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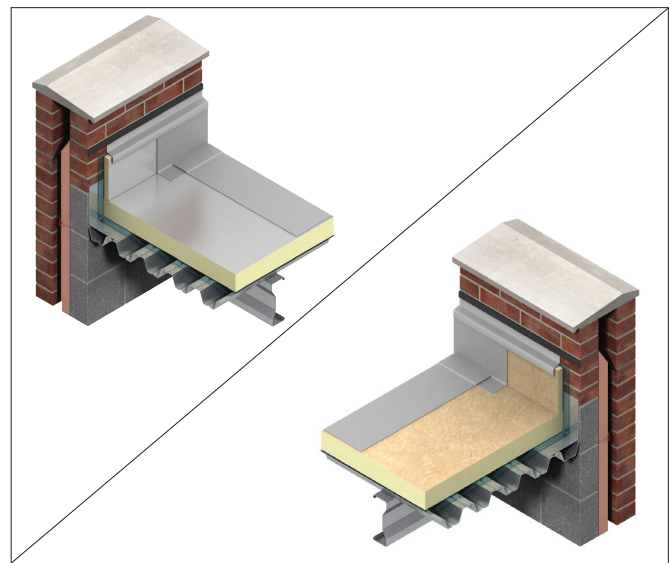


Agrément Certificate
16/5332
Product Sheet 1

KINGSPAN THERMAROOF RANGE INSULATION

THERMAROOF TR26 LPC/FM AND THERMATAPER TT46 LPC/FM AND THERMAROOF TR27 LPC/FM AND THERMATAPER TT47 LPC/FM ROOFING BOARDS

This Agrément Certificate Product Sheet⁽¹⁾ relates to Thermarroof TR26 LPC/FM and Thermataper TT46 LPC/FM Roofing Boards, rigid thermoset polyisocyanurate foil-faced insulation, and Thermarroof TR27 LPC/FM and Thermataper TT47 LPC/FM Roofing Boards, rigid thermoset polyisocyanurate glas-tissue-faced insulation, for use as a thermal insulation layer on limited access flat concrete, metal or timber roof decks. Thermataper TT46 LPC/FM and Thermataper TT47 LPC/FM 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 a single-ply mechanically-fixed roof waterproofing membrane or adhesively-bonded waterproofing membrane in domestic and non-domestic buildings.
(1) Hereinafter referred to as 'Certificate'.



CERTIFICATION INCLUDES:

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

KEY FACTORS ASSESSED

Thermal performance — the TR26 and TT46 products have a declared thermal conductivity (λ_D) of $0.022 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ and the TR27 and TT47 products have declared thermal conductivities (λ_D) of $0.024 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ to $0.026 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ depending on the thickness range (see section 6).

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

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

Behaviour in relation to fire — the products have a reaction to fire classification* of Class E (see section 9).

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 12).

The BBA has awarded this 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 June 2016

John Albon — Head of Approvals
Construction Products

Claire Curtis-Thomas
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, Thermarroof TR26 LPC/FM and Thermataper TT46 LPC/FM and Thermarroof TR27 LPC/FM and Thermataper TT47 LPC/FM Roofing Boards, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



The Building Regulations 2010 (England and Wales) (as amended)

Requirement: A1	Loading
Comment:	The products are acceptable. See section 8.1 of this Certificate.
Requirement: B4(2)	External fire spread
Comment:	Roofs incorporating the products can satisfy this Requirement. See section 9.3 of this Certificate.
Requirement: C2(c)	Resistance to moisture
Comment:	The products can contribute to satisfying this Requirement. See sections 7.1 and 7.4 of this Certificate.
Requirement: L1(a)(i)	Conservation of fuel and power
Comment:	The products can contribute to satisfying this Requirement. See section 6 of this Certificate.
Regulation: 7	Materials and workmanship
Comment:	The products are acceptable. See section 12.1 and the <i>Installation</i> part of this Certificate.
Regulation: 26	CO₂ emission rates for new buildings
Regulation: 26A	Fabric energy efficiency rates for new dwellings (applicable to England only)
Regulation: 26A	Primary energy consumption rates for new buildings (applicable to Wales only)
Regulation: 26B	Fabric performance values for new dwellings (applicable to Wales only)
Comment:	The products can contribute to satisfying these Regulations. See section 6 of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation: 8(1)	Durability, workmanship and fitness of materials
Comment:	The products are acceptable. See section 12.1 and the <i>Installation</i> part of this Certificate.
Regulation: 9	Building standards applicable to 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 section 8.1 of this Certificate.
Standard: 2.8	Spread from neighbouring buildings
Comment:	Roofs incorporating the products can satisfy this Standard, with reference to clauses 2.8.1 ⁽¹⁾⁽²⁾ . See section 9.3 of this Certificate.
Standard: 3.15	Condensation
Comment:	The products will contribute to a roof satisfying this Standard, with reference to clauses 3.15.1 ⁽¹⁾⁽²⁾ , 3.15.4 ⁽¹⁾⁽²⁾ and 3.15.5 ⁽¹⁾⁽²⁾ . See sections 7.1 and 7.5 of this Certificate.
Standard: 6.1(b)	Carbon dioxide emissions
Standard: 6.2	Building insulation envelope
Comment:	The products can contribute to satisfying these Standards, with reference to clauses, or parts of, 6.1.1 ⁽¹⁾ , 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 section 6 of this Certificate.
Standard: 7.1(a)(b)	Statement of sustainability
Comment:	The products 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 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 6.1 of this Certificate.
Regulation: 12	Building standards applicable to conversions
Comment:	All comments given for these products under Regulation 9, Standards 1 to 6, 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) 2012 (as amended)

Regulation: 23	Fitness of materials and workmanship
Comment:	The products are acceptable. See section 12.1 and the <i>Installation</i> part of this Certificate.
Regulation: 29	Condensation
Comment:	The products can contribute to satisfying this Regulation. See section 7.1 of this Certificate.
Regulation: 30	Stability
Comment:	The products are acceptable. See section 8.1 of this Certificate.
Regulation: 36(b)	External fire spread
Comment:	Roofs incorporating the products can satisfy this Regulation. See section 9.3 of this Certificate.

Regulation:	39(a)(i)	Conservation measures
Regulation:	40(2)	Target carbon dioxide emission rate
Comment:	The products 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) 2007

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

See section: 3 *Delivery and site handling* (3.5) of this Certificate.

Additional Information

NHBC Standards 2016

NHBC accepts the use of Thermarroof TR26 LPC/FM and Thermataper TT46 LPC/FM and Thermarroof TR27 LPC/FM and Thermataper TT47 LPC/FM Roofing boards, provided they are installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs and balconies*.

CE marking

The Certificate holder has taken the responsibility of CE marking the products 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 Thermarroof TR26 LPC/FM and Thermataper TT46 LPC/FM Roofing Boards are rigid thermoset polyisocyanurate insulation boards with low emissivity composite foil-facings on both sides. Thermarroof TR27 LPC/FM and Thermataper TT47 LPC/FM Roofing Boards are rigid thermoset polyisocyanurate insulation boards with glass-tissue-facing on both sides. They are manufactured using CFC/HCFC-free materials, with zero ozone depletion potential (0 ODP) and global warming potential (GWP) of less than 5.

1.2 The boards have the nominal characteristics shown in Table 1.

Table 1 Nominal characteristics⁽¹⁾

Property	Thermarroof TR26/TR27 LPC/FM	Thermataper TT46/TT47 LPC/FM
Length (mm)	2400 ⁽²⁾⁽³⁾ and 600 ⁽³⁾	1200
Width (mm)	1200	1200
Thickness (mm)	25 to 160 in 5 mm increments	25 to 160 in 5 mm increments
Compressive strength at 10% compression* (kPa)	150	150
Density (kg·m ⁻³)	32	32

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

(2) For TR26.

(3) For TR27.

1.3 Thermataper TT46 LPC/FM Roofing Boards and Thermataper TT47 LPC/FM Roofing Boards are available in tapered versions for falls of 1:120, 1:80, 1:60, 1:40 and 1:30.

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

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

2 Manufacture

2.1 Raw materials are injected onto the facer on a conveyor belt. The exothermic reaction expands the foam, which then comes into contact with the upper facer. An automated process cures and cuts the products to the required size.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities

- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Kingspan Insulation Limited has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by the Loss Prevention Certification Board LPCB (Certificate 388).

3 Delivery and site handling

3.1 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.

3.2 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.

3.3 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.

3.4 Wet boards should not be used.

3.5 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 Thermaroom TR26 LPC/FM and Thermataper TT46 LPC/FM and Thermaroom TR27 LPC/FM and Thermataper TT47 LPC/FM Roofing Boards.

Design Considerations

4 General

4.1 Thermaroom TR26 LPC/FM and Thermataper TT46 LPC/FM and Thermaroom TR27 LPC/FM and Thermataper TT47 LPC/FM Roofing Boards are suitable for use as a thermal insulation layer on concrete, metal or timber flat roofs, with access limited to maintenance only.

4.2 Decks should be designed in accordance with the relevant clauses of BS 5250 : 2011, BS 8212 : 1995 and BS EN 1995-1-1 : 2004 and either BS 6229 : 2003 or BS EN 13956 : 2012 and, where appropriate, *NHBC Standards 2016*, Chapter 7.1.

4.3 Roofs should incorporate an effective VCL below the products which is compatible with both the product and the waterproofing system. Advice should be sought from the Certificate holder.

4.4 Thermaroom TR26 LPC/FM and Thermataper TT46 LPC/FM Roofing Boards are for use with mechanically-fixed single-ply waterproof membranes which are the subject of a current Agrément Certificate and laid in accordance with that Certificate.

4.5 Thermaroom TR27 LPC/FM and Thermataper TT47 LPC/FM Roofing Boards are for use with one of the following waterproofing specifications:

- partially-bonded built-up reinforced bitumen membranes, in accordance with the recommendations of Table 5 of BS 8747: 2007 and installed in accordance with BS 8217 : 2005
- mastic asphalt laid in accordance with BS 8218 : 1998
- liquid applied systems which are the subject of a current Agrément Certificate and laid in accordance with, and within the limitations imposed by, that Certificate
- single-ply waterproof membranes which are the subject of a current Agrément Certificate and laid in accordance with that Certificate.

4.6 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 8.11).

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

4.8 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.

4.9 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 fall.

5 Practicability of installation

The products are designed to be installed by a competent general builder, or a contractor, experienced with these types of products.

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 appropriate declared thermal conductivity (λ_D) value as shown in Table 2 of this Certificate.

Table 2 Declared thermal conductivity (λ_D)

Product	Insulation thickness (mm)	Declared thermal conductivity, λ_D ($W \cdot m^{-1} \cdot K^{-1}$)
TR26 and TT46	all	0.022
TR27 and TT47	< 80	0.026
	$\geq 80 < 120$	0.025
	≥ 120	0.024

6.2 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 for Thermaroof TR26 and Thermaroof TR27 – mechanically fixed

U value ($W \cdot m^{-2} \cdot K^{-1}$) ⁽¹⁾	Deck construction/insulation thickness (mm)					
	Concrete ⁽²⁾⁽³⁾		Timber ⁽²⁾⁽⁴⁾		Metal ⁽²⁾⁽⁵⁾	
	TR26	TR27	TR26	TR27	TR26	TR27
0.13	210	215	205	215	210	225
0.16	170	175	165	175	170	185
0.18	150	155	145	155	155	165
0.20	130	140	130	135	140	145
0.25	100	110	100	110	110	120

(1) Thermaroof TR26 LPC/FM or Thermaroof TR27 LPC/FM Roofing Boards.

(2) Includes 5.55 steel fixings per m² and 3.55 steel waterproofing fixings per m², 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 single-ply 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 single-ply waterproofing membrane, 12.5 mm plasterboard.

(5) Metal deck (not included in calculation), VCL, 12.5 mm plasterboard or 1.5 mm single-ply waterproofing membrane.

Table 4 Example U values for Thermaroof TR27 LPC/FM – 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) Thermaroof TR27 LPC/FM 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 single-ply 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 single-ply waterproofing membrane, 12.5 mm plasterboard.

(5) Metal deck (not included in calculation), VCL, 1.5 mm single-ply waterproofing membrane.

Junctions



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

7 Condensation 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, Annex H and the relevant guidance.

7.2 The products must be used in conjunction with an effective VCL.

7.3 The different components of the products have the following water vapour resistance and resistivity values:

- 80 MN·s·g⁻¹ resistance to vapour diffusion of each foil-facing on the boards
- 1 MN·s·g⁻¹ resistance to vapour diffusion of each glass-tissue-facing on the boards
- 300 MN·s·g⁻¹·m⁻¹ vapour diffusion resistivity of the foam core of the boards; the resistance to vapour transmission of the boards and the VCL should both be reduced to take account of vapour migration through butted board joints and fixing perforations.

Surface condensation



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



7.5 For buildings in Scotland, constructions will be acceptable where the thermal transmittance (U value) does not exceed 1.2 W·m⁻²·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 roof decks, using appropriate fixings, the boards can adequately transfer maintenance traffic loads and negative and positive (suction and pressure) wind loads to the roof deck.

8.2 When adhesively fixed, adhesion between the insulation board component and VCL, and between the boards and overlay, is 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, mechanical fixing should be considered, and the advice of the Certificate holder should be sought as to the method of fixing. Reference should be made to BS EN 1991-1-4 : 2005 where a calculation is required for a specific building project.

8.3 The roof construction must be structurally sound and have sufficient strength and stability to resist all dead, imposed and wind loadings. It must also have adequate resistance to the pull-out forces created by the wind forces acting on the specified fixings used.

8.4 The suitability of the roof construction for any specified mechanical fixings or adhesive bond must be checked before installation. In cases where mechanical fixings are needed, in-situ pull-out or pull-through testing needs to be carried out 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.

8.5 The number and type of mechanical fixings required will vary depending on the geographical location of the building, topographical data and height and width of the roof concerned etc, and the Certificate holder's advice should be sought in this respect. The Certificate holder recommends a minimum number of fixings per board size: see sections 14.4, 14.5 and 14.24.

8.6 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 EN 1991-1-4 : 2005. All calculations should be approved by a suitably competent and experienced individual.

8.7 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.

8.8 For adhesive application of the TR27 boards, the substrate must be dry and free of dust, 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.

8.9 Roof waterproof covering systems (see sections 4.4 and 4.5 for suitable types) must be applied in accordance with the relevant Agrément Certificates or manufacturer's guidance.

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

8.11 The products 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.

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

Table 5 Maximum clear span

Maximum clear span (mm)	Minimum roofboard thickness (mm)
> 150 ≤ 175	45
> 175 ≤ 200	50
> 200 ≤ 225	55
> 225 ≤ 250	60 – 160

8.13 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 products have a reaction to fire classification* of Class E to BS EN 13501-1 : 2007.

9.2 The fire rating of any roof containing the products will depend on the type of deck and the nature of the roof waterproofing.



9.3 The constructions shown in Table 6 and Table 7 achieve a roof covering designation of either AB or AC (Low vulnerability in Scotland) and are acceptable for use less than 6 m from a relevant boundary.

Table 6 Fire ratings for Thermo roof TR26

Standard	Substrate deck ⁽¹⁾	VCL ⁽¹⁾	Insulation	Waterproofing membrane ⁽¹⁾	Fixing method ⁽¹⁾	Roof inclination	Designation
BS 476-3 : 2004	18 mm OSB timber	0.22 mm Sarnavap	85 mm Thermo roof TR26	1.25 mm Sarnafil S327-12EL	Mechanical	0°	EXT.F.AB
	18.5 mm plywood	0.21 mm Ecovap	80 mm Thermo roof TR26	1.26 mm Sarnafil S327-12EL	Mechanical	45°	EXT.S.AB
	0.75 mm profiled metal	0.20 mm Ecovap	50 mm Thermo roof TR26	1.20 mm Trelleborg Ecoséal EPFR 120	Mechanical	0°	EXT.F.AC
STN EN 1363-1 : 2001, STN EN 1363-2 : 2001 and STN EN 1365-2 : 2001	0.75 mm profiled metal	0.2 mm foil PE	2 x 55 mm Thermo roof TR26	1.20 mm PVC	Mechanical	0°	Retained specimen integrity for 32 minutes

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

Table 7 Fire ratings for Thermarook TR27

Standard	Substrate deck ⁽¹⁾	VCL ⁽¹⁾	Insulation	Waterproofing membrane ⁽¹⁾	Fixing method ⁽¹⁾	Roof inclination	Designation	
BS 476-3 : 2004	18 mm OSB timber	1.5 mm bituminous	100 mm Thermarook TR27	1.23 mm Sarnafil G410-12EL	2170 Adhesive	0°	EXT.F.AC	
	18 mm OSB timber	1.4 mm bituminous	100 mm Thermarook TR27	1.2 mm Sarnafil G410-12EL	2170 Adhesive	45°	EXT.S.AB	
	18 mm OSB timber	3 mm bituminous	100 mm Thermarook TR27	5 mm thick Sarnafil TG76-12 Felt	2142S Adhesive	0°	EXT.F.AC	
	12 mm plywood	2 mm Paravapo SBS metaHined bituminous	90 mm Thermarook TR27	5 mm thick Parafor Solo GFM	Mechanical	0°	EXT.F.AB	
	12 mm plywood	3 mm Paravapo SBS metaHined bituminous	90 mm Thermarook TR27	Graviflex Extensive Green Roof System with live Sedum plant covering	Bonded by torching and Insta stik Adhesive	0°	EXT.F.AA	
	18 mm WBP plywood	2 mm bituminous	120 mm Thermarook TR27	2.2 mm (including fleece backing) ICB Alwitra Evalon V single-ply	Caswell ICB PU-M Adhesive and DOW Insta stik	0°	EXT.F.AB	
	18 mm WBP plywood	2 mm bituminous	120 mm Thermarook	2.4 mm ICB Alwitra XTEVA single-ply	Caswell ICB PU-M Adhesive and DOW Insta stik	0°	EXT.F.AB	
	6 mm calcium silicate board	Liquid Plastics 1.5 mm bituminous	40 mm Thermarook TR27	Gamma 20	Liquid Plastics Decostik Adhesive	0°	EXT.F.AB	
	Classified in accordance with BS EN 13501-5 : 2005	6 mm calcium silicate board	Liquid Plastics 1.5 mm bituminous	40 mm Thermarook TR27	Gamma 20	Liquid Plastics Decostik Adhesive	0°	B _{ROOF} (t4)
	STN EN 1363-1 : 1999, STN EN 1363-2 : 1999 and STN EN 1365-2 : 2000	Trapezoidal steel sheet 85A 0.75 mm S 320 G	0.2 mm foil PE	100 mm Thermarook TR27	1.2 mm Protan PVC foil single-ply	Mechanical	0°	Retained specimen integrity for 31 minutes

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

9.4 The designation of other specifications, eg when used on combustible substrates, 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⁽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.

10 Acoustic performance

Thermarook TR26 LPC/FM and Thermarook TR27 LPC/FM boards have also been assessed for airborne sound transmission (see Table 8) and rain-generated impact sound reduction (see Table 9). The degree of sound insulation achieved for completed constructions will depend substantially on the design and quality of construction of the roof and their associated flanking elements. Further improvements may be achieved through the use of additional acoustic insulation.

Table 8 Airborne sound transmission

Test method	Method calculated	Substrate deck ⁽¹⁾	Insulation	Waterproofing membrane ⁽¹⁾	Fixing method ⁽¹⁾	Roof inclination	Airborne sound reduction
BS EN ISO 140-3 : 1995, BS 2750-3 : 1995 and BS EN ISO 140-6 : 1998	BS EN ISO 717-1 : 1997	0.7 mm thick galvanized steel deck	80 mm Thermarook TR26/TR27	single-ply	Mechanical	0°	R _w (C;Ctr) = 27 (-1;-3) dB

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

Table 9 Rain-generated impact sound reduction

Test method	Substrate deck ⁽¹⁾	VCL ⁽¹⁾	Insulation	Waterproofing membrane ⁽¹⁾	Roof inclination	Rain-generated impact sound reduction
ISO 140-18 : 2006	0.7 mm thick galvanized steel deck	Polythene	100 mm Thermarroof TR26	1.2 mm single-ply membrane		LIA = 60.2 dB
	0.7 mm thick profiled metal deck (MF)	1.5 mm bituminous felt (A)	110 mm Thermarroof TR27 (A)	1.2 mm single-ply membrane with a fleece backing (A)	0°	LIA = 56.1 dB
		0.2 mm polythene (MF)	110 mm Thermarroof TR27 (MF)			LIA = 57.0 dB
	0.7 mm thick galvanized steel deck	Polythene	100 mm Thermarroof TR26	1.2 mm single-ply membrane with a fleece backing	0°	LIA = 57.4 dB

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

(A) Adhesively fixed.

(MF) Mechanically fixed.

11 Maintenance

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

12 Durability



12.1 The boards are rot-resistant and durable, and will have a life at least as long as that of the roof waterproof covering.

12.2 When the waterproof covering is renewed at a later date, the insulation will remain suitable for continued use, provided it is undamaged by replacement of the waterproof covering.

Installation

13 General

13.1 Thermarroof TR26 LPC/FM and Thermapaper TT46 LPC/FM and Thermarroof TR27 LPC/FM and Thermapaper TT47 LPC/FM 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.

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

13.3 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 or backfalls found in the roof deck must be rectified prior to laying the insulation.

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

13.5 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.

13.6 Where the specified VCL is other than a reinforced bitumen membrane 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.

13.7 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.

13.8 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.

13.9 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. Boards accidentally wetted must be left to dry out or, if damaged, replaced before application of the waterproof layer
- boards should be installed only when the ambient temperature is above 5°C to prevent condensation.

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

13.11 Once installed, access to the roof should be restricted in accordance with section 4.6 of this Certificate.

14 Procedure

Thermarroof TR26 LPC/FM and Thermataper TT46 LPC/FM Roofing Boards

General

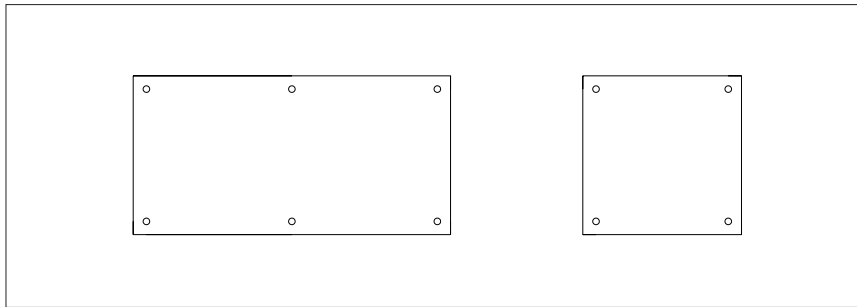
14.1 The specified VCL should have a minimum of 150 mm side and end laps which should be adequately sealed.

14.2 The VCL should also be turned up at, but not sealed to, all vertical surfaces which abut the roof, to a minimum height of 250 mm and overhanging the verge or gutter by the same amount.

14.3 Before applying the roof finish, the projecting 250 mm of the VCL should be turned over the insulation and sealed down to form an envelope.

14.3 A minimum of 6 fixings should be used for 2400 mm by 1200 mm boards, or a minimum of 4 for 1200 mm by 1200 mm boards. Fixings located along the edges or at the corners of boards should be situated no less than 50 mm, but less than 150 mm, from the board edges (see Figure 1).

Figure 1 Minimum layout of fixings



14.5 The requirements for an additional number of fixings above those noted in section 14.4, should be assessed in accordance with BS 6399-2 : 1997 or BS EN 1991-1-4 : 2005.

14.6 The waterproofing membrane is mechanically fixed, the securing requirements of which should be considered separately.

Timber (eg tongue-and-groove boards) or concrete decks

14.7 Timber or concrete decks should be clean and free from large projections, steps or gaps.

14.8 The deck should either be graded to allow correct falls to all drainage outlets or the Thermataper TT46 LPC/FM Roofing Boards should be utilised to form the roof falls.

14.9 Thermarroof TR26 LPC/FM Roofing Boards should be laid break-bonded, whilst Thermataper TT46 LPC/FM Roofing Boards are laid using a chequerboard pattern. Both systems should be laid above a suitable VCL with joints between the insulation boards lightly butted.

Metal decks

14.10 The boards are laid above a suitable VCL with joints lightly butted.

14.11 Thermarroof TR26 LPC/FM Roofing Boards should be laid break-bonded, Thermataper TT46 LPC/FM Roofing Boards are laid using a chequerboard pattern, either with the long edge at right angles to the trough openings or diagonally across the corrugation line. Whichever system is chosen, care must be taken to ensure all joints are supported by the deck.

14.12 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.

Thermarroof TR27 LPC/FM and Thermataper TT47 LPC/FM Roofing Boards

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

14.13 If using a bituminised felt VCL, the felt 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.

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

14.15 Hot bitumen adhesive (maximum temperature of 240°C), polyurethane adhesive or a suitable solvent-based adhesive is applied over the VCL and the roofing boards are fully embedded into it and close butted. Thermarroof TR27 LPC/FM Roofing Boards should be laid break-bonded, whilst Thermataper TT47 LPC/FM Roofing Boards are laid using a chequerboard pattern.

14.16 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

14.17 Before applying the 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 a suitable primer. The advice of the Certificate holder should be sought in respect of a suitable primer.

14.18 For adhered systems, the VCL is fully bonded with hot bitumen, polyurethane adhesive or a suitable solvent-based adhesive and the laps sealed. The boards are applied in the manner described for timber decks (see sections 14.15 and 14.16).

Metal decks

14.19 If adhering the VCL and insulation boards, the deck should be treated with a suitable primer before applying the VCL. The advice of the Certificate holder should also be sought in respect of a suitable primer.

14.20 For adhered systems, the reinforced 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 sections 14.15 and 14.16).

14.21 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.

14.22 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.

Mechanical fixings

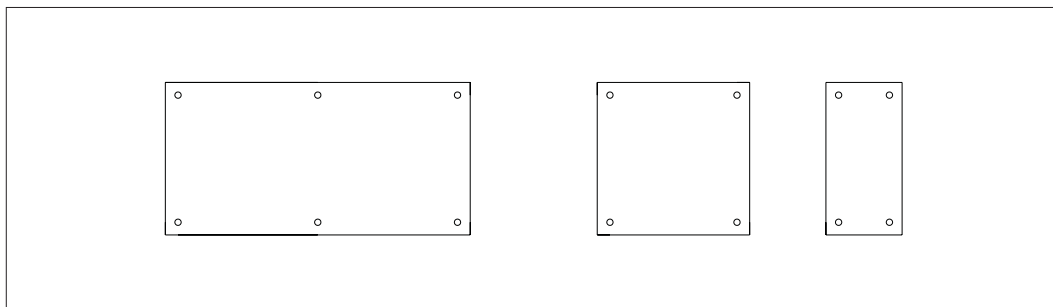
14.23 Alternatively, boards can be secured to timber, metal and concrete decks by means of mechanical fixings.

14.24 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 10 and shown in Figure 2, 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 mm by 600 mm boards.

Table 10 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 2 Fixing layouts – minimum fixing numbers (for solely mechanically-fixed specification)



14.25 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.

Technical Investigations

15 Tests

Tests were carried out by the BBA to determine:

- behaviour under variations in temperature (unrestrained)
- behaviour under distributed load and increased temperature
- bowing under the effect of a thermal gradient
- behaviour on exposure to moisture
- behaviour under concentrated loads in the middle of a free span.

16 Investigations

16.1 An examination was made of data relating to:

- density
- dimensional stability with temperature
- water vapour resistance/resistivity
- dimensional changes due to variations
- effect of concentrated load under a free span
- fire rating
- compressive strength
- thermal conductivity (fresh and aged)
- dimensional accuracy
- dimensional variations in unrestrained panels
- behaviour under distributed load and increased in humidity temperature
- effect of immersion and heat ageing on compressive and tensile strength
- resistance to peel
- condensation risk
- adhesion.

16.2 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.

16.3 Wind uplift testing has been conducted by the Certificate holder in accordance with BRL 1309 (Dutch National Assessment Guideline) for the Thermarof TR26 LPC/FM boards fixed to a profiled steel deck substrate with various fixings. This data has been reviewed by the BBA and can be obtained from the Certificate holder.

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- BS 2750-3 : 1995 *Acoustics — Measurement of sound insulation in buildings and of building elements — Laboratory measurements of airborne sound insulation of building elements*
- BS 3416 : 1991 *Specification for bitumen-based coatings for cold application, suitable for use in contact with potable water*
- 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 8212 : 1995 *Code of practice for dry lining and partitioning using gypsum plasterboard*
- BS 8217 : 2005 *Reinforced bitumen membranes for roofing — Code of practice*
- BS 8218 : 1998 *Code of practice for mastic asphalt roofing*
- BS 8747 : 2007 *Reinforced bitumen membranes (RBMs) for roofing — Guide to selection and specification*
- BS EN 1991-1-4 : 2005 + A1 : 2010 *Eurocode 1 : Actions on structures — General actions — Wind actions*
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Conditions of Certification

17 Conditions

17.1 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.

17.2 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.

17.3 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.

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

17.5 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.

17.6 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.