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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
14/5085
Product Sheet 1

RADMAT SINGLE-PLY ROOF WATERPROOFING SYSTEMS

ESHAPLAN MF SINGLE-PLY PVC ROOF WATERPROOFING MEMBRANES

This Agrément Certificate Product Sheet(1) relates to Eshaplan MF Single-Ply PVC Roof Waterproofing Membranes, for use as mechanically fastened roof waterproofing membranes 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 including joints, when completely sealed and consolidated, will resist the passage of moisture to the interior of the building (see section 6).

Properties in relation to fire — the membranes will enable a roof to be unrestricted under Building Regulations (see section 7).

Resistance to wind uplift — the membranes will resist the effects of any wind suction likely to occur in practice (see section 8).

Resistance to foot traffic — the membranes will accept, without damage, the limited foot traffic and loads associated with installation and maintenance of the system (see section 9).

Durability — under normal service conditions, the membranes will provide a durable waterproof covering with a service life of at least 30 years for fixed systems (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: 19 February 2014

Simon Wroe
Head of Approvals — Materials

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, Eshaplan MF Single-Ply PVC Roof Waterproofing Membranes, if installed, used and maintained in accordance with this Certificate, will meet or contribute to meeting 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:	B4(2)	External fire spread
Comment:		On suitable non-combustible substructures, use of the membranes will enable a roof to be unrestricted under this Requirement. See section 7 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		Data for water resistance on the membranes, including joints, indicate that the membranes meet this Requirement. See section 6.1 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The membranes are acceptable materials. See section 11 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The membranes can contribute to a construction satisfying this Regulation. See sections 10 and 11 and the *Installation* part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		On suitable non-combustible substructures, use of the membranes will be unrestricted by the requirements of clause 2.8.1[1][2] of this Standard. See section 7 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Data examined for water resistance on the membranes, including joints, indicate that use of the membranes can enable a roof to satisfy the requirements of clauses 3.10.1[1][2] and 3.10.7[1][2] of this Standard. See section 6.1 of this Certificate.
Standard:	7.1(a)	Statement of sustainability
Comment:		The products can contribute to meeting the relevant Requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
Regulation:	12	Building standards applicable to conversions
Comment:		All comments given for these membranes 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

Regulation:	23(a)(i)(iii)(b)(i)	Fitness of materials and workmanship
Comment:		The membranes are acceptable materials. See section 11 and the *Installation* part of this Certificate.
Regulation:	28(b)	Resistance to moisture and weather
Comment:		Data for water resistance on the membranes, including joints, indicate that the use of the membranes 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 non-combustible substructures, use of the membranes will be unrestricted by the requirements of this Regulation. See section 7 of this Certificate.

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

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

See section: 1 *Description* (1.2) of this Certificate.

Additional Information

NHBC Standards 2014

NHBC accepts the use of Eshaplan MF Single-Ply PVC Roof Waterproofing Membranes, provided they are installed, used and maintained in accordance with this Certificate, as meeting Technical Requirement R3 in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs and balconies* and Chapter 7.2 *Pitched roofs*.

CE marking

The Certificate holder has taken the responsibility of CE marking the products in accordance with harmonised European Standard BS 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 MF Single-Ply PVC Roof Waterproofing Membranes are polyester-reinforced, flexible polyvinyl chloride (PVC) single-ply roof waterproofing membranes.

1.2 The nominal characteristics of the membranes are:

Thickness* (mm)	1.2, 1.5 and 1.8
Width* (m)	1.50 and 2.12
Length* (m)	15 and 20
Mass per unit area* ($kg \cdot m^{-2}$)	1.575 (1.2 mm), 1.95 (1.5 mm) and 2.34 (1.8 mm)
Tensile strength* [$N \cdot (50\ mm)^{-1}$]	900
Elongation at break* (%)	15
Tear strength* (N)	200
Low temperature foldability* (°C)	–35
Colour	
lower side	standard grey (RAL 7001)
upper side	standard grey (RAL 7001), anthracite grey (RAL 7015), stone red (RAL 3011), white (RAL 9010), blue (RAL 5005), green (RAL 6004) and turquoise green (RAL 5018).

1.3 Ancillary items for use with the product, but which are outside the scope of this Certificate, are:

- PVC 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 $g \cdot m^{-2}$ — for use as a separation layer for mechanical and chemical protection
- glass fleece 120 $g \cdot m^{-2}$ — for use as a separation layer between the membrane and EPS insulation boards
- mechanical fasteners and tubular washers.

2 Manufacture

2.1 The membranes are manufactured by a two-pass extrusion coating process of the polyester reinforcement.

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.

Assessment and Technical Investigations

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

Design Considerations

4 General

4.1 Eshaplan MF Single-Ply PVC Roof Waterproofing Membranes are satisfactory for use as a mechanically fixed waterproofing layer on flat and pitched roofs with limited access.

4.2 Limited access roofs are defined for the purpose of this Certificate as those roofs subjected only to pedestrian traffic for maintenance of the roof covering and cleaning of gutters. Where traffic in excess of this is envisaged, special precautions, such as additional protection to the membrane, must be taken.

4.3 Flat roofs are defined for the purpose of this Certificate as those roofs 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, for example, overall and local deflection and direction of falls. Pitched roofs are defined for the purpose of this Certificate as those having a fall in excess of 1:6.

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

4.5 Insulation materials used in conjunction with the systems must be either:

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

4.6 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.

5 Practicability of installation

The membranes are designed to be installed by trained and approved installers.

6 Weathertightness

6.1 The membranes, including 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 and 3.10.7

Northern Ireland — Regulation 28(b).

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

7 Properties in relation to fire

7.1 A system comprising a trapezoidal steel deck, a polyethylene vapour control layer, 150 mm thick mineral wool insulation and layer of Eshaplan MF 1.2 mm membrane, mechanical fastened, will be designated as unrestricted.

7.2 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, Appendix A, Clause A1

Scotland — test by a UKAS accredited laboratory to conform to Mandatory Standard 2.8, clause 2.8.1

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

8 Resistance to wind uplift

8.1 The resistance to wind uplift of the membranes is provided by mechanical fasteners secured to the deck and passing through the membrane. The number of fixings will depend on a number of factors, including:

- wind uplift forces to be resisted
- elastic limit of the membrane
- pull-out strength of fasteners
- appropriate safety factors.

8.2 The wind uplift forces are calculated in accordance with BS EN 1991-1-4 : 2005 and its National Annex. On this basis, the number of fixings required should be established using a maximum permissible load of 0.6 kN per fixing.

8.3 Wind uplift load results from testing on installed systems are:

	Corrected load per fixing (N)
System 1[1]	600
System 2[2]	600
System 3[3]	780
System 4[4]	660.

(1) Sample tested was a 0.75 mm thick profiled steel deck, 100 mm of mineral wool insulation fastened with two fasteners per board with 1.2 mm Eshaplan MF , width 1060 mm, mechanically fastened at 250 mm centres using 4.8 mm x 140 mm fasteners and 82 mm x 40 mm metal plates.

(2) Sample tested was a 0.75 mm thick profiled steel deck, 100 mm of mineral wool insulation fastened with two fasteners per board with 1.2 mm Eshaplan MF, width 1060 mm, mechanically fastened at 250 mm centres using 4.8 mm x 140 mm fasteners and plastic plates.

(3) Sample tested was a 0.75 mm thick profiled steel deck, 100 mm of mineral wool insulation fastened with two fasteners per board with 1.2 mm Eshaplan MF, width 1500 mm, mechanically fastened at 250 mm centres using 4.8 mm x 140 mm fasteners and 82 mm x 40 mm metal plates.

(4) Sample tested was a 0.75 mm thick profiled steel deck, 100 mm of mineral wool insulation fastened with two fasteners per board with 1.2 mm Eshaplan MF, width 1500 mm, mechanically fastened at 250 mm centres using 4.8 mm x 140 mm fasteners and plastic plates.

9 Resistance to foot traffic

9.1 Results of tests indicate that the membranes can accept the limited foot traffic and light concentrated loads associated with installation and maintenance. However, reasonable care should be taken to avoid puncture by sharp objects or concentrated loads.

9.2 Where regular traffic is envisaged (eg for maintenance of lift equipment), a walkway should be provided using concrete slabs supported on bearing pads or an anti-slip walkway with or without a protection sheet. The advice of the Certificate holder should be sought on the most appropriate method to be used with the amount of traffic involved.

10 Maintenance

Roofs covered with the membranes should be the subject of annual inspections, as is good practice with waterproofing systems.

11 Durability

11.1 Accelerated weathering tests and evidence from long-term existing sites confirm that satisfactory retention of physical properties is achieved. Available evidence indicates that the mechanically fixed system will have a life in excess of 30 years.

11.2 In environments where the membranes are in contact with organic solvents, the life expectancy of the membranes may be reduced. In cases of doubt, the advice of the Certificate holder should be sought.

12 Reuse and recyclability

The products comprise PVC and polyester, which can be recycled.

Installation

13 General

13.1 Installation of Eshaplan MF Single-Ply PVC Roof Waterproofing Membranes must be carried out in accordance with the relevant clauses of the Certificate holder's instructions, BS 8000-4 : 1989 and this Certificate.

13.2 Conditions on site should be those for normal roof waterproofing work. Deck surfaces must be dry, clean and free from sharp projections such as nail heads and concrete nibs. When used over a rough substrate, a suitable protection layer should be placed over the substrate.

13.3 Installation should not be carried out during wet weather (eg rain, fog, snow) nor when the temperature is below 0°C unless suitable precautions against surface condensation are taken in accordance with the Certificate holder's instructions.

13.4 When used over bitumen, bitumen-bound insulation products, coal tar, pitch or oil-based products, a separation layer must be interposed between the substrate and the membrane. In cases of doubt, the advice of the Certificate holder should be sought.

14 Procedure

14.1 The membranes are unrolled onto the substrate without undulations, with 110 mm minimum side laps and 60 mm minimum end laps.

14.2 The membranes are fixed to the deck (through insulation boards, where appropriate) in the joint overlaps prior to welding of the seams in accordance with the Certificate holder's instructions.

14.3 The membranes are to be fixed at the edges by mechanically fastening using flatbar, PVC coated metal or by welding.

Hot-air welding

14.4 Joints are made using either automatic or hand-operated machines with the temperature set in accordance with the Certificate holder's instructions.

14.5 The lap area must be dry and clean. If the membrane in the weld area has become contaminated, it must be cleaned in accordance with the Certificate holder's instructions.

14.6 The welded width of the joint must be a minimum of 40 mm for field welds and detailing. Care should be taken that overheating of the membrane does not occur, possible impairment of the membrane may result.

14.7 Flashings are to be formed in accordance with the Certificate holder's instructions.

14.8 The seam is tested with a metal probe to highlight poorly-welded areas. Any such areas must be made good using hot-air welding.

15 Repair

In the event of accidental damage, repairs can be carried out by cleaning around the damaged area and applying a patch of the appropriate membrane in accordance with the Certificate holder's instructions.

Technical Investigations

16 Tests

16.1 Tests were conducted on Eshaplan MF membranes and results assessed to determine:

- tensile strength and elongation
- dimensional stability
- low temperature foldability
- shear strength of joints
- peel strength
- interlaminar peel strength
- wind loading per fastener
- static indentation
- dynamic indentation
- water vapour transmission
- vapour resistance
- resistance to water pressure
- percentage weight loss
- water absorption
- percentage plasticiser
- effects of long-term heat ageing
- effects of long-term UV ageing.

16.2 Samples of 1.2 mm Eshaplan MF were taken from an existing site 23 years old, and tests were conducted and results assessed to determine:

- nail tear
- thickness
- mass per unit area.

17 Investigations

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

17.2 An assessment was made of existing data on fire performance to ENV 1187, Test 3. The classification to BS EN 13501-5 : 2005 is $B_{ROOF}(t3)$.

17.3 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.

17.4 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 1991-1-4 : 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 roof tests*

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

BS EN ISO 9001 : 2008 *Quality management systems — Requirements*

ENV 1187 : 2002 *Test methods for external fire exposure to 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 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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