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Agrément Certificate
97/3430
Product Sheet 1

FLAGON PVC SINGLE-PLY ROOF WATERPROOFING SYSTEMS

FLAGON SFc, SFb, SV AND Sb ROOF WATERPROOFING MEMBRANES

This Agrément Certificate Product Sheet(1) relates to Flagon SFc, SFb, SV and Sb Roof Waterproofing Membranes, a range of fully bonded and loose-laid and ballasted reinforced PVC membranes, for use on flat and pitched roofs with limited access in exposed, protected, inverted, roof garden and green 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 interior of a building (see section 6).

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

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

Resistance to mechanical damage — the products will accept the limited foot traffic and loads associated with installation and maintenance (see section 9).

Resistance to root penetration — the 1.5 mm membranes will adequately resist plant root penetration (see section 10).

Durability — under normal service conditions, the products will provide a durable roof waterproofing with a service life in excess of 35 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

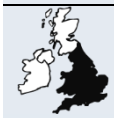
Date of Sixth issue: 26 May 2021

Originally certificated on 30 December 1997

Hardy Giesler
Chief Executive Officer

Regulations

In the opinion of the BBA, Flagon SFc, SFb, SV and Sb Roof Waterproofing Membranes, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	**B4(1)**	**External fire spread**
Comment:		The products are restricted by this Requirement, in some circumstances. See section 7.4 of this Certificate.
Requirement:	**B4(2)**	**External fire spread**
Comment:		The use of the products may enable a roof to be unrestricted under the requirements of this Regulation. See sections 7.1 to 7.3 of this Certificate.
Requirement:	**C2(b)**	**Resistance to moisture**
Comment:		The products, including joints, will enable a roof to satisfy this Requirement. See section 6 of this Certificate.
Regulation:	**7(1)**	**Materials and workmanship**
Comment:		The products are acceptable. See section 12.1 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	**8(1)(2)**	**Durability, workmanship and fitness of materials**
Comment:		The use of the products satisfies the requirements of this Regulation. See sections 11.1 and 12.1 and the *Installation* part of this Certificate.
Regulation:	**9**	**Building standards applicable to construction**
Standard:	2.6	Spread to neighbouring buildings
Comment:		The products are restricted under clause 2.6.4(1)(2) of this Standard, in some circumstances. See section 7.5 of this Certificate.
Standard:	2.8	Spread from neighbouring buildings
Comment:		The products may enable a roof to be unrestricted under clause 2.8.1(1)(2) of this Standard. See sections 7.1 to 7.3 of this Certificate.
Standard:	3.10	Precipitation
Comment:		The products, 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 6 of this Certificate.
Standard:	7.1(a)	Statement of sustainability
Comment:		The products can contribute to satisfying 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:		Comments in relation to the products 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 (as amended)

Regulation:	**23(a)(i) (iii)(b)(i)**	**Fitness of materials and workmanship**
Comment:		The products are acceptable. See section 12.1 and the *Installation* part of this Certificate.
Regulation:	**28(b)**	**Resistance to moisture and weather**
Comment:		The products, including joints, can enable a roof to satisfy the requirements of this Regulation. See section 6 of this Certificate.
Regulation:	**36(b)**	**External fire spread**
Comment:		The products may enable a roof to be unrestricted by the requirements of this Regulation. See sections 7.1 to 7.3 of this Certificate.

Construction (Design and Management) Regulations 2015
Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See sections: 1 *Description* (1.2) and 3 *Delivery and site handling* (3.2 and 3.4) of this Certificate.

Additional Information

NHBC Standards 2021

In the opinion of the BBA, Flagon SFc, SFb, SV and Sb Roof Waterproofing Membranes, for use as fully bonded roof waterproofing systems, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs, terraces and balconies*.

The NHBC Standards do not cover the use of the products in the refurbishment of existing roofs.

CE marking

The Certificate holder has taken the responsibility of CE marking the products in accordance with harmonised European Standard EN 13956 : 2012.

Technical Specification

1 Description

1.1 Flagon membranes included in this Certificate are:

- Flagon SFc — a glass fibre reinforced PVC membrane with a non-woven polyester (200 $g \cdot m^{-2}$) fleece-backing, for fully bonded systems
- Flagon SFb — a glass fibre reinforced PVC membrane with a non-woven polyester (300 $g \cdot m^{-2}$) fleece-backing, for fully bonded systems
- Flagon SV — a glass fibre reinforced PVC membrane, for loose-laid and ballasted systems
- Flagon Sb— a non-reinforced PVC membrane with a non-woven polypropylene (300 $g \cdot m^{-2}$) fleece-backing, for fully bonded systems.

1.2 The products are available in a selection of RAL colours and are manufactured to the nominal characteristics given in Table 1.

Table 1 Nominal characteristics

Characteristic (unit)	Membrane					
	Flagon SFc		Flagon SFb	Flagon SV		Flagon Sb
Thickness (mm)	1.2	1.5	1.5	1.2	1.5	1.5
Width (m)	1.65	1.65	2.1	1.6, 2.1	1.6, 2.1	2.1
Length (m)	20	20	20	20	20	20
Mass per unit area ($kg \cdot m^{-2}$)	1.70	2.00	2.10	1.50	1.80	2.25
Roll weight (kg)	56.0	66.0	88.2	48.0, 63.0	57.6, 75.6	94.5
Watertightness	pass	pass	pass	pass	pass	pass
Tensile strength (N per 50 mm) Method A	≥650	≥700	≥800	—	—	≥1000
Tensile strength ($N \cdot m^{-2}$) Method B	—	—	—	9	9	—
Elongation (%)	≥80	≥80	≥80	≥200	≥200	≥40
Tear strength (trapezoidal) (N)	≥150	≥170	≥250	≥110	≥135	≥250
Low temperature foldability (°C)	≤-25	≤-25	≤-25	≤-25	≤-25	≤-25
Resistance to static loading (kg)	≥20	≥20	≥20	≥20	≥20	≥20
Resistance to dynamic loading on rigid support (mm)	≥450	≥800	≥900	≥450	≥800	≥800
Dimensional stability (%)	≤ 0.1	≤ 0.1	≤ 0.1	≤0.1	≤ 0.1	≤ 2
Joint peel resistance (N per 50 mm)	≥200	≥200	≥200	≥200	≥200	≥200
Joint shear resistance (N per 50 mm)	>520	>560	>640	>430	>540	>800
Resistance to root penetration	—	pass	pass	—	pass	pass
Reaction to fire	Class E	Class E	Class E	Class E	Class E	Class E

(1) No performance determined.

1.3 Ancillary items for use with the products, and inside the scope of this Certificate, include:

- Flagon Corners — preformed Flagon membrane for internal and external corners
- Flagon Flagmetal Sheet — Flagon PVC compound-coated material sections, for use at perimeter details and other detailing areas
- Flagon Walkway — a PVC membrane with anti-slip surface for maintenance traffic
- Flexocol C — a single-component, polyurethane contact adhesive for bonding non-fleece-backed membranes to the substrate for upstands and detail work
- Flexocol W LV— a single-component, polyurethane adhesive for bonding fleece-backed PVC and TPO membranes to the substrate
- Vaporflag — a 0.3 or 0.4 mm thick, black polyethylene membrane for use as a vapour control layer
- Sopravap EVA 35 — a fully bonded SBS modified bitumen membrane with a composite aluminium and a glass fibre reinforcement. The upper surface is finished with talcum/sand, and the lower surface is protected by a thermofusible film, for use as a vapour control layer
- Soprabase SLP300 SF — a fully bonded SBS modified bitumen membrane with composite polyester reinforcement (glass mat and non-woven polyester). The upper surface is finished with talcum or sand and the lower surface is protected by a thermofusible film, for use as a vapour control layer
- Soprabase SLV200 SF — a fully bonded SBS modified bitumen membrane with a glass fibre reinforcement. The upper surface is finished with talcum or sand and the lower surface is protected by a thermofusible film, for use as a vapour control layer
- SBS Easytorch 2000 — a fully bonded SBS modified bitumen membrane with a glass fibre reinforcement. The upper surface is finished with talcum or sand and the lower surface is protected by a thermofusible film, for use as a vapour control layer
- Sopravap Global PB A30 TF – a fully bonded polymer-modified bitumen membrane with an aluminium reinforcement. The upper surface is finished with talcum or sand and the lower surface is protected by a thermofusible film, for use as a vapour control layer
- Sopravap Alu Activa 2 — an SBS modified bitumen membrane with a composite aluminium reinforcement (polyester and aluminium). SBS lanes alternated with non-stick lanes protected with a thermofusible film are laid out on the upper and lower surfaces of the membrane, for use as a vapour control layer

- Sopravap Stick Alu S16 — a self-adhesive modified bitumen membrane with a composite glass grid/aluminium reinforcement. The upper surface has a sand finish and the lower surface is protected by a silicone release sheet, for use as a vapour control layer
- Sopravap Stick S16 – a self-adhesive SBS modified bitumen membrane with a composite glass grid polyester / glass fleece reinforcement. The upper surface is finished with fine sand. The lower surface has a self-adhesive finish that is protected by a silicone release sheet, for use as a vapour control layer
- Sopravap Stick Alu KSD — an SBS modified bitumen with a composite aluminium reinforcement (polyester and aluminium) also acting as the upper surface protection. The lower surface is protected by a silicone release film, for use as a vapour control layer
- Sopravap Stick A15 — a self-adhesive SBS modified bitumen membrane with a composite aluminium reinforcement (polyester and aluminium). The upper surface is finished with talcum or sand. The lower surface has a self-adhesive finish that is protected by a silicone release sheet, for use as a vapour control layer
- Aquadere — cold applied bitumen emulsion primer (solvent free), used to increase adherence for bitumen-based waterproofing membranes
- Sopradere Quick — cold applied fast drying bitumen emulsion primer composed of bitumen, volatile solvents and adhesive additives, for the preparation of substrates such as concrete, metal or wood
- Elastocol 600 — cold applied bitumen primer composed of elastomeric bitumen and volatile solvents for self-adhesive, bitumen based, waterproofing sheets.

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

- Outlets, scuppers, vents and pipe collars
- Flag Geotextile — a 200 $g \cdot m^{-2}$ non-woven polyester, for use as a separation layer
- Flag Butyl Tape — for use in sealing Vaporflag vapour control layers
- Coltack Evolution CA or Coltack Evolution 750 — a single-component polyurethane spray-applied adhesive, for bonding insulation boards to the substrate
- Soprabond 525 — a single-component polyurethane liquid applied adhesive, for bonding insulation boards to the substrate
- Insulation boards — rigid polyisocyanurate (PIR) foam boards.

2 Manufacture

2.1 The products are manufactured by impregnating the glass fibre reinforcement with PVC plastisol and passing through a calender.

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 the manufacturer has been assessed and registered as meeting the requirements of EN ISO 9001 : 2015 by SGS (Certificate FR 18/81842815).

3 Delivery and site handling

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

3.2 The adhesives are delivered to site in 5 or 20L tins. These must be kept tightly sealed, and stored in a cool, ventilated location away from ignition sources and other chemicals. Storage temperatures of between +5 and +30°C will give the component a shelf-life of six months.

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

3.4 The Certificate holder has taken the responsibility of classifying and labelling the products and ancillary items under the *CLP Regulation (EC) No 1272/2008* on the *classification, labelling and packaging of substances and mixtures.* Users must refer to the relevant Safety Data Sheet(s).

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Flagon SFc, SFb, SV and Sb Roof Waterproofing Membranes.

Design Considerations

4 General

4.1 Flagon SFb, SFc and Sb Roof Waterproofing Membranes are satisfactory for use as fully bonded waterproofing systems on flat or pitched roofs with limited access. The bonding medium for Flagon SFb and Flagon SFc is Flexocol W LV or Flexocol C. The membranes are suitable for the following specifications:

- exposed flat and pitched roofs with limited access
- protected flat roofs with limited access
- inverted flat roofs with limited access
- green roofs and roof gardens (1.5 mm, or thicker, membranes only).

4.2 Flagon SV is satisfactory for use as a loose-laid and ballasted waterproofing system on flat or pitched roofs with limited access in the following specifications:

- protected flat roofs with limited access
- inverted flat roofs with limited access
- green roofs and roof gardens (1.5 mm, or thicker, membranes only).

4.3 Decks to which the products are to be applied must comply with the relevant requirements of BS 6229 : 2018, BS 8217 : 2005 and, where appropriate, *NHBC Standards* 2021, Chapter 7.1.

4.4 The following terms are defined for the purpose of this Certificate as:

- roof garden (intensive) — a roof with a substantial layer of growing medium with planting that can include shrubs and trees, generally accessible to pedestrians
- green roof (extensive) — a roof with a shallow layer of growing medium planted with low-maintenance plants such as mosses, sedums, grasses and some wild flower species.

4.5 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 of this Certificate and the relevant clauses of the Certificate holder's installation instructions).

4.6 Flat roofs are defined for the purpose of this Certificate as those having a minimum finished fall of 1:80[(1)]. 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.

(1) *NHBC Standards* 2021 require a minimum fall of 1:60 for green roofs and roof gardens.

4.7 Pitched roofs are defined for the purpose of this Certificate as those having a fall greater than 1:6.

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

4.9 Imposed loads, dead loading and wind load specifications should be calculated by a suitable experienced and competent individual in accordance with BS EN 1991-1-1 : 2002, BS EN 1991-1-3 : 2003 and BS EN 1991-1-4 : 2005, and their UK National Annexes.

4.10 Recommendations for the design of green roof 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*.

4.11 The drainage systems for inverted roofs, green roofs or roof gardens must be correctly designed, and the following points should be addressed:

- provision made for access for maintenance purposes
- dead loads for green roof and roof gardens can increase if the drains become partially or completely blocked causing waterlogging of the drainage layer
- additional guidance for inverted roof specifications is given in BBA Information *Bulletin No 4 Inverted roofs – Drainage and U value corrections.*

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

- as described in the relevant clauses of BS 6229 : 2018, or
- the subject of a current BBA Certificate and used in accordance with, and within the limitations of, that Certificate.

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

4.14 The NHBC requires that roof membranes, once installed, be inspected in accordance with *NHBC Standards* 2021, Chapter 7.1, Clause 7.1.12, including the use of an appropriate integrity test, where required. Any damage to the membrane is repaired in accordance with section 15 of this Certificate and reinspected.

5 Practicability of installation

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

6 Weathertightness

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

7 Properties in relation to fire

7.1 When tested in accordance with CEN/TS 1187 : 2012, Test 4, the products as included in Fire Annex 1 of this Certificate, are classified as $B_{ROOF}(t4)$ in accordance with EN 13501-5 : 2016(1) and so are unrestricted with respect to proximity to a boundary by the national Building Regulations.

(1) Individual reports are available from the Certificate holder.

7.2 In the opinion of the BBA, a roof incorporating the products will also be unrestricted under the national Building Regulations in the following circumstances:

- when used in protected or inverted roof specifications, including an inorganic covering listed in the Annex of Commission Decision 2000/553/EC.
- a roof garden covered with a drainage layer of gravel 100 mm thick and a soil layer 300 mm thick
- irrigated roof gardens or green roofs.

7.3 The designation of other specifications should be confirmed by reference to the requirements of the documents supporting the national Building Regulations.

7.4 The products, when used in pitches greater that 70°, excluding upstands, should not be used on buildings in England and Wales that have a storey at least 18 m above ground level and which contain one or more dwellings, an institution, a room for residential purposes (excluding any room in a hostel, hotel or boarding house), student accommodation, care homes, sheltered housing, hospitals or dormitories in boarding schools.

7.5 The products, when used in pitches greater than 70°, excluding upstands, should not be used on buildings in Scotland that have a storey more than 11 m above ground level.

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

8 Resistance to wind uplift

8.1 When fully bonded to a decking or to a reinforced bituminous membrane, the products will have sufficient adhesion to resist the effects of wind suction, elevated temperatures and thermal shock conditions likely to occur in practice.

8.2 When fully adhered 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 should be taken into account when the insulation material is selected.

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

8.4 The soil used in roof gardens and ballast on inverted/protected roofs must not be of a type that will be removed or become delocalised owing to wind scour experienced on the roof.

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

9 Resistance to mechanical damage

9.1 The products can accept the limited foot traffic and light concentrated loads associated with installation and maintenance. Reasonable care should be taken to avoid puncture by sharp objects or concentrated loads.

9.2 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 bearing pads or Flagon Walkway).

9.3 The products are capable of accepting minor structural movement while remaining weathertight.

10 Resistance to root penetration

The 1.5 mm membranes are resistant to root penetration and can be used in a roof waterproofing system for roof gardens and green roofs.

11 Maintenance

11.1 The roof systems should be the subject of six-monthly inspections and maintenance in accordance with BS 6229 : 2018, Chapter 7, to ensure continued satisfactory performance.

11.2 Guidance is available within the latest edition of *The GRO Green Roof Code – Green Roof Code of Best Practice for the UK.*

11.3 Where damage has occurred, it should be repaired in accordance with section 17 of this Certificate and the Certificate holder's instructions.

12 Durability

12.1 Under normal service conditions, the products will have a service life in excess of 35 years.

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

13 Reuse and recyclability

The products components comprise PVC, which can be recycled.

Installation

14 General

14.1 Installation of Flagon SFc, SFb, SV and Sb Roof Waterproofing Membranes must be carried out by installers trained and approved by the Certificate holder, in accordance with the relevant clauses of BS 6229 : 2018, BS 8000-0 : 2014, BS 8000-4 : 1989 and BS 8217 : 2005, the Certificate holder's instructions and this Certificate.

14.2 Substrates to which the products are to be applied must be sound, dry, clean and free from sharp projections such as nail heads and concrete nibs. When used over a rough substrate, a suitable protection layer must be placed over the substrate.

14.3 Installation must not be carried out during inclement weather (eg rain, fog or snow). The products can be installed below 0°C; however, at temperatures below 5°C, suitable precautions against surface condensation must be taken.

14.4 In all cases, a vapour control layer is used directly over the deck. When internal temperatures and humidity conditions will exceed 22°C/50% relative humidity, special precautions should be taken, and the Certificate holder consulted.

14.5 Insulation boards must be fixed to the substrate in such a way as not to impair the performance of the membrane.

14.6 All flashings must be formed in accordance with the Certificate holder's instructions.

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

15 Procedure

Fully bonded (adhered)

15.1 The bonding agent (Flexocol W LV or bitumen) is applied to the substrate at the prescribed rate using the appropriate method.

15.2 When bonding Flagon SV (in vertical applications), Flexocol C must be used.

15.3 The membrane is unrolled into the bonding agent, taking care not to stretch the material and ensuring adequate overlaps for jointing (see section 16).

15.4 Flagon SV is used at perimeter upstands, being fully adhered to the upstand.

Loose-laid and ballasted

15.5 Flagon SV must be unrolled over the substrate, on top of any protective or isolating layer, taking care not to stretch the material and ensuring adequate overlaps for jointing (see section 16).

15.6 A suitable protection layer must be laid over the membrane prior to application of the ballast.

15.7 Loose-laid applications must 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 (eg pads) may be considered.

15.8 For loose-laid applications, the extra dead loading due to the weight of the aggregate and/or paving, must be taken into account when designing the deck.

15.9 Details at perimeter upstands must be fully adhered or mechanically fixed.

16 Jointing and flashing procedure

Hot-air welding (automatic welding machine)

16.1 The welding 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.

16.2 The overlap width of the membranes must be a minimum of 50 mm and the overlap must be spot welded, with a welding machine, every 150 to 200 mm along the length of the joint.

16.3 The temperature for the automatic welding machine must be set in accordance with the Certificate holder's instructions, depending on the thickness of the membrane and the ambient temperature.

16.4 The joint is welded using the machine. Care must be taken to ensure that overheating of the membrane does not occur, as possible impairment of the membrane may result.

16.5 The seam must be tested with a suitable metal probe and any weakness repaired immediately.

Hot-air welding (hand-held welder)

16.6 The welding 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.

16.7 The overlap width of the membranes must be a minimum of 80 mm and the overlap must be spot welded approximately every 400 mm along the length of the joint.

16.8 The temperature for the hand-held welder must be set in accordance with the Certificate holder's instructions, depending on the thickness of the membrane and the ambient temperature.

16.9 The joint is pre-welded parallel to, and behind, the main welding line. The pre-weld is tested for delamination prior to the main welding being carried out.

16.10 The main weld is carried out. Care must be taken to ensure that overheating of the membrane does not occur, as possible impairment of the membrane may result.

16.11 The seam must be tested with a suitable metal probe and any weakness repaired immediately.

Flashing

16.12 Flashing and detailing must be formed in accordance with the Certificate holder's instructions.

17 Repair

In the event of damage occurring, 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

18 Tests

18.1 An assessment was made of test data to determine:

tests on the reinforcement

- mass per unit area
- tensile strength and elongation

tests on the membrane

- mass per unit area
- tensile strength and elongation at break
- nail tear resistance at 23, 40 and -10°C
- trapezoidal tear resistance
- dimensional stability
- low temperature foldability
- dynamic indentation
- static indentation
- weight loss at elevated temperatures at 15, 30 and 90 days
- 180 days heat ageing at 80°C, followed by low temperature foldability
- plasticiser content
- dehydrochlorination
- ash content
- colour change after UV exposure equal to 4500 $MJ \cdot m^{-2}$ of radiation energy and low temperature foldability

tests on joints

- joint shear strength
- T-peel.

18.2 Results of root resistance tests were assessed.

18.3 Samples were taken from an existing site over 20 years old for a product of similar compound formulation but different installation technique. Comparison testing was carried out on new products from the factory, site samples and site samples following additional UV ageing, and the results assessed to determine:

- thickness
- mass per unit area
- low temperature foldability
- resistance to dynamic impact.

19 Investigations

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

19.2 Existing data on fire performance of the reinforced membranes were evaluated.

19.3 An inspection visit was conducted to an existing site at least 20 years old.

Bibliography

BS 6229 : 2018 *Flat roofs with continuously supported flexible waterproof coverings — Code of practice*

BS 8000-0 : 2014 *Workmanship on construction sites — Introduction and general principles*
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 + A1 : 2015 *Eurocode 1 : Actions on structures — General actions — Snow loads*
NA + A1 : 15 to BS EN 1991-1-3 : 2003 + A1 : 2015 UK National Annex to *Eurocode 1: Actions on structures — General actions — Snow loads*
BS EN 1991-1-4 : 2005 + A1 : 2010 *Eurocode 1 : Actions on structures — General actions — Wind actions*
NA to BS EN 1991-1-4 : 2005 + A1 : 2010 UK National Annex to *Eurocode 1 : Actions on structures — General actions — Wind actions*

EN 13501-5 : 2016 *Fire classification of construction products and building elements — Classification using data from external fire exposure to roofs tests*

EN 13956 : 2012 *Flexible sheet for waterproofing — Plastic and rubber sheets for roof waterproofing — Definitions and characteristics*

EN ISO 9001 : 2015 *Quality management systems — Requirements*

20 Conditions

20.1 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.

20.2 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.

20.3 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.

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

20.5 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.

20.6 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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Fire Annex 1 – Fire Data for FLAGON Sb and FLAGON SFc

Systems A							
SUBSTRATE	**PRIMER**	**VAPOUR BARRIER**	**INSULATION[1] LAYER 1**	**INSULATION[1] LAYER 2 (Optional)**	**TOP LAYER**	**SYSTEMS**	**FIRE REPORTS ASSESSED**
Wood Particle Board (Density: 680 kg/m³; thickness ≥ 16 mm) Or Trapezoidal profiled Steeldeck 106/750 (Thickness ≥ 0.75 mm) Or Fibre cement board (Density: 1850 kg/m³; thickness ≥ 8 mm)	–	• No vapour control layer or • VAPOR FLAG LOOSE LAID	• Sopratherm G 40-140 mm thickness MECHANICALLY FASTENED	–	• FLAGON Sb (thickness 1.5 mm) • FLAGON SFc (thickness 1.5 mm) GLUED with Flexocol W LV	Systems A1 and A2	20029C
	–	• No vapour control layer or • VAPOR FLAG LOOSE LAID	• Sopratherm G 40-140 mm thickness MECHANICALLY FASTENED	• Sopratherm G 40-140 mm thickness MECHANICALLY FASTENED		Systems A1 and A2	
	• Sopradere Quick or • Aquadere	All bituminous VCL with RTF E or better • SOPRAVAP EVA 35 • SOPRABASE SLP300 SF • SOPRABASE SLV 200 SF • SBS EASYTORCH 2000 • SOPRAVAP GLOBAL PB A30 TF TORCHED	• Sopratherm G 40-140 mm thickness GLUED[2]	–		Systems A3	
	• Sopradere Quick or • Aquadere	All bituminous VCL with RTF E or better • SOPRAVAP EVA 35 • SOPRABASE SLP300 SF • SOPRABASE SLV 200 SF • SBS EASYTORCH 2000 • SOPRAVAP GLOBAL PB A30 TF TORCHED	• Sopratherm G 40-140 mm thickness GLUED[2]	• Sopratherm G 40-140 mm thickness GLUED[2]		Systems A3	
	• Elastocol 600	All bituminous VCL with RTF E or better • SOPRAVAP ALU ACTIVA 2 • SOPRAVAP STICK ALU S16 • SOPRAVAP STICK S16 • SOPRAVAP STICK ALU KSD • SOPRAVAP STICK A15 PARTIALLY / FULLY SELF ADHERED	• Sopratherm G or • Sopratherm F 40-140 mm thickness MECHANICALLY FASTENED/ GLUED[2]	–		Systems A4	
	• Elastocol 600	All bituminous VCL with RTF E or better • SOPRAVAP ALU ACTIVA 2 • SOPRAVAP STICK ALU S16 • SOPRAVAP STICK S16 • SOPRAVAP STICK ALU KSD • SOPRAVAP STICK A15 PARTIALLY/FULLY SELF ADHERED	• Sopratherm G or • Sopratherm F 40-140 mm thickness MECHANICALLY FASTENED/ GLUED[2]	• Sopratherm G or • Sopratherm F 40-140 mm thickness MECHANICALLY FASTENED/ GLUED[2]		Systems A4	

(1) Insulation is outside the scope of this Certificate.
(2) Glued with Soprabond 525 or Coltack CA or Coltack Evolution 750.

Fire Annex 1 – Fire Data for FLAGON Sb and FLAGON SFc

REPORT REFERENCE	NATURE OF REPORT	TEST CENTRE	DATE OF REPORT
20029C	Extended Application Report to CEN/TS 16459 : 2013	Exova Warrington Fire	08/12/2020

Note: Systems A are determined by the different vapour barriers used or not used and their fixing method. Further details of the system definitions can be obtained from the Certificate holder.

System A1	NO VAPOUR CONTROL LAYER
System A2	PE VAPOUR CONTROL LAYER - fixing method 1
System A3	BITUMINOUS VCL - fixing method 2
System A4	BITUMINOUS VCL - fixing method 3

Other systems assessed:

SUBSTRATE	PRIMER	VAPOUR BARRIER	INSULATION	TOP LAYER	FIRE REPORTS ASSESSED
Exterior grade WBP plywood (thickness 18 mm)	–	–	–	• FLAGON SFc (thickness 1.2 mm) FULLY BONDED with moisture curing polyurethane adhesive	61423
	Bitumen primer	Bitumen vapour control layer FULLY BITUMEN-BONDED	Polyurethane insulation board (thickness 50 mm) FULLY BITUMEN-BONDED	• FLAGON SFc (thickness 1.2 mm) FULLY BONDED with moisture curing polyurethane adhesive	61422

REPORT REFERENCE	NATURE OF REPORT	TEST CENTRE	DATE OF REPORT
61423	External Fire Exposure Roof Test to BS 476: Part 3: 1958	Warrington Fire research	22/03/1994
61422	External Fire Exposure Roof Test to BS 476: Part 3: 1958	Warrington Fire research	23/03/1994