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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

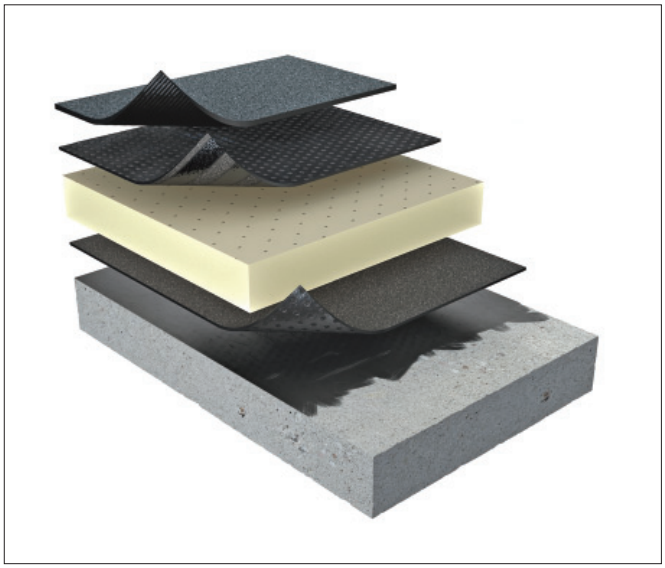
Agrément Certificate
11/4858
Product Sheet 1

LANGLEY WATERPROOFING SYSTEMS ROOFING BOARDS

LANGLEY PARAFOAM ULTRA AND PARAFOAM ULTRA TAPERED ROOFING BOARDS

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Langley Parafoam Ultra and Parafoam Ultra Tapered Roofing Boards, rigid thermoset polyisocyanurate glass tissue faced insulation for use as a thermal insulation layer on limited access pitched or flat concrete, metal or timber roof decks. Langley Parafoam Ultra Tapered Roofing Boards are also for use on zero pitch roofs to create or improve falls. The products are for use in conjunction with a vapour control layer and adhesively bonded or mechanically fixed roof waterproofing membrane in domestic and non-domestic 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

Thermal performance — the products' have declared thermal conductivities ($\lambda_{90/90}$ *value*) ranging from 0.024 $W \cdot m^{-1} \cdot K^{-1}$ to 0.026 $W \cdot m^{-1} \cdot K^{-1}$ depending on thickness (see section 5).

Condensation risk — the products can contribute to limiting the risk of surface condensation (see section 6).

Strength and stability — when installed on suitable substrates using appropriate adhesive and/or mechanical fixing methods, the products can adequately transfer maintenance traffic loads and wind loads to the roof deck (see section 7).

Behaviour in relation to fire — the fire rating of any roof containing the products will depend on the type of completed roof construction (see section 8).

Durability — the products, when used as thermal insulation in the roof systems described in this Certificate, will have a life at least as long as that of the roof waterproof covering (see section 10).

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

Date of First issue: 30 August 2011

Sean Moriarty
Head of Approvals — Physics

Greg Cooper
Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Regulations

In the opinion of the BBA, Langley Parafoam Ultra and Parafoam Ultra Tapered Roofing Boards, 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)

Requirement:	A1	Loading
Comment:		The products are acceptable. See section 7.1 of this Certificate.
Requirement:	B4(2)	External fire spread
Comment:		Roofs incorporating the products can meet this Requirement. See section 8.2 of this Certificate.
Requirement:	C2(c)	Resistance to moisture
Comment:		The products will contribute to a roof meeting this Requirement. See sections 6.1, 6.3 and 6.6 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		The products can meet or contribute to meeting this Requirement. See sections 5.2 and 5.3 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The products are an acceptable material. See section 10 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The products can contribute to a construction satisfying this Regulation. See section 10 and the *Installation* part of this Certificate.
Regulation:	9	Building standards — construction
Standard:	1.1	Structure
Comment:		The products are acceptable, with reference to clauses 1.1.1[(1)(2)], 1.1.2[(1)(2)] and 1.1.3[(1)(2)]. See sections 7.1 of this Certificate.
Standard:	2.8	Spread from neighbouring buildings
Comment:		Roofs incorporating these products can meet this Standard, with reference to clauses 2.8.1[(1)(2)]. See section 8.2 of this Certificate.
Standard:	3.15	Condensation
Comment:		The products will contribute to a roof meeting this Standard, with reference to clauses 3.15.1[(1)(2)], 3.15.3[(1)(2)], 3.15.4[(1)(2)], 3.15.5[(1)(2)] and 3.15.6[(1)(2)]. See sections 6.1, 6.4 and 6.6 of this Certificate.
Standard:	6.1(b)	Carbon dioxide emissions
Standard:	6.2	Building insulation envelope
Comment:		The products can contribute to satisfying the requirements of these Standards, with reference to clauses, or parts of, 6.1.2[(2)], 6.1.6[(1)], 6.2.1[(1)(2)], 6.2.3[(1)], 6.2.4[(2)], 6.2.5[(2)], 6.2.6[(1)], 6.2.7[(1)], 6.2.8[(1)(2)], 6.2.9[(1)(2)], 6.2.10[(1)(2)], 6.2.11[(1)(2)], 6.2.12[(2)] and 6.2.13[(1)(2)]. See sections 5.2 and 5.3 of this Certificate.
Standard:	7(a)(b)	Statement of sustainability
Comment:		The products can contribute to meeting 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 products can contribute to a construction meeting a higher level of sustainability as defined in this Standard, with reference to clauses 7.1.4[(1)(2)] Aspects 1[(1)(2)] and 2[(1)], 7.1.6[(1)(2)] Aspects 1[(1)(2)] and 2[(1)] and 7.1.7[(1)(2)] Aspect 1[(1)(2)]. See section 5.2 of this Certificate.
Regulation:	12	Building standards — conversions
Comment:		All comments given for these products under Regulation 9, also apply to this Regulation, with reference to clause 0.12.1[(1)(2)] and Schedule 6[(1)(2)].

(1) Technical Handbook (Domestic).
(2) Technical Handbook (Non-Domestic).

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

Regulation:	B2	Fitness of materials and workmanship
Comment:		The products are acceptable. See section 10 and the *Installation* section of this Certificate.
Regulation:	C5	Condensation
Comment:		The products contribute to a roof meeting this Regulation. See sections 6.1 and 6.6 of this Certificate.
Regulation:	D1	Stability
Comment:		The products are acceptable. See section 7.1 of this Certificate.
Regulation:	E5(b)	External fire spread
Comment:		Roofs incorporating the products can meet this Regulation. See section 8.2 of this Certificate.
Regulation:	F2(a)(i)	Conservation measures
Regulation:	F3(2)	Target carbon dioxide Emissions Rate
Comment:		Roofs incorporating the products can satisfy or contribute to satisfying this Regulation. See sections 5.2 and 5.3 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 section 2 *Delivery and site handling* (2.5) of this Certificate.

Non-regulatory Information

NHBC Standards 2011

NHBC accepts the use of Langley Parafoam Ultra and Parafoam Ultra Tapered Roofing Boards, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs and balconies* and Chapter 7.2 *Pitched roofs*.

Technical Specification

1 Description

1.1 Langley Parafoam Ultra and Parafoam Ultra Tapered Roofing Boards are rigid thermoset polyisocyanurate insulation boards with glass-tissue facings on both sides. They are manufactured using CFC/HCFC free materials, with zero ozone depletion potential (0 ODP) and a global warming potential (GWP) of less than 5.

1.2 Boards(1) have the nominal characteristics as shown in Table 1.

Table 1 Nominal characteristics

Property	Parafoam Ultra	Parafoam Ultra Tapered
Length (mm)	2400 and 600	1200
Width (mm)	1200	1200
Thickness (mm)	25 to 150 in 5 mm increments	25 to 145 in 5 mm increments
Compressive strength at 10% compression (kPa)	150	150
Density ($kg \cdot m^{-3}$)	32	32

(1) Other board sizes may be available on request.

1.3 Langley Parafoam Ultra Tapered Roofing Boards are available in falls of 1:80, 1:60, 1:40 and 1:30.

1.4 Quality control checks are carried out on raw materials, during the manufacturing process and on finished boards.

1.5 The boards are installed as part of a system in conjunction with the following items:

- waterproofing membrane
- vapour control layer (VCL)
- adhesive or fixings — incorporating countersunk washer.

2 Delivery and site handling

2.1 Boards are delivered to site in packs shrink-wrapped in polythene. Each pack carries a label bearing the company's name, product code and batch number and the BBA logo, incorporating the number of this Certificate.

2.2 Boards must be stored flat, off the ground on a clean, level surface under cover to protect them from precipitation, moisture, high winds and mechanical damage.

2.3 Boards must be protected from prolonged exposure to sunlight by storing either under cover or by covering with opaque polythene sheets or waterproof tarpaulin. Where possible, the boards should be stored inside a building.

2.4 Wet boards should not be used.

2.5 Boards must not be exposed to naked flame or other ignition sources.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Langley Parafoam Ultra and Parafoam Ultra Tapered Roofing Boards.

Design Considerations

3 General

3.1 Langley Parafoam Ultra and Parafoam Ultra Tapered Roofing Boards are suitable for use as a thermal insulation layer on concrete, metal or timber pitched or flat roofs, with access limited to maintenance only.

3.2 Decks should be designed in accordance with the relevant clauses of BS 6229 : 2003, BS 8217 : 2005, BS 8218 : 1998 and where appropriate, the *NHBC Standards* 2011, Chapter 7.1.

3.3 Roofs should incorporate an effective VCL below the boards.

3.4 Boards are for use with one of the following waterproofing specifications:

- Langley Parafor partially bonded built-up bitumen felt, laid in accordance with BS 8217 : 2005
- Langley Paraphalt polymer modified mastic asphalt laid in accordance with BS 8218 : 1998.

3.5 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 and cleaning of gutters, etc (see also section 7.13).

3.6 Flat roofs are defined for the purpose of this Certificate as those roofs having a minimum finished fall of 1:80 and a maximum 1:6 as defined in BS 6229 : 2003.

3.7 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.

3.8 Tapered boards may be used where appropriate to achieve the minimum finished falls required. If using the tapered insulation board a fall of 1:60 will be acceptable to achieve at least 1:80 post construction falls.

3.9 Pitched roofs are defined as those having falls in excess of 1:6.

4 Practicability of installation

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

5 Thermal performance

5.1 Calculations of thermal transmittance (U value), should be carried out in accordance with BS EN ISO 6946 : 2007 and BRE Report (BR 443 : 2006) *Conventions for U-value calculations*, using the declared thermal conductivity ($\lambda_{90/90}$ *value*) of the products as shown in Table 2.

Table 2 Thermal conductivity ($\lambda_{90/90}$ values)

Insulation thickness (mm)	Thermal conductivity ($W \cdot m^{-1} \cdot K^{-1}$)
< 80	0.026
≥ 80 < 120	0.025
≥ 120	0.024

5.2 The U value of a completed roof will depend on the thickness of insulation used, the number and type of fixings and the insulating value of other roof components/layers. Example U values of roofs incorporating the products are shown in Tables 3 and 4.

Table 3 Example U values — Mechanically fixed

U value requirement ($W \cdot m^{-2} \cdot K^{-1}$)(1)	Deck construction/insulation thickness (mm)		
	Concrete(2)(3)	Timber(2)(4)	Metal(2)(5)
0.13	215	215	225
0.16	175	175	185
0.18	155	155	165
0.20	140	135	145
0.25	110	110	120

(1) Langley Parafoam Ultra Roofing Boards.
(2) Includes 5.55 steel fixings per m^2 and 3.55 steel waterproofing fixings per m^2, with a 4.8 mm cross sectional head diameter and full insulation penetration depth.
(3) Concrete decking 2.0 $W \cdot m^{-1} \cdot K^{-1}$, 38 mm timber battens (15%), VCL, 1.5 mm waterproofing membrane, 12.5 mm plasterboard.
(4) 18 mm plywood decking, 150 mm timber joists (12.5%) with 150 mm airspace (87.5%), VCL, 1.5 mm waterproofing membrane, 12.5 mm plasterboard.
(5) Metal deck – (not included in calculation), VCL, 1.5 mm waterproofing membrane.

Table 4 Example U values — Adhesively fixed

U value requirement ($W \cdot m^{-2} \cdot K^{-1}$)[1]	Deck construction/insulation thickness (mm)		
	Concrete[2][3]	Timber[2][4]	Metal[2][5]
0.13	170	170	175
0.16	135	135	145
0.18	120	120	130
0.20	115	110	120
0.25	90	90	95

(1) Langley Parafoam Ultra Roofing Boards.
(2) Adhesively fixed with no metal fixings.
(3) Concrete decking 2.0 $W \cdot m^{-1} \cdot K^{-1}$, 38 mm timber battens (15%), VCL, 1.5 mm waterproofing membrane, 12.5 mm plasterboard.
(4) 18 mm plywood decking, 150 mm timber joists (12.5%) with 150 mm airspace (87.5%), VCL, 1.5 mm waterproofing membrane, 12.5 mm plasterboard.
(5) Metal deck – (not included in calculation), VCL, 1.5 mm waterproofing membrane.

5.3 The products can 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 incorporating a VCL with a vapour resistance of at least 250 $MN \cdot s \cdot g^{-1}$ will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2002, Section 8.4 and Appendix D and BRE Report (BR 262 : 2002) *Thermal insulation: avoiding risks* in England and Wales.

6.2 For the purposes of assessing the risk of interstitial condensation, the boards vapour resistivity may be taken as approximately 306 $MN \cdot s \cdot g^{-1} \cdot m^{-1}$.

Surface condensation

6.3 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 0.35 $W \cdot m^{-2} \cdot K^{-1}$ at any point and the junctions with other elements are designed in accordance with section 5.3.

6.4 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 1.2 $W \cdot m^{-2} \cdot K^{-1}$ at any point. Guidance may be obtained from BS 5250 : 2002, Section 8 and BRE Report (BR 262 : 2002).

6.5 Alternatively, a detailed assessment in accordance with BS 5250 : 2002, Annex D, and BS EN ISO 13788 : 2002, Section 5 can be carried out to show that surface condensation and mould growth are not predicted.

6.6 Where an effective VCL is difficult to ensure, eg due to a large number of penetrations through this layer, the risk of condensation should be assessed in accordance with BS 6229 : 2003, Annex A.

7 Strength and stability

7.1 When installed on suitable roof decks, boards can adequately transfer maintenance traffic loads and negative and positive (suction and pressure) wind loads to the roof deck.

7.2 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.

7.3 The suitability of the roof construction, and in particular the immediate substrate, to accept the adhesive bond and mechanical fixing must be checked before installation. 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.

7.4 The type and number of fixings will depend on the roof construction and location; the Certificate holder's advice can be sought in this respect. The Certificate holder recommends a minimum number of fixings per board size, see section 12.12.

7.5 All design analysis must be in accordance with British or European Standards relevant to the construction. The requirement for fixings to suit the wind uplift requirements for the particular site should be assessed in accordance with BS 6399-2 : 1997 or BS EN 1991-1-4 : 2005. All calculations should be approved by a suitably competent person eg a Chartered Engineer or equivalent.

7.6 Each fixing should incorporate a head or washer which is a minimum of 50 mm diameter if round or 50 mm by 50 mm if square. Fixings installed along the edges or at corners of boards should be greater than 50 mm but less than 150 mm from the board edge.

7.7 For adhesive application of the insulation boards, the substrate must be free of dust, dry and installation should be in accordance with the instructions of the adhesive manufacturer. The surface of the substrate must have sufficient cohesive strength to resist the calculated wind load acting upon the structure.

7.8 When adhering is the chosen method for the insulation or waterproofing, adhesion between the insulation board and VCL and between the board and overlay must be adequate to resist the effects of wind suction and thermal cycling likely to be experienced under normal conditions. Metal deck profiles should give a bonding area of at least 33% of the total projected surface area. In areas where high wind speeds can be expected, additional mechanical fixings should be considered and the advice of a suitably qualified Chartered Engineer should be sought as to the method of fixing as defined in the relevant clauses of BS 6399-2 : 1997 and BS EN 1991-1-4 : 2005.

7.9 Roof waterproof systems (see section 3.4 for suitable types) must be applied in accordance with the relevant British Standards, Agrément Certificates or manufacturer's guidance.

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

7.11 The boards have 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 boards are not suitable when permanent roof access is required.

7.12 When profiled decking is used, boards will need to span across the ribs. Maximum permissible spans between ribs for board thickness are shown in Table 5.

Table 5 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

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

8 Behaviour in relation to fire

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

8.2 The constructions shown in Table 6 achieve a roof covering designation AA or AB (Low vulnerability in Scotland) rating and are acceptable for use less than 6 m from a relevant boundary. For other roof constructions, designers should refer to the relevant guidance in the documents supporting the national Building Regulations.

Table 6 Fire ratings

Standard	Substrate deck[1]	VCL[1]	Insulation	Waterproofing membrane[1]	Fixing method[1]	Roof inclination	Designation
BS 476-3 : 2004	12 mm plywood	2 mm Paravapo SBS metal lined bituminous	90 mm Parafoam Ultra	5 mm thick Parafor Solo GFM	Mechanical	0°	EXT.F.AB
	12 mm plywood	3 mm Paravapo SBS metal lined bituminous	90 mm Parafoam Ultra	Graviflex Extensive Green Roof System with live Sedum plant covering	Bonded by torching and Insta stik Adhesive	0°	EXT.F.AA

(1) These items are outside the scope of the Certificate. Specific constructions used should be tested.

8.3 The designation of other specifications, eg when used on combustible substrates, should be confirmed by:

England and Wales — test or assessment in accordance with Clause 6 of appendix A of Approved Document B, volumes 1 and 2.

Scotland — test to conform to clauses 2.C[1] and 2.F[2].

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland — test or assessment by a UKAS accredited laboratory, or an independent consultant with appropriate experience.

9 Maintenance

No maintenance of the insulation layer will be required provided the roof waterproof covering remains intact.

10 Durability

Boards are rot-resistant and durable. They will have a life at least as long as that of the roof waterproof covering.

Installation

11 General

11.1 Langley Parafoam Ultra and Parafoam Ultra Tapered Roofing Boards must be installed in accordance with the Certificate holder's instructions and BS 6229 : 2003, BS 8217 : 2005, or the relevant Agrément Certificate, depending on the waterproofing to be applied.

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

11.3 For tapered boards to be effective in providing a uniform fall, it is essential that the structural deck is true and even. Any hollows, depressions, backfalls, found in the roof deck, must be rectified prior to laying the insulation.

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

11.5 The deck to which the VCL is to be applied must be level, clean, dry and sound, and free from dust, grease and other defects which may impair restraint of the insulation boards (ie adhering and/or mechanically fixing). For adhered systems, all deck joints must be taped and, where necessary, the deck coated with bitumen primer to BS 3416 : 1991.

11.6 Where the specified VCL is other than a bituminised felt or bitumen coated foil, any fixings that penetrate the VCL should be of the self-sealing type. Advice should be sought from the Certificate holder.

11.7 On multi-storey buildings or in areas subject to high wind loads, additional mechanical fixings may be required and the advice of the Certificate holder should be sought on any limitations of use.

11.8 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 minimum 50 mm by 50 mm square or a 50 mm diameter circular plate countersunk washer, which must not restrain more than one board.

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

- protect the boards during laying, before the application of the roof waterproofing, or to lay the roof covering at the same time as laying the boards. However boards accidentally wetted, must be replaced before application of the waterproof layer
- boards should be installed only when the ambient temperature is above 5°C to prevent condensation.

11.10 Boards can be cut with a sharp knife or fine-toothed saw to fit around projections through the roof.

11.11 Boards are for use with the waterproofing membranes specified in section 3.4, that are laid in accordance with the relevant British Standard or subject of a current Agrément Certificate and laid in accordance with that Certificate.

11.12 Once installed, access to the roof should be restricted in accordance with section 3.5.

12 Procedure

Timber decks (eg tongue-and-groove boards, plywood)

12.1 The Paravapo SBS VCL is nailed to the deck and the nail heads blanked out with hot bitumen. Laps are sealed using the appropriate grade of bitumen, a polyurethane adhesive or a suitable solvent based adhesive in accordance with BS 8217 : 2005.

12.2 Care should be taken to ensure continuity of the VCL at joints, upstands and roof penetrations.

12.3 Hot bitumen adhesive (maximum temperature of 240°C) or a polyurethane adhesive or a suitable solvent-based adhesive is applied over the Paravapo SBS VCL and the roofing boards are fully embedded into it and close butted.

Langley Parafoam Ultra Roofing Boards should be laid break-bonded, whilst Langley Parafoam Ultra Taped Roofing Boards are laid using a chequer board pattern.

12.4 When using non-bituminous waterproofing systems or adhesives, all board joints and edges should be sealed with 50 mm wide aluminium foil adhesive tape, prior to the application of the adhesive system and roof waterproofing membrane.

Concrete and screeded concrete decks

12.5 Before applying the Paravapo SBS VCL, a screed graded to the appropriate fall should be applied where necessary and, if adhering the VCL and insulation boards, the whole deck treated with Langley Bitumen Primer.

12.6 For adhered systems, the Paravapo SBS VCL is fully bonded with hot bitumen, a polyurethane adhesive or a suitable solvent based adhesive and the laps sealed, and the boards applied in the manner described for timber decks (see sections 12.3 and 12.4).

Metal decks

12.7 If adhering the Paravapo SBS VCL and the insulation boards, the deck should be treated with Langley Bitumen Primer before applying the VCL.

12.8 The reinforced Paravapo SBS VCL is fully bonded, using hot bitumen, a polyurethane adhesive or a suitable solvent-based adhesive, to the metal deck and the boards applied in the manner described for timber decks (see section 12.3 and 12.4).

12.9 Boards are laid either with the long axis at right angles to the corrugations of the metal deck or diagonally across the corrugations of the deck, ensuring that all joints are supported on the crown flats of the decking.

12.10 The thickness of the board to be used is dependent on the width of the trough openings of the metal deck as indicated in Table 5, section 7.12.

Mechanical fixings

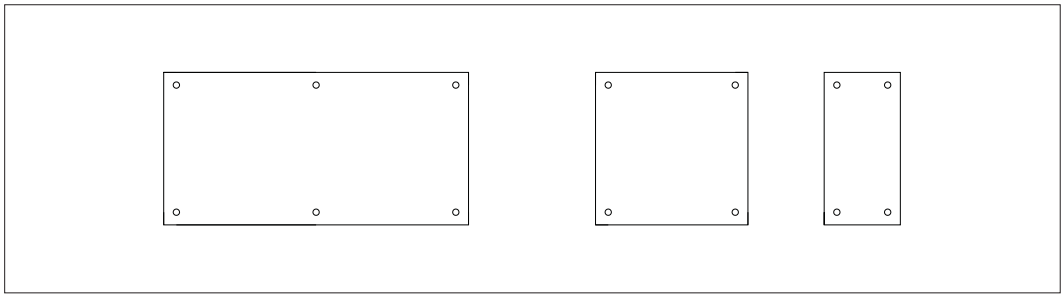
12.11 Alternatively, boards can be secured to timber, metal and concrete decks by means of mechanical fixings.

12.12 Each fixing should incorporate a minimum 50 mm by 50 mm square or 50 mm diameter circular plate countersunk washer, which must not restrain more than one board. The minimum number of fixings for each board size is given in Table 7 and shown in Figure 1, with the requirement of additional fixings assessed in accordance with BS 6399-2 : 1997 or BS EN 1991-1-4 : 2005: These should be placed within the individual board area and be sited more than 50 mm and less than 150 mm from the edges and corners of the board, eg giving a minimum fixing rate of 5.55 fixings per square metre for 1200 by 600 mm boards.

Table 7 Minimum number of fixings (for solely mechanically fixed specification)

Board dimensions (mm)	Minimum number of fixings
2400 x 1200	6
1200 x 1200	4
600 x 1200	4

Figure 1 Fixing layouts – minimum fixing numbers (for solely mechanically fixed specification)



12.13 On tall buildings or in areas subject to high-wind loads, additional mechanical fixings may be required(1). The suitability of the substrate to accept and retain mechanical fixings must be checked prior to the work commencing.

(1) The requirement for additional fixings must be assessed in accordance with BS 6399-2 : 1997 or BS EN 1991-1-4 : 2005.

Pitched roofs

12.14 Boards should be either fully bonded or mechanically fixed to the supporting deck. Alternatively, a combination of the two methods can be used. For solely mechanically fixed boards, the fixings should be installed as specified in section 12.12, with the minimum number of fixings for each board given in Table 7.

12.15 A suitable VCL with lapped and sealed joints should be applied prior to the installation of the boards, as outlined in sections 12.1 or 12.5 to 12.8.

12.16 Boards are installed on the supporting deck in the manner described for timber decks (see sections 12.3 and 12.4).

12.17 When installing above a profile metal deck, boards can be laid either with the long axis at right angles to the corrugations of the deck, or diagonally across the corrugations of the deck, ensuring that all board joints are supported on the crown flats of the decking.

12.18 Each fixing should be installed in the manner described in section 12.12.

12.19 Waterproofing systems should then be applied above the insulation as described in section 12.20.

Weatherproofing (all systems)

12.20 Waterproofing systems should be applied above the insulation boards and as noted in section 3.4.

Technical Investigations

13 Tests

Tests were carried out by the BBA and the results assessed to determine:

- resistance to loading (free span)
- resistance to peel.

14 Investigations

14.1 An assessment was made of the results of test data in accordance with MOAT No 50 : 1992 to determine:

- density
- compressive strength at 10% compression
- dimensional stability with temperature
- dimensional accuracy
- thermal conductivity (fresh and aged)
- water vapour resistance/resistivity
- fire rating
- adhesive bonding
- mechanical fixings
- condensation risk.

14.2 The manufacturing processes were examined, including quality control.

Bibliography

BS 476-3 : 2004 *Fire tests on building materials and structures — Classification and method of test for external fire exposure to roofs*

BS 3416 : 1991 *Specification for bitumen based coatings for cold application, suitable for use in contact with potable water*

BS 5250 : 2002 *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 8218 : 1998 *Code of practice for mastic asphalt roofing*

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

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

BS EN ISO 13788 : 2002 *Hygrothermal performance of building components and building elements — Internal surface temperature to avoid critical surface humidity and interstitial condensation — Calculation methods*

MOAT No 50 : 1992 *Technical guidelines for the assessment of thermal insulation systems intended for supporting waterproof coverings on flat and sloping roofs*

15 Conditions

15.1 This Certificate:

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

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

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

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

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

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

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual 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.

15.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

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