### Radmat Building Products Ltd

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# RADMAT SINGLE-PLY ROOF WATERPROOFING SYSTEMS

#### ESHAPLAN B AND FB SINGLE-PLY PVC ROOF WATERPROOFING MEMBRANES

This Agrément Certificate Product Sheet<sup>(1)</sup> relates to EshaPlan B and FB Single-Ply PVC Roof Waterproofing Membranes, glass-reinforced, PVC roofing membranes. EshaPlan B is for use as loose-laid ballasted waterproofing on flat roofs with limited access, and EshaPlan FB is for use as fully-adhered waterproofing on flat or pitched roofs with limited access.

(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**

Weathertightness — the membranes will resist the passage of moisture into the building (see section 6). **Properties in relation to fire** — the membranes will enable a roof to be unrestricted under the Building Regulations (see section 7).

**Resistance to wind uplift** — the membranes will resist the effects of any likely wind suction acting on the roof (see section 8).

**Resistance to foot traffic** – the membranes will accept the limited foot traffic and loads associated with installation and maintenance (see section 9).

Durability — under normal service conditions the membranes will provide a durable roof waterproofing with a service life in excess of 30 years (see section 11).

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: 4 August 2015

John Albon — Head of Approvals **Construction Products** 

Claire Curtis-Thomas Chief Executive

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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, EshaPlan B and FB Single-Ply PVC Roof Waterproofing Membranes, 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	The Building Regulations 2010 (England and Wales) (as amended)		
Requirement:	B4(2)	External fire spread	
Comment:		On suitable substructures or in suitable specifications, the use of the membranes will enable a roof to be unrestricted under the requirements of this Regulation. See sections 7.1, 7.2, 7.3 and 7.5 of this Certificate.	
Requirement:	C2(b)	Resistance to moisture	
Comment:		The membranes, including joints, will enable a roof to meet this Requirement. See section 6.1 of this Certificate.	
Regulation:	7	Materials and workmanship	
Comment:		The membranes are acceptable. See section 11 and the <i>Installation</i> part of this Certificate.	

The Building (Scotland) Regulations 2004 (as amended) 8(1)(2) Regulation: Durability, workmanship and fitness of materials The use of the membranes satisfies the requirements of this Regulation. See sections 10 and 11 and the Comment: Installation part of this Certificate. 9 Building standards applicable to construction Regulation: Standard: 2.8 Spread from neighbouring buildings The membranes, when applied to a suitable substructure or in a suitable specification, are regarded as Comment: having low vulnerability under clause 2.8.1<sup>(1)(2)</sup> of this Standard. See sections 7.1, 7.2, 7.3 and 7.5 of this Certificate. Standard: 3 10 Precipitation The membranes, including joints, will enable a roof to satisfy the requirements of this Standard, with Comment: reference to clauses 3.10.1<sup>(1)(2)</sup> and 3.10.7<sup>(1)(2)</sup>. See section 6.1 of this Certificate. Standard: 7.1(a) Statement of sustainability The membranes can contribute to meeting the relevant requirements of Regulation 9, Standards 1 to 6 and Comment: therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard. Regulation: 12 Building standards applicable to conversions All comments given for these membranes under Regulation 9, Standards 1 to 6 also apply to this Comment: 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(a)(i)(iii)(b)(i) Fitness of materials and workmanship	
Comment:		The membranes are acceptable. See section 11 and the <i>Installation</i> part of this Certificate.
Regulation:	28(b)	Resistance to moisture and weather
Comment:		The membranes, including joints, can enable a roof to satisfy the requirements of this Regulation. See section 6.1 of this Certificate.
Regulation:	36(b)	External fire spread
Comment:		On suitable substructures or in suitable specifications, the use of the membranes will be unrestricted by the requirements of this Regulation. See sections 7.1, 7.2, 7.3 and 7.5 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 sections:

1 Description (1.2) and 3 Delivery and site handling (3.3) of this Certificate.

## Additional Information

#### NHBC Standards 2014

NHBC accepts the use of EshaPlan B and FB Single-Ply PVC Roof Waterproofing Membranes, 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 EN 13956 : 2005. 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 EshaPlan B and FB Single-Ply PVC Roof Waterproofing Membranes are glass-reinforced (50 g·m<sup>-2</sup>), PVC roofing membranes. EshaPlan FB includes a polyester fleece backing (250 g·m<sup>-2</sup>).

1.2 The membrane is manufactured to the nominal characteristics given in Table 1.

Characteristic (unit)	Va	alue
	EshaPlan B	EshaPlan FB
Thickness* (mm)	1.5	1.5(1)
Width* (m)	2.12	2.12
Length* (m)	15	15
Mass per unit area* (kg·m⁻²)	2.01	2.20
Watertightness	pass	pass
Tensile strength* (N·m⁻²) – Method B	≥ 8	_
Tensile strength* (N per 50 mm) – Method A	_	≥ 400
Elongation* (%)	≥ 100	≥ 30
Tear strength (trapezoidal)* (N)	≥ 125	NPD
Low temperature foldability* (°C)	≤-30	≤-30
Resistance to static loading* (kg)	≥ 20	NPD
Resistance to dynamic loading* (mm)		
substrate A	≥ 500	≥ 500
substrate B	≥ 500	≥ 500
Dimensional stability* (%)	≤ 0.1	≤ 0.3
Joint peel resistance* (N per 50 mm)	≥ 185	≥ 185
Joint shear resistance* (N per 50 mm)	≥ 700	≥ 600
Reaction to fire*	Class E	Class E
Colour	light grey (RAL 7001)	light grey (RAL 70 anthracite (RAL 70

(1) Excluding fleece backing.

(2) Other colours are available on request, subject to a minimum order.

1.3 The following adhesives are used in conjunction with the membranes:

- EshaPlan CA for use in bonding EshaPlan B at upstands and details
- EshaPlan PU Contact Adhesive for use in bonding EshaPlan FB to substrates.

1.4 Ancillary items for use with the products, but which are outside of the scope of the Certificate, include:

- ProTherm PIR Insulation
- EshaPlan coated metal a 0.6 mm galvanized steel sheet, coated with 0.6 mm of EshaPlan PVC compound, for use in detailing
- EshaPlan PVC internal and external corners prefabricated corner units
- polyester fleeces 120 and 300 g·m<sup>-2</sup> for use as separation layers
- glass fleece 120 g·m<sup>-2</sup> for use as a separation layer between the membrane and EPS insulation boards
- EshaPlan Reinforced Strip a 150 mm wide strip for use in sealing butt joints in EshaPlan FB.

#### 2 Manufacture

2.1 The membranes are manufactured by a two-pass extrusion coating process of the glass reinforcement. For EshaPlan FB, the polyester fleece is laminated to the PVC membrane.

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.

## 3 Delivery and site handling

3.1 The membranes are delivered to site in rolls wrapped in polythene on pallets with labels bearing the manufacturer's name and address, product identification, dimensions, batch number and the BBA logo incorporating the number of this Certificate.

3.2 Rolls should be stored on their side, on a clean, level surface and kept under cover.

3.3 Ancillary items classified under the *Classification*, *Labelling and Packaging of Substances and Mixtures (CLP Regulation)* 2009 are given in Table 2 along with flashpoints. These products bear the appropriate hazard warning.

,		
Material	Flashpoint (°C)	Classification
EshaPlan CA(1)	-17	Highly flammable, Irritant
EshaPlan PU Contact Adhesive	Not applicable	Harmful

(1) These components should be stored in accordance with *The Dangerous Substances and Explosive Atmospheres Regulation* 2002.

## Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on EshaPlan B and FB Single-Ply PVC Roof Waterproofing Membranes.

## Design Considerations

#### 4 General

- 4.1 EshaPlan B is satisfactory for use as a roof waterproofing membrane, in the following specifications:
- loose-laid and ballasted on flat roofs with limited access
- on flat inverted roofs with limited or pedestrian access
- green roofs (extensive planting) on flat roofs with limited access.

4.2 EshaPlan FB is satisfactory for use as a roof waterproofing membrane in fully-adhered flat and pitched roofs with limited access.

4.3 Limited access roofs are defined for the purpose of this Certificate as those subjected only to pedestrian traffic for maintenance of the roof covering, cleaning of gutters, etc. Where traffic in excess of this is envisaged, additional protection to the membrane must be provided (see section 9).

4.4 Flat roofs are defined for the purpose of this Certificate as those having a minimum finished fall of 1:80. For design purposes, 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, etc. Pitched roofs are defined for the purpose of this Certificate as those having a fall greater than 1:6.

4.5 Decks to which the products are to be applied must comply with the relevant requirements of BS 6229 : 2003, BS 8217 : 2005 and, where appropriate, *NHBC Standards* 2014, Chapter 7.1.

4.6 Insulation materials to be used in conjunction with the membrane must be in accordance with the Certificate holder's instructions and be either:

- as described in the relevant clauses of BS 8217 : 2005, or
- the subject of a current BBA Certificate and be used in accordance with that Certificate.

4.7 The membranes can be adversely affected by contact with bituminous or coal tar products, or polystyrene insulation boards, and a suitable separating layer must be used. When doubt arises, the advice of the Certificate holder should be sought.

4.8 Structural decks for loose-laid and ballasted, inverted roofs and green roofs must be suitable to transmit the dead and imposed loads experienced in service.

4.9 Imposed loads, dead loading and wind load specifications are calculated in accordance with BS EN 1991-1-1 : 2002, BS EN 1991-1-3 : 2003, BS EN 1991-1-4 : 2005 and their respective UK National Annexes.

4.10 Recommendations for the design of green roof specifications are available within the latest edition of *The GRO* Green Roof Code – Green Roof Code of Best Practice for the UK, issued by The Green Roof Organisation (GRO).

4.11 The drainage system for green roofs must be correctly designed, and provision made for access for maintenance purposes. Dead loads for green roofs can increase if the drains become partially or completely blocked causing waterlogging of the drainage layer.

4.12 In inverted roof specifications, the ballast requirements should be calculated in accordance with the relevant parts of BS EN 1991-1-4 : 2005 and its UK National Annex.

4.13 Additional guidance for inverted roof specifications is given in BBA Information Bulletin No 4 Inverted roofs – Drainage and U value corrections.

### 5 Practicability of installation

Installation of the membrane must be only carried out by installers trained and approved by the Certificate holder.

#### 6 Weathertightness

6.1 The membrane and joints, when completely sealed and consolidated, will adequately resist the passage of moisture into the building and enable a roof to comply with the requirements of the national Building Regulations:

**England and Wales** — Approved Document C, Requirement C2(b), section 6 **Scotland** — Mandatory Standard 3.10, clauses 3.10.1<sup>(1)(2)</sup> and 3.10.7<sup>(1)(2)</sup>

(1) Technical Handbook (Domestic)

(2) Technical Handbook (Non-Domestic)

Northern Ireland — Regulation 28(b).

6.2 The membrane is impervious to water and will achieve a weathertight roof capable of accepting minor structural movement.

#### 7 Properties in relation to fire

7.1 When tested in accordance with DD CEN/TS 1187 : 2012 (Test 4) and classified to BS EN 13501-5 : 2005, a system consisting of an 18 mm plywood substrate primed with Esha SA Primer, a layer of EshaBase SA Alu Self Adhesive Vapour Control Layer, a 90 mm thick polyisocyanurate (PIR) ProTherm insulation bonded with EshaStik Polyurethane Adhesive and a layer of EshaPlan FB bonded with EshaBond PU Fleeceback Adhesive, achieved class B<sub>ROOF</sub> (t4).

7.2 The membrane, when used in protected or inverted roof specifications including an inorganic covering listed in the Annex of Commission Decision 2000/553/EC, can be considered to be unrestricted under the national Requirements.

7.3 In the opinion of the BBA, the use of the membrane in irrigated green roofs will be unrestricted under the national Requirements:

England and Wales - Requirement B4(2)

Scotland – Mandatory Standard 2.8, clause 2.8.1<sup>(1)(2)</sup>

(1) Technical Handbook (Domestic)

(2) Technical Handbook (Non-Domestic)

Northern Ireland – Regulation 36(b).

7.4 If allowed to dry, plants used in a green roof may allow flame spread across the roof and this should be taken into consideration when selecting suitable plants. Appropriate planting irrigation and/or protection should be applied to ensure the overall fire-rating of the roof is not compromised.

7.5 The designation of other specifications should be confirmed by:

**England and Wales** — test or assessment in accordance with Approved Document B, Appendix A, clause 1 **Scotland** — test to conform to Mandatory Standard 2.8, clause 2.8.1<sup>(1)(2)</sup>

(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.

#### 8 Resistance to wind uplift

8.1 The adhesion of EshaPlan FB will be limited by the cohesive strength of the substrate. On substrates of high cohesive strength, the adhesion of the membranes is sufficient to resist the effect of wind suction, thermal cycling and minor structural movements occurring in practice.

8.2 The ballast requirements for loose-laid roof systems must be calculated in accordance with the relevant parts of BS EN 1991-1-4 : 2005 and its UK National Annex. When using gravel ballast, the system must always be loaded with a minimum depth of 50 mm of aggregate. In areas of high wind exposure, the Certificate holder's advice should be sought. Alternatively, concrete slabs on suitable supports can be used.

8.3 The ballast on inverted/protected roofs must not be of a type that will be removed or become delocalised owing to wind scour experienced on the roof.

#### **9** Resistance to foot traffic

Results of tests indicate that the membrane can accept the limited foot traffic and light concentrated loads associated with installation and maintenance. Reasonable care should be taken to avoid puncture by sharp objects or concentrated loads. Where traffic in excess of this is envisaged, such as maintenance of lift equipment, a walkway should be provided.

#### 10 Maintenance

10.1 Systems must be the subject of annual inspections and maintenance to ensure continued performance. be cleared. 3, Exposed membrane must be free from the build-up of silt and other debris, and unwanted vegetation must

10.2 Any damage must be repaired in accordance with section 16 and the Certificate holder's instructions.

10.3 Green roofs must be the subject of regular inspections, particularly in autumn after leaf fall and in spring, to ensure that unwanted vegetation and other debris are cleared from the roof and drainage outlets. Guidance is available within the latest edition of The GRO Green Roof Code – Green Roof Code of Best Practice for the UK.

### 11 Durability



🐲 Accelerated weathering tests confirm that satisfactory retention of physical properties is achieved. Under normal conditions, the membranes will have a service life in excess of 30 years.

### 12 Reuse and recyclability

The products contain PVC, which can be recycled.

## Installation

#### 13 General

13.1 Installation of EshaPlan B and FB Single-Ply PVC Roof Waterproofing Membranes must be carried out by installers trained and approved by the Certificate holder in accordance with the relevant clauses of BS 8000-4 : 1989, BS 8217 : 2005, the Certificate holder's instructions and this Certificate.

13.2 Substrates to which the membrane is applied must be sound, dry, clean and free from sharp projections such as nail heads and concrete nibs. Rough substrates must first be overlaid with a suitable protection layer.

13.3 Installation should not be carried out during inclement weather (eg rain, fog, snow). When the temperature is below 5°C suitable precautions against surface condensation must be taken.

13.4 All detailing must be formed in accordance with the Certificate holder's instructions.

13.5 Ballast or other bulk material must not be stored on one area of the roof prior to installation, to ensure that localised overloading does not occur.

### 14 Procedure

#### Loose-laid applications

14.1 The membrane is laid flat onto the substrate without folds or ripples, with 50 mm minimum side laps and 50 mm minimum end laps.

14.2 The membrane is mechanically fastened at the perimeter of the roof in accordance with the Certificate holder's instructions. The lap joint in these areas extends 50 mm past the fixing bar or plate.

14.3 The lap joints are welded by hot-air welding in accordance with sections 14.8 to 14.10 of this Certificate and the Certificate holder's instructions.

14.4 The membrane must be covered by at least a 50 mm depth of well-rounded gravel or other suitable ballast depending on the specification being installed. In areas of high wind exposure, paving slabs set on a suitable support may be considered.

#### Fully-adhered

14.5 The membrane is laid flat onto the substrate without folds or ripples, with 50 mm minimum side laps and butted at the end of the roll.

14.6 The membrane is folded or rolled back to its centre and Icopal Single-Ply Fleeceback Adhesive applied to the substrate in accordance with the Certificate holder's recommendations, ensuring that no adhesive is applied to the weld area of the membrane. The membrane is rolled out into the wet adhesive. The process is repeated for the other end of the membrane.

14.7 The side lap joints are welded by hot-air welding in accordance with sections 14.8 to 14.10 of this Certificate and the Certificate holder's instructions. The end of the EshaPlan FB membrane is butt jointed and sealed using EshaPlan Reinforced Strip heat welded along the joint.

#### Lap joints

14.8 Hot-air welded lap joints are produced by using either an automated welding machine or a hand held welder in accordance with the Certificate holder's instructions.

14.9 The weld depth is a minimum of 40 mm.

14.10 When hand welding, the joint must be rolled immediately using a silicone rubber seam-roller, to ensure an even bond.

## 15 Repair

Any damage must be repaired by cleaning around the affected area and welding a patch of the membrane over it, as described in sections 14.8 to 14.10 of this Certificate.

## **Technical Investigations**

### 16 Tests

16.1 Tests were carried out on EshaPlan B and FB Single-Ply PVC Roof Waterproofing Membranes and the results assessed to determine:

- peel from substrate
- fatigue cycling.

16.2 Tests were carried out on EshaPlan FB, which uses the same PVC compound, and the results assessed to determine:

sample from factory

- percentage plasticiser
- percentage weight loss
- effects of long-term heat ageing
- effects of long-term UV ageing.

sample from 23 year old existing site

- nail tear
- thickness
- mass per unit area.

#### 17 Investigations

17.1 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.

17.2 An assessment was made of existing data on fire performance.

17.3 Visits to existing sites installed during 1969 and 1981 were carried out and samples were taken to assess the durability of the product under normal service conditions.

## Bibliography

BS 6229 : 2003 Flat roofs with continuously supported coverings — Code of practice

BS 8000-4 : 1989 Workmanship on building sites - Code of practice for waterproofing

BS 8217 : 2005 Reinforced bitumen membranes for roofing - Code of practice

BS EN 1991-1-1 : 2002 Eurocode 1: Actions on structures — General actions — Densities, self-weight, imposed loads for buildings

NA to BS EN 1991-1-1 : 2002 UK National Annex to Eurocode 1: Actions on structures — General actions — Densities, self-weight, imposed loads for buildings

BS EN 1991-1-3 : 2003 Eurocode 1 : Actions on structures – General actions – Snow loads

NA to BS EN 1991-1-3 : 2003 UK National Annex to Eurocode 1: Actions on structures — General actions — Snow loads

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

NA to BS EN 1991-1-4 : 2005 UK National Annex to Eurocode 1 : Actions on structures — General actions — Wind actions

BS EN 13501-5 : 2005 Fire classification of construction products and building elements Classification using data from external fire exposure to roofs tests

DD CEN/TS 1187 : 2012 Test methods for external fire exposure to roofs

EN 13956 : 2005 Flexible sheet for waterproofing — Plastic and rubber sheets for roof waterproofing — Definitions and characteristics

EN ISO 9001 : 2008 Quality management systems - Requirements

#### **18 Conditions**

18.1 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.

18.2 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.

18.3 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.

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

18.5 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.

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

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