Head of Approvals — Physics

Greg Cooper  
Chief Executive

Date of First issue: 6 October 2010

*Certificate amended on 25 November 2010 with updated information in the Thermal performance section and revised installation figures.*

*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 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, the Foamseal Range of Insulation, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:



## The Building Regulations 2010 (England and Wales)

<b>Requirement:</b> A1	<b>Loading</b>
Comment:	Floors incorporating the products can meet this Requirement. See section 10 of this Certificate.
<b>Requirement:</b> B3(4)	<b>Internal fire spread (structure)</b>
Comment:	For products with a Class E surface, the dimensions of any cavity created are restricted by this Requirement. See section 7.1 of this Certificate.
<b>Requirement:</b> C2(c)	<b>Resistance to moisture</b>
Comment:	The risk of interstitial condensation must be assessed for each construction. The products can adequately limit the risk of surface condensation. See sections 6.1 and 6.6 of this Certificate.
<b>Requirement:</b> L1(a)(i)	<b>Conservation of fuel and power</b>
Comment:	The products can contribute to meeting this Requirement. See sections 5.1 and 5.2 of this Certificate.
<b>Requirement:</b> Regulation 7	<b>Materials and workmanship</b>
Comment:	The products are acceptable materials. See section 13 and the <i>Installation</i> part of this Certificate.



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

<b>Regulation:</b> 8(1)	<b>Fitness and durability of materials and workmanship</b>
Comment:	The products can contribute to a construction satisfying this Regulation. See section 13 and the <i>Installation</i> part of this Certificate.
<b>Regulation:</b> 9	<b>Building Standards – construction</b>
<b>Standard:</b> 1.1(a)(b)	<b>Structure</b>
Comment:	Constructions incorporating the products can satisfy this Standard, with reference to clause 1.1.1 <sup>(1)(2)</sup> . See section 10 of this Certificate.
<b>Standard:</b> 2.4	<b>Cavities</b>
Comment:	For products with a Class E surface, the dimensions of any cavity created are restricted by this Standard, with reference to clauses 2.4.1 <sup>(1)</sup> , 2.4.2(1) and 2.4.7 <sup>(1)</sup> . See section 7.1 of this Certificate.
<b>Standard:</b> 3.15	<b>Condensation</b>
Comment:	The risk of interstitial condensation must be assessed for each construction. The products can adequately limit the risk of surface condensation, with reference to clauses 3.15.1 <sup>(1)</sup> , 3.15.3 <sup>(1)</sup> , 3.15.4 <sup>(1)</sup> and 3.15.5 <sup>(1)</sup> . See sections 6.1 and 6.7 of this Certificate.
<b>Standard:</b> 6.1(b)	<b>Carbon dioxide emissions</b>
<b>Standard:</b> 6.2	<b>Building insulation envelope</b>
Comment:	The products can contribute to a wall, floor or roof satisfying these Standards, with reference to clauses, or parts of, 6.1.2 <sup>(1)(2)</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>(1)(2)</sup> , 6.2.6 <sup>(2)</sup> , 6.2.7 <sup>(1)</sup> , 6.2.8 <sup>(2)</sup> , 6.2.9 <sup>(1)</sup> , 6.2.10 <sup>(1)(2)</sup> , 6.2.11 <sup>(1)(2)</sup> and 6.2.12 <sup>(2)</sup> . See sections 5.1 and 5.2 of this Certificate.
<b>Regulation:</b> 12	<b>Building standards – conversions</b>
Comment:	All comments given for these products under Regulation 9, also apply to this Regulation, with reference to clause 0.12.1 <sup>(1)</sup> and Schedule 6 <sup>(1)</sup> . (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).



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

<b>Regulation:</b> B2	<b>Fitness of materials and workmanship</b>
Comment:	The products are acceptable. See section 13 and the <i>Installation</i> part of this Certificate.
<b>Regulation:</b> C5	<b>Condensation</b>
Comment:	The risk of interstitial condensation must be assessed for each construction. See section 6.1 of this Certificate.
<b>Regulation:</b> D1	<b>Stability</b>
Comment:	Floors incorporating the products can meet this Regulation. See section 10 of this Certificate.
<b>Regulation:</b> E4(4)	<b>Internal fire spread – Structure</b>
Comment:	For products with a Class E surface, the dimensions of any cavity created are restricted by this Regulation. See section 7.1 of this Certificate.
<b>Regulation:</b> F2(a)(i)	<b>Conservation measures</b>
<b>Regulation:</b> F3(2)	<b>Target carbon dioxide Emission Rate</b>
Comment:	The products can contribute to meeting this Regulation. See sections 5.1 and 5.2 of this Certificate.

## Construction (Design and Management) Regulations 2007

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

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

See sections: 2 *Delivery and site handling* (2.1 to 2.3) and 14 *Precautions* (14.1 to 14.6) of this Certificate.

# Non-regulatory Information

## NHBC Standards 2010

NHBC accepts the use of the Foamseal Range of Insulation, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 5.1 *Substructure and ground bearing floors*, Chapter 5.2 *Suspended ground floors*, Chapter 6.2 *External timber framed walls*, Chapter 7.1 *Flat Roofs and Balconies*, Chapter 7.2 *Pitched roofs* and Chapter 8.3 *Floor finishes*.

# Technical Specification

## 1 Description

1.1 The Foamseal Range of Insulation comprises a group of spray applied HFC blown, rigid polyurethane foams. It is applied in timber-frame stud walling, pitched roofs, including hybrid roofs, flat timber roofs and timber and concrete ground-floor constructions as a thermal insulation and built up in layers, not exceeding 20 mm in thickness.

1.2 The products have the following nominal characteristics as shown in Table 1.

Table 1 *Nominal characteristics*

Insulation name	Thermal conductivity ( $\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ )			Water vapour resistivity ( $\text{MN}\cdot\text{s}\cdot\text{g}^{-1}\cdot\text{m}^{-1}$ )	Reaction to fire rating
	Insulation thickness <80 mm	Insulation thickness 80 mm to 120 mm	Insulation thickness >120 mm		
Renotherm	0.028	0.026	0.025	305	Class 1 surface spread of flame to BS 476-7 : 1997
Synthesia RF	0.028	0.027	0.026	479	Class 1 surface spread of flame to BS 476-7 : 1997
Synthesia S303	0.028	0.027	0.026	403	Class E to EN 13501-1 : 2002
Synthesia S353	0.028	0.027	0.026	366	Class E to EN 13501-1 : 2002

1.2 The foam 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 Quality control arrangements on site include checks on density and appearance.

## 2 Delivery and site handling

2.1 The two components of the products are delivered to site in drums (up to 250 kg capacity) bearing the product name, batch number and the BBA identification mark incorporating a BBA Certificate number.

2.2 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.

2.3 The isocyanate component is classified as 'harmful', under *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009* (CHIP4) and bear the appropriate hazard warning signs. When cured, the product does not constitute a hazard.

# Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Foamseal Range of Insulation.

## Design Considerations

### 3 General

3.1 The Foamseal Range of Insulation is effective in reducing the thermal transmittance (U value) of roofs, walls and floors in new or existing domestic or similar buildings.

3.2 The products can be applied to bitumen felt, breathable roof tile underlays, timber sarking boards or a plasterboard ceiling lining in pitched roofs, including hybrid roofs, tiled or slated to BS 5534 as follows:

- between timber rafters only
- between and under timber rafters
- as a combination between and under timber rafters and between ceiling joists in a non-habitable roof (hybrid roof, which contain both sloping and horizontal insulation).

3.3 The products can also be used:

- between timber joists in flat timber roofs
- between the studs of conventional timber-frame external wall constructions with an air cavity between the internal lining and Foamseal Insulation
- on the underside of a timber floor deck, between the floor joists in timber ground floors or to concrete ground floors.

3.4 New constructions<sup>(1)</sup> must be designed in accordance with the relevant recommendations of:

- BS 5250 : 2002
- BS 5534 : 2003
- BS 6229 : 2003
- BS 8009 : 2003
- BS 8102 : 2009
- BS 8103-3 : 1996
- BS 8204-1 : 2003
- BS 8204-2 : 2003
- BS 8215 : 1991
- BS EN 1995-1-1 : 2004.

(1) Further information is given in BRE Report (BR 262 : 2002) *Thermal insulation : avoiding risks*.

3.5 Existing constructions must be in a good state of repair with no evidence of rain penetration or damp. Defects should be made good prior to installing the products.

3.6 The products must not come into direct contact with flue pipes, chimneys or other heat producing appliances (see section 8).

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

3.8 The products form a strong bond with clean and dry substrates. This should be taken into account when specifying the product or anticipating future alterations.

3.9 The products contribute to the airtightness of the building envelope

3.10 To satisfy the requirements of NHBC, a vapour control layer of a type specified in their Standards must be applied behind the plasterboard lining in the roof and timber frame wall applications, and the product must only be applied to a roof construction incorporating a breathable roof tile underlay.

### **Pitched Roofs**

3.11 Care must be taken to ensure the integrity of the roof tile underlay drape when spraying the product (see section 15.5).

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

### **External walls (timber-frame dwellings)**

3.13 Constructions incorporating a masonry outer leaf (includes masonry units and natural stone blocks) should be in accordance with BS EN 1996-1-1 : 2005, BS EN 1996-1 : 2 : 2005, BS EN 1996-2 : 2006, BS EN 1996-3 : 2006, BS 5628-3 : 2005 and BS 8000-3 : 2001. The designed residual cavity width should be 50 mm wide.

3.14 It is recommended that services which penetrate the dry lining, eg, light switches, power outlets, are kept to a minimum to limit damage to vapour checks. In addition, any penetrations should be either enclosed in plasterboard or stone mineral wool or suitably tested proprietary fire-rated systems in order to preserve the fire resistance of the wall.

3.15 Installation must not be carried out until the moisture content of the timber frame is less than 20%.

### **Timber and concrete ground floor constructions**

3.16 The product must not be used where it may come into contact with moisture from the ground.

3.17 Ground-supported concrete floors incorporating the product must include a suitable damp-proof membrane laid in accordance with the relevant clauses of CP 102 : 1973, BS 8102 : 1990 and/or BS 8215 : 1991.

3.18 Suspended concrete ground floors incorporating the product must include a damp-proof membrane or suitable ventilation of the sub-floor as appropriate.

3.19 The overlay to the product should be:

- a cement-based floor screed, laid in accordance with the relevant clauses of BS 8204-1 : 2003 and/or BS 8204-2 : 2003, and BS 8000-9 : 2003, or
- wood-based floor, eg tongue-and-groove, flooring grade particle board (Type P5 or P7) to BS EN 312 : 2003 or oriented strand board of type OSB/3 or OSB/4 to BS EN 300 : 2006, 18 mm thick (minimum), installed in accordance with DD CEN/TS 12872 : 2007, or
- a concrete slab in accordance with BS 8204-1 : 2003 and BS 8204-2 : 2003.

## 4 Practicability of installation

The products should only be installed by contractors trained and approved by the Certificate holder in accordance with the Certificate holder's Installation Manual.

## 5 Thermal performance

5.1 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 thermal conductivity values in Table 1. Example U values for pitched roofs, flat roofs, walls and floors are given in Tables 2 to 6 and typical design roof U values in Tables 7 to 9. Fortuitous air infiltration in hybrid roofs increases the heat loss from the loft void and should be accounted for by adding a 10% correction factor to the calculated roof U value (see Table 3).

*Table 2 Pitched roof U values*

Rafter depth (mm)	Insulation thickness (mm)	Thermal conductivity ( $W \cdot m^{-1} \cdot K^{-1}$ )	Construction U value ( $W \cdot m^{-2} \cdot K^{-1}$ )
150	75	0.028	0.38
150	120	0.026	0.25
150	150	0.025	0.21
200	175	0.025	0.17
200	200	0.025	0.16

Note: Assuming construction of roof (external to internal):

- Foamseal insulation (91.6%)/timber rafters (8.3%)
- with or without air cavity
- plasterboard – 12.5 mm.

*Table 3 Hybrid pitched roof U values including a 10% correction factor*

Roof pitch ( $\theta$ ):	20	30	40	50	60
U value ( $W \cdot m^{-2} \cdot K^{-1}$ )	0.18	0.18	0.19	0.20	0.22

Note: Assuming construction of roof (external to internal):

- 100 mm Renotherm foam insulation (91.6%)/100 mm deep timber rafters (8.3%)
- loft void air cavity resistance  $0.16 \text{ m}^2 \cdot K \cdot W^{-1}$
- 100 mm Renotherm foam insulation (91.6%)/timber ceiling joists (8.3%)
- plasterboard – 12.5 mm.

*Table 4 Flat roof U values*

Joist depth (mm)	Insulation thickness (mm)	Thermal conductivity ( $W \cdot m^{-1} \cdot K^{-1}$ )	Construction U value ( $W \cdot m^{-2} \cdot K^{-1}$ )
150	75	0.028	0.39
150	120	0.026	0.27
150	150	0.025	0.23
200	175	0.025	0.19
200	200	0.025	0.17

Note: Assuming construction of roof (external to internal):

- PVC waterproofing – 1.5 mm
- timber deck – 20 mm
- Foamseal insulation (87.5%)/timber joist (12.5%)
- air cavity where applicable (87.5%)/timber framing (12.5%)
- plasterboard – 12.5 mm.

*Table 5 Timber frame walls U value*

Rafter depth (mm)	Insulation thickness (mm)	Thermal conductivity ( $W \cdot m^{-1} \cdot K^{-1}$ )	Construction U value ( $W \cdot m^{-2} \cdot K^{-1}$ )
89	75	0.028	0.38
140	130	0.025	0.24
200	190	0.025	0.18

Note: Assuming construction of wall (external to internal):

- outer leaf brick – 102 mm
- unventilated air cavity – 50 mm
- OSB – 13 mm
- Foamseal insulation (85%)/timber framing (15%)
- air cavity (85%)/timber framing (15%)
- plasterboard – 12.5 mm.

**Table 6 Suspended timber joist floor U values**

P/A (perimeter/area)	Insulation thickness (mm)	Thermal conductivity (W·m <sup>-1</sup> ·K <sup>-1</sup> )	Construction U value (W·m <sup>-2</sup> ·K <sup>-1</sup> )
0.2	75	0.028	0.22
0.6	75	0.028	0.30
1.0	75	0.028	0.32
0.2	100	0.026	0.19
0.6	100	0.026	0.24
1.0	100	0.026	0.26
0.2	120	0.026	0.17
0.6	120	0.026	0.21
1.0	120	0.026	0.23

Note: Assuming construction of floor (external to internal):

- Foamseal insulation (89%)/timber framing (11%)
- chipboard – 20 mm.

**Table 7 Mean design roof, floor and wall U values – England and Wales<sup>(1)</sup>**

Construction	U value (W·m <sup>-2</sup> ·K <sup>-1</sup> )		
	Roof	Floor	Wall
Existing building – new or replaced element	–	0.22	0.28
Existing building – renovated or retained element	–	0.25	0.30
Notional dwelling	0.16	0.25	0.35
Existing building – new, replaced, renovated or retained roof <sup>(2)</sup>	0.16	–	–
Existing building – new, replaced, renovated or retained roof <sup>(3)</sup>	0.18	–	–
Notional non-domestic building	0.18	0.22	0.26
Dwelling new-build limit	0.20	0.25	0.30
Non-domestic new-build limit	0.25	0.25	0.35

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

(2) Hybrid pitched roof.

(3) Insulation at rafter level.

**Table 8 Mean design roof, floor and wall U values – Scotland<sup>(1)</sup>**

Construction	U value (W·m <sup>-2</sup> ·K <sup>-1</sup> )		
	Roof	Floor	Wall
Notional dwelling	0.13	0.15	0.19
New dwelling simplified method	0.13	0.15	0.19
Conversion unheated building (into dwellings) <sup>(2)</sup>	0.13	0.15	0.19
Extension to dwelling <sup>(2)</sup>	0.13	0.15	0.19
Conversion of unheated building (into dwellings) <sup>(3)</sup>	0.15	0.15	0.19
Extension to dwelling <sup>(3)</sup>	0.15	0.15	0.19
Alterations and reconstructions to a dwelling <sup>(2)</sup>	0.15	0.18	0.22
Stand-alone building < 50 m <sup>2</sup> to a dwelling <sup>(2)</sup>	0.15	0.20	0.23
New non-dwellings limit for shell and fit out	0.15	0.20	0.25
Conversion of unheated building	0.15	0.20	0.25
Notional non-dwelling <sup>(4)</sup>	0.16	0.25	0.30
Alterations and reconstructions to a dwelling <sup>(3)</sup>	0.18	0.18	0.22
Stand-alone building < 50 m <sup>2</sup> to a dwelling <sup>(3)</sup>	0.18	0.18	0.22
New dwelling limit	0.18	0.20	0.25
New non-domestic limit	0.20	0.22	0.27
Conversion of heated building	0.25	0.25	0.30
Notional non-dwelling <sup>(3)</sup>	0.25	0.25	0.30

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

(2) Hybrid pitched roof.

(3) All other roof insulation.

(4) Pitched roof

Table 9 Mean design roof, floor and wall U values – Northern Ireland<sup>(1)</sup>

Construction	U value (W·m <sup>-2</sup> ·K <sup>-1</sup> )		
	Roof	Floor	Wall
Notional dwelling	0.16	0.25	0.35
Existing building — new, replaced, renovated or retained roof <sup>(2)</sup>	0.16	—	—
Existing building — new, replaced, renovated or retained roof <sup>(3)</sup>	0.20	—	—
Existing building — new roof <sup>(4)</sup> , floor or wall	0.20	0.22	0.30
Building new-build limit	0.25	0.25	0.35
Notional non-domestic building	0.25	0.25	0.35
Existing building — replaced, renovated or retained roof <sup>(4)</sup> , floor or wall	0.25	0.25	0.35

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

(2) Hybrid pitched roof.

(3) Pitched roof — insulation at rafter level.

(4) Flat roof.

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


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

**Scotland** — Accredited Construction Details (Scotland)

**Northern Ireland** — Accredited Construction Details (version 1.0).

## 6 Condensation risk

### Interstitial condensation

 6.1 Roofs, walls and floors should be designed and constructed in accordance with the relevant parts of BS 5250 and Annex D including a well-sealed ceiling for the roof application, or EN 15026, using the approximate water vapour resistivity values of the products shown in Table 1.

6.2 It is essential that roof, wall or floor design, construction and maintenance not only limits opportunities for vapour migration by diffusion but also by convection through gaps, cracks and laps in air/vapour controlling layers and through penetrations. This is particularly important for roofs which include layers of high resistance to vapour diffusion on both sides of the insulation layer. See also section 3.7.

6.3 Care should be taken to provide adequate ventilation, particularly in rooms expected to experience high humidities.

### Roofs


6.4 Dynamic simulations to BS EN 15026 : 2007 indicate that the vapour control layer properties (with sealed laps) detailed in Table 10 are acceptable in roofs with no penetrations. The suitability of other constructions may be assessed by using an appropriate dynamic modelling package, see section 16.2.


Table 10 Vapour control layer properties

VCL equivalent air layer thickness $s_d$ (m)	VCL water vapour resistance (MN·s·g <sup>-1</sup> )	Roof type
10	50	Flat roof
10	50	Hybrid pitched roof
50	250	Pitched roof


6.5 Fortuitous air infiltration in hybrid roofs contributes to reducing the risk of interstitial condensation.

### Surface condensation

 6.6 Walls, floors and roofs will adequately limit the risk of surface condensation where the thermal transmittance (U value) does not exceed 0.7 W·m<sup>-2</sup>·K<sup>-1</sup> for walls and floors and 0.35 W·m<sup>-2</sup>·K<sup>-1</sup> for roofs.

 6.7 Walls, floors and roofs will adequately limit the risk of surface condensation where the thermal transmittance (U value) does not exceed 1.2 W·m<sup>-2</sup>·K<sup>-1</sup>.

## 7 Behaviour in relation to fire

 7.1 The products achieved the fire ratings shown in Table 1.

7.2 The products must be protected from naked flames and other ignition sources during and after installation (see also sections 9.1, 9.2 and 14.5)

7.3 When installed, the products will 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 until the lining is compromised. Alternatively, the rafters and insulation in the pitched roof application may remain exposed when using the products with a class 1 surface spread of flame rating to BS 476-7 : 1997 and after conducting a condensation risk analysis in accordance with section 6. Although the Renotherm and Synthesia RF products have a class 1 surface spread of flame rating, they could contribute to the development stages of a fire, however to a limited extent in the early stages of the fire.

7.4 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 and relevant purpose group. The design and installation of cavity barriers must take into account any anticipated differential movement.

## Walls

7.5 The products can be added to the void between studwork in any loadbearing, timber-framed inner leaf to a double leaf wall system providing that:

- there is an air cavity between the plasterboard lining and the products
- the existing inner leaf system has been shown to satisfy the loadbearing capacity performance criterion of BS 476-21 : 1987 or BS EN 1365-1 : 1999 for the required fire resistance period.

7.6 The suitability of constructions other than those described in section 7.5 should be demonstrated by an appropriate test or assessment.

## Roofs

7.7 The use of the products in a tiled pitched roof should not affect its external rating when evaluated by assessment or test to BS 476-3 : 2004.

## 8 Proximity of flues and appliances

When installing the products 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, clauses 3.19.1<sup>(1)(2)</sup> to 3.19.9<sup>(1)(2)</sup>

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

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

## 9 Materials in contact — Wiring installations

9.1 De-rating of electric cables should be considered in areas where the product restricts the flow of air. Where the foam is likely to bond to electric cables, suitable conduit or trunking should be used.

9.2 Recessed lighting must not be used with this form of insulation.

## 10 Floor loading



The products, when covered with a suitable floor covering, are capable of resisting a uniformly distributed load of <math>< 1.5 \text{ kN}\cdot\text{m}^{-2}</math> and a concentrated load of <math>< 1.4 \text{ kN}</math> for category A1 and type A situations for domestic and residential activities as defined in NA to BS EN 1991-1-1 : 2002, Table NA.2 and BS 6399-1 : 1996, Table 1 respectively. Further assessment is necessary in the case of duty walkways and floors subject to physical activities.

## 11 Moisture penetration

11.1 The products must be used above the damp-proof membrane (dpm) and must not be used where they may come into contact with moisture from the ground.

11.2 For floors subject to national Building Regulations, construction should be as detailed or designed in accordance with:

**England and Wales** — Approved Document C, Section 4

**Scotland** — Mandatory Standard 3.4, clauses 3.4.2<sup>(1)(2)</sup> to 3.4.4<sup>(1)(2)</sup> and 3.4.6<sup>(1)(2)</sup>

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

**Northern Ireland** — Technical Booklet C, Section 1.

## 12 Maintenance

The products, once installed do not require any regular maintenance and have suitable durability provided the roof waterproof layers are inspected and maintained at regular intervals (see section 13), so maintenance is not required.



## 13 Durability



The durability of the products is satisfactory and will have a life equivalent to that of the structure in which it is incorporated.

## Installation

### 14 Precautions

14.1 The insulation process may produce a build-up of harmful vapours. It is required that all personnel in the area for treatment wear the correct protective clothing, breathing equipment and gloves. The Certificate holder's instructions must be followed at all times.

14.2 Vapours given off by certain components, ie 4,4' diphenylmethane diisocyanate (MDI), are generally heavier than air and will tend to move to lower parts of the building. These parts should be suitably ventilated.

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

14.4 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.

14.5 After installation in loft voids, fire warning labels are placed in prominent positions if the foam is to be left exposed. The foam is a combustible material; adequate precautions should be taken to avoid ignition at all times.

14.6 To prevent the products from entering the 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 Building elements to be insulated must be assessed for suitability and any necessary repairs carried out. Roofs must be 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.

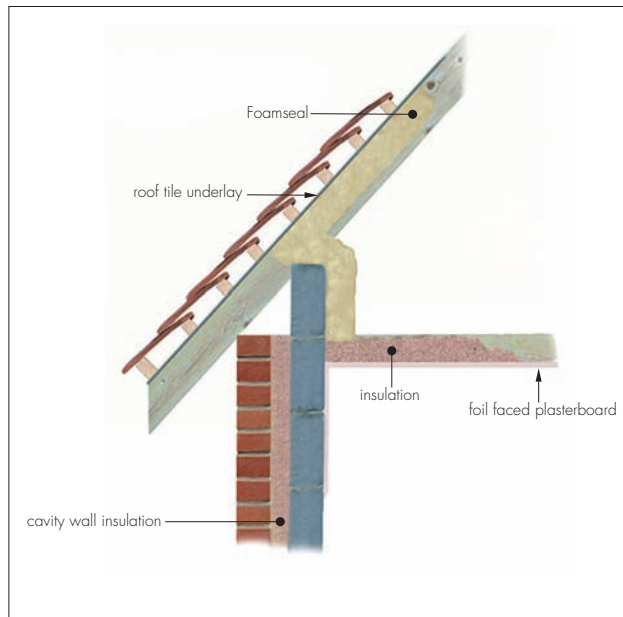
15.3 Where there is no provision made for ventilation of the space, care should be taken to ensure that ingress of moisture vapour from the dwelling space below is restricted (see also sections 6.1 and 6.2).

15.4 Where additional insulation to that provided in sections 15.5 and 15.6 is required, various forms of insulation, including Foamseal, can be placed between the horizontal ceiling joists, after conducting a condensation risk analysis in accordance with section 6.

**Between rafters application** (see Figure 1)

15.5 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 (see also section 6.4).

Figure 1 Typical pitched roof application



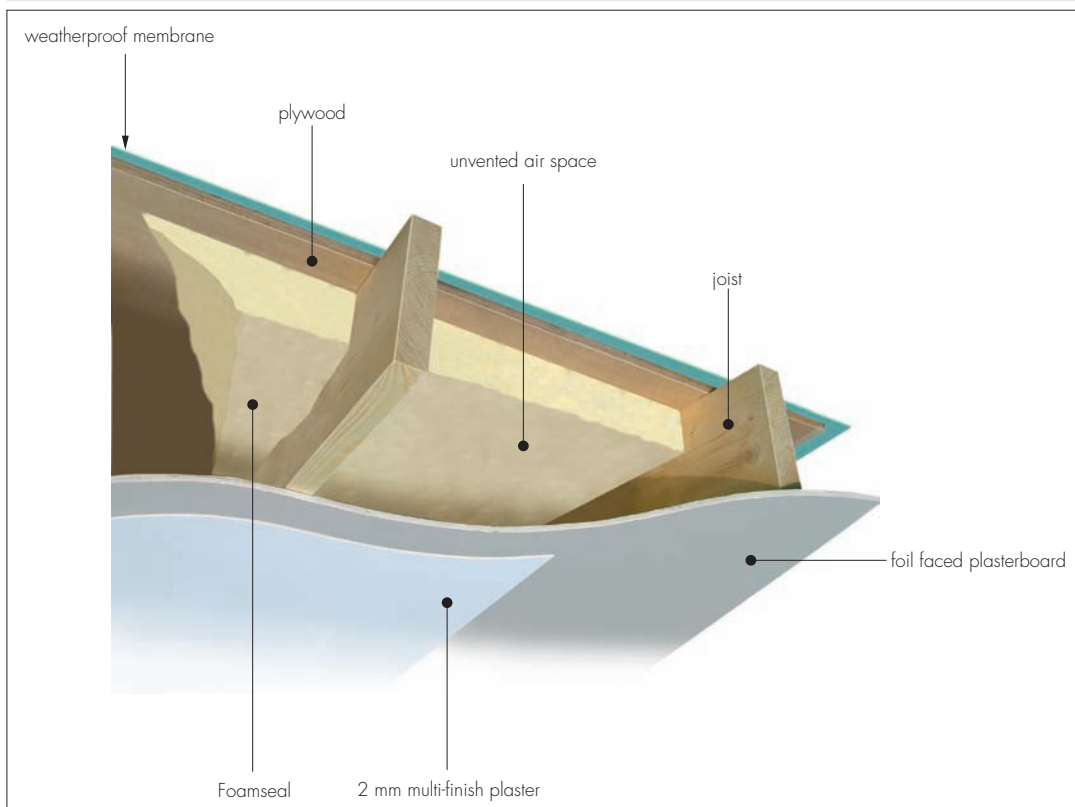
**Between and below rafters**

15.6 The foam is spray applied to the depth of the rafters as in section 15.5. 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 (see also section 6.4).

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

15.7 The product is sprayed directly to the underside of the roof deck, as described in section 15.5 (see also section 6.4).

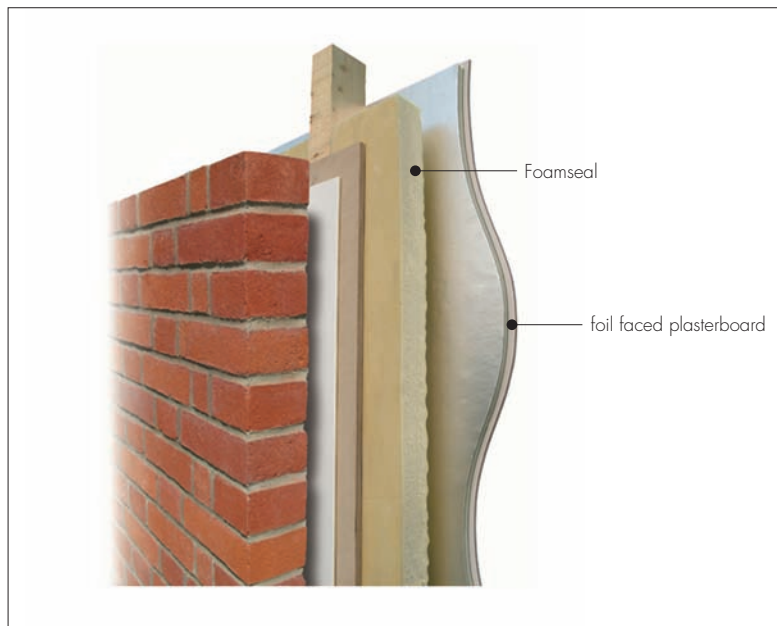
Figure 2 Typical flat roof application



### Timber-frame walls (see Figure 3)

15.8 The products are sprayed into the cavity formed by the studs as in section 15.5 leaving an air cavity between the plasterboard lining and the insulation.

Figure 3 Typical timber-frame application



15.9 Where required, a vapour control layer with lapped and sealed joints is placed over the stud face before applying the internal finish (see also section 6.1).

### Ground Floors (see Figure 4)

15.10 All concrete floor surfaces should be smooth, level and flat to within 5 mm when measured with a 2 m straight-edge. Irregularities greater than this must be removed. Minor irregularities (up to 10 mm deep) may be levelled with mortar or thin screed.

15.11 In ground-supported concrete floors, the concrete floor slab over which the products are spray applied should be left for as long as possible to maximise drying out and dissipation of constructional moisture, in accordance with BS 8203 : 2001, Section 3.1.2.

15.12 Where the products are used over ground-supported concrete floor slabs a suitable damp-proof membrane in accordance with CP 102 : 1973, Section 11 and BS 8204-1 : 2003 or BS 8204-2 : 2003 should be laid to resist moisture from the ground. If a liquid-type damp-proof membrane is applied to the slabs, it should be of a type compatible with the products and be allowed to dry out fully prior to installation of the boards.

15.13 Where the products are used on hardcore bases under ground-supported concrete slabs, the hardcore must be compacted and blinded with a thin layer of sand before application of the dpm and product.

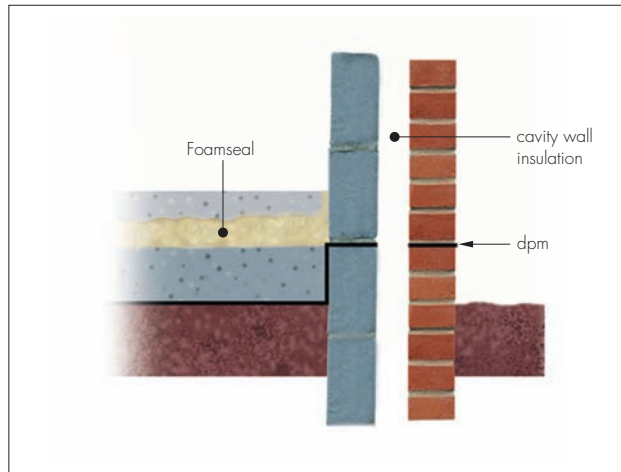
15.14 The products can be used on beam and block suspended concrete floors, that are the subject of a current Agrément Certificate and installed in accordance with, and within the limitations imposed by that Certificate, or those designed and installed to the precast concrete and general loading codes, that have been assessed as suitable.

15.15 Where a screed or concrete slab is laid over the product, vertical spray applied insulation should be provided and be of sufficient depth to fully separate the screed or slab from the wall and provide a minimum thermal resistance of  $0.75 \text{ m}^2 \cdot \text{K} \cdot \text{W}^{-1}$ .

15.16 To limit the risk of damage from condensation and other sources of dampness, the products should only be spray applied after the construction is made substantially weathertight, eg after glazing. During construction the products must also be protected from water spillage, plaster droppings and traffic.

15.17 The foam is spray applied to the required depth as in section 15.5.

Figure 4 Typical ground floor application



### Cement-based screed overlay

15.18 The foam is spray applied to the floor perimeter edges. If required a polythene vapour control layer, minimum 0.125 mm thick, is laid over the product with 150 mm laps. A compacted screed is then poured over to a depth of 65 mm for a domestic dwelling and 75 mm for others. The relevant clauses of BS 8204-1 : 2003 or BS 8204-2 : 2003 should be followed and BRE's *Building Elements, Floors & Flooring*, Chapter 4.2, should be consulted.

### Concrete slab overlay (ground-bearing only)

15.19 The foam is spray applied to the floor perimeter edges. If required a vapour control layer, minimum 0.125 mm thick, is laid over the foam with 150 mm laps. The concrete slab is laid to the required thickness in accordance with BS 8000-9 : 2003 and BS 8204-1 : 2003.

### Suspended timber floors

15.20 The foam is spray applied to the underside of the floor deck, between the floor joists as in section 15.5.

15.21 An air gap must be left between the joists and the ground to allow for sub-floor ventilation.

### 16 Investigations

16.1 An examination of the Foamseal Range of Insulation was made of independent data relating to:

- thermal conductivity
- behaviour in relation to fire
- water vapour permeability.

16.2 A series of dynamic computer simulations to BS EN 15026 : 2007 were carried out on a range of roof constructions to assess the risk of interstitial condensation. The simulations included building humidity class 4, meteorological data for solar irradiation (direct and indirect) and rainfall for standard reference years, material moisture storage functions, porosity, specific heat capacity and long term projections of material moisture contents.

16.3 The methods adopted for quality control, relating to incoming materials and the installed product, were examined and found to be satisfactory.

## Bibliography

- BS 476-3 : 2004 *Fire tests on building materials and structures — Classification and method of test for external fire exposure to roofs*
- BS 476-7 : 1997 *Fire tests on building materials and structures — Method of test to determine the classification of the surface spread of flame of products*
- BS 476-21 : 1987 *Fire tests on building materials and structures — Methods for determination of the fire resistance of loadbearing elements of construction*
- BS 5250 : 2002 *Code of practice for control of condensation in buildings*
- BS 5628-3 : 2005 *Code of practice for the use of masonry — Materials and components, design and workmanship*
- BS 5534 : 2003 *Code of practice for slating and tiling (including shingles)*
- BS 6229 : 2003 *Flat roofs with continuously supported coverings — Code of practice*
- BS 6399-1 : 1996 *Loading for buildings — Code of practice for dead and imposed loads*
- BS 8000-3 : 2001 *Workmanship on building sites — Code of practice for masonry*
- BS 8000-9 : 2003 *Workmanship on building sites — Cementitious levelling screeds and wearing screeds — Code of practice*
- BS 8102 : 1990 *Code of practice for protection of structures against water from the ground*
- BS 8102 : 2009 *Code of practice for protection of below ground structures against water from the ground*
- BS 8103-3 : 1996 *Structural design of low-rise buildings — Code of practice for timber floors and roofs for housing*
- BS 8203 : 2001 *Code of practice for installation of resilient floor coverings*
- BS 8204-1 : 2003 *Screeds, bases and in-situ floorings — Concrete bases and cement sand levelling screeds to receive floorings — Code of practice*
- BS 8204-2 : 2003 *Screeds, bases and in-situ floorings — Concrete wearing surfaces — Code of practice*
- BS 8215 : 1991 *Code of practice for design and installation of damp-proof courses in masonry construction*
- BS EN 300 : 2006 *Oriented Strand Boards (OSB) — Definitions, classification and specifications*
- BS EN 312 : 2003 *Particleboards — Specifications*
- BS EN 1365-1 : 1999 *Fire resistance tests for loadbearing elements — Walls*
- BS EN 1991-1-1 : 2002 *Eurocode 1 : Actions on structures — General actions— Densities, self-weight, imposed loads for buildings*
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- BS EN 1996-1-1 : 2005 *Eurocode 6 : Design of masonry structures — General rules for reinforced and unreinforced masonry structures*
- BS EN 1996-1-2 : 2005 *Eurocode 6 : Design of masonry structures — General rules — Structural fire design*
- BS EN 1996-2 : 2006 *Eurocode 6 : Design of masonry structures — Design considerations, selection of materials and execution of masonry*
- BS EN 1996-3 : 2006 *Eurocode 6 : Design of masonry structures : Simplified calculation methods for unreinforced masonry structures*
- BS EN ISO 6946 : 1997 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*
- EN 13501-1 : 2002 *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*
- CP 102 : 1973 *Code of practice for protection of buildings against water from the ground*
- DD CEN/TS 12872 : 2007

## 17 Conditions

17.1 This Certificate:

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

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

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

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

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

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

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

