

Radmat Building Products Ltd

Esha House
St Mary's Business Park
Albany Road
Market Harborough
Leicestershire LE16 7EB

Tel: 01858 410372 Fax: 01858 410572

e-mail: techenquiries@radmat.com

website: www.radmat.com



Agreement Certificate

15/5282

Product Sheet 1

RADMAT ESHA BITUMINOUS ROOFING SYSTEMS

ESHAFLEX TOTAL ROOF WATERPROOFING SYSTEMS

This Agrément Certificate Product Sheet⁽¹⁾ relates to EshaFlex Total 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 with limited access.

(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, will enable a roof to be unrestricted under the Building Regulations (see section 8).

Resistance to wind uplift — the systems will enable a roof to be unrestricted under the Building Regulations (see section 9).

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

Durability — under normal service conditions, the systems will provide a durable waterproof covering with a service life in excess of 30 years (see section 12).

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 Agrément

Date of First issue: 9 December 2015

John Albon – Head of Approvals
Construction Products

Claire Curtis-Thomas
Chief Executive

The BBA is a UKAS accredited certification body – Number 113.

The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

British Board of Agrément

Bucknalls Lane
Watford
Herts WD25 9BA

tel: 01923 665300

fax: 01923 665301

clientservices@bba.star.co.uk

www.bbacerts.co.uk

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Regulations

In the opinion of the BBA, EshaFlex Total 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)

Requirement:	B4(2)	External fire spread
Comment:	On a suitable substructure, the use of the systems will enable a roof to be unrestricted under this Requirement. See section 8 of this Certificate.	
Requirement:	C2(b)	Resistance to moisture
Comment:	The systems, including joints, will enable a roof to meet this Requirement. See section 6.1 of this Certificate.	
Requirement:	C2(c)	Resistance to moisture
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.	
Requirement:	7	Materials and workmanship
Comment:	The systems are acceptable. See section 12.1 and the <i>Installation</i> part of this Certificate.	



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Durability, workmanship and fitness of materials
Comment:	The use of the systems satisfies the requirements of this Regulation. See sections 11 and 12.1 and the <i>Installation</i> part of this Certificate.	
Regulation:	9	Building standards applicable to construction
Standard:	2.8	Spread from neighbouring buildings
Comment:	The systems, when applied to a suitable substructure, are regarded as having low vulnerability under clause 2.8.1 ⁽¹⁾⁽²⁾ of this Standard. See sections 8.1, 8.2 and 8.4 of this Certificate.	
Standard:	3.10	Precipitation
Comment:	The use of the systems, including joints, will enable a roof to meet the requirements of this Standard, with reference to clauses 3.10.1 ⁽¹⁾⁽²⁾ and 3.10.7 ⁽¹⁾⁽²⁾ . See section 6.1 of this Certificate.	
Standard:	3.15	Condensation
Comment:	The vapour control layer components of the systems will enable a roof to satisfy this Standard, with reference to clauses 3.15.1 ⁽¹⁾ , 3.15.3 ⁽¹⁾ , 3.15.5 ⁽¹⁾ and 3.15.6 ⁽¹⁾ . See section 7 of this Certificate.	
Standard:	7.1(a)	Statement of sustainability
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.	
Regulation:	12	Building standards applicable to conversions
Comment:	All comments given for these systems 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 systems are acceptable. See section 12.1 and the <i>Installation</i> part of this Certificate.
Regulation:	28(b)	Resistance to moisture and weather
Comment:		Tests for water resistance indicate that the system membranes, including joints, meet the requirements of this Regulation. See section 6.1 of this Certificate.
Regulation:	29	Condensation
Comment:		The systems can contribute to a roof meeting this Regulation. See section 7 of This Certificate.
Regulation:	36(b)	External fire spread
Comment:		Tests indicate that, on suitable substructures, the use of the systems will enable a roof to be unrestricted under the requirements of this Regulation. See section 8 of this Certificate.

Construction (Design and Management) Regulations 2015

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, Principal Designer/CDM co-ordinator, designer and contractors 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 2014

NHBC accepts the use of EshaFlex Total Roofing Systems, provided they are installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs and balconies* and Chapter 7.2 *Pitched roofs*.

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 : 2011 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 Roof Waterproofing Systems consist of the following waterproofing membranes and vapour control layers:

- EshaFlex 370 Black *Mineral* — a 195 g·m⁻² 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 black mineral, for use as a cap sheet in systems which are partially- and fully-adhered by torch application
- EshaFlex 370 Grey *Mineral* — a 195 g·m⁻² 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 grey mineral, for use as a cap sheet in systems which are partially- and fully-adhered by torch application
- EshaFlex 370 MF Black *Mineral* — a 230 g·m⁻² polyester-fibre glass reinforced, SBS polymer-modified bitumen membrane cap sheet with a grooved lower surface finish with a thermofusible film and an upper surface finish of

black mineral, for use as a cap sheet in mechanically-fastened applications where overlaps are sealed by torch application

- EshaFlex 370 Plain — a 180 g·m⁻² 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 and cap sheet in ballasted applications and as a base sheet in systems which are fully-adhered by torch application
- EshaFlex 370 SA Black *Mineral* — a 230 g·m⁻² polyester-fibre glass reinforced, SBS polymer-modified bitumen membrane with a self-adhesive lower surface covered with release film and an upper surface finish of black mineral, for use as a cap sheet in fully-adhered applications
- EshaFlex TK60 Black *Mineral* — a 230 g·m⁻² 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-adhered by torch application
- EshaFlex TK40 — a 200 g·m⁻² 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⁻² 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⁻² 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⁻² 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 2mm — a 200 g·m⁻² 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⁻² 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⁻² 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
- 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.

1.2 The nominal characteristics of the waterproofing membranes and water vapour control layers are given in Tables 1 and 2 respectively.

Table 1 Nominal characteristics of membranes

Characteristic (unit)	EshaFlex waterproofing membranes					
	370 Black	370 Grey	370 MF Black	370	370 SA Black	TK60 Black
Thickness (mm)	4.5	4.5	4.5	3.8	4.2	4.5
Roll width (m)	1.0	1.0	1.0	1.0	1.0	1.0
Roll length (m)	7.5	7.5	7.5	7.5	7.5	7.5
Mass per unit area (kg·m ⁻²)	4.9	4.9	4.9	4.1	4.2	4.9
Roll weight (kg)	36.8	36.8	36.8	30.8	30.8	36.8
Tensile strength (N·50 mm ⁻¹)						
longitudinal	700	700	800	700	800	700
transverse	700	700	700	700	700	700
Elongation (%)						
longitudinal	18	18	25	18	25	18
transverse	25	25	25	25	25	25
Nail tear strength (N)	300	300	350	300	350	300
Watertightness (at 10 kPa)	pass	pass	pass	pass	pass	pass
Low temperature flexibility (°C)	≤ -20	≤ -20	≤ -20	≤ -20	≤ -20	≤ -20

Table 1 Nominal characteristics of membranes (continued)

Characteristic (unit)	EshaFlex waterproofing membranes					
	370 Black	370 Grey	370 MF Black	370	370 SA Black	TK60 Black
Upper surface finish	black mineral	grey mineral	black mineral	sand	black mineral	black mineral
Lower surface finish	grooves and thermofusible film				self-adhesive covered with release film	thermo-fusible film

Table 2 Nominal characteristics of vapour control layers

Characteristic (unit)	EshaBase Vapour Control Layers			
	SA Sand	SA Alu 2mm	SA Alu 4.2mm	Alu
Thickness (mm)	2.0	2.0	4.2	4.0
Roll width (m)	1.0	1.0	1.0	1.0
Roll length (m)	10	10	7.5	5.0
Roll weight (kg)	20	32	36.8	25
Tensile strength (N·50 mm ⁻¹)				
longitudinal	1250	1250	1250	500
transverse	2000	1250	1250	375
Elongation (%)				
longitudinal	5	5	5	3
transverse	5	5	5	3
Nail tear strength (N)	-	400	400	150
Watertightness (at 60 kPa)	pass	pass	pass	pass
Water vapour permeability (m ² ·s ⁻¹ ·Pa ⁻¹ ·kg ⁻¹)	20,000	≥ 8.12 x 10 ¹²	≥ 8.12 x 10 ¹²	≥ 8.12 x 10 ¹²
Low temperature flexibility (°C)	≤ -20	≤ -10	≤ -10	≥ 0

1.3 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 MFGT — a rigid polyisocyanurate (PIR) foam-cored insulation board, faced with a polypropylene fleece on both surfaces
- ProTherm PIR B — 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 F — a rigid PIR foam-cored insulation board, with an aluminium foil face composite on both surfaces
- ProTherm EPS/PIR Comp Taper — EPS/polyisocyanurate composite board, with mineral-filled glass fibre tissue on the upper face and polypropylene fleece on the lower
- ProTherm MW — dual-density mineral wool insulation manufactured from renewable volcanic stone
- ProTherm CelGlass — an insulation board manufactured from graded recycled glass and natural raw materials
- ProFast — a range of mechanical fasteners for insulation and for membrane and trim attachment
- ProFlow — a range of gravity rainwater outlets
- ProLight — a range of polycarbonate and glass rooflights
- ProSafe — a range of roof safety products.

2 Manufacture

2.1 The waterproofing membranes and vapour control layers 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 : 2008 and BS EN ISO 14001 : 2004 by KIWA (Certificate K74027/01).

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 Roof Waterproofing Systems.

Design Considerations

4 General

4.1 EshaFlex Total Roof Waterproofing Systems are satisfactory for use:

- as partially-bonded single- and two-layer waterproofing on flat or zero fall roofs and pitched roofs with limited access
- as fully-bonded single- and two-layer waterproofing on flat or zero fall roofs and pitched roofs with limited access
- as mechanically-fastened single-ply waterproofing on flat or zero fall roofs and pitched roofs with limited access
- loose-laid and ballasted as a two-layer waterproofing on flat roofs with limited access
- on inverted, warm and cold flat roofs with limited access.

4.2 The mineral surfaced membranes may, where appropriate, be used as an exposed cap sheet or in detail work.

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).

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

4.5 Flat roofs are defined for the purposes of this Certificate as those having a minimum finished fall of 1:80. For design purposes, twice the minimum finished fall should be assumed unless a detailed analysis of the roof is available, including overall and local deflection, direction of falls, etc.

4.6 Zero fall roofs (also known as completely flat) are defined for the purposes of this Certificate as those having a finished fall which can vary between 0° and 0.7°.

4.7 On completely flat roofs, it is important to identify the correct drainage points to ensure that the drainage provided is effective.

4.8 Decks to which the membranes are to be applied must comply with the relevant requirements of either BS 6229 : 2003 or BS 8217 : 2005 and, where appropriate, *NHBC Standards 2014, Chapters 7.1 Flat roofs and balconies* and

7.2 Pitched roofs.

4.9 For inverted roofs, structural decks to which the system is to be applied must be suitable to transmit the dead and imposed loads experienced in service.

4.10 Imposed loads, dead loading and wind load specifications are calculated in accordance with BS EN 1991-1-1 : 2002, BS EN 1991-1-3 : 2003, BS EN 1991-1-4 : 2005 and their respective UK National Annexes.

4.11 In inverted roof specifications, the ballast requirements should be calculated in accordance with the relevant parts of BS EN 1991-1-4 : 2005 and its UK National Annex. 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 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 meet 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 When tested and classified in accordance with BS EN 13501-5 : 2005, a system comprising a 19 mm exterior plywood substrate primed with EshaPrimer, a 120 mm thick ProTherm PIR insulation board bonded with EshaStik adhesive, a layer of EshaVent fully bonded onto primed ProTherm PIR insulation board with EshaPrimer, and a torch-applied layer of EshaFlex 370 Black Mineral, achieved a B_{ROOF(t4)} rating.

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



8.3 When used on flat roofs with one of the surface finishes defined in The Building Regulations (England and Wales), Appendix A, Table A5, Part iii, or The Building Regulations (Northern Ireland), Technical Booklet E, Table 4.6, Part IV, and listed below, the roof is deemed to be of designation B_{ROOF(t4)}:

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



8.4 The designation of other specifications (eg on combustible substrates) should be confirmed by:

England and Wales — test or assessment in accordance with Approved Document B, Appendix A, clause 1

Scotland — tests to confirm compliance with Mandatory Standard 2.8, clause 2.8.1

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

9 Resistance to wind uplift

9.1 The adhesion of the bonded membranes is sufficient to resist the effects of wind suction, elevated temperature and thermal shock conditions up to 2KPa.

9.2 When the membranes are mechanically fixed, the resistance to wind uplift is provided by mechanical fasteners secured to the deck and passing through the membrane. The number of fixings and their position will depend on:

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

9.3 The number of fixings used should be established by reference to the wind uplift forces calculated in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex on the basis of maximum permissible loads of 0.68 kN per fixing for single-layer systems and 0.40 kN per fixing for multi-layer systems.

9.4 The ballast requirements for loose-laid systems must be calculated in accordance with the relevant parts of BS EN 1991-1-4 : 2005 and its UK National Annex. The membranes should always be ballasted with a minimum depth of 50 mm of aggregate (20 to 40 grade gravel). In areas of high-wind exposure, the Certificate holder's advice should be sought. Alternatively, concrete slabs on suitable supports can be used.

10 Resistance to foot traffic

The system 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 Maintenance



11.1 Systems must be the subject of annual inspections and maintenance to ensure continued performance. Maintenance should include checks and operations to ensure that, where applicable:

- adequate ballast is in place and evenly distributed over the membrane
- protection layers are in good condition
- exposed membranes are free from the build-up of silt, and other debris and unwanted vegetation are cleared.

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

12 Durability



12.1 The systems will have a service life in excess of 30 years.

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

13 General

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

13.2 Substrates to which the system is to be applied must be sound, dry and clean, and free from sharp projections such as nail heads and concrete nibs.

13.3 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.

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

13.5 If the roof is likely to be subject to uncontrolled pedestrian access, the substructure must meet 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.

13.6 At falls in excess of 5° (1:11), the provision for mechanical fixings as required by BS 8217 : 2005 should be observed. For slopes above 10° (1:5.7), the Certificate holder's advice should be sought.

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

14 Procedure (vapour control layer)

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

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

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

14.4 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.

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

14.6 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.

15 Procedure (membrane)

Partially-bonded

15.1 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.

15.2 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

15.3 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.

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

Mechanically-fastened

15.5 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.

15.6 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.

Loose-laid

15.7 Side laps must be a minimum of 80 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.

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

- laying a 0.2 mm thick polyethylene protective sheet or non-woven polyester sheet covered by at least 50 mm of well-rounded gravel (gravel size 15/30 mm)
- laying a 0.2 mm thick polyethylene or non-woven polyester sheet (minimum mass 300 g·m⁻²) covered by a 20 mm thick layer of sand overlaid with a layer of concrete paving slabs⁽¹⁾.

(1) If paving on plastic pads, the sand is not required.

16 Detailing

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

17 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 in accordance with the Certificate holder's instructions.

Technical investigations

17 Tests

17.1 Tests were carried out on the vapour control layers to EN 13970 : 2011 and the results assessed to determine:

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

17.2 A wind-uplift test of the system consisting of a plywood deck, an EshaBase SA ALU self-adhesive vapour control layer, a ProTherm PIR insulation board partially adhered with polyurethane insulation adhesive and torch bonded EshaFlex 370 roof waterproofing system was conducted and the results assessed for resistance to wind uplift.

17.3 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 for 12 weeks at 70°C
- flow resistance on unaged samples and on samples heat aged for 12 weeks at 70°C.

18 Investigations

18.1 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.

18.2 Fire test data relating to external fire performance of the system were evaluated.

18.3 Wind-uplift test data of the mechanically-fastened single-layer and multi-layer systems were assessed.

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

Bibliography

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

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

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

BS EN 1991-1-4 : 2005 *Eurocode 1 — Actions on structures — General actions — Wind actions*

NA to BS EN 1991-1-4 : 2005 *UK National Annex to Eurocode 1 — Actions on structures — General actions — Wind actions*

BS EN 13501-5 : 2005 + A1 : 2009 *Fire classification of construction products and building elements — Classification using data from external fire exposure to roofs tests*

BS EN ISO 9001 : 2008 *Quality management systems — Requirements*

BS EN ISO 14001 : 2004 *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 : 2011 *Flexible sheets for waterproofing — Bitumen water vapour control layers — Definitions and characteristics*

19 Conditions

19.1 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 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.

19.2 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.

19.3 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.

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

19.5 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.

19.6 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.