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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
11/4814
Product Sheet 1

ADVANCED SINGLE-PLY SYSTEMS

ENVIROPLAN SINGLE-PLY ROOF WATERPROOFING MEMBRANES

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Enviroplan Single-Ply Roof Waterproofing Membranes, thermoplastic polyolefin (TPO) membranes for use in fully adhered, mechanically fixed, loose-laid and ballasted and protected flat and pitched roof specifications with limited access.

AGRÉMENT 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 5).

Properties in relation to fire — tests indicate that the membranes will enable a roof to be unrestricted under the current Building Regulations (see section 6).

Resistance to wind uplift — the membranes will resist the effects of any likely wind suction acting on the roof (see section 7).

Resistance to foot traffic — the membranes will accept the limited foot traffic and loads associated with the installation and maintenance (see section 8).

Durability — under normal service conditions the systems should provide a durable roof waterproofing with a service life of at least 20 years (see section 10).

The BBA has awarded this Agrément 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: 28 February 2011

Stuart Sadler
Head of Approvals — Materials

Greg Cooper
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, Enviroplan Single-Ply Roof Waterproofing Membranes, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:

The Building Regulations 2010 (England and Wales)

Requirement:	B4(2)	External fire spread
Comment:		Tests to BS 476-3 : 1958 indicate that on a suitable substructure, the use of the membranes will enable a roof to be unrestricted under this Requirement. See sections 6.1 to 6.5 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		Tests for water resistance on the membranes, including the joints, meet this Requirement. See section 5.1 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The membranes are acceptable materials. See section 10 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 products can contribute to a construction meeting this Regulation. See sections 9.1, 9.2, 10 and the *Installation* part of this Certificate.
Regulation:	9	Building standards — construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		Tests to BS 476-3 : 1958 indicate that the membranes when applied to a suitable substrate, are regarded as having low vulnerability under clause 2.8.1[1][2] of this Standard. See sections 6.1 to 6.3 and 6.5 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Tests for water resistance indicate that the use of the membranes, including joints will enable a roof to satisfy the requirements of this Standard, with reference to clauses 3.10.1[1][2] and 3.10.7[1][2]. See section 5.1 of this Certificate.
Regulation:	12	Building standards — conversions
Comment:		All comments given for the systems under Regulation 9 also apply to this Regulation, with reference to clause 0.12[1][2] and Schedule 6[1][2].

(1) Technical Handbook (Domestic).
(2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The membranes are acceptable materials. See section 10 and the *Installation* part of this Certificate.
Regulation:	B3(2)	Suitability of certain materials
Comment:		The systems are acceptable. See section 9.1 and 9.2 of this Certificate.
Regulation:	C4(b)	Resistance to ground moisture and weather
Comment:		Tests for water resistance indicate that the membranes, including joints meet the requirements of this Regulation. See section 5.1 of this Certificate.
Regulation:	E5(b)	External fire spread
Comment:		Tests to BS 476-3 : 1958 indicate that on a suitable substructure, the use of the membranes will be unrestricted by the requirements of this Regulation. See sections 6.1 to 6.5 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 sections: 1 *Description* (1.2) and 2 *Delivery and site handling* (2.3) of this Certificate.

Non-regulatory Information

NHBC Standards 2011

NHBC accepts the use of Enviroplan Single-Ply Roof Waterproofing Membranes, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs and balconies* and 7.2 *Pitched roofs*.

Technical Specification

1 Description

1.1 Enviroplan Single-Ply Roof Waterproofing Membranes are manufactured from thermoplastic polyolefin (TPO) and are available in two grades:

- Enviroplan MF — reinforced with 75 g·m^{-2} glass net. The top layer is grey and the underside is black
- Enviroplan FA — reinforced with 50 g·m^{-2} glass fibre mat and with a polyester fleece backing.

1.2 The membranes are manufactured to a width of 1.35 m and length of 14.82 m. The membranes have the nominal thickness and weight characteristics given in Table 1.

Table 1 Nominal characteristics

Characteristics (units)	Enviroplan MF							Enviroplan FA		
Thickness (mm)	1.5	1.6	1.8	2.0	2.2	2.5	3.0	1.5	1.8	2.0
Weight per unit area (kg·m^{-2})	1.5	1.6	1.8	2.0	2.2	2.5	3.0	1.5	1.8	2.0
Roll weight (kg)	30	32	36	40	44	50	60	30	36	40

1.3 Ancillary items for use with the membranes include:

- Enviroplan Vapour Control Layers — self-adhesive vapour control membranes
- Enviroplan Membrane Adhesive
- Enviroplan Iron — galvanized steel bars for mechanical fixing of the membrane
- Enviroplan Contour — galvanized steel bars for mechanical fixing at vertical upstands.

1.4 Quality control checks are carried out on incoming raw materials, during production and on the finished product.

2 Delivery and site handling

2.1 Membranes are delivered to site as rolls on timber pallets, packaged in polyethylene film bearing self-adhesive tapes with the manufacturer's name, product identification, size and batch number/manufacturing date.

2.2 Rolls should be stored in a cool, dry area on a clean, level surface, and kept under cover. Rolls should only be unwrapped from packaging at time of installation.

2.3 Enviroplan Membrane Adhesive is classified as 'harmful' and 'highly flammable' under *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009* (CHIP4). It should be stored in a well-ventilated area in accordance with the *Highly Flammable Liquids and Petroleum Gases Regulations* 1972.

Assessment and Technical Investigations

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

Design Considerations

3 General

3.1 Enviroplan Single-Ply Roof Waterproofing Membranes are satisfactory for use as waterproofing on pitched and flat roofs with limited access in the following:

- Enviroplan MF in mechanically-fastened systems
- Enviroplan FA in fully-adhered, loose-laid and ballasted and protected membrane systems.

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

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

3.4 Decks to which the membranes 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 *Flat roofs and balconies*.

3.5 Insulation systems or materials used in conjunction with the product must either be:

- 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 Practicability of installation

Installation of the product must be carried out by trained and approved contractors.

5 Weathertightness

5.1 Tests confirm that the membranes, and joints in the membranes, when completely sealed and consolidated, will adequately resist the passage of moisture to the inside of the building and so meet the requirements of the national Building Regulations (see section 15, Table for *Physical properties — general*):

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 C4(b).

5.2 The membranes are impervious to water and, when used in one of the systems described in this Certificate, will achieve a weathertight roof capable of accepting minor structural movement without damage (see section 15, Table for *Physical properties — directional*).

6 Properties in relation to fire

6.1 When tested in accordance with BS 476-3 : 1958, a system comprising 0.7 mm profiled steel deck, Enviroplan Vapour, 85 mm thick glass fibre-faced polyurethane insulation and mechanically fixed 1.5 mm Enviroplan MF achieved an EXT.F.AB rating.

6.2 When tested to BS 476-3 : 1958, a system comprising 0.7 mm profiled steel deck, Enviroplan Vapour, 85 mm thick foil-faced polyurethane insulation and 1.5 mm Enviroplan FA, fully adhered using Enviroplan Membrane Adhesive, achieved an EXT.F.AB rating.

6.3 When used in a loose-laid and ballasted specification including a minimum surface finish of 50 mm of aggregate, the membranes are deemed to satisfy BS 476-3 : 1958, designation EXT.F.AA.

6.4 When used on flat roofs with one of the surface finishes defined in Part iii of Table A5 of Appendix A 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.

6.5 The designation of other specifications (eg on combustible substrates) should be confirmed by:

England and Wales — Test or assessment in accordance with Approved Document B, Appendix A, Clause A1.

Scotland — Tests conform to Mandatory Standard 2.8, clause 2.8.1

Northern Ireland — Test or assessment by a UKAS accredited laboratory, or an independent consultant with appropriate experience.

7 Resistance to wind uplift

7.1 In mechanically-fastened systems, the number of fixings and their position will depend on:

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

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

7.3 The adhesion of bonded systems is sufficient to resist the effects of wind suction, and thermal cycling or other minor structural movements likely to occur in service (see section 15, Table for *Physical properties — general*)

7.4 Where the membrane is bonded to insulation boards, the resistance to wind uplift will be dependent on the cohesive strength of the insulation and the method by which it is secured to the roof deck. This must be taken into account when selecting suitable insulation material.

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

8 Resistance to foot traffic

The membranes can accept the limited foot traffic and light concentrated loads associated with the installation and maintenance operations. Reasonable care should be taken to avoid puncture by sharp objects or concentrated loads. On limited access roofs, where traffic in excess of this is envisaged, such as maintenance of lift equipment, a walkway should be provided, for example,using concrete slabs supported on suitable bearing pads (see section 15, Table for *Physical properties — general*).

9 Maintenance

9.1 Roofs must be the subject of annual inspections and maintenance to ensure continued performance. Maintenance should include checks and operations to ensure the following where applicable:

- adequate ballast in place and evenly distributed over the membrane
- protection layers are in good condition
- exposed membrane is free from the build-up of silt and other debris and drainage channels are clear.

9.2 Where damage has occurred then it should be repaired in accordance with section 14 and the Certificate holder's instructions.

10 Durability

Accelerated weathering tests confirm that satisfactory retention of physical properties is achieved. Available evidence indicates that the membranes should have a life of at least 20 years.

Installation

11 General

11.1 Installation of Enviroplan Single-Ply Roof Waterproofing Membranes must be carried out by trained and approved installers working in accordance with the relevant clauses of the Certificate holder's instructions and BS 8000-4 : 1989.

11.2 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, concrete nibs. When used over a rough substrate, in loose-laid, protected roof or mechanically-fastened systems, a suitable protection layer should be placed over the substrate.

11.3 Installation should not be carried out during wet weather (eg rain, fog, snow) nor when the temperature is below 5°C unless suitable precautions are taken in accordance with the Certificate holder's instructions.

12 Procedure

Fully-adhered system

12.1 The Enviroplan FA is unrolled onto the substrate, without ripples, with a 60 mm overlap.

12.2 One half of the membrane is folded back and adhesive applied to the membrane and substrate at a rate of between 0.15 $kg \cdot m^{-2}$ and 0.40 $kg \cdot m^{-2}$. The adhesive should allowed to dry for between 5 and 10 minutes (dependent on weather conditions) until tacky, prior to membrane being folded back onto the substrate.

12.3 The process given in section 12.2 is repeated for the other half of the membrane.

Mechanically-fastened system

12.4 The Enviroplan MF is unrolled onto the substrate, without ripples, with a minimum overlap of 60 mm plus the width of the washer.

12.5 The membrane is secured within the lap area using fasteners and seam plates. The maximum distance between each fastening assembly is 300 mm and the minimum distance between the plates and sheet edge must be 15 mm.

Loose-laid and ballasted roof system

12.6 The Enviroplan FA is unrolled onto the substrate, without ripples, with a 60 mm overlap, and mechanically fastened at perimeters.

12.7 When used in a loose-laid and ballasted system a suitable protection layer must be laid over the membrane prior to the application of the ballast.

12.8 Loose-laid applications should be covered by at least a 50 mm depth of well-rounded gravel. In areas of high-wind exposure, paving slabs set on a suitable support may be considered (eg pads).

13 Jointing and flashing procedure

Hot-air welding

13.1 All joints must be sealed, wherever possible by automatic rather than by hand-held hot-air gun. The temperature should be set in accordance with the Certificate holder's instructions.

13.2 The welding area should be dry and clean. If the membrane in the welding area is oxidised due to prolonged outdoor exposure it must be cleaned in the prescribed manner.

13.3 The welded width of the joint must be a minimum of 60 mm. Care should be taken to ensure over-heating of the membrane does not occur, as this will result in scorching and carbonisation of the membrane.

13.4 The seam should be tested with a suitable metal probe and any weakness immediately repaired.

Flashing

13.5 Flashing and detailing should be formed in accordance with the Certificate holder's instructions.

14 Repair

In the event of accidental damage, repairs can be carried out by cleaning the area around the damage and applying a patch as described in the Certificate holder's instructions.

Technical Investigations

15 Tests

15.1 Data from tests carried out or assessed by the BBA are summarised in Tables 2 and 3.

15.2 Testing was also carried out on the following properties:

- thickness
- width
- weight per unit area
- flatness and trueness
- ash content.

Table 2 Physical properties — directional

Test (units)	Mean results[1]				Method
	Enviroplan MF		Enviroplan FA		
	Longitudinal	Transverse	Longitudinal	Transverse	
Tensile strength (N per 50 mm)	1145	813	572	498	EN 12311-2
Tensile strength on heat ageing[2] (N per 50 mm)	1129	753	—	—	EN 12311-2
Elongation at maximum force (%)	4.5[3]	4.5[3]	542	633	EN 12311-2
Elongation on heat ageing[2] (%)	5.0[3]	3.8[3]	—	—	EN 12311-2
Nail tear (N)					MOAT 67 : 4.3.11
+18°C	606.8	745.8	835.5	731.5	
+40°C	544.0	529.5	560.3	496.1	
–10°C	820.6	1034.5	1103.5	1110.3	
Dimensional stability (%)	–0.1	+0.1	0.0	0.0	EN 1107-2

(1) All tests carried out on 1.5 mm membranes.

(2) Heat aged 84 days at 80°C.

(3) To failure of reinforcement.

— not tested.

Table 3 Physical properties – general

Test (units)	Mean result		Method
	Enviroplan MF[1]	Enviroplan FA[2]	
Water vapour permeability ($g \cdot m^{-2} \cdot day^{-1}$)	0.21		BS 3177 (25°C/75% RH)
Water vapour resistance ($MN \cdot s \cdot g^{-1}$)	977.0		BS 3177 (25°C/75% RH)
Low temperature folding (–35°C)			EN 495-5
unaged	pass	—	
UV aged[3]	pass	—	
heat aged[4]	pass	—	
Static indentation (kg)			EN 12730
concrete	L_{15}	—	
EPS	L_{25}	—	
Dynamic indentation (kg)			EN 12691
EPS	I_{15}	—	
perlite	I_{15}	—	
Water absorption (%)	2.10	—	MOAT 67 : 4.3.13
Tensile strength of joints (N per 50 mm)			EN 12317-2
control	445.6	—	
after heat ageing[4]	451.8	—	
Resistance to peel (N per 50 mm)			MOAT 67 : 4.3.3
control	—	152	
after heat ageing[4]	—	156	
Resistance to wind uplift			MOAT 67 : 4.3.2
fully adhered (kPa)	—	6	
mechanically fastened (N)[5]			
load per fixing	1400	—	
corrected load per fixing	596	—	

(1) All tests carried out on 1.5 mm membranes.
(2) All tests carried out on 1.6 mm membranes.
(3) UV aged using 4500 $MJ \cdot m^{-2}$ UVA.
(4) 28 days at 80°C.
(5) Using Enviroplan Vapour over a profiled 0.7 mm thick, galvanized steel decking with aluminium-faced polyurethane boards, mechanically fastened to the deck.
— Not tested.

16 Investigations

16.1 Existing data on fire performance of the membranes to BS 476-3 : 1958 were examined.

16.2 The manufacturing processes were examined, including methods of quality control. Details were also obtained of the quality and composition of the materials used.

Bibliography

BS 476-3 : 1958 *Fire tests on building materials and structures — External fire exposure roof test*

BS 3177 : 1959 *Method for determining the permeability to water vapour of flexible sheet materials used for packaging*

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*

EN 495-5 : 2000 *Flexible sheets for waterproofing — Determination of foldability at low temperature — Plastic and rubber sheet for roof waterproofing*

EN 1107-2 : 2001 *Flexible sheets for waterproofing — Determination of dimensional stability — Plastic and rubber sheet for roof waterproofing*

EN 12311-2 : 2000 *Flexible sheets for waterproofing — Determination of tensile properties — Plastic and rubber sheets for roof waterproofing*

EN 12317-2 : 2000 *Flexible sheets for waterproofing — Determination of shear resistance of joints — Plastic and rubber sheets for roof waterproofing*

EN 12691 : 2001 *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of resistance to impact*

EN 12730 : 2001 *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of resistance to static loading*

MOAT No 67 : 2001 *UEAtc Technical Guide for the assessment of non-reinforced, reinforced and/or Backed Roof Waterproofing Systems made of FPO*

17 Conditions

17.1 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.

17.2 Publications and documents referred to in this Certificate are those that the BBA deems to be relevant at the date of issue or re-issue of this Certificate and include any: Act of Parliament; Statutory Instrument; Directive; Regulation; British, European or International Standard; Code of Practice; manufacturers' instructions; or any other publication or document similar or related to the aforementioned.

17.3 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.

17.4 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/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.

17.5 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; 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. 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.

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