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Agrément Certificate

07/4444

Product Sheet 7

QUINN THERM

QUINN THERM QRFR-GFR GLASS-FIBRE-FACED FLAT ROOF BOARD

This Agrément Certificate Product Sheet⁽¹⁾ relates to Quinn Therm QRFR-GFR Glass-fibre-faced Flat Roof Board, comprising a rigid polyisocyanurate (PIR) foam board with glass fibre facings on both sides. The product is for use as a thermal insulation layer on limited access concrete, timber or metal flat roof decks. It is for use in conjunction with a vapour control layer and adhesively-fixed roof waterproofing membranes, 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

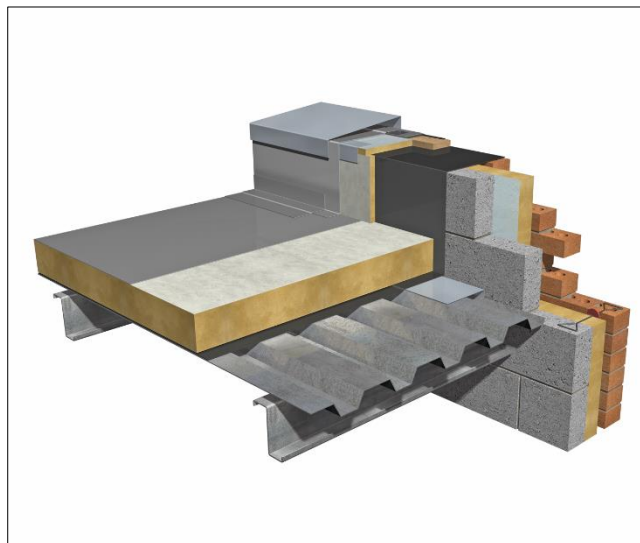
Thermal performance — the product has a declared thermal conductivity* (λ_D) of $0.026 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$, $0.025 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ or $0.024 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$, dependent upon the insulation thickness (see section 6).

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

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

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

Durability — the product, when used as thermal insulation in the roof system described in this Certificate, will have a life at least as long as that of a roof waterproof covering (see section 11).



The BBA has awarded this Certificate to the company named above for the product described herein. This product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 23 May 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, Quinn Therm QRFR-GFR Glass-fibre-faced Flat Roof Board, 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 product can contribute to satisfying this Requirement. See sections 8.1 and 8.2 of this Certificate.
Requirement:	B4(2)	External fire spread
Comment:		Roofs incorporating the product can satisfy this Requirement. See section 9.3 of this Certificate.
Requirement:	C2(c)	Resistance to moisture
Comment:		The product 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 product can contribute to satisfying this Requirement. See section 6 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The product is an acceptable material. See section 11 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 energy efficiency rates for new dwellings (applicable to Wales only)
Comment:		The product can contribute to satisfying these Regulations; however, compensating fabric/services measures may be required. See section 6 of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Durability, workmanship and fitness of materials
Comment:		The product can contribute to a construction satisfying this Regulation. See section 11 and the <i>Installation</i> part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	1.1	Structure
Comment:		The product is acceptable, with reference to clauses 1.1.1 ⁽¹⁾⁽²⁾ , 1.1.2 ⁽¹⁾⁽²⁾ and 1.1.3 ⁽¹⁾⁽²⁾ . See sections 8.1 and 8.2 of this Certificate.
Standard:	2.8	Spread from neighbouring buildings
Comment:		Roofs incorporating the product can satisfy this Standard, with reference to clause 2.8.1 ⁽¹⁾⁽²⁾ . See section 9.3 of this Certificate.
Standard:	3.15	Condensation
Comment:		The product can contribute to a roof satisfying 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 7.1 and 7.5 of this Certificate.

Standard:	6.1(b)	Carbon dioxide emissions
Standard:	6.2	Building insulation envelope
Comment:		The product 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 product can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard. In addition, the product can contribute to a construction meeting a higher level of sustainability as defined in this Standard, with reference to clauses 7.1.4 ⁽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 6.2 of this Certificate.
Regulation:	12	Building standards applicable to conversions
Comment:		Comments made in relation to the product 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 product is acceptable. See section 11 and the <i>Installation</i> section of this Certificate.
Regulation:	29	Condensation
Comment:		The product can contribute to satisfying this Regulation. See section 7.1 of this Certificate.
Regulation:	30	Stability
Comment:		The product can contribute to satisfying this Regulation. See sections 8.1 and 8.2 of this Certificate.
Regulation:	36(b)	External fire spread
Comment:		Roofs incorporating the product 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:		Roofs incorporating the product can satisfy 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* (3.3) of this Certificate.

Additional Information

NHBC Standards 2016

NHBC accepts the use of Quinn Therm QRFR-GFR Glass-fibre-faced Flat Roof Board, provided it is 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 product, in accordance with harmonised European Standard BS EN 13165 : 2012. An asterisk (*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

Technical Specification

1 Description

1.1 Quinn Therm QRFR-GFR Glass-fibre-faced Flat Roof Board comprises a rigid polyisocyanurate (PIR) foam board with glass fibre facings on both sides.

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

Table 1 Nominal characteristics

Length x width (mm)	1200 x 600
Thickness (mm)	25 to 150
Compressive strength at 10% compression* (kPa)	≥150
Edge detail	Plain or rebated

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

- waterproofing membrane
- vapour control layer (VCL)
- adhesive and/or mechanical fixings.

2 Manufacture

2.1 Quinn Therm QRFR-GFR Glass-fibre-faced Flat Roof Board is manufactured by blending together polyol and MDI in a continuous foaming process aided by a blowing agent, and sandwiched between two glass fibre facings. After formation, the boards are left to cure and are cut to 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 being operated by the manufacturer are being maintained.

2.3 The management system of Quinn Therm Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by Certification Europe (Certificate 2500/262).

3 Delivery and site handling

3.1 The product is delivered to site in packs, shrink-wrapped in polythene, containing a label with the product description and characteristics, the manufacturer's name, and the BBA logo incorporating the number of this Certificate.

3.2 It is essential that the product is stored off the ground, inside or under cover on a flat, dry, level surface in a well-ventilated area, and with nothing stored on top of it. The product must be protected from rain, snow and prolonged exposure to sunlight. Boards that have been allowed to get wet, or that are damaged, must not be used.

3.3 The product must not be exposed to a naked flame or other ignition sources, or to solvents or other chemicals.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Quinn Therm QRFR-GFR Glass-fibre-faced Flat Roof Board.

Design Considerations

4 General

4.1 Quinn Therm QRFR-GFR Glass-fibre-faced Flat Roof Board is suitable for use as a thermal insulation layer on concrete, timber or metal flat roofs, with access limited to maintenance only (see section 4.5).

4.2 Decks should be designed in accordance with the relevant clauses of BS 6229 : 2003, BS 8217 : 2005, BS 8218 : 1998 or BS EN 13956 : 2012 and, where appropriate, *NHBC Standards* 2016, Chapter 7.1.

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

4.4 The product is for use with the following waterproofing systems:

- partially-bonded reinforced bitumen membranes to BS 8217 : 2005
- mastic asphalt membrane to 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 membranes (adhesive or mechanically fixed), such as PVC, CSM, CPE, FPO (including TPO), VET, PIB or EPDM, which are the subject of a current Agrément Certificate and laid in accordance with, and within the limitations imposed by, that Certificate.

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

4.6 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.

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

5 Practicability of installation

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

6 Thermal performance



6.1 Calculations of thermal transmittance (U value), should be carried out in accordance with BS EN ISO 6946 : 2007 and BRE Report BR 443 : 2006, using the declared thermal conductivity (λ_D)* for the insulation as given below:

Declared thermal conductivity (λ_D)*:

- 0.026 $W \cdot m^{-1} \cdot K^{-1}$ for 25 mm to 79 mm thickness
- 0.025 $W \cdot m^{-1} \cdot K^{-1}$ for 80 mm to 119 mm thickness
- 0.024 $W \cdot m^{-1} \cdot K^{-1}$ for 120 mm to 150 mm thickness.

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

Table 2 Example U values

U value ($W \cdot m^{-2} \cdot K^{-1}$)	Insulation thickness ⁽¹⁾ (mm)		
	Concrete ⁽²⁾⁽⁵⁾	Timber ⁽³⁾⁽⁵⁾	Metal ⁽⁴⁾⁽⁵⁾
0.13	—	—	—
0.15	150	145	—
0.16	145	135	145
0.18	125	120	130
0.20	120	110	120
0.25	95	90	95

(1) Nearest available thickness. Insulation adhered to the VCL — no fixings.

(2) Suspended ceiling — no thermal value, 150 mm concrete deck — 1.35 $W \cdot m^{-1} \cdot K^{-1}$, VCL, insulation adhered to the VCL and single-ply waterproofing membrane adhered to the Insulation.

(3) 12.5 mm plasterboard, 150 mm timber joists (12.5%)/air cavity (87.5%), 18 mm plywood decking, VCL, insulation adhered to the VCL and single-ply waterproofing membrane adhered to the Insulation.

(4) Metal deck (not included in calculation), VCL, insulation adhered to the VCL and single-ply waterproofing membrane adhered to the Insulation.

(5) Includes 3.13 galvanized steel insulation fixings per m^2 and 3.55 galvanized steel waterproofing fixings per m^2 , with a 4.8 mm cross-sectional diameter.

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, Annexes D and H, and the relevant guidance.

7.2 The glass fibre facings have a water vapour resistance of 0.108 $MN \cdot s \cdot g^{-1}$ and the insulation core has a water vapour resistivity of 300 $MN \cdot s \cdot g^{-1} \cdot m^{-1}$ and, therefore, will provide a significant resistance to water vapour transmission.

7.3 To minimise moisture entering the roof, a VCL should be used with sealed and lapped joints and be turned up around the insulation and bonded to the waterproofing finish.

Surface condensation



7.4 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $0.35 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ at any point and the junctions with other elements are designed in accordance with 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 $1.2 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ at any point and the junctions with other elements are designed in accordance with the guidance referred to in BS 5250 : 2011, Annex H. Further guidance may be obtained from BRE Report BR 262 : 2002 and section 6.3 of this Certificate.

8 Strength and stability



8.1 When installed on suitable flat roof decks, using an appropriate adhesive fixing method, with additional mechanical fixings if required, the product can adequately transfer maintenance traffic loads and negative (suction) and positive (pressure) wind loads to the roof deck.

8.2 A dynamic wind-uplift test carried out on a finished roof system incorporating an adhesively-fixed roof waterproofing membrane and insulation boards adhesively fixed to the VCL/metal decking, achieved a wind pressure of -2.0 kPa. The tested system comprised: IKO Ultra prevENT torch-applied reinforced bituminous capsheet; IKO systems underlay (sand); 25 mm thick Quinn Therm QRFR insulation, adhesively-bonded to the VCL using SoudaTherm roff 170 adhesive; and self-adhesive VCL (IKO VCL – Sand SA) applied to bitumen primed metal decking. For adhesively-fixed systems, additional mechanical fixings should be considered and must be designed accordingly (including safety factor) for specific site conditions with higher wind loadings (see sections 8.6 and 8.7).

8.3 For adhesive application of the insulation product, the substrate must be free of dust and be 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. The adhesion between the deck and the VCL, the VCL and product, and between the product and the waterproofing system 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 engineer should be sought as to the method of fixing as defined in the relevant clauses of BS EN 1991-1-4 : 2005.

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

8.5 The suitability of the substrate to accept the adhesive bond or mechanical fixings must be established before installation. Mechanical fixings must be checked before installation by carrying out in-situ pull-out or pull-through testing to determine the maximum safe working load the fixings can resist. The advice of the Certificate holder should be sought in respect of suitable mechanical fixings.

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 carried out by a suitably qualified and experienced individual.

8.7 The fixing method and, if necessary, the type and number of mechanical fixings required will vary depending on the geographical location of the building, the topographical data, and the 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 (see sections 13.4 and 13.5).

8.8 Roof waterproofing systems (see section 4.4 for suitable types) must be applied in accordance with the relevant Agrément Certificates and manufacturer's instructions.

8.9 For design purposes, the product may be assumed to have an allowable compressive strength as detailed in Table 1.

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

8.11 When profiled decking is used, the product will need to span across the ribs. Maximum permissible spans between ribs for the different product thicknesses are given in Table B.1 of BS 4841-4 : 2006, reproduced below. For the minimum adhesive bonding area, see section 8.3.

Table 3 Maximum clear span

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

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

9 Behaviour in relation to fire

9.1 The reaction to fire classification* of the product in accordance with BS EN 13501-1 : 2007 is Class F for 25 mm to 55 mm thicknesses, and Class E for 60 mm to 150 mm thicknesses.

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



9.3 When classified in accordance with BS EN 13501-5 : 2005, a system comprising a 17.5 mm plywood deck, a 0.12 mm black plastic sheet VCL, a 150 mm thick QRFR-GFR glass-fibre-faced PIR insulation board mechanically fixed to the plywood, and an adhesively-fixed 3 mm layer of Sika Trocal SGK PVC fleece-backed single ply membrane, achieved a B_{ROOF} (t4) rating and is therefore suitable for use less than 6 m from a boundary.

9.4 The designation of other specifications should be confirmed by:

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

Scotland — test to conform to clauses 2.C⁽¹⁾ and 2.F⁽²⁾

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

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

10 Maintenance

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

11 Durability



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

Installation

12 General

12.1 Quinn Therm QRFR-GFR Glass-fibre-faced Flat Roof Board must be installed in accordance with the Certificate holder's instructions, BS 6229 : 2003, BS 8217 : 2005, BS 8218 : 1998 and BS EN 13956 : 2012.

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

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

12.4 The suitability of the substrate deck to accept the adhesive bond or mechanical fixings must be checked prior to the work commencing.

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

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

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

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

12.8 The product is for use with the waterproofing systems specified in section 4.4, and laid in accordance with the relevant British Standard and current Agrément Certificate.

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

13 Procedure

Timber decks eg tongue-and-groove boards, plywood (Figure 2)

13.1 A VCL is fixed to the deck, in accordance with BS 8217 : 2005 and the manufacturer's instructions.

13.2 The VCL should be laid with sealed laps, turned up around the insulation and sealed to the waterproof finish at all edges and penetrations such as roof lights, with detailing in accordance with the Standards and guidance in sections 7.1 and 12.1.

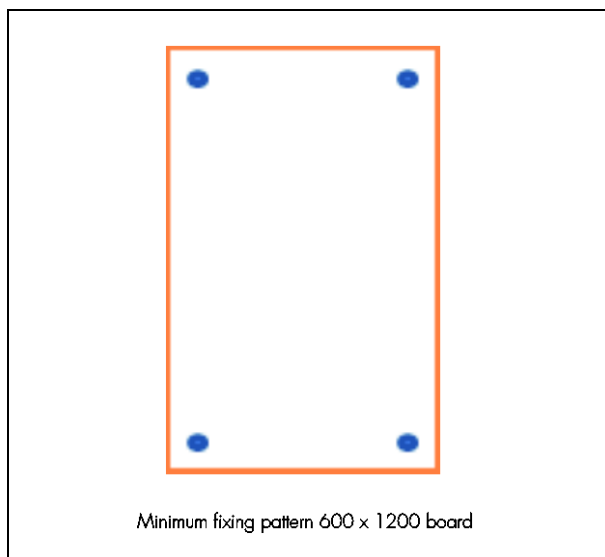
13.3 Where the insulation boards are adhered, hot bitumen adhesive, a polyurethane adhesive or a suitable solvent-based adhesive is applied over the VCL and the roofing boards are fully embedded into it and close butted in a break-bonded pattern.

13.4 If mechanical fixing is required for the insulation boards to suit the particular site conditions as an addition to, or instead of, the adhesive fixing method, the actual number of fixings is to be determined by a suitably qualified and experienced individual. For mechanical fixings, the pattern and minimum number of fixings (four per 600 mm by 1200 mm board) is shown in Figure 1.

13.5 Each fixing should incorporate a head or washer which is a maximum of 50 mm in diameter if round, or 50 mm by 50 mm if square. Fixings located along the edge or at corners of the boards should be situated no less than 50 mm and

no more than 150 mm from the board edge. For non-bituminous VCL's, the fixings penetrating the VCL should be self-sealing. For bituminous VCL's the nail heads should be blanked out with hot bitumen.

Figure 1 Minimum fixing pattern (dimensions in mm)



13.6 The roof waterproofing membrane is applied in accordance with the manufacturer's instructions.

Concrete decks (Figure 3)

13.7 Before applying the VCL, an appropriate levelling screed should be applied where necessary. The whole deck should be treated with a suitable primer, if necessary, in accordance with the manufacturer's instructions. The advice of the Certificate holder should be sought in respect of a suitable primer.

13.8 The VCL is fully bonded with hot bitumen, a polyurethane adhesive or a suitable solvent-based adhesive, and the laps are sealed. The insulation boards and roof waterproofing membrane are then applied in the manner described for timber decks (see sections 13.3 to 13.5).

Metal decks (Figure 4)

13.9 Before applying the VCL, the deck should be treated with a suitable primer, if necessary, in accordance with the manufacturer's instructions. The advice of the Certificate holder should be sought in respect of a suitable primer.

13.10 A reinforced VCL is fully bonded using hot bitumen, a polyurethane adhesive or a suitable solvent-based adhesive, to the metal deck and the laps are sealed. The insulation boards and roof waterproofing membrane are then applied in the manner described for timber decks (see sections 13.3 to 13.5).

13.11 The insulation boards are laid with the long edges at right angles to the ribs and all board ends must be fully supported on a rib.

13.12 The thickness of the insulation board used depends on the width of the rib openings of the metal deck, as indicated in section 8, Table 3.

Figure 2 Installation — Timber deck

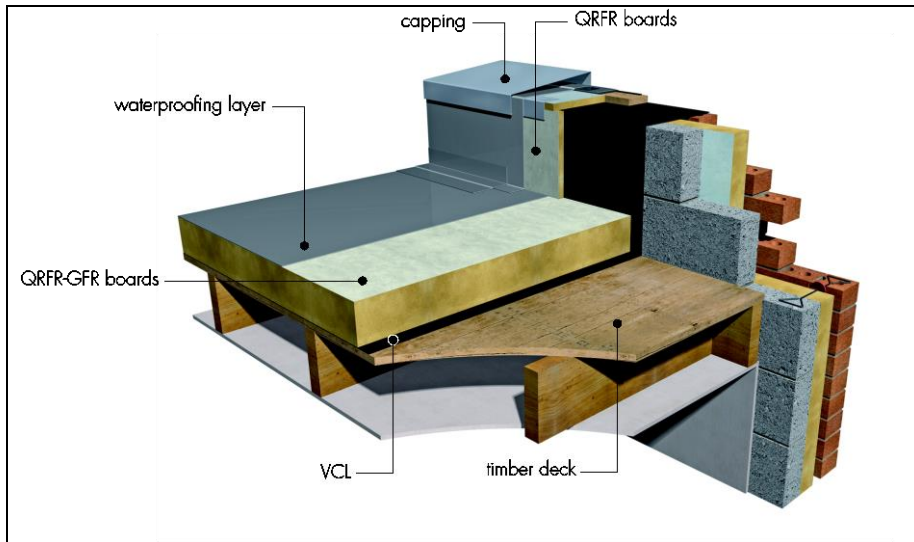


Figure 3 Installation — Concrete deck

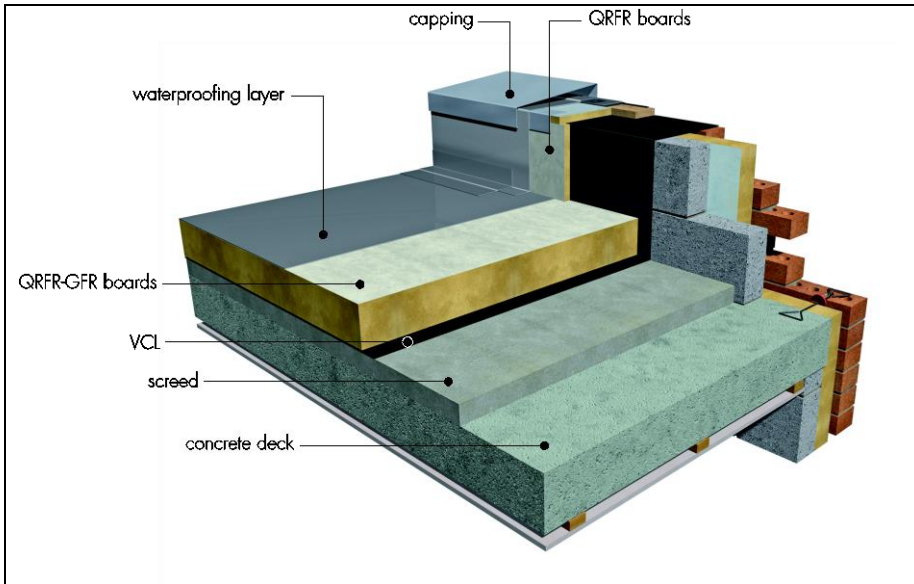
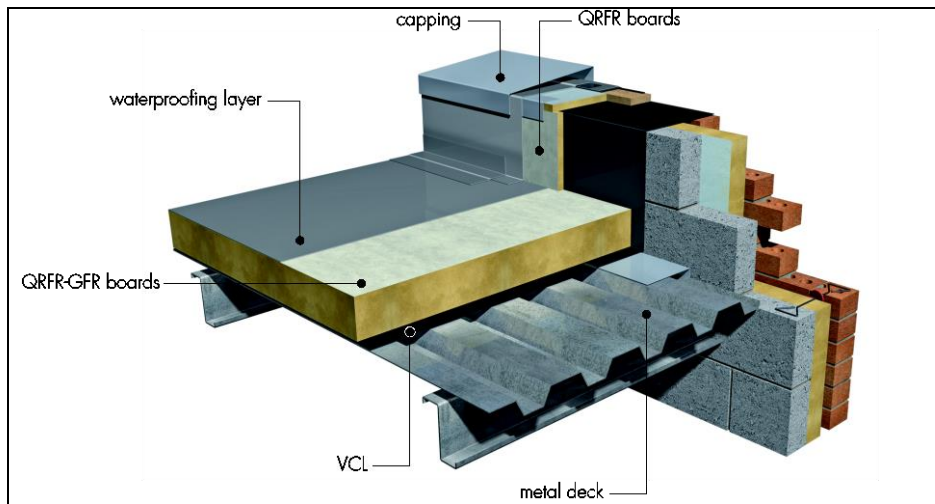


Figure 4 Installation — Metal deck



Technical Investigations

14 Tests

Tests were carried out by the BBA to determine:

- behaviour under distributed load and increased temperature
- compressive strength
- thermal conductivity
- dimensional stability
- wind uplift.

15 Investigations

15.1 An assessment was made of the results of test data relating to:

- fire rating
- thermal conductivity
- tensile strength perpendicular to faces
- water vapour transmission.

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

15.3 An assessment was made of typical constructions which achieve the design U values.

15.4 The manufacturing process was evaluated, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

Bibliography

- BS 4841-4 : 2006 *Rigid polyurethane (PUR) and polyisocyanurate (PIR) products for building end-use applications — Specification for laminated insulation boards (roofboards) with auto-adhesively or separately bonded facings for use as roofboard thermal insulation under non-bituminous single ply roofing membranes.*
- BS 5250 : 2011 *Code of practice for control of condensation in buildings*
- BS 6229 : 2003 *Flat roofs with continuously supported coverings — Code of practice*
- BS 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 + A1 : 2010 *Eurocode 1 — Actions on structures — General actions — Wind actions*
- BS EN 13165 : 2012 + A1 : 2015 *Thermal insulation products for buildings — Factory made rigid polyurethane foam (PU) products — Specification*
- BS EN 13956 : 2012 *Flexible sheets for waterproofing. Plastic and rubber sheets for roof waterproofing. Definitions and characteristics*
- BS EN 13501-1 : 2007 + A1 : 2009 *Fire classification of construction products and building elements — Classification using test data from reaction to fire tests*
- BS EN 13501-5 : 2005 + A1 : 2009 *Fire classification of construction products and building elements — Classification using data from external fire exposure to roofs tests*
- BS EN ISO 6946 : 2007 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*
- BS EN ISO 9001 : 2008 *Quality management systems — Requirements*
- BRE Report BR 262 : 2002 *Thermal insulation: avoiding risks*
- BRE Report BR 443 : 2006 *U-value conventions in practice*

16 Conditions

16.1 This Certificate:

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

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

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

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

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

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

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

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