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### Agrément Certificate

11/4817

Product Sheet 1

## XTRATHERM THIN-R INSULATION

### XTRATHERM THIN-R FLAT ROOF INSULATION BOARD (FR ALU)

This Agrément Certificate Product Sheet<sup>(1)</sup> relates to Xtratherm Thin-R Flat Roof Insulation Board (FR ALU), comprising a rigid polyisocyanurate (PIR) board with a composite foil-facing on both sides. The product is for use as a thermal insulation layer and to create or improve falls on limited access concrete, timber or metal flat roof decks, in new and existing domestic and non-domestic buildings. It is for use in conjunction with a vapour control layer and a single-ply mechanically fixed roof waterproofing membrane.

(1) Hereinafter referred to as 'Certificate'.

#### CERTIFICATION INCLUDES:

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



#### KEY FACTORS ASSESSED

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

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

**Strength and stability** — when installed on suitable substrates using appropriate fixing methods, the product can adequately transfer maintenance traffic loads and wind loads to the roof deck (see section 8).

**Behaviour in relation to fire** — the overall fire rating of any roof containing the product will depend on the type of deck and the nature of the roof waterproof covering (see section 9).

**Durability** — the product, when used as thermal insulation in the roof system described in this Certificate, will have a life at least as long as that of the roof waterproof covering (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

Claire Curtis-Thomas

Date of Third issue: 23 August 2017

John Albon – Head of Approvals  
Construction Products

Claire Curtis-Thomas  
Chief Executive

Originally certificated on 28 February 2011

*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, Xtratherm Thin-R Flat Roof Insulation Board (FR ALU), 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>A1</b>	<b>Loading</b>
Comment:		The product can contribute to satisfying this Requirement. See section 8.1 of this Certificate.
<b>Requirement:</b>	<b>B4(2)</b>	<b>External fire spread</b>
Comment:		Roofs incorporating the product can satisfy this Requirement. See sections 9.1 and 9.3 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 and 7.4 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 section 6 of this Certificate.
<b>Regulation:</b>	<b>7</b>	<b>Materials and workmanship</b>
Comment:		The product is an acceptable. See section 11 and the <i>Installation</i> part 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>
Comment:		The product can contribute to satisfying these Regulations; however, compensating fabric/services measures may be required. See section 6 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>9</b>	<b>Building standards applicable to construction</b>
Standard:	<b>1.1</b>	Structure
Comment:		The product can contribute to satisfying this Standard, with reference to clauses 1.1.1 <sup>(1)(2)</sup> , 1.1.2 <sup>(1)(2)</sup> and 1.1.3 <sup>(1)(2)</sup> . See section 8.1 of this Certificate.
Standard:	<b>2.8</b>	Spread from neighbouring buildings
Comment:		Roofs incorporating the product can satisfy this Standard, with reference to clauses 2.8.1 <sup>(1)(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)(2)</sup> , 3.15.5 <sup>(1)(2)</sup> and 3.15.6 <sup>(1)(2)</sup> . See sections 7.1 and 7.5 of this Certificate.

Standard:	6.1(b)	Carbon dioxide emissions
Standard:	6.2	Building insulation envelope
		The product can contribute to satisfying these Standards, with reference to clauses, or parts of, 6.1.1 <sup>(1)</sup> , 6.1.2 <sup>(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>(2)</sup> , 6.2.5 <sup>(2)</sup> , 6.2.6 <sup>(1)</sup> , 6.2.7 <sup>(1)</sup> , 6.2.8 <sup>(1)(2)</sup> , 6.2.9 <sup>(1)(2)</sup> , 6.2.10 <sup>(1)(2)</sup> , 6.2.11 <sup>(1)(2)</sup> , 6.2.12 <sup>(2)</sup> and 6.2.13 <sup>(1)(2)</sup> . See section 6 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The product can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard. In addition, the product can contribute to a construction meeting a higher level of sustainability as defined in this Standard, with reference to clauses 7.1.4 <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 of this Certificate.
<b>Regulation:</b>	<b>12</b>	<b>Building standards applicable to conversions</b>
Comment:		Comments given for this 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</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>29</b>	<b>Condensation</b>
Comment:		The product can contribute to satisfying this Regulation. See section 7.1 of this Certificate.
<b>Regulation:</b>	<b>30</b>	<b>Stability</b>
Comment:		The product can contribute to satisfying this Regulation. See section 8.1 of this Certificate.
<b>Regulation:</b>	<b>36(b)</b>	<b>External fire spread</b>
Comment:		Roofs incorporating the product can satisfy this Regulation. See sections 9.1 and 9.3 of this Certificate.
<b>Regulation:</b>	<b>39(a)(i)</b>	<b>Conservation measures</b>
<b>Regulation:</b>	<b>40(2)</b>	<b>Target carbon dioxide emission rate</b>
Comment:		The product can contribute to satisfying these Regulations. See section 6 of this Certificate.

## Construction (Design and Management) Regulations 2015

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

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

See section: 3 *Delivery and site handling* (3.4) of this Certificate.

## Additional Information

### NHBC Standards 2017

In the opinion of the BBA, Xtratherm Thin-R Flat Roof Insulation Board (FR ALU), if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Chapter 7.1 *Flat roof and balconies*.

### CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard BS EN 13165 : 2012. An asterisk (\*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

## Technical Specification

### 1 Description

1.1 Xtratherm Thin-R Flat Roof Insulation Board (FR ALU) is a rigid polyisocyanurate (PIR) board manufactured with a composite foil-facing on both sides.

1.2 The product has the nominal characteristics shown in Table 1.

Table 1 Nominal characteristics

Length and width (mm)	1200 x 600 or 2400 x 1200
Thickness (mm)	25 to 165 (in 5 mm increments)
Compressive strength* at 10% compression (kPa)	≥150
Edge profile	Squared, rebated

1.3 Boards are also available in a tapered version for falls of 1:120, 1:80 and 1:60 (1200 mm by 1200 mm).

1.4 The product is installed as part of a roof system in conjunction with the following items (which are outside the scope of this Certificate):

- mechanically fixed single-ply roof waterproofing membrane
- vapour control layer (VCL)
- mechanical fixings — incorporating a countersunk washer.

### 2 Manufacture

2.1 Raw materials, mixed to a controlled formulation, are blended and poured onto the foil-facing then cured and cut to the required dimensions.

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 Xtratherm Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008, BS EN ISO 14001 : 2004 and OHSAS 18001 : 2007 by BRE (Certificates 718, 718EMS and 718-HS respectively).

### 3 Delivery and site handling

3.1 The product is delivered to site in polythene-wrapped packs. Each pack contains a label bearing the Certificate holder's name, board dimensions and the BBA logo incorporating the number of this Certificate.

3.2 The product must be protected from prolonged exposure to sunlight, and stored dry, flat and raised above ground level (to avoid contact with ground moisture). Where possible, packs should be stored inside. If stored outside, they should be under cover, or protected with opaque polythene sheeting.

3.3 The product is light and easy to handle; care should be taken when handling individual items 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 Xtratherm Thin-R Flat Roof Insulation Board (FR ALU).

## Design Considerations

### 4 General

4.1 Xtratherm Thin-R Flat Roof Insulation Board (FR ALU) is suitable for use as a fully supported thermal insulation layer on flat roofs with concrete, timber and profiled metal roof decks (see section 8.10), in conjunction with a suitable roof waterproofing membrane system (see section 4.4), with limited access only (see section 4.5).

4.2 Decks should be designed in accordance with the relevant clauses of either BS 6229 : 2003 or BS EN 13956 : 2012 and, where appropriate, NHBC Standards 2016, Chapter 7.1.

4.3 Roofs should incorporate a VCL below the product that is compatible with both the product and the waterproofing system. Advice should be sought from the Certificate holder.

4.4 The product is for use with a mechanically fixed single-ply roof waterproofing system, such as PVC, CSM, CPE, FPO (including TPO), VET, PIB or EPDM, which is the subject of a current Agrément Certificate and laid in accordance with, and within the limitations imposed by, that Certificate.

4.5 Limited access roofs are defined for the purpose of this Certificate as those roofs subject only to pedestrian traffic for maintenance of the roof covering, cleaning of gutters, etc.

4.6 For the purposes of this Certificate, flat roofs are defined as those roofs having a minimum finished fall of 1:80 and a maximum of 1:6, as defined in BS 6229 : 2003.

4.7 For design purposes on flat roofs, twice the minimum finished fall should be assumed, unless a detailed analysis of the roof is available, including overall and local deflections, direction of falls etc.

### 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 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\* ( $\lambda_D$  value) of 0.022 W·m<sup>-1</sup>·K<sup>-1</sup>.

6.2 The U value of a completed roof will depend on the thickness of insulation used, the type of fixings and the insulating value of other roof components/layers. Example U values of roofs incorporating the product are shown in Tables 2 and 3.

**Table 2 Example U values for constructions with galvanized steel fixings ( $W \cdot m^{-2} \cdot K^{-1}$ )**

U value ( $W \cdot m^{-2} \cdot K^{-1}$ )	Insulation thickness <sup>(1)</sup> (mm)		
	Concrete <sup>(2)(3)</sup>	Timber <sup>(2)(4)</sup>	Metal <sup>(2)(5)</sup>
0.13	—	165	—
0.15	145	140	150
0.16	140	130	140
0.18	120	115	125
0.20	110	105	110
0.25	90	80	90

- (1) Nearest available thickness.
- (2) Includes 5.55 galvanized steel insulation fixings per  $m^2$  and 3.55 galvanized steel waterproofing fixings per  $m^2$ , with a 4.8 mm cross-sectional diameter.
- (3) 150 mm concrete decking  $1.33 W \cdot m^{-2} \cdot K^{-1}$ , VCL, 1.5 mm waterproofing membrane.
- (4) 12.5 mm plasterboard, 150 mm timber joists (12.5%)/ air cavity (87.5%), 18 mm plywood decking, VCL, 1.5 mm waterproofing membrane.
- (5) Metal deck, VCL, 1.5 mm waterproofing membrane.

**Table 3 Example U values for constructions with stainless steel fixings ( $W \cdot m^{-2} \cdot K^{-1}$ )**

U value ( $W \cdot m^{-2} \cdot K^{-1}$ )	Insulation thickness <sup>(1)</sup> (mm)		
	Concrete <sup>(2)(3)</sup>	Timber <sup>(2)(4)</sup>	Metal <sup>(2)(5)</sup>
0.13	165	155	165
0.15	140	135	140
0.16	130	125	135
0.18	115	110	120
0.20	105	100	105
0.25	85	80	85

- (1) Nearest available thickness.
- (2) Includes 5.55 stainless steel insulation fixings per  $m^2$  and 3.55 stainless steel waterproofing fixings per  $m^2$ , with a 4.8 mm cross-sectional diameter.
- (3) 150 mm concrete decking  $1.33 W \cdot m^{-2} \cdot K^{-1}$ , VCL, 1.5 mm waterproofing membrane.
- (4) 12.5 mm plasterboard, 150 mm timber joists (12.5%)/ air cavity (87.5%), 18 mm plywood decking, VCL, 1.5 mm waterproofing membrane
- (5) Metal deck, VCL, 1.5 mm waterproofing membrane.

## Junctions



6.3 The product can contribute to maintaining continuity of thermal insulation at junctions with other elements and minimise thermal bridges and air infiltration when installed in accordance with the guidance in the documents supporting the national Building Regulations.

## 7 Condensation risk

### Interstitial condensation



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

7.2 For the purposes of assessing the risk of interstitial condensation, the following vapour resistivity/resistance values of the individual components may be used:

- PIR insulation core —  $300 \text{ MN}\cdot\text{s}\cdot\text{g}^{-1}\cdot\text{m}^{-1}$
- composite foil-facing —  $1000 \text{ MN}\cdot\text{s}\cdot\text{g}^{-1}\cdot\text{m}^{-1}$ .

7.3 To minimise moisture entering the roof, a VCL should be used, with joints sealed and lapped. It should be turned up around the insulation and bonded to the waterproofing finish. In the case of single-ply roofing membranes, the recommendations of the SPRA Design guide should be followed.

### Surface condensation



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



7.5 For buildings in Scotland, constructions will be acceptable where the thermal transmittance (U value) does not exceed  $1.2 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$  at any point, and the junctions with other elements are designed in accordance with the guidance referred to in BS 5250 : 2011, Annex H. Further guidance may be obtained from BRE Report BR 262 : 2002 and section 6.3 of this Certificate.

## 8 Strength and stability



8.1 When installed on suitable flat roof decks, using appropriate fixing methods, the product can adequately transfer maintenance traffic loads and negative and positive (suction and pressure) wind loads to the roof deck.

8.2 The roof construction or immediate substrate to which the boards are fixed must be structurally sound and have sufficient strength and stability to resist all dead, imposed and wind loads. It must also have adequate resistance to the pull-out forces created by the wind forces acting on the specified fixings used.

8.3 The suitability of the roof construction, and in particular the immediate substrate, for any specified mechanical fixings must be checked before installation by carrying out in-situ pull-out or pull-through testing to determine the minimum safe working load the fixings can resist. The advice of the Certificate holder should also be sought in respect of suitable mechanical fixings.

8.4 The type and number of fixings will depend on the roof construction and location; the Certificate holder's advice should be sought in this respect. The Certificate holder recommends a minimum number of fixings per board size (see section 13.4).

8.5 All design analysis must be in accordance with British or European Standards relevant to the construction. All calculations should be carried out by a suitably qualified and experienced individual.

8.6 Each fixing must incorporate a head or washer with a minimum 50 mm diameter if round or 50 mm by 50 mm diameter if square. Fixings installed along the edges or at corners of boards should be situated between 50 mm and 150 mm from the board edge (210 mm for tapered boards).

8.7 Roof waterproof covering systems (see section 4.3 for suitable types) must be applied in accordance with the relevant Agrément Certificates and Certificate holder's instructions.

8.8 For design purposes, the boards may be assumed to have an allowable compressive strength\* of 150 kPa at 10% compression.

8.9 The product has not been assessed for use with permanent distributed or concentrated loads, such as air conditioning units, mechanical plants, water tanks, etc. Such loads should be supported directly on the roof construction. The product is not suitable when permanent roof access is required.

8.10 When profiled decking is used, the product will need to span across the ribs. Maximum permissible spans between ribs for the different product thicknesses are given in Table B.1 of BS 4841-4 : 2006 (reproduced in Table 4 of this Certificate).

Table 4 Maximum clear span

Maximum clear span (mm)		Minimum roofboard thickness (mm)
<75		25
>75	≤100	30
>100	≤125	35
>125	≤150	40
>150	≤175	45
>175	≤200	50
>200	≤225	55
>225	≤250	60

8.11 When maintenance is required to the roof waterproofing, protective boarding should be laid over the roof surface to avoid concentrations of load.

## 9 Behaviour in relation to fire



9.1 The product has a reaction to fire classification\* of Class E to EN 13501-1 : 2007.

9.2 The fire rating of any roof containing the product will depend on the type of deck and the nature of the roof waterproof covering.



9.3 The following systems achieved a classification of B<sub>ROOF</sub>(t4) in accordance with EN 13501-5 : 2005 and so are unrestricted by the national Building Regulations.

- 0.7 mm profile metal deck, a 250 micron polythene vapour control layer, a 100 mm thick insulation board and a 1.2 mm Xenith PVC waterproofing membrane with mechanical fixings
- 0.7 mm profile metal deck, a 250 micron polythene vapour control layer, a 100 mm thick insulation board and a 1.5 mm Sikaplan 15VG PVC waterproofing membrane with mechanical fixings.

9.4 The designation of other specifications should be confirmed by:

**England and Wales** — test or assessment in accordance with Approved Document B, Volumes 1 and 2, Appendix A, Clause 6

**Scotland** — test to conform to clauses 2.C<sup>(1)</sup> and 2.F<sup>(2)</sup>

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

**Northern Ireland** — test to conform to clauses 5.21 and 5.22.

## 10 Maintenance

The product, once installed, does not require any maintenance and has suitable durability provided the roof waterproofing is inspected and maintained at regular intervals (see section 11).

## 11 Durability



The product is rot resistant and durable, and will have a life at least as long as that of the roof waterproofing.



### 12 General

12.1 Xtratherm Thin-R Flat Roof Insulation Board (FR ALU) must be installed in accordance with the Certificate holder's instructions, BS 6229 : 2003, BS 8217 : 2005, BS EN 13956 : 2012 and the relevant Agrément Certificate.

12.2 Care should be taken to ensure the deck is graded to the correct falls, and is dry, clean and free from any projections or gaps.

12.3 Any hollows, depressions or backfalls found in the roof deck must be rectified prior to laying the insulation.

12.4 If tapered boards are to be effective in providing a uniform fall, it is essential that the structural deck is true and even.

12.5 The suitability of the substrate to accept and retain mechanical fixings must be checked prior to work commencing.

12.6 The deck to which the VCL is to be applied must be even, dry and sound, and free from dust and grease and other defects which may impair the bond. All deck joints should be taped.

12.7 In areas where high wind speeds can be expected, additional mechanical fixings should be considered; the advice of a suitably qualified and experienced individual should be sought as to the method of fixing as defined in the relevant clauses of BS EN 1991-1-4 : 2005 and its UK National Annex.

12.8 The mechanical fixing frequency and pattern should be predetermined in accordance with the Certificate holder's instructions and the relevant clauses of BS 6399-2 : 1997 or BS EN 1991-1-4 : 2005. Each fixing should incorporate a square or circular plate countersunk washer (see section 8.6), which must not restrain more than one board.

12.9 To prevent moisture being trapped on or in the insulation, it is essential to:

- protect the product during laying, before the application of the roof waterproofing, or lay the roof covering at the same time as the product. If the product is accidentally wetted, it must be replaced
- install the product only when the ambient temperature is above 5°C, to prevent condensation.

12.10 The product can be cut with a sharp knife or fine-toothed saw, to fit around projections through the roof.

12.11 Once installed, access to the roof should be restricted in accordance with section 4.5.

### 13 Procedure

#### General

13.1 The number of mechanical fixings required to fix the product will vary depending on the geographical location of the building, the topographical data, and height and width of the roof concerned.

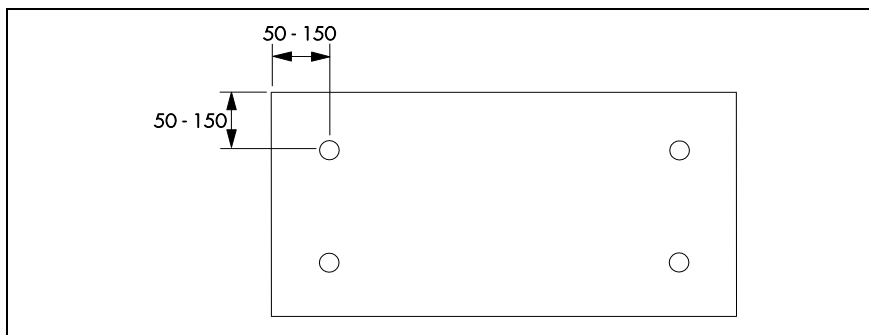
13.2 The requirements for an additional number of fixings above those specified in section 12.8 should be assessed in accordance with BS 6399-2 : 1997 or BS EN 1991-1-4 : 2005.

### Timber/metal and concrete decks

13.3 A 0.25 mm thick polythene VCL should be laid, with 150 mm sealed laps. The VCL should be turned up around the insulation and sealed to the waterproof finish at all edges and penetrations such as roof lights. Advice may be sought from the Certificate holder.

13.4 Boards are laid over the VCL in a break-bonded pattern. On profiled metal decks, the long edges of the board should be laid at right angles to the ribs and all board ends must be fully supported on a rib. Boards are secured to the deck with a minimum of four mechanical fixings (for 1200 by 600 mm boards) or six mechanical fixings (for 2400 by 1200 mm boards) placed within the individual board area and sited between 50 mm and 150 mm from all edges (see Figures 1 and 2). For tapered boards (1200 by 1200 mm), a minimum of four fixings is recommended, sited 210 mm from all edges (see Figure 3). Countersunk washers with square or circular plates of at least 50 mm by 50 mm or 50 mm diameter should be used with each fixing.

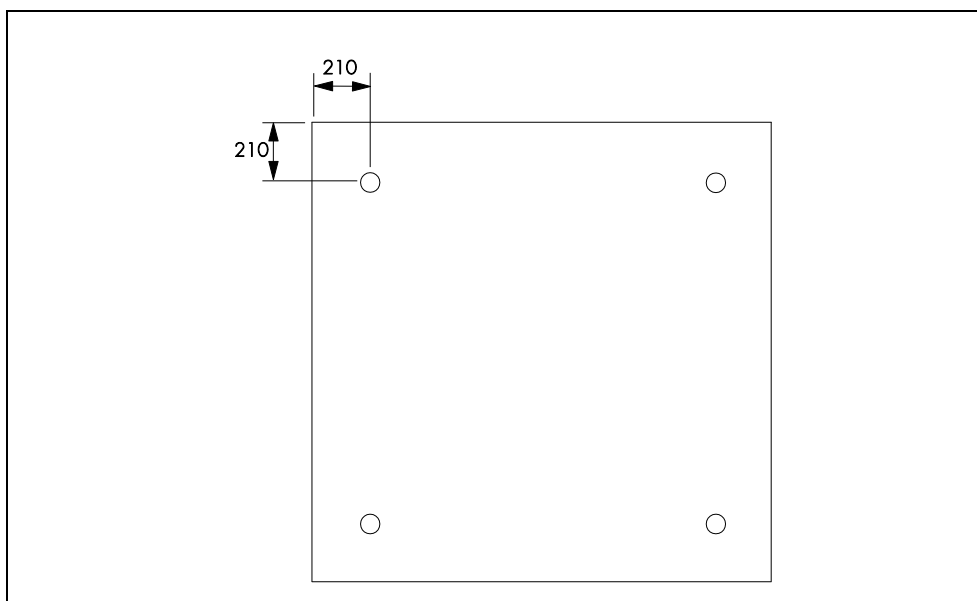
*Figure 1 Fixing layout 1200 by 600 mm board — minimum number of fixings*



*Figure 2 Fixing layout 2400 by 1200 mm board — minimum number of fixings*



Figure 3 Fixing layout 1200 by 1200 mm tapered board — minimum number of fixings



13.5 The single-ply roof waterproofing membrane is mechanically fixed in accordance with the manufacturer's instructions.

## Technical Investigations

### 14 Tests

Results of tests were assessed to determine:

- density
- reaction to fire
- thermal conductivity
- compressive strength
- dimensional stability
- tensile strength perpendicular to faces
- behaviour under variations in temperature (unrestrained)
- behaviour under distributed load and increased temperature
- effect of concentrated load on cantilevered parts
- bowing under the effect of a thermal gradient
- behaviour on exposure to moisture
- effect of concentrated load under a free span
- dimensional variations in unrestrained panels.

### 15 Investigations

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

15.2 An assessment of the risk of interstitial condensation was made.

15.3 A series of U value calculations was carried out.

15.4 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

- BS 4841-4 : 2006 *Rigid polyurethane (PUR) and polyisocyanurate (PIR) products for building end-use applications. Specification for laminated insulation boards (roofboards) with auto-adhesively or separately bonded facings for use as roofboard thermal insulation under non-bituminous single-ply roofing membranes*
- BS 5250 : 2011 *Code of practice for control of condensation in buildings*
- BS 6229 : 2003 *Flat roofs with continuously supported coverings — Code of practice*
- BS 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*
- BS 8217 : 2005 *Reinforced bitumen membranes for roofing — Code of practice*
- BS EN 1991-1-4 : 2005 *Eurocode 1 : Actions on structures — General actions — Wind actions*
- BS EN 13165 : 2012 *Thermal insulation products for buildings — Factory made rigid polyurethane foam (PU) products — Specification*
- BS EN 13956 : 2012 *Flexible sheets for waterproofing — Plastic and rubber sheets for roof waterproofing — Definitions and characteristics.*
- 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*
- BS OHSAS 18001 : 2007 *Occupational health and safety management systems. Requirements*
- BRE Report (BR 262 : 2002) *Thermal insulation: avoiding risks*
- BRE Report (BR 443 : 2006) *Conventions for U-value calculations*
- EN 13501-1 : 2007 *Fire classification of construction products and building elements — Classification using data from reaction to fire tests*
- EN 13501-5 : 2005 *Fire classification of construction products and building elements — Classification using data from external fire exposure to roofs tests*

### 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 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.