



Esha (UK) Ltd

Esha House
 St Mary's Business Park
 Albany Road
 Market Harborough
 Leicestershire LE16 7EB
 Tel: 01858 410372 Fax: 01858 410572
 e-mail: sales@esha.co.uk
 website: www.esha.co.uk

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**Agrement
 Certificate
 No 89/2338**

*Third issue**

Designated by Government
 to issue
 European Technical
 Approvals

ESHA ROOF COVERING SYSTEMS

Revêtement d'étanchéité
 Dachabdichtungen

Product



• THIS CERTIFICATE OF CONFIRMATION RELATES TO ESHA ROOF COVERING SYSTEMS, WHICH COMPRISE A RANGE OF GLASS-FIBRE AND/OR POLYESTER REINFORCED, POLYMER MODIFIED BITUMEN MEMBRANES.


- The product is for use as:
 - (1) a fully or partially bonded one- or two-layer built-up roof waterproofing system on flat and pitched roofs
 - (2) a ballasted loose-laid two-layer roof waterproofing system on flat roofs.

- The product is manufactured in Holland by Esha Nederland BV, imported and marketed in the United Kingdom by Esha (UK) Ltd.

continued

Regulations — Detail Sheet 1

1 The Building Regulations 2000 (as amended) (England and Wales)

 The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of roof waterproofing membranes with the Building Regulations. In the opinion of the BBA, Esha Roof Covering Systems, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: B4(2)	External fire spread
Comment:	Data obtained on tests to BS 476-3 : 1958 indicate that on suitable substructures the use of the systems will enable a roof to be unrestricted under this Requirement. See sections 4.1, 4.2 and 4.3 of the relevant Detail Sheet.
Requirement: C4	Resistance to weather and ground moisture
Comment:	Tests for water resistance on the membranes, including joints, indicate that the materials meet this Requirement. See sections 6.1 and 6.2 of these Front Sheets.
Requirement: Regulation 7	Materials and workmanship
Comment:	The systems comprise acceptable materials. See sections 10.1 and 10.2 of these Front Sheets.

continued

Confirmation of a Dutch Agrément issued by BDA Intron, to Esha Nederland BV, Postbus 2301, 9704 CH Groningen, The Netherlands.

These Front Sheets must be read in conjunction with the accompanying Detail sheets, which provide information on specific roof covering systems.

Electronic Copy

2 The Building Standards (Scotland) Regulations 1990 (as amended)



In the opinion of the BBA, Esha Roof Covering Systems, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Technical Standards as listed below.

Regulation:	10	Fitness of materials and workmanship
Standards:	B2.1 and B2.2	Selection and use of materials, fittings, and components, and workmanship
Comment:		The systems comply with these Standards. See sections 10.1 and 10.2 of these Front Sheets.
Regulation:	12	Structural fire precautions
Standard:	D9.1	Fire spread from an adjoining building
Comment:		Data obtained from tests to BS 476-3 : 1958 indicate that on suitable substructures the use of the systems will enable a roof to be unrestricted under the requirements of this Standard. See sections 4.1 and 4.3 of the relevant Detail Sheet.
Regulation:	17	Resistance to moisture
Standard:	G3.1	Resistance to precipitation — Resistance to precipitation
Comment:		Tests for water resistance to the membranes, including joints, indicate that the use of the systems will enable a roof to satisfy the requirements of this Standard. See sections 6.1 and 6.2 of these Front Sheets.

3 The Building Regulations (Northern Ireland) 2000



In the opinion of the BBA, Esha Roof Covering Systems, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The systems comprise acceptable materials. See sections 10.1 and 10.2 of these Front Sheets.
Regulation:	C4	Resistance to ground moisture and weather
Comment:		Tests for weather resistance of the systems, including joints, indicate that the use of the systems will enable a roof to satisfy the requirements of this Regulation. See sections 6.1 and 6.2 of these Front Sheets.
Regulation:	E5	External fire spread
Comment:		Data obtained from tests to BS 476-3 : 1958 indicate that on suitable substructures, the use of the systems will enable a roof to be unrestricted under the requirements of this Regulation. See sections 4.1, 4.2 and 4.3 of the relevant Detail Sheet.

4 Construction (Design and Management) Regulations 1994 (as amended)

Construction (Design and Management) Regulations (Northern Ireland) 1995 (as amended)

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See section: 1 Description (1.3) of each Detail Sheet.

5 General

5.1 Limited access roofs are defined for the purpose of this Certificate as those roofs that are 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.

5.2 When designing flat roofs, 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. Flat roofs are defined for the purpose of this Certificate as those roofs having a minimum finished fall of 1:80. Pitched roofs are defined as those having falls in excess of 1:6.

5.3 Decks to which the membranes are to be applied must comply with the relevant requirements of BS 8217 : 1994 and BS 6229 : 1982 and, where appropriate, NHBC Standards, Chapter 7.1 or the Zurich Building Guarantees Technical Standards, Section 5, clause 5.9.3.19.

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

- (a) as described in the relevant clauses of BS 8217 : 1994, or
- (b) the subject of a current BBA Certificate and be used in accordance with, and within the limitations of, that Certificate.

6 Weathertightness



6.1 Test data confirm that the membranes and joints in the membranes, when completely sealed and consolidated, will adequately resist the passage of moisture to the inside of the building and so meet the requirements of the national Building Regulations.

England and Wales

Approved Document C, Requirement C4, Section 5.1

Scotland

Standard G3.1, Regulation 17

Northern Ireland

Regulation C4.

6.2 The membranes are impervious to water and, when used in the systems described, will give a weathertight roof covering capable of accepting minor structural movements without damage.

7 Resistance to wind uplift

7.1 Data confirm that the adhesion of the bonded systems to the decking, or to bituminous felt, is sufficient to resist the effects of wind suction,

elevated temperature and thermal shock conditions likely to occur in practice.

7.2 The precise ballast requirement for the loose-laid systems should be calculated in accordance with the relevant parts of BS 6399-2 : 1997, but should not be below a minimum thickness of 50 mm. The use of concrete slabs on suitable protective supports should be considered in areas of high design wind loads.

8 Resistance to foot traffic

The systems can accept, without damage, the limited foot traffic and light concentrated loads associated with installation and maintenance operations. Where traffic in excess of this is envisaged, additional protection to the membrane, in accordance with the marketing company's instructions, must be provided. However, reasonable care is required, to avoid puncture by sharp objects.

9 Maintenance

Where possible, it is recommended that at least once every two years the roofing should be thoroughly cleaned and inspected to detect any defects at an early stage. In the event of damage, the sheets can be effectively repaired using traditional methods for bonding bituminous felts after first removing the surface finish and cleaning the substrate back to unweathered material.

10 Durability



10.1 All available evidence, including the examination of the product's performance in use and accelerated weathering tests, indicates that the life of the Esha Roof Covering Systems will be in excess of 20 years.

10.2 With the mineral and ceramic surfaced product, it is possible that some localised loss of the surfacing may occur after some years in areas where complex detailing of the roof design is incorporated.

Bibliography

BS 476-3 : 1958 *Fire tests on building materials and structures — External fire exposure roof test*

BS 6229 : 1982 *Code of practice for flat roofs with continuously supported coverings*

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

BS 8217 : 1994 *Code of practice for built-up felt roofing*

11 Conditions

11.1 This Certificate:

- (a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (d) is copyright of the BBA.

11.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, shall be construed as references to such publication in the form in which it was current at the date of this Certificate.

11.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabricating process(es) thereof:

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) remain covered by a valid Dutch Agrément; and

(c) are reviewed by the BBA as and when it considers appropriate.

11.4 In granting this Certificate, the BBA makes no representation as to:

- (a) the presence or absence of any patent or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the nature of individual installations of the product, including methods and workmanship.

11.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.



In the opinion of the British Board of Agrément, Esha Roof Covering Systems are fit for their intended use provided they are installed, used and maintained as set out in this Certificate. Certificate No 89/2338 is accordingly awarded to Esha (UK) Ltd.

On behalf of the British Board of Agrément

A handwritten signature in black ink, appearing to read 'P. Q. Newson'.

Date of Third issue: 4th June 2003

Chief Executive

**Original Certificate issued 14th November 1989. This revised version issued to include reference to the revised national Building Regulations, change of Dutch Issuing Institute and the revision of the CDM Regulation.*



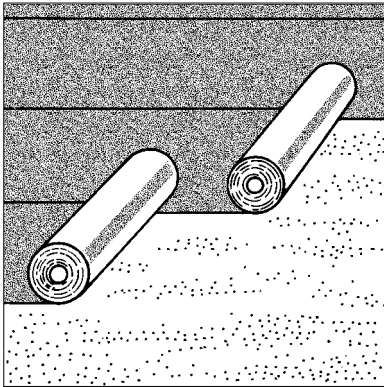
Esha (UK) Ltd

ESHAFORT 2000 ROOF COVERING SYSTEM (POUR AND ROLL)

Certificate No 89/2338

DETAIL SHEET 2
Third issue*

Product



• THIS DETAIL SHEET RELATES TO ESHAFORT 2000 ROOF COVERING SYSTEM (POUR AND ROLL).

• The product is for use as:

(1) a fully or partially bonded one or two layer built-up roof waterproofing system on flat and pitched roofs

(2) a ballasted loose-laid two layer roof waterproofing system on flat roofs.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the product's position regarding the Regulations, general information relating to the products, and the Conditions of Certification, respectively.

Technical Specification

1 Description

1.1 The Eshafort 2000 Roof Covering System (Pour and Roll) comprises:

Eshafort 2000 — a spunbonded polyester (180 gm^{-2}) reinforced polymer modified bitumen sheet finished on both surfaces with sand, for use as a base sheet or as a cap sheet with additional protection.

Eshafort 2000 Mineral — a spunbonded polyester (180 gm^{-2}) reinforced polymer modified bitumen sheet with a mineral granular finished upper surface and a sand-finished under surface, for use as a cap sheet.

Eshafort 2000 Ceramic — a spunbonded polyester (180 gm^{-2}) reinforced polymer modified bitumen sheet with a ceramic granular finished upper surface and a sand-finished under surface, for use as a cap sheet.

Vilflex 2000 — a glass fibre (60 gm^{-2}) reinforced polymer modified bitumen sheet finished on both surfaces with sand, for use as a base sheet.

1.2 Eshafort 2000, 2000 Mineral and 2000 Ceramic are manufactured by saturating and coating 180 gm^{-2} spunbonded polyester reinforcement and Vilflex 2000 by saturating and coating a 60 gm^{-2} glass fibre reinforcement with SBS modified bitumen. The surfaces are finished by application of sand and/or mineral or ceramic granules. The finished material is cut to length and ejected onto a cardboard tube.

1.3 The products are manufactured to the nominal dimensions listed in Table 1.

Table 1 Nominal dimensions

	Thickness (mm)	Roll width (m)	Roll length (m)	Roll weight (kg)	Weight per unit area (kg^{-2})
Eshafort 2000					
Sand	2.3	1.0	10	23	2.3
Mineral	2.4 ⁽¹⁾	1.0	10	33	3.3
Ceramic	2.4 ⁽¹⁾	1.0	10	36	3.6
Vilflex 2000	1.5	1.0	20	32	1.6

(1) Includes selvedge edge.

1.4 Other products used with Eshafort 2000 roof covering include:

Eshabase-Peral (Eshaper AL) — a bituminised perforated glass fleece, for use as a partially bonded underlay.

Esha Quick Primer — a bituminous primer for substructures.

Bitumen bonding compound — oxidised bitumen type 95/25 and 115/15, used for bonding between layers and to substructure.

Eshabase PERF — a bituminised perforated glass fleece for use as a sub-layer.

Eshabase G — a bituminised glass fleece for use as a sub-layer.

Eshabase P and Eshabase PEW — bituminised polyester reinforced membranes for use as sub-layers.

1.5 Quality control checks are carried out on the incoming materials, during manufacture and on the final product. Quality control on the final product includes checks on:

thickness
width
length
mass per unit area.

2 Delivery and site handling

2.1 The membranes are delivered to site in paper wrappings bearing the product identification and the BBA identification mark incorporating the number of this Certificate.

2.2 The rolls must be stored upright on the selvedge end on a smooth, level surface and kept under cover.

Design Data

3 General

3.1 Eshafort 2000 Roof Covering System (Pour and Roll) is satisfactory for use as:

- (a) a fully or partially bonded waterproofing system, as part of a built-up specification and where necessary in conjunction with appropriate roofing felts to BS 747 : 2000, and
- (b) a loose-laid, two-layer roof waterproofing system, ballasted with aggregate, on flat roofs with limited access, or under heavy protection (eg concrete tiles) on flat roofs with regular pedestrian traffic.

4 Properties in relation to fire



4.1 When tested in accordance with BS 476-3 : 1958 a system comprising 18 mm thick roofing grade plywood, one layer of Vilflex 2000 underlay, fully bonded to the plywood with hot bitumen and one layer of Eshafort 2000 Mineral cap sheet, fully bonded to the Vilflex 2000 with hot bitumen, achieved an EXT.F.AA rating.



4.2 When used for flat roofs with one of the surface finishes (listed below) defined in Part iii of Table 5 of Appendix A of Approved Document B of the Building Regulations (England and Wales), or Technical Booklet E, Table 4.6 of Part IV of the Building Regulations Northern Ireland, the roof is deemed to be of designation AA.

Surface finishes:

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



4.3 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 A1

Scotland

test to conform with Standard D9.1

Northern Ireland

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

Installation

5 General

5.1 Installation of Eshafort 2000 Roof Covering System (Pour and Roll) must be carried out by trained installers, working in accordance with the relevant clauses of the manufacturer's instructions and BS 8000-4 : 1989 and BS 8217 : 1994.

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

5.3 At falls in excess of 5° (1:11), the normal precautions against slippage and the provision for mechanical fixings as required by BS 8217 : 1994 should be observed.

5.4 If the roof is likely to be subjected to uncontrolled pedestrian access, the substructure must meet the requirements of clauses 8.3 of BS 8217 : 1994, and one of the surface finishes (1, 2 or 3) described in clauses 8.11 and 8.13 of the code must be used to prevent damage to the roof covering.

5.5 On completion of the roof, the sand-faced cap sheet should have a surface finish applied in accordance with BS 8217 : 1994, clauses 8.11 and 9.17. Surface finishes in the code of practice include:

- (a) stone aggregate in dressing compound
- (b) precast concrete paving slabs
- (c) proprietary tiles on bonding compound.

5.6 The mineral and ceramic-faced cap sheets require no additional surface protection.

6 Application

Loose-laid applications — flat roof

6.1 A separating layer of a paper underlay should be loose-laid over the substructure and fully secured around the perimeter and upstands for a minimum distance of 450 mm. All laps are sealed with hot bitumen; 60 mm edge laps and 100 mm end laps should be employed.

6.2 A layer of Vilflex 2000 base sheet is then laid with overlaps of 60 mm minimum at roll edges and ends. The laps are bonded using 95/25, 115/15 grades of bitumen adhesive.

6.3 A layer of Eshafort 2000 is then fully bonded directly to the base sheet with joints overlapping at least 60 mm using the appropriate hot bitumen

adhesive. The overlaps should be offset at least 100 mm in respect to those of the base sheet.

6.4 A minimum 50 mm depth of aggregate should be loaded onto the roof covering. Where roofs are likely to be subjected to uncontrolled pedestrian traffic, however, a concrete tile finish should be used.

6.5 Where concrete tiles are required, the waterproof system is first covered by a layer of sand into which the tiles are set. A separating layer may be used in place of the sand.

Partially bonded applications — flat and pitched roofs

6.6 A layer of Eshabase-Peral (Eshaper Al) should be loose-laid edge to edge, over the substructure. It should be fully bonded with hot bitumen for 500 mm at the edge and around all penetrations.

6.7 A top layer of Eshafort 2000 ceramic or mineral is fully bonded in hot bitumen onto the base layer. Ensure that the bitumen seeps regularly into the perforations. Edge laps of at least 60 mm and end laps of at least 100 mm are required.

6.8 On nailable substructures a layer of Eshafort 2000 is fastened mechanically to the substrate (usually simultaneously with the insulation), using the relevant clauses in BS 8217 : 1994. A top layer of Eshafort 2000 mineral or ceramic is then fully bonded to the base layer using the appropriate grade hot bitumen.

6.9 Flat roofs and pitched roofs to falls of up to 1:2 require a 95/25 grade bitumen; falls in excess of 1:2 require a 115/15 grade bitumen.

Fully bonded applications

6.10 A layer of Vilflex 2000 should be fully bonded to the substructure with 60 mm minimum overlaps bonded using the appropriate grade hot bitumen (see section 6.2).

6.11 A top layer of Eshafort 2000 ceramic or mineral is then fully bonded to the first layer using the appropriate grade hot bitumen (see section 6.9). Edge laps of at least 60 mm and end laps of at least 100 mm are required.

Technical Investigations

The following is a summary of the technical investigations carried out on the Eshafort 2000 Roof Covering System (Pour and Roll).

7 Tests

Results of tests carried out by Kiwa NV, which show typical properties for the material, are summarised in Tables 2 to 5.

Table 2 Characteristics of reinforcement

Test (units)	Method ⁽¹⁾	Mean results	
		Polyester	Glass fibre
Mass per unit area (gm ⁻²)	MOAT 31 : 6B	182	62
Tensile strength (N per 50 mm)	MOAT 31 : 6C		
longitudinal		675	295
transverse		475	235
Elongation (%)	MOAT 31 : 6C		
longitudinal		35	1.5
transverse		23	1.5

(1) The test document is detailed in the *Bibliography*. Numbers in the table refer to sections in the document.

Table 3 Characteristics of coating mass

Test (units)	Method ⁽¹⁾	Mean result
Fines content (%)	MOAT 31 : 6F	11
Softening point (°C) (ring and ball)	MOAT 31 : 6G	
unaged		120
heat aged ⁽²⁾		89
heat aged ⁽³⁾		112
Low temperature flexibility (°C)	MOAT 31 : 6D	
unaged		-20
heat aged ⁽²⁾		0
heat aged ⁽³⁾		-5
Elastic recovery (%)	MOAT 31 : 6H	
unaged		200
heat aged ⁽²⁾		<25
heat aged ⁽³⁾		25

(1) The test document is detailed in the *Bibliography*. Numbers in the table refer to sections in the document.

(2) Heat aged 180 days at 70°C.

(3) Heat aged 56 days at 80°C.

Table 4 Finished product — physical properties

Test (units)	Method ⁽¹⁾	Mean results	
		Eshafort 2000 Mineral	Vilflex 2000
Tensile strength (N per 50 mm)	MOAT 31 : 6C		
longitudinal		1000	390
transverse		595	320
Elongation (%)	MOAT 31 : 6C		
longitudinal		48	3.7
transverse		48	3.4
Slip resistance	MOAT 27 : 5.1.7	pass	—
Tearing strength (N)	MOAT 27 : 5.4.1		
longitudinal		180	65
transverse		195	65
Low temperature flexibility (°C)	MOAT 31 : 6D	-20	<-40
Unrolling at low temperature	MOAT 27 : 5.4.3		
MOAT 27 : 5.4.3		pass	—
Heat resistance (°C)	MOAT 31 : 6E		
unaged		120	120
heat aged ⁽²⁾		85	—
Dimensional stability (%) (free shrinkage)	MOAT 27 : 5.1.6.1		
longitudinal		-0.20	—
transverse		+0.20	—

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections in the various documents.

(2) Heat aged 180 days at 70°C.

— indicates not tested.

Table 5 Service performance — system

Test (units)	Method ⁽¹⁾	Mean result
		Eshafort 2000 Mineral
Fatigue strength	MOAT 27 : 5.1.8	pass
Static indentation concrete substrate	MOAT 27 : 5.1.9	L ₄
		L ₄
Dynamic indentation concrete substrate	MOAT 27 : 5.1.10	I ₃
		I ₃
		I ₃
Resistance to wind uplift (kPa) System ⁽²⁾	MOAT 27 : 5.1.2.1	>8
Resistance to thermal shock (kPa) System ⁽²⁾	MOAT 27 : 5.1.5	>8
Resistance to water pressure	MOAT 27 : 5.1.4.1	pass
Integrity of joints	MOAT 27 : 5.2.1	pass
Tensile strength of joints (N per 50 mm)	MOAT 27 : 5.2.2	585

(1) The test document is detailed in the *Bibliography*. Numbers in the table refer to sections in the document.

(2) Chipboard/bitumen/Vilflex 2000/bitumen/Eshafort 2000 Mineral.

8 Investigations

8.1 Data in the Kiwa Agrément No K111 95/02 and BDA Intron Agrément CTG-422/1 were evaluated in the context of UK roofing practice and building regulations.

8.2 UK data on the fire performance of the product were examined.

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

8.4 A visit was made to a site in progress to assess the method of application.

Bibliography

BS 476-3 : 1958 *Fire tests on building materials and structures — External fire exposure roof test*

BS 747 : 2000 *Reinforced bitumen sheets for roofing — Specification*

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

BS 8217 : 1994 *Code of practice for built-up felt roofing*

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

MOAT No 31 : 1984 *Special Directives for the Assessment of Reinforced Homogeneous Waterproof Coverings of Styrene-Butadiene-Styrene (SBS) Elastomer Bitumen*



On behalf of the British Board of Agrément

Date of Third issue: 4th June 2003

Chief Executive

*Original Detail Sheet issued 14th November 1989. This revised version issued to include change of product name, and reference to the revised national Building Regulations.



Esha (UK) Ltd

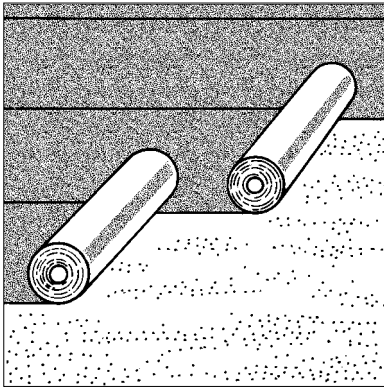
ESHAFLEX ROOF COVERING SYSTEMS (TORCH-ON)

Certificate No 89/2338

DETAIL SHEET 3

Third issue*

Product



• THIS DETAIL SHEET RELATES TO THE ESHAFLEX 2000 AND 3000 ROOF COVERING SYSTEMS (TORCH-ON).

• The product is for use as:

- (1) a fully or partially bonded one- or two-layer built-up roof waterproofing system on flat and pitched roofs
- (2) a ballasted loose-laid two-layer waterproofing system on flat roofs.

This Detail Sheet must be read in conjunction with the Front Sheets which give the product's position regarding the Regulations, general information relating to the products, and the Conditions of Certification, respectively.

Technical Specification

1 Description

1.1 The Eshaflex Roof Covering Systems (Torch-on) comprise:

Eshaflex 2000 — a spunbonded polyester (180 gm^{-2}) reinforced polymer modified bitumen sheet with a sand-finished upper surface and a thermofusible polythene film under surface, for use as a base sheet or as a cap sheet with additional protection.

Eshaflex 2000 Mineral — a spunbonded polyester (180 gm^{-2}) reinforced polymer modified bitumen sheet with a mineral granular finished upper surface and a thermofusible polythene film under surface, for use as a cap sheet.

Eshaflex 2000 Ceramic — a spunbonded polyester (180 gm^{-2}) reinforced polymer modified bitumen sheet with a ceramic granular finished upper surface and a thermofusible polythene film under surface, for use as a cap sheet.

Eshaflex 3000 — a spunbonded polyester/glass-fibre ($155 \text{ gm}^{-2}/8 \text{ gm}^{-2}$) reinforced polymer modified bitumen sheet with a sand-finished upper surface and a thermofusible polythene film under surface, for use as a base sheet or as a cap sheet with additional protection.

Eshaflex 3000 Mineral — a spunbonded polyester/glass-fibre ($155 \text{ gm}^{-2}/8 \text{ gm}^{-2}$) reinforced polymer modified bitumen sheet with a mineral granular finished upper surface and a thermofusible polythene film under surface, for use as a cap sheet.

Eshaflex 3000 Ceramic — a spunbonded polyester/glass-fibre ($155 \text{ gm}^{-2}/8 \text{ gm}^{-2}$) reinforced

polymer modified bitumen sheet with a ceramic granular finished upper surface and a thermofusible polythene film under surface, for use as a cap sheet

Eshaflex Super — a spunbonded polyester (180 gm^{-2}) reinforced polymer modified bitumen sheet with a sand-finished upper surface and a thermofusible polythene film under surface, for use as a base sheet or as a cap sheet with additional protection.

Eshaflex Super Mineral — a spunbonded polyester (180 gm^{-2}) reinforced polymer modified bitumen sheet with a mineral granular finished upper surface and a thermofusible polythene film under surface, for use as a cap sheet.

Vilflex 2000 Torch — a glass-fibre (60 gm^{-2}) reinforced polymer modified bitumen sheet with a sand-finished upper surface and a thermofusible polythene film under surface, for use as a base sheet.

1.2 Eshaflex 2000, 2000 Mineral and 2000 Ceramic are manufactured by saturating and coating 180 gm^{-2} spunbonded polyester reinforcement and Vilflex 2000 Torch by saturating and coating a 60 gm^{-2} glass fibre reinforcement with SBS modified bitumen.

1.3 Eshaflex 3000, 3000 Mineral and 3000 Ceramic are manufactured by saturating and coating ($155 \text{ gm}^{-2}/8 \text{ gm}^{-2}$) spunbonded polyester/glass reinforcement with SBS modified bitumen. Eshaflex Super and Eshaflex Super Mineral are manufactured by saturating and coating 180 gm^{-2} spunbonded polyester reinforcement with SBS modified bitumen. The surfaces are finished by application of thermofusible polythene film and/or sand, mineral or ceramic granules. The finished material is cut to length and ejected onto a cardboard tube.

1.4 The products are manufactured to the nominal dimensions listed in Table 1.

Table 1 Nominal dimensions

	Thickness (mm)	Roll width (m)	Roll length (m)	Roll weight (kg)	Weight per unit area (kgm ⁻²)
Eshaflex 2000					
Sand	3.6	1.0	7.5	30	4.0
Mineral	3.6 ⁽¹⁾	1.0	7.5	35	4.7
Ceramic	3.6 ⁽¹⁾	1.0	7.5	38	5.1
Eshaflex 3000					
Sand	3.4	1.0	7.5	31	4.1
Mineral	3.4 ⁽¹⁾	1.0	7.5	33	4.4
Ceramic	3.4 ⁽¹⁾	1.0	7.5	36	4.8
Eshaflex Super					
Super	5.2	1.0	5.0	28	5.5
Mineral	5.4 ⁽¹⁾	1.0	5.0	30	5.9

(1) Thickness on mineral surface.

1.5 Other products used with Eshaflex 2000 roof covering include:

Eshabase-Peral — a bituminised perforated glass fleece for use as a partial bonded underlay.

Esha Quick Primer — a bituminous primer for substructures.

Eshabase G — a bituminised glass fleece with a thermofusible polythene film and anti-tack undersurface.

Eshabase P and Eshabase PEVW — bituminised polyester reinforced membranes for use as sub-layers.

1.6 Quality control checks are carried out on the incoming materials, during manufacture and on the final product. Quality control on the final product includes checks on:

thickness

width

length

mass per unit area.

2 Delivery and site handling

2.1 The membranes are delivered to site in paper wrappings bearing the product identification and the BBA identification mark incorporating the number of this Certificate.

2.2 The rolls must be stored upright on the selvedge end, on a smooth, level surface and kept under cover.

Design Data

3 General

Eshaflex Roof Covering Systems (Torch-on) membranes are satisfactory for use as:

- a fully or partially bonded waterproofing system, as part of a built-up specification and where necessary in conjunction with appropriate roofing felts to BS 747 : 2000 on flat and pitched roofs, and
- a loose-laid, two-layer roof waterproofing system, ballasted with aggregate, on flat roofs with limited access, or under heavy protection (eg concrete tiles) on flat roofs with regular pedestrian traffic.

4 Properties in relation to fire



4.1 When tested in accordance with BS 476-3 : 1958 a system comprising 18 mm thick roofing grade plywood, one layer of Vilflex 2000 Torch underlay, fully bonded to the plywood by torching and one layer of Eshaflex 2000 Mineral cap sheet, fully bonded to the Vilflex 2000 MEC by torching, achieved an EXT.F.AA rating.



4.2 A roof is deemed to be designation AA when used for flat roofs with one of the surface finishes defined in the Building Regulations (and listed):

England and Wales

Approved Document B, Appendix A, Table A5, Part (iii)

Northern Ireland

Technical Booklet E, Part N, Table 4.6.

Surface finishes:

- 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.



4.3 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 A1

Scotland

test to conform with Standard D9.1

Northern Ireland

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

Installation

5 General

5.1 Installation of Eshaflex Roof Covering Systems (Torch-On) must be carried out by trained installers working in accordance with the relevant clauses of the manufacturer's instructions and BS 8000-4 : 1989 and BS 8217 : 1992.

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

5.3 At falls in excess of 5° (1:11), the normal precautions against slippage and the provision for mechanical fixings as required by BS 8217 : 1994, should be observed.

5.4 If the roof is likely to be subjected to uncontrolled pedestrian access, the substructure must meet the requirements of clause 8.3 of BS 8217 : 1994, and one of the surface finishes (1, 2 or 3) described in clauses 8.11 and 8.13 of the code must be used to prevent damage to the roof covering.

5.5 On completion of the roof, the sand-faced cap sheet should have a surface finish applied in accordance with BS 8217 : 1994, clauses 8.11 and 9.17. Surface finishes in the code of practice include:

- stone aggregate in dressing compound
- pre-cast concrete paving slates
- proprietary tiles on bonding compound.

5.6 The mineral and ceramic-faced cap sheets require no additional surface protection.

Application

Loose-laid applications — flat roof

6.1 A separating layer of a paper underlay should be loose-laid over the substructure with loose overlaps of 60 mm minimum.

6.2 A layer of Vilflex 2000 Torch base sheet is then laid with torch-welded overlaps of 100 mm.

6.3 A layer of Eshaflex membrane is then fully torch welded directly to the base sheet with overlaps of 60 mm minimum. The overlaps should be offset at least 100 mm with respect to those of the base sheet.

6.4 A minimum 50 mm depth of aggregate is loaded onto the roof covering. Where roofs are likely to be subjected to uncontrolled pedestrian traffic, however, a concrete tile finish should be used.

Partially bonded applications — flat and pitched roofs

6.5 A layer of bituminised perforated glass fleece should be loose-laid with the anti-adhesive covering facing down, edge to edge, over the substructure.

6.6 A top layer of Eshaflex ceramic or mineral membrane is then fully torch welded directly onto the base layer. Ensure that the bitumen seeps regularly into the perforations. Joints are offset by a minimum of 60 mm. Edge laps of at least 60 mm and end laps of at least 100 mm are required.

6.7 On nailable substructures a layer of Eshaflex membrane is fastened mechanically to the substrate (usually simultaneously with the insulation), using the relevant clauses of BS 8217 : 1994. A top layer of Eshaflex mineral or ceramic membrane is then fully torch welded to the base layer with overlaps of 60 mm minimum.

Fully bonded specification — flat and pitched roofs

6.8 A first layer of Vilflex 2000 Torch should be fully bonded to the substructure with overlaps of 60 mm minimum.

6.9 A top layer of Eshaflex ceramic or mineral membrane is then fully bonded to the first layer, with an offset 60 mm minimum overlapping.

Technical Investigations

The following is a summary of the technical investigations carried out on the Eshaflex Roof Covering Systems (Torch-on).

7 Tests

Results of tests carried out by Kiwa NV which show typical properties for the material are summarised in Tables 2 to 5.

Table 2 Characteristics of reinforcements

Test (units)	Method ⁽¹⁾	Mean results	
		Polyester	Glass fibre
Mass per unit area (gm ⁻²)		182	62
Tensile strength (N per 50 mm)	MOAT 31 : 6C		
longitudinal		675	295
transverse		475	235
Elongation (%)	MOAT 31 : 6C		
longitudinal		35	1.5
transverse		23	1.5

(1) The test document is detailed in the *Bibliography*. Numbers in the table refer to sections of the document.

Table 3 Characteristics of coating mass

Test (units)	Method ⁽¹⁾	Mean result
Fines content (%)	MOAT 31 : 6F	11
Softening point (°C) (ring and ball)	MOAT 31 : 6G	
unaged		120
heat aged ⁽²⁾		89
heat aged ⁽³⁾		112
Low temperature flexibility (°C)	MOAT 31 : 6D	
unaged		-20
heat aged ⁽²⁾		0
heat aged ⁽³⁾		-5
Elastic recovery (%)	MOAT 31 : 6H	
unaged		200
heat aged ⁽²⁾		<25
heat aged ⁽³⁾		25

(1) The test document is detailed in the *Bibliography*. Numbers in the table refer to sections of the document.

(2) Heat aged 180 days at 70°C.

(3) Heat aged 56 days at 80°C.

Table 4 Finished product — physical properties

Test (units)	Method ⁽¹⁾	Mean results	
		Eshaflex 2000 Mineral	Vilflex 2000 Torch
Tensile strength (N per 50 mm)	MOAT 31 : 6C		
longitudinal		835	415
transverse		635	390
Elongation (%)	MOAT 31 : 6C		
longitudinal		55	3.4
transverse		69	3.4
Slip resistance	MOAT 27 : 5.1.7	pass	—
Tearing strength (N)	MOAT 27 : 5.4.1		
longitudinal		380	140
transverse		330	120
Low temperature flexibility (°C)	MOAT 31 : 6D	-20	-20
Unrolling at low temperature	MOAT 27 : 5.4.3	pass	—
Heat resistance (°C)	MOAT 31 : 6E		
unaged		110	120
heat aged ⁽²⁾		80	—
Dimensional stability (%) (free shrinkage)	MOAT 27 : 5.1.6.1		
longitudinal		0.35	—
transverse		+0.20	—

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections of the various documents.

(2) Heat aged 180 days at 70°C.

— Indicates not tested.

Table 5 Service performance

Test (units)	Method ⁽¹⁾	Mean result Eshaflex 2000 Mineral
Fatigue strength	MOAT 27 : 5.1.8	pass
Static indentation concrete substrate	MOAT 27 : 5.1.9	L ₄
PS-25 substrate		L ₄
Dynamic indentation concrete substrate	MOAT 27 : 5.1.10	I ₃
Perlite substrate		I ₃
PS-25 substrate		I ₃
Resistance to wind uplift (kPa) System ⁽²⁾	MOAT 27 : 5.1.2.1	>8
Resistance to thermal shock (kPa) System	MOAT 27 : 5.1.5	>8
Resistance to water pressure	MOAT 27 : 5.1.4.1	pass
Integrity of joints	MOAT 27 : 5.2.1	pass
Tensile strength of joints (N per 50 mm)	MOAT 27 : 5.2.2	710

(1) The test document is detailed in the *Bibliography*. Numbers in the table refer to sections of the various documents.

(2) Chipboard/Vilflex 2000 Torch/Eshaflex 2000 Mineral.

8 Investigations

8.1 Data in the Kiwa Agrément No K1111 95/02 and BDA Intron Agrément CTG-422/1 were evaluated in the context of UK roofing practice and building regulations.

8.2 UK data on the fire performance of the product were examined.

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

Bibliography

BS 476-3 : 1958 *Fire tests on building materials and structures — External fire exposure roof test*

BS 747 : 2000 *Reinforced bitumen sheets for roofing — Specification*

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

BS 8217 : 1994 *Code of practice for built-up felt roofing (supersedes CP 144 : Part 3)*

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

MOAT No 31 : 1984 *Special Directives for the Assessment of Reinforced Homogeneous Waterproof Coverings of Styrene-Butadiene-Styrene (SBS) Elastomer Bitumen*



On behalf of the British Board of Agrément

P. Q. Newson

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Chief Executive

*Original Detail Sheet issued 14th November 1989. This revised version issued to include change of product name, reference to the revised national Building Regulations and Standards.