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Agrément Certificate
20/5843
Product Sheet 1

SOPREMA MODIFIED BITUMEN MEMBRANES

DUO HIGH TECH WATERPROOFING MEMBRANES

This Agrément Certificate Product Sheet(1) relates to DuO High Tech Waterproofing Membranes, comprising polyester/glass composite reinforced polymer-modified bitumen, for use in waterproofing in flat and pitched roofing.

(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 to the interior of a building (see section 6).

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

Resistance to wind uplift — the membranes 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 without damage (see section 9).

Resistance to penetration of roots — the DuO High Tech Landscape and DuO High Tech Landscape FC membrane will resist penetration by roots (see section 10).

Durability — under normal service conditions, the products will provide a durable waterproof covering with a service life of at least 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 First issue: 15 December 2020

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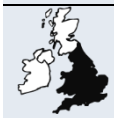
Regulations

In the opinion of the BBA, DuO High Tech 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 7.5 of this Certificate.
Requirement:	**B4(2)**	**External fire spread**
Comment:		On suitable non-combustible substructures, the products can enable a roof to be unrestricted under this Requirement. See sections 7.1, 7.2, 7.3 (Wales only) and 7.4 of this Certificate.
Requirement:	**C2(b)**	**Resistance to moisture**
Comment:		The products will enable a roof to satisfy this Requirement. See section 6 of this Certificate.
Regulation:	**7**	**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
		The products are restricted under clause 2.6.4(1)(2) of this Standard in some circumstances. See section 7.4 of this Certificate.
Standard:	2.8	Spread from neighbouring buildings
Comment:		The products, when applied to a suitable substructure, can be regarded as having low vulnerability under clause 2.8.1(1)(2) of this Standard. See sections 7.1, 7.2, 7.4 and 7.6 of this Certificate.
Standard:	3.10	Precipitation
Comment:		The use of the products 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)**	**Fitness of materials and workmanship**
Comment:	**(iii)(b)(i)**	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 will enable a roof to satisfy the requirements of this Regulation. See section 6 of this Certificate.
Regulation:	**36(b)**	**External fire spread**
Comment:		On suitable substructures, the use of the products can enable a roof to be unrestricted by the requirements of this Regulation. See sections 7.1 to 7.4 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* (3.3) of this Certificate.

Additional Information

NHBC Standards 2020

NHBC accepts the use of DuO High Tech Waterproofing 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*.

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 BS EN 13707 : 2013.

Technical Specification

1 Description

1.1 DuO High Tech Waterproofing Membranes comprise a polyester/glass composite reinforcement with an upper coating of thermoplastic polyolefin (TPO)-modified bitumen and a lower coating of styrene-butadiene-styrene (SBS)-modified bitumen. The upper surface finish of the membranes is either slate or talc, and the lower a thermofusible polyethylene film or polypropylene fleece. The following membranes are covered by this Certificate:

- DuO High Tech — the standard membrane, for use in single-ply or built-up specifications
- DuO High Tech FC — an enhanced fire-resistance version of the standard membrane
- DuO High Tech Aero — designed for use in partially bonded single-ply specifications
- DuO High Tech Aero FC — an enhanced fire-resistance version of the DuO High Tech Aero membrane
- DuO High Tech Mecano — for use in mechanical fastened specifications
- DuO High Tech FC Mecano — an enhanced fire-resistance version of the DuO High Tech Mecano membrane
- DuO High Tech Landscape — for use on green roofs and green gardens
- DuO High Tech FC Landscape — an enhanced fire-resistance version of the DuO High Tech Landscape membrane.

1.2 The membranes are manufactured to the nominal parameters given in Table 1, using the reinforcement types listed in Table 2, with the declared values given in Table 3.

Table 1 Nominal parameters

Parameter (unit)	Grade			
	4	4A	5	5A
Upper surface finish	talc	slate	talc	slate
Thickness (mm)	4.00	4.00	5.00	5.00
Width (m)	1	1	1	1
Length (m)	7.5, 8.0, 10.0	7.5, 8.0, 10.0	5.0, 7.5, 8.0	5.0, 7.5, 8.0
Mass per unit area ($kg \cdot m^{-2}$)	4.2	4.8	5.2	5.8

Table 2 Reinforcement

Product range name	Reinforcement type	Reinforcement mass per unit area ($g \cdot m^{-2}$)
DuO High Tech	polyester/glass scrim polyester/glass fleece	180 and 200 160/50 and 250/50
DuO High Tech FC	polyester/glass scrim polyester/glass fleece	180 and 200 160/50 and 250/50
DuO High Tech Aero(1)	polyester/glass scrim	180
DuO High Tech Aero FC(1)	polyester/glass scrim	180
DuO High Tech Mecano	polyester/glass scrim polyester/glass fleece	180 and 200 160/50 and 250/50
DuO High Tech FC Mecano	polyester/glass scrim polyester/glass fleece	180 and 200 160/50 and 250/50
DuO High Tech Landscape	polyester/glass scrim polyester/glass fleece	180 and 200 160/50 and 250/50
DuO High Tech FC Landscape	polyester/glass scrim polyester/glass fleece	180 and 200 160/50 and 250/50

(1) Only 4 and 4A grades available.

Table 3 CE marking declared values

Characteristic (unit)		Membrane						
	DuO High Tech	DuO High Tech FC	DuO High Tech Aero	DuO High Tech Aero FC	DuO High Tech Mecano	DuO High Tech FC Mecano	DuO High Tech Landscape	DuO High Tech FC Landscape
Tensile strength (N per 50 mm)	880 ± 20%	880 ± 20%	880 ± 20%	880 ± 20%	880 ± 20%	880 ± 20%	880 ± 20%	880 ± 20%
Elongation(1) (%)	55 ± 20% abs(1)	55 ± 20% abs(1)	55 ± 20% abs(1)	55 ± 20% abs(1)	55 ± 20% abs(1)	55 ± 20% abs(1)	55 ± 20% abs(1)	55 ± 20% abs(1)
Resistance to static loading (kg)	25	25	25	25	25	25	25	25
Resistance to tearing (N)	330 ± 25%	330 ± 25%	330 ± 25%	330 ± 25%	330 ± 25%	330 ± 25%	330 ± 25%	330 ± 25%
Flow resistance after heat exposure (°C)	≥100	≥100	≥100	≥100	≥100	≥100	≥100	≥100
Flexibility after heat exposure – TPO/SBS (°C)	–10/–10 ± 5	–10/–10 ± 5	–10/–10 ± 5	–10/–10 ± 5	–10/–10 ± 5	–10/–10 ± 5	–10/–10 ± 5	–10/–10 ± 5

(1) abs = absolute value.

1.3 DuO High Tech membrane (the standard membrane) is also available as DuO High Tech No Flame with a polypropylene fleece on the underside of the membrane, for use in cold adhered systems using DuO Elastomeric Adhesive or De Boer DuO Fix PU.

1.4 DuO Elastomeric Adhesive and De Boer DuO Fix PU are for use in cold bonding installation specifications.

1.5 DuO Primer, Elastocol 500, Aquadere, Sopradere Quick and Elastocol 600 are solvent-based bitumen primers for preparation of concrete, wood and existing bitumen substrates.

1.6 Other membranes manufactured by the Certificate holder that can be used in conjunction with the DuO High Tech Waterproofing Membranes, but outside the scope of this Certificate, are:

Vapour control layers

- Sopravap PB Alu 3
- Soprarock SBS P3 TF - TT
- Sopraglass PB V3 TT - TF

Underlayers

- Soprarock PB P3 TT – TF
- Ventirock PB 3 TF
- Soprarock SBS P3 TT – TF
- Sopravap Stick C15
- Soprastick TF

2 Manufacture

2.1 The membranes are manufactured by coating the reinforcement with a top layer of TPO-modified bitumen coating mass followed by coating the lower face with an SBS-modified bitumen coating mass using traditional bitumen coating techniques.

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 Soprema NV has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 and BS EN ISO 14001 : 2015 by SGS Belgium NV (Certificates FR18/81842815 and FR18/81842816 respectively).

3 Delivery and site handling

3.1 The membranes are delivered to site in rolls on pallets covered in shrink-wrapped polythene. Every pallet and roll has a label bearing the product name, Certificate holder's name, production identification numbers and the BBA logo incorporating the number of this Certificate.

3.2 Individual rolls should be stored upright on a clean, level surface, away from excessive heat and kept dry.

3.3 The Certificate holder has taken the responsibility of classifying and labelling the products 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 DuO High Tech Waterproofing Membranes.

Design Considerations

4 General

4.1 Duo High Tech Waterproofing Membranes are satisfactory for use as:

- a fully or partially torch-bonded waterproofing for flat or pitched roofs with limited access, as part of a single layer or built-up specification and, where necessary, in conjunction with appropriate roofing membranes, or to BS 8747 : 2007
- a full or partially hot bitumen-bonded waterproofing for flat or pitched roofs with limited access, as part of a single layer or built-up specification and, where necessary, in conjunction with appropriate roofing membranes, or to BS 8747 : 2007
- cold-bonded for flat roofs with limited access, as part of a single layer or built-up specification and, where necessary, in conjunction with appropriate roofing membranes
- a single-ply, loose-laid waterproofing layer, ballasted with aggregate on flat roofs with limited access, or under heavy protection (eg concrete slabs) on flat roofs with regular pedestrian traffic
- a mechanically fixed waterproof layer on flat roofs with limited access
- a single-ply overlay for existing asphalt and bitumen membrane roofs
- green roof specifications on flat roofs with limited or pedestrian access, or pitched roofs with limited access
- roof garden specifications on flat roofs
- waterproofing to concrete podium decks in a multi-layer system with heavy protection (eg concrete paving slabs), for regular pedestrian traffic or soft green landscaping in conjunction with appropriate membranes.

4.2 The slate-finished membranes are satisfactory for use, where appropriate, as an exposed cap sheet or in detail work.

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

4.6 For the purpose of this Certificate, flat roofs are defined as those having a minimum finished fall of 1:80(1). When designing flat roofs, twice the minimum finished fall should be assumed, unless a detailed analysis of the roof is available including, for example, overall and local deflection and direction of falls.

(1) *NHBC Standards* 2020 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 in excess of 1:6.

4.8 For loose-laid and ballasted roofs, green roofs and roof gardens, structural decks to which the systems are to be applied must be suitable to transmit the dead and imposed loads experienced in service.

4.9 Imposed loads, dead loading and wind loads must be calculated by a suitably 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 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*.

4.11 The drainage systems for 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 can increase if the drains become partially or completely blocked, causing waterlogging of the drainage layer.

4.12 Insulation systems or materials used in conjunction with the membranes must be either

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

5 Practicability of installation

Installation of DuO High Tech Waterproofing Membranes must be carried out by contractors trained and approved by the Certificate holder.

6 Weathertightness

The products, including joints, when completely sealed and consolidated, will adequately resist the passage of moisture to the inside of the building and so satisfy the requirements of the national Building Regulations.

7 Properties in relation to fire

7.1 A flat system comprising an 18 mm thick chipboard substrate, one layer of 2 mm thick, glass-reinforced bitumen underlay torch-bonded, and one layer of DuO High Tech 4A FC torch-bonded, achieved an EXT.F.AA classification(1) to BS 476-3 : 1958 and so is unrestricted under the national Building Regulations.

(1) Test report reference 103294, issued by Warrington Fire Research Centre. Copies are available from the Certificate holder on request.

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

- a roof garden covered with a drainage layer of gravel 100 mm thick and a soil layer 300 mm thick
- an irrigated roof garden or green roof
- when protected by an inorganic covering (eg gravel or paving slabs) listed in the Annex of Commission Decision 2000/553/EC.

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

- 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
- macadam.

7.4 The performance of other specifications should be established in accordance with the requirements of the documents supporting the national Building Regulations

7.5 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 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.

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

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

8 Resistance to wind uplift

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

8.2 Where the membranes are 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 precise ballast requirement for a loose-laid system should be calculated in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex, but should be a minimum of 50 mm. The use of concrete slabs on suitable protective supports should be considered in areas of high design wind loads.

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

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

8.5 The wind uplift forces to be resisted should be calculated by a suitably experienced and competent individual in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex, and the number of fixings required calculated on the basis of a maximum permissible load of 0.45 kN per fixing.

8.6 The soil used in roof gardens must not be of a type that will be removed or become delocalised due to wind scour experienced on the roof.

8.7 It must 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. Care must be taken to avoid puncture by sharp objects or concentrated loads. On limited access roofs where excessive traffic is envisaged, such as for maintenance of lift equipment, a walkway must be provided (for example, by using concrete slabs supported on bearing pads).

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

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

10 Resistance to penetration of roots

10.1 Results of test data indicate that DuO High Tech Landscape and DuO High Tech Landscape FC are suitable as a root-resistant membrane when used in roof garden applications and will provide adequate protection against penetration by roots.

10.2 Advice on suitable planting specifications can be sought from the Certificate holder.

11 Maintenance

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

11.2 Green roofs and roof gardens must be the subject of regular inspections, particularly in autumn after leaf fall and in spring, to ensure unwanted vegetation and other debris are cleared from the roof and drainage outlets (see section 4.10). Guidance is available in *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 15 and the Certificate holder's instructions.

12 Durability

12.1 The membranes, when subjected to normal conditions of use in a roof, will retain their integrity for a period of at least 35 years.

12.2 When using the mineral-surfaced cap sheets, some localised loss of mineral surfacing may occur after some years in areas where complex detailing of the roof design is incorporated.

Installation

13 General

13.1 The installation of DuO High Tech Waterproofing Membranes is carried out in accordance with the relevant clauses of BS 8000-0 : 2014, BS 8000-4 : 1989 and BS 8217 : 2005, the Certificate holder's instructions and this Certificate.

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

13.3 The products may be laid in conditions normal to roofing work and must not be laid in rain, snow or heavy fog, or if the temperature falls below 5°C.

13.4 At falls in excess of 5° (1:11), precautions against slippage and requirements for mechanical fixing as required by BS 8217 : 2005, should be observed.

13.5 If the roof is likely to be subjected to uncontrolled pedestrian access, the substructure must satisfy the requirements of BS 8217 : 2005, clauses 6.12 and 6.13, and to prevent damage to the roof covering one of the surface finishes described in clauses 8.19.3 and 8.19.4 of *The GRO Green Roof Code* must be used.

13.6 On completion of the roof, the sanded top layers must have a surface finish applied in accordance with BS 8217 : 2005, clauses 6.12 and 8.19. Surface finishes in *The GRO Green Roof Code* include:

- stone aggregate bonded in dressing compound
- precast concrete paving flags
- proprietary tiles in bonding compound.

13.7 The slate-finished membranes, when used on roofs with limited access, require no further surface protection.

13.8 When used for remedial work, existing waterproofing layers must be made sound and existing surface finishes (eg surface dressing) must be removed and then primed.

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

14 Procedure

14.1 Membranes are installed by torch-bonding, cold adhesive bonding or traditional hot bitumen bonding, or are loose-laid and ballasted or mechanically fastened.

14.2 Side and end laps for the membranes are given in Table 4.

Table 4 Joint dimensions

Specification type	Width of side lap (mm)	Width of end lap (mm)
Cap sheet of Multi-layer	80	100
Single-ply	100	150
Aero	100	150
Mecano	130	150

Fully bonded applications

14.3 Prior to application of the membrane the substrate is primed.

14.4 Bonding is achieved either by traditional pour and roll methods or by melting the lower surface by torching and pressing the membrane down. Care must be taken when torching not to overheat the coating.

Partially bonded applications

14.5 Partially bonded applications can be achieved either by the normal BS 8217 : 2005 method or by using DuO High Tech Aero membranes.

14.6 When installing in accordance with BS 8217 : 2005, a layer of type 3G felt to BS 8747 : 2007 or a specialist venting layer product from section 1.6 of this Certificate is loose-laid over the substrate. The membrane is then fully bonded onto the perforated layer, ensuring that the bitumen seeps regularly into the perforations.

14.7 DuO High Tech Aero is applied by torching, the pattern on the underside of the membrane producing a partial bond.

Loose-laid applications

14.8 The membrane is unrolled on the substrate, with overlaps and jointing carried out.

14.9 With loose-laid systems the membranes must be ballasted to combat the effects of wind uplift. This can be achieved by:

- at least 50 mm of clean rounded aggregate (20/40 grade), as free from fines as practicable
- concrete paving slabs on a supporting layer of sand
- concrete paving slabs to BS EN 1339 : 2003 on bearing pads.

Mechanical fastened applications (Mecano)

14.10 Fasteners are installed within the overlap, with the fastener plate a minimum of 10 mm from the edge of the membrane.

14.11 Once the fasteners are installed, the overlap is sealed by torching or hot-air welding.

Cold adhesive bonding (No Flame)

14.12 Following the priming of the substrate, DuO Elastomeric Adhesive is spread evenly across the substrate at a rate of 1 $kg \cdot m^{-2}$. When using De Boer DuO Fix PU Adhesive, it is applied in strips across the substrate at a rate of 250 to 300 $g \cdot m^{-2}$.

14.13 DuO No Flame membrane is rolled out into the wet adhesive and pressed down firmly.

14.14 Joint overlaps must be sealed by either torching or hot-air welding.

15 Repair

In the event of damage, the membranes can be effectively repaired, after cleaning, with a patch of the appropriate membrane torch-bonded over the damaged area in accordance with the Certificate holder's instructions.

Technical Investigations

16 Tests

16.1 An assessment was made of data in relation to:

- thickness
- adherence of slate protection
- tensile shear of joints
- static indentation
- dynamic indentation
- peel of joints
- low temperature flexibility
  - — unaged
  - — heat aged
- heat resistance
  - — unaged
  - — heat aged
- fatigue cycling
  - — unaged
  - — heat aged
- tensile strength
- elongation at break
- tear resistance
- dimensional stability
- root resistance.

16.2 A test report on samples taken from a number of existing sites up to 20 years old was assessed, including comparison testing of samples taken for some sites after 10, 15 and 20 years. Tests were carried out to determine:

- thickness
- tear resistance
- low temperature flexibility
- dimension stability
- tensile strength
- heat resistance
- resistance to nail tear
- elongation at break
- tensile shear of joints

Physical properties of coating masses

TPO

- ring and ball
  - — unaged
  - — heat aged
- penetration

25°C

— unaged

— heat aged

60°C

— unaged
— heat aged
- low temperature flexibility
  — unaged
  — heat aged

SBS

- ring and ball
- low temperature flexibility

Physical properties of the system

- wind uplift
  — multi-layer system
  — Duo High Tech Aero
  — steel deck — system consisted of a steel profile deck, DeboTack 2.5 t/f k180 self-adhesive membrane, Taurox NP Bitufilm and DuO High Tech fully bonded.

17 Investigations

17.1 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.

17.2 An evaluation was made of fire test data.

Bibliography

BS 476-3 : 2004 *External fire exposure roof test*

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

BS EN 1339 : 2003 *Concrete paving flags — Requirements and test methods.*

BS 8000-4 : 1989 *Workmanship on building sites — Code of practice for waterproofing*

BS 8000-0 : 2014 *Workmanship on construction sites. Introduction and general principles*

BS 8217 : 2005 *Reinforced bitumen membranes for roofing — Code of practice*

BS 8747 : 2007 *Reinforced bitumen membranes (RBMs) for roofing — Guide to selection and specification*

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*

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

BS EN ISO 14001 : 2015 *Environmental management systems — Specification with guidance for use*

BS EN 13707 : 2013 *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.