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**Agrément
Certificate
No 06/4384**

Designated by Government
to issue
European Technical
Approvals

Product

• THIS CERTIFICATE RELATES TO KINGSPAN THERMAROOF TR21, A RIGID POLYISOCYANURATE INSULATION BOARD WITH GLASS-REINFORCED PERFORATED CELLULOSE FACINGS ON BOTH SIDES.

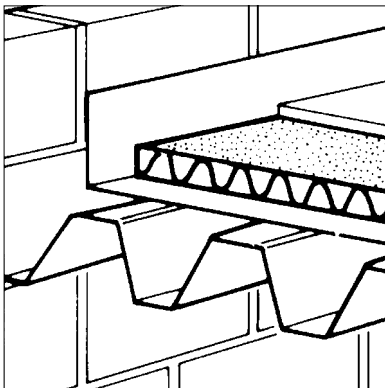
• The board is for use as a thermal insulation layer on limited access flat roofs on suitably designed concrete, timber or metal structural decks.

• The board is available in a number of thicknesses to suit different design requirements.

• The board must always be used with a suitable vapour control layer.

• Tapered boards are available to create or improve falls on flat roofs.

• It is essential that the board is installed in accordance with the conditions set out in the Design Data and Installation parts of this Certificate.




KINGSPAN THERMAROOF TR21

Isolant d'étanchéité support d'étanchéité
Wärmedämmung des Daches

Regulations

1 The Building Regulations 2000 (as amended) (England and Wales)

 The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of roof insulation with the Building Regulations. In the opinion of the BBA, Kingspan Thermaroom TR21, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: B4(2)

External fire spread

Comment:

When used in conjunction with appropriate roof decks and roof finishes, the board can meet this Requirement. See sections 10.3 and 10.4 of this Certificate.

Requirement: C2(c)

Resistance to moisture

Comment:

The board is acceptable. See sections 12.2 and 12.4 of this Certificate.

Requirement: L1(a)(i)

Conservation of fuel and power

Comment:

The board will enable, or contribute to enabling, a roof to meet the Target Emission Rate. See sections 11.1 to 11.5 of this Certificate.


Requirement: Regulation 7

Materials and workmanship

Comment:

The product is acceptable. See section 14 of this Certificate.

2 The Building (Scotland) Regulations 2004

 In the opinion of the BBA, Kingspan Thermaroom TR21, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Mandatory Standards as listed below.

Regulation: 8

Fitness and durability of materials and workmanship

Regulation: 8(1)

Fitness and durability of materials and workmanship

Comment:

The board can contribute to a construction meeting this Regulation. See section 14 and the *Installation* part of this Certificate.

Regulation: 9

Building standards – construction

Standard: 2.8

Spread from neighbouring buildings

Comment:

When used in conjunction with appropriate roof decks and roof finishes, the board is unrestricted under this Standard, with reference to clause 2.8.1⁽¹⁾⁽²⁾. See section 10.4 of this Certificate.

Standard: 3.15

Condensation

Comment:

When used in conjunction with an appropriate vapour control layer, the board will be unrestricted under this Standard, with reference to clauses 3.5.1⁽¹⁾⁽²⁾ to 3.5.4⁽¹⁾⁽²⁾. See sections 12.3 and 12.4 of this Certificate.

Standard: 6.2

Building insulation envelope

Comment:

The board will enable a roof to satisfy the Elemental Method of limiting heat loss, with reference to clause 6.2.1⁽¹⁾⁽²⁾. See sections 11.1, 11.6 and 11.7 of this Certificate.

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Electronic Copy

3 The Building Regulations (Northern Ireland) 2000



In the opinion of the BBA, Kingspan Thermarroof TR21, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The board is acceptable. See section 14 of this Certificate.
Regulation:	C5	Condensation
Comment:		When used in conjunction with an appropriate vapour control layer, the board will be unrestricted under this Regulation. See section 12.4 of this Certificate.
Regulation:	E5	External fire spread
Comment:		When used in conjunction with appropriate roof decks and roof finishes, the board can satisfy this Regulation. See sections 10.3 and 10.4 of this Certificate.
Regulation:	F2	Building fabric
Comment:		The board will enable a roof to satisfy the Elemental Method of limiting heat loss. See sections 11.1 and 11.8 of this Certificate.

4 Construction (Design and Management) Regulations 1994 (as amended) Construction (Design and Management) Regulations (Northern Ireland) 1995 (as amended)

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See section: 9 Resistance to loading (9.1).

Technical Specification

5 Description

5.1 Kingspan Thermarroof TR21 is a polyisocyanurate insulation board with glass-reinforced perforated cellulose facing either side and produced by a continuous laminating process. The raw materials in their correct proportions are mixed and sprayed evenly onto the inside face of the glass-reinforced, perforated cellulose facing. The PIR foam, is brought into contact with the second glass-reinforced cellulose facing and cured under pressure.

5.2 The boards⁽¹⁾ are available with nominal dimensions of:

size (mm) 1200 by 600
thickness⁽²⁾ (mm) 30, 35, 40, 50, 60, 70, 75 and 80.

(1) The boards are also available in a tapered version for falls of 1:60.

(2) Other thicknesses are available on request.

5.3 The foam core has nominal physical characteristics of:

- compressive stress (min) — 150 kPa at 10% yield
- density — 32 kgm⁻³.

6 Delivery and site handling

6.1 The boards are delivered to site in packs shrink-wrapped in polythene sheet. Each pack carries a label bearing the manufacturer's name and the BBA identification mark incorporating the number of this Certificate.

6.2 Packs should be stored flat, off the ground, on a clean, level surface under cover to protect them from precipitation moisture, mechanical damage or high winds.

6.3 Boards should not be stored in direct sunlight or in areas subject to elevated temperatures, there may be a risk of bowing caused by a thermal gradient across the board, especially when in excess of 30 mm thick.

6.4 Care must be taken to avoid damaging corners and edges.

Design Data

7 General

7.1 Kingspan Thermarroof TR21 is for use as a thermal insulation layer on limited access flat roofs with concrete, timber or metal structural decks.

7.2 Decks should be designed in accordance with the relevant clauses of BS 8217 : 2005, BS 8218 : 1998, BS 6229 : 2003 and, where appropriate, NHBC Standards, Chapter 7.1 and the Zurich Building Guarantee Technical Manual, section 4 Superstructure.

7.3 The roofs should incorporate an effective vapour control layer (VCL).

7.4 The boards are for use with one of the following waterproofing specifications:

- (a) built-up felt specifications laid partially bonded, in conjunction with a type 3G venting layer to BS 747 : 2000, directly on to the boards in accordance with BS 8217 : 2005
- (b) two-layer, mastic asphalt with sheathing felt laid in accordance with BS 8218 : 1998 deemed to be of designation AA.

7.5 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. Where traffic in excess of this is envisaged, special precautions, such as additional protection to the waterproofing membrane, must be taken.

7.6 Flat roofs are defined for the purpose of this Certificate as those roofs having a minimum finished fall of 1:80 as in BS 6229 : 2003. Pitched roofs are defined as those having falls in excess of 1:6.

7.7 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 deflection, direction of falls, and so on.

7.8 Tapered boards may be used where appropriate to achieve the minimum finished falls required.

8 Adhesion

Adhesion between the insulation board and the vapour control layer (VCL) and between the board 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 as defined in the relevant clauses of BS 6399-2 : 1997.

9 Resistance to loading

9.1 The boards have adequate resistance to the loads associated with the minimal pedestrian traffic envisaged in the maintenance of the roof. For areas where heavier pedestrian traffic is envisaged (ie access to lift motor rooms), extra precautions should be taken. Walkways of paving on bearer pads must be provided. Where such traffic cannot be controlled, paving slabs must be used as the loading medium.


9.2 Care must be taken to avoid damage to the boards by impact or by concentrated loads when

unprotected or when covered by an appropriate waterproofing system.

10 Behaviour in relation to fire


10.1 The fire rating of any roof containing the boards will depend on the type of deck and on the built-up felt or mastic asphalt waterproofing layer and surface finish used.

10.2 When tested to BS 476-3 : 2004 a roof comprising under System 600 Cap Sheet, 95/25 bonding bitumen, fixed to a timber deck, achieved an EXT.FAC rating.

 10.3 When used for flat roofs incorporating the built-up felt specifications described in section 7.4(a) and with one of the surface finishes defined in Part iii of Table A5 of Appendix A of Approved Document B of the Building Regulations (England and Wales) or Technical Booklet E, Table 4.6, Part IV of the Building Regulations (Northern Ireland) (and listed below), the roof is deemed to be of designation AA.

Surface finishes:

- bitumen-bedded stone chippings covering the whole surface to a depth of not less than 12.5 mm
- bitumen-bedded tiles of a non-combustible material
- sand and cement screed, or
- macadam.

 10.4 The designation of other specifications for example, when used on combustible substrates, should be confirmed by:

England and Wales

Test or assessment in accordance with Clause A1 of appendix A of Approved Document B

Scotland

Test to conform to Mandatory Standard 2.8, clause 2.8.1⁽¹⁾⁽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.

11 Thermal performance



 11.1 Calculations of the thermal transmittance (U value) of specific roof constructions should be carried out in accordance with BS EN ISO 6946 : 1997 and BRE report (BR 443 : 2006), *Conventions for U value calculations* using thermal conductivity ($\lambda_{90/90}$ value) for the boards as shown in Table 1.

Table 1 Thermal conductivity

Thickness (mm)	Declared λ value ($\text{Wm}^{-1}\text{K}^{-1}$)
<80	0.027
>80<120	0.026
>120	0.025

 11.2 Subject to the selection of the appropriate board thickness the construction can improve on the Elemental U value of $0.25 \text{ Wm}^{-2}\text{K}^{-1}$ required by the 2002 Regulations. The product can therefore contribute to enabling a building to meet the Target Emission Rate 'average' improvements of 20% (dwellings) and 23 to 28% (buildings other than dwellings) specified in Approved Documents L1A and L2A respectively.


11.3 The product can maintain, or contribute to maintaining, continuity of thermal insulation at junctions between the roof and other building elements. Guidance in this respect and on limiting heat loss by air infiltration, can be found in *Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings* TSO 2002.

11.4 Compliance with the guidance referred to in section 11.3, including airtightness measures, will allow the use of the default psi values from Table 3 of BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings* and Table K1 of SAP 2005 *The Government's Standard Assessment Procedure for Energy Rating of Dwellings*, in Target Emission Rate calculations to SAP 2005 or the Simplified Building Energy Model (SBEM)⁽¹⁾.


(1) Published by the Department for Communities and Local Government on its website: www.communities.gov.uk

11.5 When installed in roofs of existing buildings, the product can meet, or contribute to meet, the relevant requirements of the following guidance documents:

- Approved Document L1B, section 2
- Approved Document L2B, section 3.

 11.6 Subject to the selection of an appropriate board thickness, roofs can satisfy the Elemental target U value of $0.25 \text{ Wm}^{-2}\text{K}^{-1}$ specified in Table 1 to clause 6.2.1 of the Technical Handbooks.

11.7 The product can maintain, or contribute to maintaining, continuity of thermal insulation at junctions between the roof and other building elements. Guidance in BRE report (BR 262 : 2002) *Thermal insulation : avoiding risks* is acceptable.


 11.8 Subject to the selection of an appropriate board thickness, a roof construction in Northern Ireland can satisfy the Elemental Target U value of $0.35 \text{ Wm}^{-2}\text{K}^{-1}$


specified in Tables 1.2 and 1.4 of Technical Booklet F.

12 Condensation risk


12.1 Where an effective VCL is difficult to ensure, eg where the board has additional mechanical fixings, the risk of condensation should be assessed in accordance with Annex A of BS 6229 : 2003.

Surface condensation

 12.2 Ceilings will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $0.35 \text{ Wm}^{-2}\text{K}^{-1}$ at any point and the junctions with other elements are designed in accordance with the relevant requirements of *Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings* TSO 2002 or BRE Information Paper IP 1/06.

 12.3 Ceilings will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $1.2 \text{ Wm}^{-2}\text{K}^{-1}$ at any point. Guidance may be obtained from section 8 of BS 5250 : 2002 and BRE report (BR 262 : 2002).


Interstitial condensation

 12.4 Roofs incorporating the board will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2002, Section 8 and Appendix D.

13 Maintenance

Maintenance of the insulation layer will not be required provided the roof waterproof covering remains intact.

14 Durability

 The boards are rot-resistant and durable. They will have a life at least as long as that of the roof waterproofing.

Installation

15 General

15.1 Installation of Kingspan Therमारoof TR21 must be in accordance with the manufacturer's instructions, BS 8217 : 2005, BS 8218 : 1998, BS 6229 : 2003 or the relevant BBA Certificate, depending on the waterproofing to be applied.

15.2 The deck surface 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 prevent adhesion. All deck joints should be taped and, where necessary, the deck coated with bitumen primer to BS 3416 : 1991.

15.3 The boards can be cut with a sharp knife or fine-toothed saw to fit around the roof edge and around projections through the roof.

15.4 To prevent moisture entrapment, the boards must be kept fully dry at all times and appropriate precautions taken against condensation and precipitation, prior to the application of the roof waterproofing layer.

16 Procedure

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

16.1 The VCL is nailed to the deck and the nail heads blanked out with hot bitumen. Laps are sealed using the appropriate grade of bitumen in accordance with BS 8217 : 2005 or BS 8218 : 1998.

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

16.3 At perimeters, the VCL must overlap at the edges of the insulation board. When mastic asphalt is used, the edge of the VCL is kept vertical to bond in with the mastic asphalt waterproofing.

16.4 Hot bitumen adhesive (maximum temperature of 240°C) is applied over the VCL and the roofing boards are fully embedded into it, and close butted with broken bond (ie staggered) end joints.

16.5 It is important to seal any exposed edges of the boards, eg at roof vents and upstands, with waterproofing or bituminous felt in hot bitumen in accordance with normal practice as defined in BS 8217 : 2005.

Concrete and screeded concrete decks

16.6 Before applying the VCL, an appropriate levelling screed should be applied where necessary, and the whole deck treated with a suitable bitumen primer.

16.7 The VCL is fully bonded with hot bitumen and laps sealed, and the boards applied in the manner described for timber decks (see sections 16.4 and 16.5).

Metal decks

16.8 Before applying the VCL, the deck is treated with a suitable primer.

16.9 A reinforced VCL is fully bonded to the metal deck and the boards applied in the manner

described for timber decks (see sections 16.4 and 16.5).

16.10 Boards are laid with the long axis at right angles to the corrugations of the metal deck, ensuring that all joints are fully supported on the crown flats of the decking.

16.11 The thickness of the board used depends on the clear span between corrugations as indicated in Table 2.

Table 2 Maximum clear span

Board thickness (mm)	Maximum clear span (mm)
25	75
30	100
35	125
40	150
45	175
50	200

Additional mechanical fixings

16.12 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 can be assessed in accordance with BS 6399-1 : 1996.

Weatherproofing (all systems)

16.13 One of the following waterproofing methods should be used:

- three-layer, built-up bitumen felt to BS 747 : 2000, or BS EN 13707 : 2004 type 3G felt base layer laid partially bonded directly on to the roofing boards with the edge of the VCL turned down and bonded to the overlay in accordance with BS 8217 : 2005
- two-layer, mastic asphalt (maximum temperature 240°C) covered with either black sheathing felt of type 4A or 4B to BS 747 : 2000 loose-laid as an isolating membrane, followed by two layers of mastic asphalt laid and finished in accordance with BS 8218 : 1998. The number of coats should be appropriate to the waterproofing requirements and traffic conditions of the roof.

16.14 Once installed, access to the roof should be restricted in accordance with section 9.

Technical Investigations

The following is a summary of the technical investigations carried out on Kingspan Thermaroom TR21.

17 Investigations

An examination was made of data relating to:

MOAT No 50 : 1992

- density
- compressive strength at 10% compression
- dimensional stability with temperature
- thermal conductivity (fresh and aged)
- water vapour permeability
- behaviour under a thermal gradient
- behaviour under variations in temperature
- resistance to high temperature
- mechanical strength.

MOAT No 27 : 1983

- peel.

Bibliography

BS 747 : 2000 *Reinforced bitumen sheets for roofing — Specification*

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

BS 6229 : 2003 *Code of practice for flat roofs with continuously supported coverings*

BS 6399-1 : 1996 *Loading for buildings — Code of practice for dead and imposed loads*

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 13707 : 2004 *Flexible sheets for waterproofing — Reinforced bitumen sheets for roof waterproofing — Definitions and characteristics*

BS EN ISO 6946 : 1997 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

MOAT No 27 : 1983 *General Directive for the Assessment of Roof Waterproofing Systems*

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

Conditions of Certification

18 Conditions

18.1 This Certificate:

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

18.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

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

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

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

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

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



In the opinion of the British Board of Agrément, Kingspan Thermarroof TR21 is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 06/4384 is accordingly awarded to Kingspan Insulation Limited.

On behalf of the British Board of Agrément

Date of issue: 6th November 2006

Chief Executive

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British Board of Agrément

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For technical or additional information,
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front page).
For information about the Agrément
Certificate, including validity and
scope, tel: Hotline 01923 665400,
or check the BBA website.