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Agrément Certificate
10/4745
Product Sheet 1

DUOFLEX STRUCTURAL WATERPROOFING

DUOFLEX ROOFING SYSTEM

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to the Duoflex Roofing System, for use as a waterproofing for inverted roofs, green roofs, roof gardens and protected roofs with limited access, in flat, including zero falls, roof specifications.

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 system will resist the passage of moisture into the building (see section 5).

Properties in relation to fire — the use of the system will enable a roof to be unrestricted under the current Building Regulations (see the *Regulations* section and section 6).

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

Resistance to foot traffic — the system will accept the limited foot traffic and loads associated with the installation and maintenance of the system and the effects of thermal or other minor movement likely to occur in practice without damage (see section 8).

Durability — under normal service conditions the system will provide an effective barrier to the transmission of liquid water and water vapour for the design life of the roof in which it is incorporated (see section 10).

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

On behalf of the British Board of Agrément

Date of First issue: 8 April 2010

Simon Wroe
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, the Duoflex Roofing System, 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 2000 (as amended) (England and Wales)

Requirement:	B4(2)	External fire spread
Comment:		On flat roofs, the system, when used in an inverted roof specification including a minimum surface finish of 50 mm of aggregate, may be deemed to be of designation AA and will enable a roof to be unrestricted under this Requirement. See sections 6.1 to 6.3 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		Tests for water resistance on the system indicate that it will enable a roof to satisfy this Requirement. See section 5.1 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The system is acceptable. See section 10 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 use of the system satisfies the requirements of this Regulation. See sections 9.1, 9.2 and 10 and the <i>Installation</i> part of this Certificate.
Regulation:	9	Building standards – construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		On flat roofs, the system, when used in an inverted roof specification including a minimum surface finish of 50 mm of aggregate, may be deemed to be of designation AA and can be regarded as having low vulnerability under clause 2.8.1 ⁽¹⁾⁽²⁾ of this Standard. See sections 6.1 to 6.3 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Tests for water resistance on the system indicate that it 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 this system under Regulation 9, 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) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See section 10 and the <i>Installation</i> part of this Certificate.
Regulation:	B3(2)	Suitability of certain materials
Comment:		The system is acceptable. See sections 9.1 and 9.2 of this Certificate.
Regulation:	C4(b)	Resistance to ground moisture and weather
Comment:		Tests for water resistance on the system indicate that it will enable a roof to satisfy the requirements of this Regulation. See section 5.1 of this Certificate.
Regulation:	E5(b)	External fire spread
Comment:		On flat roofs, the system, when used in an inverted roof specification including a minimum surface finish of 50 mm of aggregate, may be deemed to be of designation AA and will enable a roof to be unrestricted under the requirements of this Regulation. See sections 6.1 to 6.3 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), 2 *Delivery and site handling* (2.1 and 2.3) and the *Installation* part of this Certificate.

Non-regulatory Information

NHBC Standards 2008

NHBC accepts the use of the Duoflex Roofing System, when installed in accordance with this Certificate, as meeting Technical Requirement R3 in relation to *NHBC Standards Chapter 7.1 Flat roofs and balconies*.

Technical Specification

1 Description

1.1 The Duoflex Roofing System is applied in two layers to provide a waterproofing layer with a minimum coating thickness of 6 mm and comprises the following components:

- Elastocol 500 Primer — for priming substrates
- Duoflex Monolithic Membrane — a hot-applied SBS modified bitumen membrane
- Flag-Soprema TR200 — a 50 g·m⁻² spunbond polyester for reinforcing the system
- Flag-Soprema Protection layers — a range of various protection layers including Elastophene 180–25, Sopralene 180–40, Sopralene Flam 250AR and Sopralene Flam Jardin a root protection membrane for use in green roof and roof garden specifications.

1.2 The nominal characteristics of the reinforcement and the above mentioned protection layers are give in Table 1.

Material	Roll width (m)	Roll length (m)	Weight (kg)
Flag-Soprema TR200	1.0	200	10
Elastophene 180–25	1.0	10	31
Sopralene 180–40	1.0	8	39
Sopralene Flam 250AR	1.0	8	45
Sopralene Flam Jardin	1.0	8	35

1.3 Ancillary products outside the scope of this Certificate used with the system are as follows:

- Flag-Soprema Paving Support Pads
- Flag-Soprema Reinforcement Strip — a polyester reinforced polymer-modified bitumen sheet to reinforce movement areas or at the interface of different materials
- Flag-Soprema Fleece Layer — a polyester reinforced fleece for use as a filter layer
- Flag-Soprema Self-Adhesive Joint Sealant — an aluminium lined, SBS modified bitumen, self-adhesive sheet to provide additional joint reinforcement and prevents ingress of the Duoflex when necessary
- Flag-Soprema Sopramat ST — a polyethylene studded membrane with an integral polypropylene filter fabric bonded to the studs for use as a drainage layer
- Flag-Soprema Ecran Var water retention layer — for use in green roof and roof garden specifications.

1.4 Quality control checks are performed on incoming raw materials, during production and on the finished components.

2 Delivery and site handling

2.1 The Duoflex Monolithic Membrane is delivered to site in 20 kg blocks packed in boxes and placed on a pallet and shrunk wrapped in plastic. The boxes and the pallets bear the product's name and the boxes also bear the date of packaging.

2.2 Reinforcement and protection layers are packaged with labels bearing the product trade name and should be stored under cover and kept dry.

2.3 The Elastocol 500 Primer is delivered to site in 5 or 30 litre cans. The product is classified under *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009* (CHIP4) and bears the appropriate hazard warning label. The flashpoint and hazard classification are given in Table 2.

Flashpoint (°C)	Classification
25	flammable ⁽¹⁾ , harmful

(1) The product should be stored in accordance with the *Highly Flammable Liquids and Liquefied Petroleum Gases Regulations* (1972).

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Duoflex Roofing System.

3 General

3.1 The Duoflex Roofing System is satisfactory for use on flat, including zero falls, roofs with limited access in either:

- a waterproofing layer in inverted roof specifications
- a waterproofing layer in protected roof specifications, eg covered by pavers or other suitable protection
- a waterproofing layer in a roof garden or green roof systems.

3.2 Limited access roofs are defined for the purpose of this Certificate as those roofs subjected only to pedestrian traffic for such duties as 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.

3.3 Flat roofs are defined for the purpose of this Certificate as those roofs having a minimum finished fall of 1:80. Pitched roofs are defined as those having falls in excess of 1:6. Zero fall roofs are defined for the purpose of this Certificate as those roofs having a finished fall of less than 1:80.

3.4 When designing flat roofs, twice the minimum finished fall should be assumed, unless a detailed analysis of the roof is available, including such information as overall and local deflection, and direction of falls.

3.5 Precast concrete, concrete block and timber decks to which the product is to be applied must comply with the relevant requirements of BS 6229 : 2003 and, where appropriate *NHBC Standards 2008*, Chapter 7.1.

3.6 Metal decking is not suitable for direct application. If metal decking is used then exterior grade plywood is used to provide a suitable flat deck on top of the metal decking.

3.7 Structural decks to which the system is to be applied must be suitable to transmit the dead and imposed loads experienced in service.

3.8 Dead loads, wind loading and imposed loads are calculated in accordance with BS 6399-1 : 1996, BS 6399-2 : 1997 and BS 6399-3 : 1988 respectively.

3.9 In green roof and roof garden specifications, dead loads could also be dramatically increased if the drains become partially or completely clogged causing waterlogging of the drainage soil layer.

3.10 Insulation materials used in conjunction with the product must be:

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

3.11 In the event that the system is contaminated by chemicals, oils and greases then the advice of the Certificate holder should be sought.

4 Practicability of installation

The system should only be installed by trained and approved contractors using specialist equipment. Details of these are available from the Certificate holder.

5 Weathertightness



5.1 Results of test data confirm that the membrane will adequately resist the passage of moisture to the inside of the building and so meet or satisfy the relevant requirements of the national Building Regulations:

England and Wales — Approved Document C, Requirement C2(b), Section 5.1

Scotland — Regulation 9, Mandatory Standard 3.10, clauses 3.10.1 and 3.10.7

Northern Ireland — Regulation C4(b).

5.2 The system will maintain its integrity as a weathertight membrane under normal conditions of exposure and can accept, without damage, minor movements of the substrate (see the *Technical Investigations* section, Table for *Physical properties* — system).

6 Properties in relation to fire



6.1 The membrane, when used in an inverted roof specification including a minimum surface finish of 50 mm of aggregate, shall be deemed to meet BS 476-3 : 1958 designation EXT.F.AA.

6.2 In the opinion of the BBA, when used in irrigated roof gardens or green roofs the use of the system will be unrestricted under the national Requirements.

6.3 The designation of other specifications should be confirmed by:

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

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.

6.4 If plants are allowed to dry in green roofs and roof gardens, they 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.

7 Resistance to wind uplift

The system will resist the effects of wind suction likely to occur in practice.

8 Resistance to foot traffic

8.1 Results of tests indicate that the system can accept, without damage, the limited foot traffic and light concentrated loads associated with installation and maintenance operations. Reasonable care is required, however, to avoid puncture by sharp objects, (see the *Technical Investigations* section, Table for *Physical properties — system*).

8.2 Persons on the roof should wear soft-soled footwear and any equipment carried onto the roof should be placed on suitable protection to prevent damage to the system.

8.3 When used over construction or expansion joints, the membrane can accommodate minor structural movements likely to occur under normal service conditions without damage. The methods described in section 12.3 should be followed (see the *Technical Investigations* section, Table for *Physical properties — system*).

9 Maintenance



9.1 Roofs should be inspected annually 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).

9.2 In situations where maintenance or repair of any of the components in the roof structure are necessary (eg protection layer, insulation, or deck), care must be taken to avoid damage to the membrane. If damage to the membrane occurs, then it must be repaired to comply with the original specification (see section 13).

10 Durability



The system, when fully protected and subject to normal service conditions, will provide an effective barrier to the transmission of liquid water and water vapour for the design life of the roof in which it is incorporated (see the *Technical Investigations* section, Tables for *Physical properties – compound* and *Physical properties — system*).

Installation

11.1 The Duoflex Roofing System must be installed in accordance with the Certificate holder's instructions, on a dry and frost-free substrate. After rain or snow, the substrate must be allowed to dry before installation can commence. The contractor can promote drying the substrate using suitable means approved by the Certificate holder. Once applied, the membrane is not affected by rain, snow or frost.

11.2 To assess the suitability of a substrate to receive the membrane, bond tests must be carried out. If bonding problems occur, advice should be sought from the Certificate holder.

11.3 Prior to the application of the membrane to the substrate, defects such as cracks, irregularities, and areas of potential weakness should be made good, and the substrate cleaned. Where faults are not critical, additional membrane may be used to fill in.

11.4 Substrates must be conditioned with Elastocol 500 Primer and allowed to dry, before application of the membrane.

12 Procedure

12.1 The Duoflex Monolithic Membrane compound is heated in a thermostatically controlled bitumen boiler. The nominal temperature range for the molten membrane is 155°C to 180°C. The temperature of the melt must never exceed 210°C.

12.2 The molten membrane is discharged from the boiler into a suitable container and applied to the roof using long-handled rubber squeegees for horizontal surfaces and a suitable spreader for vertical surfaces.

12.3 At expansion joints up to 12 mm wide with less than 50% movement, a strip of Flag-Soprema Reinforcement Strip, extending 75 mm either side of the joint, is fully encapsulated in the Duoflex Monolithic Membrane as additional reinforcement. At structural movement joints greater than 12 mm and up to 50 mm wide (maximum 50% total movement), a proprietary joint system should be installed. The Certificate holder should be consulted for suitable products.

12.4 The first layer of the molten membrane is applied at a rate of 3 kg·m⁻².

12.5 The Flag-Soprema TR200 reinforcement should be embedded by lightly brushing it into the first layer of the membrane whilst it is still warm and tacky. The reinforcement overlaps should be at least 75 mm wide.

12.6 The second layer of membrane is applied over the top of the Flag-Soprema TR200 at a rate of 3 kg·m⁻².

12.7 Once the membrane has been applied the appropriate protective membrane is then installed, whilst the second layer of the membrane is still hot. This is in accordance with the Certificate holder's instructions prior to applying any insulation and ballast as defined by the specification.

13 Repair

Any damage to the system must be repaired as soon as possible to ensure that the integrity of the waterproofing is maintained. The system may be repaired by removing the damaged area and reinstating the system to the original specification. The advice of the Certificate holder should be sought.

Technical Investigations

14 Tests

14.1 Samples were obtained from the manufacturer for the purpose of testing. The results of these tests are summarised in Tables 3 and 4.

Test (units)	Mean results	Method
Penetration (dmm)		ASTM D 5329
unaged	74	
re-melted ⁽¹⁾	75	
prolonged heating ⁽²⁾	84	
Flow (mm)		ASTM D 5329
unaged	<1	
re-melted ⁽¹⁾	<1	
prolonged heating ⁽²⁾	1	
Low temperature flexibility		CAN/CGSB-37.50-M89
unaged	0	
heat aged 200 days at 70°C	10	
water exposure 180 days at 60°C	10	

(1) Re-melted 7 times at 200°C.
 (2) Prolonged heating for 5 hours at 205°C.

Test (units)	Mean results	Method
6 m head of water	pass	MOAT 27 : 5.1.4.2
Water vapour transmission rate (g·m ⁻² ·day ⁻¹)	0.25	BS 3177 (25°C/RH 75%)
Water vapour resistance (MN·s·g ⁻¹)	822	BS 3177 (25°C/RH 75%)
Dynamic indentation ⁽¹⁾		EOTA TR 006
unaged	L ₄	
heat aged 200 days at 70°C	L ₄	
Static indentation ⁽¹⁾		EOTA TR 007
unaged	L ₄	
water exposure 180 days at 60°C	L ₄	
Resistance to fatigue		EOTA TR 008
unaged	pass	
heat aged 200 days at 70°C	pass	

(1) System included a protection sheet.

14.2 The following tests were also carried out on components of the system:

Compound

- fines content

Reinforcement

- thickness
- mass per unit area
- tensile strength

Protection layer

- thickness
- tensile strength.

15 Investigations

15.1 The manufacturing process was examined, including the methods adopted for quality control.

15.2 A site in progress was carried out to assess the practicability of installation.

Bibliography

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

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

BS 6399-1 : 1996 *Loading for buildings — Code of practice for dead and imposed loads*

BS 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*

BS 6399-3 : 1988 *Loading for buildings — Code of practice for imposed roof loads*

ASTM D 5329 : 2004 *Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements*

CAN/CGSB 37.50 M-89 *Hot-Applied Rubberized Asphalt for Roofing and Waterproofing*

EOTA Technical Report TR 006 (May 2004), *Determination of the resistance to dynamic indentation [Liquid Applied Roof Waterproofing Kits (LARWK)]*

EOTA Technical Report TR 007 (May 2004), *Determination of the resistance to static indentation [Liquid Applied Roof Waterproofing Kits (LARWK)]*

EOTA Technical Report TR 008 (May 2004), *Determination of the resistance to fatigue movement [Liquid Applied Roof Waterproofing Kits (LARWK)]*

MOAT No 27 : 1983 *General Directive for the Assessment of Roof Waterproofing Systems*

16 Conditions

16.1 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.

16.2 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.

16.3 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.

16.4 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.

16.5 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.