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Agrément Certificate
10/4762
Product Sheet 1

SIPLAST MEMBRANES

PREFLEX AND GRAVIFLEX MEMBRANES

This Agrément Certificate Product Sheet⁽¹⁾ relates to Preflex and Graviflex Membranes, modified bitumen membranes for use in roof garden applications (including completely flat roof applications).

(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 products will resist the passage of moisture into the building (see section 6).

Properties in relation to fire — in the opinion of the BBA, the products, when used in a suitable specification, will enable a roof to be unrestricted under Building Regulations (see section 7).

Resistance to wind uplift — resistance to wind uplift is dependent on the top layers of the roof garden green-roof specification (see section 8).

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

Resistance to penetration of roots — the products will adequately resist plant root penetration (see section 10).

Durability — under normal service conditions, the products will provide a durable waterproof covering with a service life of at least 25 years (see section 12).

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

Simon Wroe
Head of Approvals — Materials

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, Preflex and Graviflex 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:		When used in irrigated roof gardens or green roofs, the products will be unrestricted under this Requirement. See sections 7.1 to 7.5 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		Tests for water resistance on the products, including joints, indicate that the products meet this Requirement. See section 6.1 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The products are acceptable. See section 12.1 and the <i>Installation</i> 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 11 and 12.1 and the <i>Installation</i> part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		When used in irrigated roof gardens or green roofs, use of the products can be regarded as having low vulnerability under clause 2.8.1 ⁽¹⁾⁽²⁾ of this Standard. See sections 7.1 to 7.3 and 7.5 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Tests for water resistance of the products indicate that their use 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 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 products under Regulation 9, Standards 1 to 6, 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) 2012

Regulation:	23(a)(i)(iii)(b)(i)	Fitness of materials and workmanship
Comment:		The products are acceptable. See section 12.1 and the <i>Installation</i> part of this Certificate.
Regulation:	28(b)	Resistance to moisture and weather
Comment:		Tests for water resistance of the products, including joints, indicate that use of the products will enable a roof to satisfy the requirements of this Regulation. See section 6.1 of this Certificate.
Regulation:	36(b)	External fire spread
Comment:		When used in irrigated roof gardens or green roofs, use of the products will be unrestricted under the requirements of this Regulation. See sections 7.1 to 7.5 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 section: 1 *Description* (1.2) of this Certificate.

Additional Information

NHBC Standards 2014

NHBC accepts the use of Preflex and Graviflex 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 BS EN 13707 : 2004. 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 Preflex and Graviflex Membranes are torch-on, SBS-modified bitumen sheets with non-woven polyester reinforcement. Graviflex Capsheet is treated with Preventol 'B' Root Inhibitor.

1.2 The membranes are manufactured to the nominal characteristics given in Table 1.

Characteristic (unit)	Preflex Underlay	Graviflex Capsheet
Thickness* (mm)	3	3.2
Thickness including mineral finish (mm)	–	4
Roll width (m)	1	1
Roll length (m)	10	8
Roll weight (kg)	38.6	40
Mass per unit area (kg·m ⁻²)	3.9	5.0
Tensile strength* [N(50 mm) ⁻¹]		
longitudinal	550	740
transverse	315	540
Elongation at break* (%)		
longitudinal	35	40
transverse	35	49
Low temperature flexibility* (°C)	≤ -15	≤ -15
Flow resistance* (°C)	≥ 100	≥ 100
Dimensional stability* (%)	≤ -0.5	≤ -0.5
Impact* (mm) (soft substrate B)	≥ 1000	≥ 1500
Static loading * (kg) (soft substrate A)	15	20
Mass per unit area of polyester reinforcement (g·m ⁻²)	120	180
Surface finish		
lower	thermofusible film	thermofusible film
upper	thermofusible film	slate flakes

1.3 Xtra-Seal QD Bitumen Primer — a bitumen primer designed to dry in approximately one hour after application.

2 Manufacture

2.1 The membranes are manufactured by saturating and coating the reinforcement with SBS (styrene-butadiene-styrene)-modified bitumen and calendaring to the correct thickness. The surfaces are finished by the application of sand/thermofusible film to the lower surface and sand, mineral granules or slate flakes to the upper surface. The sheets are cooled, trimmed and rolled for packaging.

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.

2.3 The management system of Icopal SAS has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by Bureau Veritas (Certificate 1.927.221/C).

3 Delivery and site handling

3.1 The membranes are delivered to site in rolls with paper wrappings bearing the product name, manufacturing data, factory name and BBA logo incorporating the number of this Certificate. The rolls are packed on pallets and shrunk wrapped in polythene.

3.2 Rolls should be stored upright on a clean, level surface, away from excessive heat and kept under cover.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Preflex and Graviflex Membranes.

Design Considerations

4 Use

4.1 Preflex and Graviflex Membranes are satisfactory for use as fully- or partially-bonded waterproofing in warm roof systems on:

- pitched, flat and zero-pitched roofs in green roofs (extensive planting) with limited access
- flat and zero-pitched roofs in roof gardens (intensive planting).

4.2 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).

4.3 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 such features as overall and local deflection, direction of falls. Pitched roofs are defined as those having a fall greater than 1:6. Zero-pitched roofs are defined for the purpose of this Certificate as those having a finished fall of less than 1:80.

4.4 Decks to which the membranes are to be applied must comply with the relevant requirements of either BS 6229 : 2003 or BS 8217 : 2005 and, where appropriate, *NHBC Standards 2013*, Chapter 7.1.

4.5 Insulation systems or materials used in conjunction with the membranes 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 Recommendations for the design of green roofs and roof garden specifications are available within the latest edition of *The GRO Green Roof Code — Green Roof Code of Best Practice for the UK 2011*.

4.7 The structural decks to which the membranes are to be applied must be suitable to transmit the dead and imposed loads experienced in service.

4.8 Imposed loads, dead loading and wind loads 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.

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

4.10 On zero-pitched roofs it is particularly important to identify the correct drainage points to ensure that the drainage provided is effective.

5 Practicability of installation

The products are designed to be installed by a competent roofing contractor, experienced with this type of product.

6 Weathertightness



6.1 Data 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:

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 the Graviflex Capsheet will adequately resist penetration of roots. When used in one of the systems described, it will achieve a weathertight roof capable of accepting minor structural movement without damage.

7 Properties in relation to fire



7.1 In the opinion of the BBA, a roof garden covered with a drainage layer of gravel 100 mm thick and a soil layer of 300 mm thick will be unrestricted.

7.2 In the opinion of the BBA, when used in irrigated roof gardens or green roofs, the membranes will be unrestricted under the national Requirements:

England and Wales — Requirement B4(2)

Scotland — Mandatory Standard 2.8, clause 2.8.1

Northern Ireland — Regulation 36(b).

7.3 The system, when protected by an inorganic covering (eg gravel or paving slabs) listed in the Annex of Commission Decision 2000/553/EC, can be considered to be unrestricted under the national Requirements.



7.4 Exposed areas of the capsheet, when used with one of the surface finishes detailed in Approved Document B, Appendix A, Table A5, part iii (England and Wales) and Technical Booklet E, Table 4.6, part iv (Northern Ireland) (listed below), would be deemed to be unrestricted:

Surface finishes

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



7.5 The designation of exposed areas of the capsheet installed to 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

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

7.6 If allowed to dry, the plants used may allow flame spread across the roof. This situation should be taken into consideration when selecting the plants for the garden. Appropriate planting irrigation and/or protection should be applied to ensure the overall fire-rating of the roof is not compromised by its use.

8 Resistance to wind uplift

8.1 The membranes, when used with a suitable roof garden or green-roof specification, will adequately resist the effects of wind uplift likely to occur in practice.

8.2 The soil used in intensive plantings should not be of a type that will be removed, or become localised, owing to wind scour experienced on site.

8.3 It should be recognised that the type of plants used could significantly affect the expected wind loads experienced in service.

9 Resistance to foot traffic

9.1 The membranes can accept the limited foot traffic and light concentrated loads associated with installation and maintenance operations. Reasonable care should be taken to avoid puncture of the membranes by sharp objects or concentrated loads. Where traffic in excess of this is envisaged, such as for maintenance of lift equipment, a walkway should be provided (for example, using concrete slabs supported on bearing pads).

9.2 Once the green roof or roof garden is installed, it can be regarded as a suitable protection for the membrane in use.

10 Resistance to penetration of roots

Results of root penetration resistance tests on the membranes and their joints indicate that they are resistant to root penetration and can be used in a roof waterproofing system for roof gardens and green roofs.

11 Maintenance



Roofs should be inspected in autumn after leaf fall and in the spring to ensure that vegetation and other debris are cleared from the roof and drainage outlets cleared. Guidance is available within the latest edition of *Guidelines to Green Roofing* The Green Roof Organisation (GRO).

12 Durability



12.1 The membranes have been used since 1989 in France and evidence from tests confirm that exposed waterproofing membranes will have a life in excess of 30 years. When fully protected and subjected to normal service conditions in roof garden and green roof specifications, the systems can provide an effective barrier to the transmission of liquid water and water vapour for the design life of the roof in which they are incorporated.

12.2 The mineral surfaced product, when exposed, will suffer some localised loss of mineral surfacing in areas where complex detailing of the roof design is incorporated.

Installation

13 General

13.1 Deck surfaces must be dry, clean and free from sharp projections such as nail heads and concrete nibs.

13.2 Installation of the membranes is carried out in accordance with the manufacturer's instructions and the relevant clauses of BS 8000-4 : 1989 and BS 8217 : 2005.

13.3 The membranes may be laid in conditions normal to roofing work and must not be laid in rain, snow or heavy fog, nor if the temperature falls below 5°C, unless precautions against condensation have been taken.

13.4 The Graviflex Capsheet has a mineral surface finish, and when used exposed on areas with limited access, does not require further surface protection.

11.5 The roofing layers must always be installed with staggered overlaps and in such a manner that no counter-seams in the direction of outlets are made.

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

14 Procedures

14.1 Preflex Underlay is fully bonded to the substrate by torching with laps of 60 mm and end laps of 60 mm.

14.2 The Graviflex Capsheet is fully bonded to the Preflex Underlay by torching with the same width of laps as the underlay.

14.3 Laps between the underlay and capsheet should be offset by a minimum of 100 mm.

15 Repair

Should damage occur, the capsheet can be effectively repaired, after cleaning, by torch-bonding a patch to the damaged area, with recommended overlaps.

Technical Investigations

16 Tests

Tests were conducted on the membranes and the results assessed to determine:

- roll weight
- thickness
- length
- low temperature flexibility
- heat resistance
- dimensional stability
- tensile strength and elongation
- nail tear resistance
- root resistance
- resistance to leakage at joints
- tensile shear of joints
- adhesion
- peel resistance of joints
- water exposure 180 days at 60°C
- chemical resistance.

17 Investigations

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

17.2 Test data were evaluated in the context of UK roofing practice and Building Regulations.

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

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.