

## Radmat Building Products Ltd

Holland House  
Valley Way  
Rockingham Road  
Market Harborough  
Leicestershire LE16 7PS

Tel: 01858 410372 Fax: 01858 410572

e-mail: [techenquiries@radmat.com](mailto:techenquiries@radmat.com)

website: [www.radmat.com](http://www.radmat.com)



**Agrément Certificate**

**15/5282**

Product Sheet 2

### RADMAT ESHA BITUMINOUS ROOFING SYSTEMS

### ESHAFLEX TOTAL GREEN ROOF WATERPROOFING SYSTEMS

This Agrément Certificate Product Sheet<sup>(1)</sup> relates to EshaFlex Total Green Roof Waterproofing Systems, a range of polymer-modified bitumen waterproofing membranes and vapour control layers for use on inverted, warm and cold, pitched, flat and zero fall roofs in green roof or roof garden 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 systems will resist the passage of moisture to the interior of a building (see section 6).

**Condensation risk** — roofs incorporating the systems will adequately limit the risk of interstitial and surface condensation (see section 7).

**Properties in relation to fire** — the systems, when used in a suitable specification, can enable a roof to be unrestricted under the national Building Regulations (see section 8).

**Resistance to wind uplift** — when correctly specified, the systems will enable a roof to be unrestricted under the national Building Regulations (see section 9).

**Resistance to mechanical damage** — the systems will accept, without damage, the limited foot traffic and loads associated with installation and maintenance (see section 10).

**Resistance to penetration of roots** — the systems will resist the penetration of roots (see section 11).

**Durability** — under normal service conditions, the systems will provide a durable waterproof covering with a service life comparable with that of a roof in which they are incorporated (see section 13).

The BBA has awarded this Certificate to the company named above for the systems described herein. These systems 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 Agreement

Date of Second issue: 14 November 2019

Originally certificated on 9 December 2015

Brian Moore  
Director



*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](http://www.bbacerts.co.uk)*

*Readers MUST check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.*

*Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.*

#### British Board of Agrément

Bucknalls Lane  
Watford  
Herts WD25 9BA

tel: 01923 665300

[clientservices@bbacerts.co.uk](mailto:clientservices@bbacerts.co.uk)

[www.bbacerts.co.uk](http://www.bbacerts.co.uk)

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## Regulations

In the opinion of the BBA, EshaFlex Total Green Roof Waterproofing Systems, 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)

<b>Requirement:</b>	<b>B4(2)</b>	<b>External fire spread</b>
Comment:		On a suitable substructure, the use of the systems can enable a roof to be unrestricted under this Requirement. See sections 8.1 to 8.3 of this Certificate.
<b>Requirement:</b>	<b>C2(b)</b>	<b>Resistance to moisture</b>
Comment:		The systems, including joints, will enable a roof to satisfy this Requirement. See section 6.1 of this Certificate.
<b>Requirement:</b>	<b>C2(c)</b>	<b>Resistance to moisture</b>
Comment:		The vapour control layer component of the systems can contribute to enabling a roof to satisfy this Requirement. See section 7 of this Certificate.
<b>Regulation:</b>	<b>7</b>	<b>Materials and workmanship (applicable to Wales only)</b>
<b>Regulation:</b>	<b>7(1)</b>	<b>Materials and workmanship (applicable to England only)</b>
Comment:		The systems are acceptable. See section 13.1 and the <i>Installation</i> part of this Certificate.



### The Building (Scotland) Regulations 2004 (as amended)

<b>Regulation:</b>	<b>8(1)(2)</b>	<b>Durability, workmanship and fitness of materials</b>
Comment:		The use of the systems satisfies the requirements of this Regulation. See sections 12.1 and 13.1 and the <i>Installation</i> part of this Certificate.
<b>Regulation:</b>	<b>9</b>	<b>Building standards applicable to construction</b>
Standard:	<b>2.8</b>	<b>Spread from neighbouring buildings</b>
Comment:		The systems, when applied to a suitable substructure, can be regarded as having low vulnerability under clause 2.8.1 <sup>(1)(2)</sup> of this Standard. See sections 8.1 to 8.3 of this Certificate.
Standard:	<b>3.10</b>	<b>Precipitation</b>
Comment:		The use of the systems, including joints, will enable a roof to satisfy the requirements of this Standard, with reference to clauses 3.10.1 <sup>(1)(2)</sup> and 3.10.7 <sup>(1)(2)</sup> . See section 6.1 of this Certificate.
Standard:	<b>3.15</b>	<b>Condensation</b>
Comment:		The vapour control layer component of the systems will enable a roof to satisfy this Standard, with reference to clauses 3.15.1 <sup>(1)</sup> , 3.15.3 <sup>(1)</sup> , 3.15.5 <sup>(1)</sup> and 3.15.6 <sup>(1)</sup> . See section 7 of this Certificate.
Standard:	<b>7.1(a)</b>	<b>Statement of sustainability</b>
Comment:		The systems can contribute to meeting the relevant requirements of Regulation 9, Standards 1 to 6 and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
<b>Regulation:</b>	<b>12</b>	<b>Building standards applicable to conversions</b>
Comment:		All comments given for the systems under Regulation 9, Standards 1 to 6 also apply to this Regulation, with reference to clause 0.12.1 <sup>(1)(2)</sup> and Schedule 6 <sup>(1)(2)</sup> .

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).



## The Building Regulations (Northern Ireland) 2012 (as amended)

<b>Regulation:</b>	<b>23(a)(i)</b>	<b>Fitness of materials and workmanship</b>
<b>Comment:</b>	<b>(iii)(b)(i)</b>	The systems are acceptable. See section 13.1 and the <i>Installation</i> part of this Certificate.
<b>Regulation:</b>	<b>28(b)</b>	<b>Resistance to moisture and weather</b>
<b>Comment:</b>		The systems, including joints, satisfy the requirements of this Regulation. See section 6.1 of this Certificate.
<b>Regulation:</b>	<b>29</b>	<b>Condensation</b>
<b>Comment:</b>		The systems can contribute to a roof satisfying this Regulation. See section 7 of this Certificate.
<b>Regulation:</b>	<b>36(b)</b>	<b>External fire spread</b>
<b>Comment:</b>		On suitable substructures, the use of the systems can enable a roof to be unrestricted under the requirements of this Regulation. See sections 8.1 to 8.3 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* (3.3) of this Certificate.

## Additional Information

### NHBC Standards 2019

In the opinion of the BBA, EshaFlex Total Green 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 and balconies*.

NHBC Standards, Chapter 7.1.9 requires that for green roofs the membrane should be visually inspected and electronically tested for waterproofing integrity before further layers are placed.

### CE marking

The Certificate holder has taken the responsibility of CE marking the systems in accordance with harmonised European Standards EN 13707 : 2013 for the bitumen sheets and EN 13970 : 2004 for the vapour control layers. An asterisk (\*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

## Technical Specification

### 1 Description

1.1 EshaFlex Total Green Roof Waterproofing Systems consist of the following waterproofing membranes and vapour control layers:

- EshaFlex 370 WS Mini Slate — a 230 g·m<sup>-2</sup> polyester-fibre glass reinforced, SBS polymer-modified bitumen membrane with a thermofusible film on the lower surface and an upper surface finish of black mineral, for use as a cap sheet in systems which are partially and fully adhered by torch application, and in mechanically fixed two-layer applications
- EshaFlex 370 Plain — a 180 g·m<sup>-2</sup> polyester-fibre glass reinforced, SBS polymer-modified bitumen membrane with a grooved lower surface finish with a thermofusible film and an upper surface finish of sand, for use as a base sheet in green roof applications which have been fully adhered by torch application

- EshaFlex TK40 — a 200 g·m<sup>-2</sup> glass fabric reinforced SBS modified bitumen with a strip-applied adhesive and release film on the lower surface and a sand upper surface, for use as a venting layer in partially adhered systems by heat-activation, resulting in approximately 60% adhesion area
- EshaVent — a 60 g·m<sup>-2</sup> glass fleece reinforced SBS polymer-modified bitumen with a self-adhesive perforated aluminium foil lower surface covered with release film and a sanded upper surface, for use as a venting layer in systems which are partially adhered by heat-activation, resulting in an adhesion area of approximately 40%
- EshaBase SA — a 200 g·m<sup>-2</sup> glass fabric reinforced SBS polymer-modified bitumen membrane with a self-adhesive lower surface covered with release film and a PE film upper surface, for use as a fully bonded base sheet
- EshaBase SA Sand — a 200 g·m<sup>-2</sup> glass fabric reinforced SBS polymer-modified bitumen membrane with a self-adhesive lower surface covered with release film and a sand-finished upper surface, for use as a vapour barrier or a fully bonded base sheet
- EshaBase SA Alu 3mm — a 200 g·m<sup>-2</sup> glass fabric reinforced and aluminium/polyester SBS polymer-modified laminate with a self-adhesive lower surface covered with release film and a sand-finished upper surface, for use as a vapour control layer
- EshaBase SA Alu 4.2mm — a 200 g·m<sup>-2</sup> glass fabric reinforced and aluminium/polyester SBS polymer-modified laminate with a self-adhesive lower surface covered with release film and a sand-finished upper surface, for use as a vapour control layer
- EshaBase Alu — a 60 g·m<sup>-2</sup> glass fleece reinforced and aluminium/polyester oxidised modified bitumen with a thermofusible film on the lower surface and a sand-finished upper surface, for use as a torch-on vapour control layer
- AluBase XL — a reinforced aluminium foil/fibre-glass net coated with a bitumen compound for use as a self-adhesive air and vapour control layer (AVCL)
- Esha SA Primer — a solvent-based bituminous primer for preparing substrates prior to application of the self-adhesive membranes
- EshaPrimer — a quick-drying bitumen primer for preparing substrates prior to the application of the torch-on membranes
- Radmat Red Primer — high penetration synthetic primer for preparing substrates prior to the application of self-adhesive AVCL's.

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

*Table 1 Nominal characteristics of membranes*

Characteristic (unit)	EshaGreen waterproofing membranes	
	370 WS Mini Slate	EshaFlex 370 Plain
Thickness (mm)	4.4	3.8
Roll width (m)	1.0	1.0
Roll length (m)	7.5	7.5
Mass per unit area (kg·m <sup>-2</sup> )	4.6	4.1
Roll weight (kg)	34.5	30.8
Tensile strength (N·50 mm <sup>-1</sup> )		
longitudinal	800	700
transverse	700	700
Elongation (%)		
longitudinal	25	18
transverse	25	25
Nail tear strength (N)	350	300
Watertightness (at 10 kPa)	Pass	Pass
Low temperature flexibility (°C)	≤ -20	≤ -20
Upper surface finish	Black mineral	Sand
Lower surface finish	Thermofusible film	

1.3 The vapour control layers are supplied to site with the nominal characteristics shown in Table 2.

**Table 2 Nominal characteristics of vapour control layers**

Characteristic (unit)	EshaBase Vapour Control Layers				
	SA Sand	SA Alu 3mm	SA Alu 4.2mm	Alu	AluBase XL
Thickness (mm)	2.0	3.0	4.2	4.0	0.60
Roll width (m)	1.0	1.0	1.0	1.0	1.0
Roll length (m)	10	7.5	7.5	5.0	40
Roll weight (kg)	20	32	36.8	25	28
Tensile strength (N·50 mm <sup>-1</sup> )					
longitudinal	1250	1250	1250	500	600
transverse	2000	1250	1250	375	600
Elongation (%)					
longitudinal	5	5	5	3	5
transverse	5	5	5	3	5
Nail tear strength (N)		400	400	150	190
Watertightness (at 60 kPa)	pass	pass	pass	pass	pass
Water vapour permeability (m <sup>2</sup> ·s <sup>-1</sup> ·Pa <sup>-1</sup> ·kg <sup>-1</sup> )	20,000	≥ 8.12 x 10 <sup>12</sup>	≥ 8.12 x 10 <sup>12</sup>	≥ 8.12 x 10 <sup>12</sup>	—
Equivalent air layer thickness* S <sub>d</sub> (m)	—	—	—	—	>1500
Low temperature flexibility (°C)	≤ -20	≤ -10	≤ -10	≥ 0	≤ -20

1.4 Other materials for use with the systems, but which are outside the scope of this Certificate, are:

- EshaStik — a moisture-curing polyurethane insulation board adhesive
- ProTherm PIR Bond and ProTherm PIR Bond Tapered — a rigid polyisocyanurate (PIR) foam-cored insulation board, faced with a polypropylene fleece on both surfaces
- ProTherm PIR TORCH and ProTherm PIR TORCH Tapered — a rigid polyisocyanurate (PIR) foam-cored insulation board, faced with bitumen-coated glass tissue on the upper surface and polypropylene fleece on the lower
- ProTherm PIR FIR FOIL and ProTherm PIR FOIL Tapered — a rigid PIR foam-cored insulation board, with an aluminium foil face composite on both surfaces
- ProTherm PIR Comp Tapered — EPS/polyisocyanurate composite board, with mineral-filled glass fibre tissue on the upper face and polypropylene fleece on the lower
- ProTherm MW — dual-density non-combustible mineral wool insulation manufactured from renewable volcanic stone
- ProTherm FoamGlas — a non-combustible insulation board manufactured from graded recycled glass and natural raw materials
- ProFast — a range of mechanical fasteners for insulation
- ProFlow — a range of gravity rainwater outlets
- ProLight — a range of polycarbonate and glass rooflights
- ProSafe — a range of roof safety products
- D10, D25, D40, and D80 — a range of drainage and reservoir boards
- G11 and G12 — geotextile filter layers
- GM0/12 — a green roof growing medium for brown roofs
- GM10, GM20, GM30, GM40 and GM50 — growing medium for green roofs
- MedO — a range of gravel stops.

## 2 Manufacture

2.1 The waterproofing membranes and AVCL's are manufactured by saturating and coating the reinforcement with SBS modified bitumen, then calendaring to the correct thickness.

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 being operated by the manufacturer are being maintained.

2.3 The management system of the manufacturer of the bitumen membranes and vapour control layers has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 and BS EN ISO 14001 : 2015 by KIWA (Certificate K74027/02).

### 3 Delivery and site handling

3.1 The membranes are delivered to site in rolls shrink-wrapped on pallets bearing the product name and production batch details.

3.2 Rolls must be stored vertically on a clean, level surface, away from excessive heat and under cover.

3.3 The Certificate holder has taken the responsibility of classifying and labelling the system components 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 Eshaflex Total Green Roof Waterproofing Systems.

### Design Considerations

#### 4 General

4.1 EshaFlex Total Green Roof Waterproofing Systems are satisfactory for use as partially and fully bonded and mechanically fastened roof waterproofing systems, including vapour control layers, on:

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

4.2 Decks to which the membranes are to be applied must comply with the relevant requirements of either BS 6229 : 2018 or BS 8217 : 2005 and, where appropriate, *NHBC Standards 2019*, Chapter 7.1. Additional guidance for inverted roof specifications is given in BBA Information Bulletin No 4 *Inverted roofs – Drainage and U value corrections*.

4.3 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, additional protection to the membrane must be provided (see section 10 of this Certificate and the relevant clauses of the Certificate holder's installation instructions).

4.4 Flat roofs are defined for the purpose of this Certificate as those having a minimum finished fall of 1:80<sup>(1)</sup>. 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 2019* require a minimum fall of 1:60 for green roofs and roof gardens.

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

4.6 Zero fall roofs are defined for the purpose of this Certificate as those having a finished fall which can vary between 0 and 1:80. Reference should also be made to the appropriate clauses in the Liquid Roofing and Waterproofing Association (LRWA) Note 7 – *Specifier Guidance for Flat Roof Falls*.



4.7 On zero fall roofs, it is particularly important to identify the correct drainage points to ensure that the drainage provided is effective .

4.8 For inverted roofs, 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 load specifications should 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 In inverted roof specifications, the ballast requirements should 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.

4.11 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*.

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

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

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

## 5 Practicability of installation

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

## 6 Weathertightness



6.1 The waterproofing membranes, including joints, when completely sealed and consolidated, will adequately resist the passage of moisture into the building and so satisfy the requirements of the national Building Regulations.

6.2 The membranes are impervious to water and will give a weathertight roof capable of accepting minor structural movement without damage.

## 7 Condensation risk



The vapour control layers provide an effective control to the passage of liquid water and water vapour.

## 8 Properties in relation to fire



8.1 In the opinion of the BBA, use of the systems in irrigated roof gardens or green roofs will be unrestricted under the requirements of the national Building Regulations.

8.2 When used in protected or inverted roof specifications, including an inorganic covering listed in the Annex of Commission Decision 2000/553/EC, the systems can be considered to be unrestricted under the national Requirements.

8.3 The designation of other specifications (eg on combustible substrates) should be confirmed by reference to the requirements of the documents supporting the national Building Regulations.

8.4 If allowed to dry, plants used in a roof garden 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 that the overall fire-rating of the roof is not compromised.

## 9 Resistance to wind uplift

9.1 The systems will resist the effects of wind suction likely to occur in service.

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

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

## 10 Resistance to mechanical damage

The systems will accept, without damage, the limited foot traffic and light concentrated loads associated with installation and maintenance. Where traffic in excess of this is envisaged, such as for maintenance of lift equipment, a walkway must be provided (for example, using concrete slabs supported on bearing pads or the manufacturer's walkway sheets). Reasonable care must be taken to avoid puncture of the membranes by sharp objects or concentrated loads.

## 11 Resistance to penetration of roots

11.1 Results of tests on the membranes indicate that they are suitable for use as root-resistant membranes and, when used with EshaFlex Total Green Roof Waterproofing Systems in roof garden applications, will provide adequate protection against penetration of roots.

11.2 Advice on suitable planting specifications can be obtained from the Certificate holder.

## 12 Maintenance



12.1 The systems must be the subject of biannual inspections and maintenance in accordance with BS 6229 : 2018, Chapter 7.

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

## 13 Durability



13.1 The exposed systems will have a life in excess of 30 years. When fully protected and subjected to normal service conditions in roof garden and green roof specifications, the systems can provide an effective barrier to the transmission of liquid water and water vapour transmission for the design life of the roof in which they are incorporated.

13.2 When using the mineral surface membranes, it is possible that some localised loss of mineral surfacing may occur after some years in areas where complex detailing of the roof design is incorporated.



### 14 General

14.1 Installation of EshaFlex Total Green Roof Waterproofing Systems must be carried out in accordance with this Certificate, the Certificate holder's instructions and the relevant clauses of BS 8000-0 : 2014, BS 8000-4 : 1989 and BS 8217 : 2005.

14.2 Substrates to which the systems are to be applied must be sound, dry and clean, and free from sharp projections such as nail heads and concrete nibs.

14.3 Installation must not be carried out during inclement weather (eg rain, fog or snow). When the temperature is below 5°C, suitable precautions against surface condensation must be taken.

14.4 Detailing must be formed in accordance with the Certificate holder's instructions.

14.5 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.

14.6 If the roof is likely to be subject to uncontrolled pedestrian access, the substructure must satisfy the requirements of BS 8217 : 2005 and, to prevent damage to the roof covering, one of the appropriate surface finishes referred to in clause 6.12 of that Standard must be used.

14.7 At falls in excess of 5° (1:11), the provision for mechanical fixings as required by BS 8217 : 2005 should be observed.

14.8 The installation of the insulation boards must be carried out in accordance with the insulation manufacturer's instructions.

### 15 Procedure (vapour control layer)

15.1 EshaBase SA Alu, EshaBase SA Sand and AluBase XL are self-adhesive membranes and must be installed in accordance with the Certificate holder's instructions.

15.2 When using EshaBase Alu membrane, bonding is achieved by melting the lower surface of the membrane using a standard roofer's torch.

15.3 When using the self-adhesive membranes, the substrates should be primed with Esha SA Primer.

15.4 The membrane must be heated carefully, ensuring that the thermofusible film is completely melted as work proceeds, and pressed down onto the prepared substrate, ensuring that a continuous 5 mm bead of bitumen is extruded from all edges and that a full bond is achieved.

15.5 Side laps must be a minimum of 80 mm, following the manufactured selvedge, and end laps a minimum of 100 mm.

15.6 At features such as roof perimeters and upstands, the membrane must be dressed up to ensure a minimum 100 mm overlap with the waterproofing to envelop the insulation.

### 16 Procedure (membrane)

#### Partially bonded

16.1 Bonding is achieved either by torching the underside of the torch-on membranes or, if the membrane has a self-adhesive backing, by removing the protective release film and applying the membrane in small areas at a time.

16.2 Side laps must be a minimum of 80 mm and end laps a minimum of 100 mm. The membrane must be fully bonded to the substrate at least one metre immediately before and after the end lap. A bead of molten material must exude from all laps to indicate a satisfactory seal and must be levelled out using a heated trowel.

#### **Fully bonded**

16.3 Bonding is achieved by melting the lower surface by torching and pressing the membrane down. Care must be taken not to overheat the coating. If the membrane has a self-adhesive backing, the protective release film is removed and the membrane applied in small areas at a time.

16.4 Side laps must be a minimum of 80 mm and end laps a minimum of 100 mm.

#### **Mechanically fastened**

16.5 The membrane should be laid flat onto the substrate without folds or ripples, and fixed to the deck using the ProFast system through the overlap of the membrane.

16.6 The position of the bars or washers and the number of fixing screws required must be in accordance with the fixing specifications provided by the Certificate holder. Side laps must be a minimum of 120 mm and end laps must be a minimum of 100 mm. The laps must be welded by torching the lower surface and pressing the membrane down.

#### **Subsequent layers**

16.7 Subsequent layers, such as separation layers, drainage layers and growing medium are installed in accordance with the Certificate holder's installation instructions.

## **17 Detailing**

Detailing should be carried out in accordance with the Certificate holder's instructions.

## **18 Repair**

In the event of damage, the cap sheets can be effectively repaired, after cleaning the surrounding areas, with a patch of the appropriate cap sheet bonded over the damaged area with an overlap on the undamaged membrane by 80 mm in all directions, in accordance with the Certificate holder's instructions.

## **Technical investigations**

## **19 Tests**

19.1 Tests were carried out on the vapour control layers to EN 13970 : 2004 and the results assessed to determine:

- mass per unit area
- thickness
- delamination strength
- tensile strength and elongation
- water vapour transmission.

19.2 An assessment was made of test data on EshaFlex SBS, EshaBase SA, EshaVent, EshaFlex TK40 membranes to determine:

- mass per unit area
- thickness, length and width
- tensile strength and elongation
- nail tear strength
- watertightness
- dimensional stability
- water vapour permeability

- low temperature flexibility on unaged samples and on samples heat aged for 1 week at 80°C and 12 weeks at 70°C
- flow resistance on unaged samples and on samples heat aged for 12 weeks at 70°C
- resistance to root penetration.

## 20 Investigations

20.1 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.

20.2 Data resulting from the issue of BBA Certificate 89/2338 and KOMO Certificate K66713/01 were examined.

## Bibliography

BS 6229 : 2003 *Flat roofs with continuously supported 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*

NA to BS EN 1991-1-1 : 2002 UK Nation Annex to *Eurocode 1 — Actions on structures — General actions*

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 — Requirements with guidance for use*

EN 13707 : 2013 *Flexible sheets for waterproofing — Reinforced bitumen sheets for roof waterproofing — Definitions and characteristics*

EN 13970 : 2004 *Flexible sheets for waterproofing — Bitumen water vapour control layers — Definitions and characteristics*

### 21 Conditions

21.1 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.

21.2 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.

21.3 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.

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

21.5 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.

21.6 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.